TRANSPORTATION

ACTIVE TRANSPORTATION

WATER / WASTEWATER

HOUGHTON | MIDDLETON | SOUTH WALSINGHAM | LONG POINT | NORTH WALSINGHAM | WINDHAM | WOODHOUSE | TOWNSEND | CHARLOTTEVILLE

# Norfolk County
# Integrated Sustainable Master Plan (ISMP)

Final Report - September 2016

MMM GROUP | R.V. Anderson Associates Limited engineering · environment · infrastructure | XCG Environmental Engineers & Scientists

# EXECUTIVE SUMMARY

The *Norfolk County Integrated Sustainable Master Plan (September 2016)*, or ISMP, is a new and comprehensive Master Plan which addresses the long-term planning and visioning for water, wastewater, transportation and active transportation infrastructure needs County-wide. The intent of the ISMP is to identify individual water, wastewater, transportation and active transportation infrastructure improvements, and opportunities to strategically integrate those improvements in order to minimize impacts and costs.

The ISMP was completed consistent with the environmental planning process for Master Plans under the *Municipal Class Environmental Assessment (Municipal Engineers Association, October 2000, as amended in 2011 and 2015)*. The project involved significant stakeholder consultation which helped to inform the development of the ISMP recommendations.

## Plan Development

A collection of short, medium and long-term water, wastewater, transportation and active transportation infrastructure recommendations have been proposed, based on a planning horizon year of 2041.

**Section 4.0** outlines the Water / Wastewater Strategy. Existing conditions, future conditions and the implementation of preferred water and wastewater solutions are reviewed. The analysis focused on water servicing and wastewater collection and treatment. Stormwater recommendations are also reviewed and are presented in **Section 4.0**.

**Section 5.0** outlines the Transportation Strategy. Existing conditions, the future vision for the County and a proposed plan for implementation of the proposed improvements and policies are reviewed. Principles and guidelines to maintain and develop existing and future transportation infrastructure are set out.

**Section 6.0** outlines the Active Transportation Strategy. The network development process, strategic actions, recommendations, policies and guidelines, and proposed implementation and costs are reviewed.

## Implementation and Financing

The water, wastewater, transportation and active transportation infrastructure recommendations are summarized in **Section 7.0**, and include both location-specific infrastructure improvements and general infrastructure / policy initiatives. The recommendations have been integrated, where possible, in order to minimize impacts and costs during implementation and to help Norfolk County to prioritize projects and implement them in an integrated fashion. Financing options are reviewed in **Section 8.0**.

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# GLOSSARY

| | |
|---|---|
| AADT | Annual Average Daily Traffic |
| ADT | Average Daily Traffic |
| AODA | Accessibility for Ontarians with Disabilities Act |
| AT | Active Transportation |
| $cBOD_5$ | Carbonaceous Biological Oxygen Demand |
| BMP | Biosolids Master Plan |
| CEAA | Canadian Environmental Assessment Act |
| CofA | Certificate of Approval |
| CFU | Colony Forming Unit |
| DFO | Fisheries and Oceans Canada |
| DWWP | Drinking Water Works Permit |
| EA | Environmental Assessment |
| ECA | Environmental Compliance Approval |
| EPA | Environmental Protection Act |
| FUS | Fire Underwriters Survey |
| GIS | Geographic Information System |
| GPL | General Purpose Lanes |
| HVAC | Heating Ventilating & Air Conditioning |
| INLOADS | Intrinsic Loads from Additional Sources |
| ISMP | Integrated Sustainable Master Plan |
| L | Litre |
| LID | Low Impact Development |
| LOS | Level of Service |
| Lpcd | Litres per capita per day |
| MCC | Motor Control Centre |
| MCEA | *Municipal Class Environmental Assessment* |
| Mg | milligrams |
| MMS | Minimum Maintenance Standards |
| MNRF | Ontario Ministry of Natural Resources and Forestry |
| MOECC | Ontario Ministry of the Environment and Climate Change |
| MTO | Ontario Ministry of Transportation |
| NFPA | National Fire Protection Association |
| OP | Official Plan |
| OPP | Ontario Provincial Police |

| | |
|---|---|
| OTM | Ontario Traffic Manual |
| OWRA | Ontario Water Resources Act |
| PPS | *Provincial Policy Statement* |
| PS | Pumping Station |
| PTFE | Polytetrafluoroethylene |
| PTTW | Permit To Take Water |
| RFP | Request for Proposal |
| SADT | Summer Average Daily Volume |
| SAGR™ | Submerged Attached Growth Reactor |
| SSET | Sanitary Sewer Equalization Tank |
| SWM | Stormwater Management |
| TCT | Trans Canada Trail |
| TDH | Total Dynamic Head |
| TP | Total Phosphorus |
| TSS | Total Suspended Solids |
| TSSA | Technical Standards & Safety Authority |
| TWL | Top Water Level |
| UV | Ultraviolet |
| VHT | Vehicle Hours Travelled |
| VKT | Vehicle Kilometers Travelled |
| WTP | Water Treatment Plant |
| WWTF | Wastewater Treatment Facility |
| WWTP | Wastewater Treatment Plant |

# 1.0 INTRODUCTION

## 1.1 Study Overview

As a largely rural, single-tier municipality restructured in 2001 to encompass a number of smaller communities, Norfolk County has sought to address long-term planning and visioning for essential community services. In order to accomplish this, the County initiated an Integrated Sustainable Master Plan (ISMP) study – a comprehensive, County-wide study which considered individual water, wastewater, active transportation and transportation infrastructure needs, as well as their inter-relationships and financial sustainability.

The ISMP study has been completed consistent with the process for Phases 1 and 2 of Master Plans under the *Municipal Class Environmental Assessment* (Class EA) (*Municipal Engineers Association, October 2000, as amended in 2011 and 2015*). This Master Plan is intended to fulfill the Class EA requirements for Schedule A and A+ Projects that are identified and to outline additional work that will be required for any identified Schedule B and C Projects.

The objectives of the ISMP were as follows:

- Review existing information on water and wastewater, transportation and active transportation and identify opportunities and challenges.
- Develop recommendations for water and wastewater to ensure that deficiencies, limitations and vulnerabilities will be addressed as the County population grows and water demands increase. Develop design criteria and guidelines for water distribution and wastewater collection, and assess options for sustainable water supply and wastewater treatment.
- Develop a long term plan and recommendations for the safe and effective management of stormwater runoff from the County's urban areas.
- Develop a transportation network which identifies the required links for the efficient movement of goods and people, and prepare processes and guidelines to assist with the maintenance and operations of the County road network. Identify short, medium and long-term transportation network improvements necessary to support the continued growth of the County.
- Develop a County-wide active transportation (walking and cycling) network of both on- and off-road facilities, and establish supportive policies and processes to help with the planning, design and development of these facilities. Build on

the 2009 Trails Master Plan and identify missing links and gaps in the overall active transportation system as well as complementary amenities.

- Provide safe and comfortable active transportation facilities both for residents' day-to-day activities and for visitors when they visit the County and explore local opportunities. Develop strategies to increase awareness about active transportation options in the County and identify short, medium and long-term priorities for implementation of active transportation projects, including potential pilot projects for immediate consideration.
- Consult with internal Norfolk County staff, public representatives, and political / agency stakeholders to identify concerns and provide opportunities for input.
- Create an implementation plan which integrates the proposed water and wastewater, transportation, and active transportation infrastructure improvements and recommendations.

The ISMP study was led by MMM Group, in consultation with the Norfolk County Engineering Section, R.V. Anderson Associates Limited and XCG Consultants Ltd. A broader compliment of County staff also provided input into the study including the:

- Community Services Department
    - Parks, Facilities and Recreation
    - County Manager's Office
- Development and Cultural Services Department
    - Community Planning Services
    - Tourism and Economic Development
    - Heritage and Culture Division
- Health and Social Services Department
    - Haldimand-Norfolk Health Unit
- Public Works and Environmental Services Department
    - Roads
    - Environmental Services
    - Engineering

## 1.2 Overview of the Planning Process

### 1.2.1 Municipal Class Environmental Assessment Process

Under the provisions of the *Ontario Environmental Assessment* (EA) *Act,* certain types of provincial and municipal undertakings can meet the requirements of the EA Act through use of an approved environmental planning process referred to as a Class EA.

The Class EA process provides a self-assessing procedure by which a group or "class" of undertakings can be planned and implemented in a way that fulfills the requirements of the EA Act without proponents having to prepare an individual EA for approval. In other words, these undertakings do not require formal submission to the Ontario Ministry of the Environment and Climate Change for approval. Upon completion of the appropriate process, the undertaking is considered approved. The *Municipal Class Environmental Assessment (Municipal Engineers Association,* October 2000, as amended in 2011 and 2015) document outlines such a process for a class of municipal projects.

The Class EA Process for municipal projects is shown in **Figure 1-1** and includes:

- **Phase 1** – Identify the problem or opportunity;
- **Phase 2** – Identify and evaluate alternative solutions to establish the preferred solution;
- **Phase 3** – Examine alternative methods of implementing the preferred solution;
- **Phase 4** – Prepare and file an Environmental Study Report; and
- **Phase 5** – Proceed to detailed design, construction and operation.

The Class EA recognizes that certain undertakings require different degrees of assessment depending on their environmental effects and defines five schedules of undertakings:

- Schedule A undertakings are considered to be minor in scale and have minimal adverse environmental effects. These undertakings are considered approved without the need for any further assessment and may proceed directly to Phase 5 of the Class EA process.
- Schedule A+ undertakings are considered to be minor in scale and have minimal adverse environmental effects. These undertakings are considered approved without the need for any further assessment and may proceed directly to Phase 5 of the Class EA process. Schedule A+ undertakings require the public to be notified prior to project implementation.

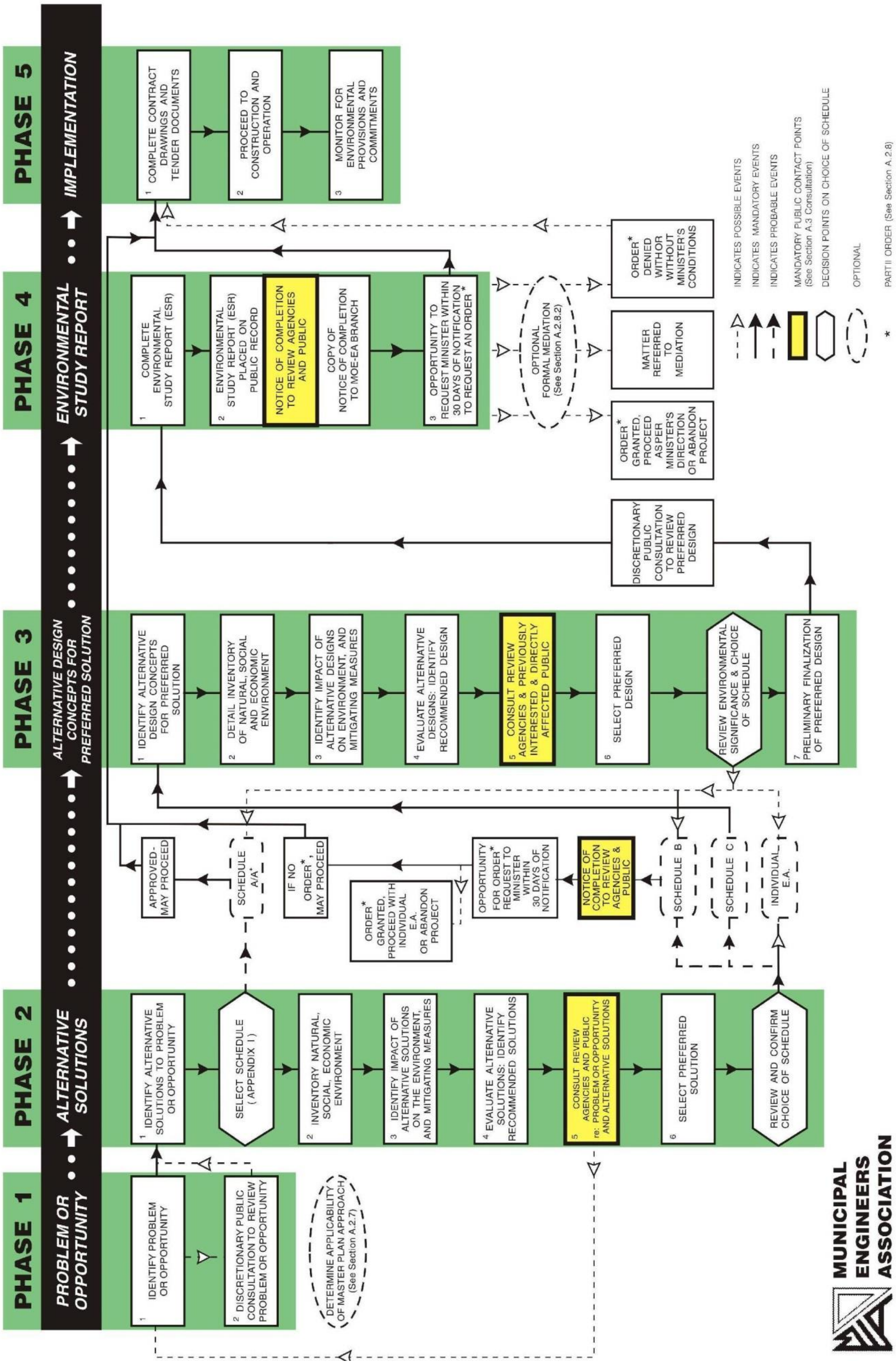
- Schedule B undertakings are those with some potential for adverse environmental effects. However, existing guidelines, approved policies and other provincial legislation regulate the majority of these effects. These undertakings require the completion of Phases 1 and 2 of the Class EA process. Schedule B projects require the filing of a project file for public review.
- Schedule C undertakings are those undertakings with potential for greater adverse environmental effects and must follow the planning and consultation process outlined in the Class EA (Phase 1 to 4). The documentation of these processes is presented in an Environmental Study Report for public review.

The Municipal Class EA process includes an appeal provision to change the status of an individual project from being subject to the Municipal Class EA process to being subject to an Individual EA as per Part II of the *EA Act*, referred to as a Part II Order. A Part II Order requires the submission of a formal document (as required by Section 6(1) of the *EA Act*) to the Ministry of the Environment and Climate Change for government review and approval.

If concerns regarding a project cannot be resolved in discussions with the proponent (for this study, the proponent is Norfolk County), then members of the public, interest groups or technical agencies may submit a Part II Order request to the Minister of the Environment and Climate Change. The Minister of the Environment and Climate Change then decides whether a Part II Order is appropriate or necessary. Requests for an order to comply with Part II of the EA Act would be possible only for those projects identified within the Master Plan that are subject to the Municipal Class EA (i.e., Schedule B and/or Schedule C projects), and not the Master Plan itself.

If no Part II Order requests are outstanding by the completion of the review period, the project is considered to have met the requirements of the Class EA and the proponent may proceed to project implementation notwithstanding any further EA requirements for identified Schedule B and C undertakings.

Figure 1-1 – Municipal Class EA Process



### 1.2.2 Municipal Class Environmental Assessment, Master Plan Process

The Master Plan process allows for the development of long-range plans which integrate the infrastructure requirements for existing and future land use with environmental assessment planning principles including the public and agency consultation. The ISMP followed the *Municipal Class Environmental Assessment (Municipal Engineers Association* [MEA], October 2000, as amended in 2011 and 2015), or *MEA Class EA,* Master Plan process, Approach #1. This approach involves preparing a Master Plan document upon completion of Phases 1 and 2 of the Municipal Class EA process. The Master Plan was completed at a broad level of assessment, thereby requiring more detailed investigations at the project-specific level in order to fulfil the Municipal Class EA documentation requirements for any Schedule B and C projects identified. The Master Plan is then considered to be the basis for, and is to be used in support of, future investigations for the specific Schedule B and C projects identified within it.

Upon completion of the ISMP, the Master Plan Report is adopted by County Council, filed and made available for public review. Requests for a Part II Order are limited to specific projects identified in the Master Plan (Schedule B or C only), and not the Master Plan itself.

Once approved, the lifespan of a Municipal Class EA Master Plan is 10 years from its completion date; however, the *MEA Class EA* (October 2000, as amended in 2011 and 2015) recommends that every five years an informal review be undertaken to determine the need for a detailed formal review and/or updating. In addition, the ISMP project implementation schedule will be reviewed annually both to confirm project priorities and to verify EA Schedules for projects approaching implementation.

## 1.3 Elements of the Integrated Sustainable Master Plan

The intent of this ISMP is to identify individual water and wastewater, transportation, and active transportation infrastructure improvements, and opportunities to strategically integrate those improvements in order to minimize impacts and costs. This Master Plan has been organized to address the requirements of the *MEA Class EA* for Master Plans:

- **Section 2** identifies the Study Area, and Problem and Opportunity statement;
- **Section 3** discusses the consultation objectives and public, stakeholder and agency activities undertaken for this Master Plan;

- **Section 4** discusses the existing and projected future conditions related to water and wastewater and the implementation of individual water and wastewater capital projects, as well as stormwater management;
- **Section 5** discusses the existing and projected future conditions related to transportation and the implementation of individual transportation capital projects;
- **Section 6** discusses the active transportation strategy, how it was developed, and how to implement the proposed active transportation network;
- **Section 7** summarizes the recommendations from Sections 4, 5, and 6, and identifies next steps for project implementation, including elements requiring further environmental assessment review and opportunities to integrate the individual projects; and,
- **Section 8** summarizes the recommendations from Sections 4, 5, and 6, and identifies next steps for project implementation, including elements requiring further environmental assessment review and opportunities to integrate the individual projects; and,
- **Section 9** discusses the process to amend / review the Master Plan.

The ISMP utilized the Population Projection Study (2014) prepared by Hemson Consulting for Norfolk County as the basis for long-term forecasts of population, housing and employment within Norfolk County. The forecast includes 2011 base year and 2031 and 2041 planning horizons. Integration of these projections is consistent with direction provided by Norfolk County Council to incorporate these projections into master planning projects that require population, housing and employment data.

# 2.0 PLANNING CONTEXT AND OPPORTUNITY STATEMENT

## 2.1 Study Area

The ISMP study area is defined by Norfolk County's municipal limits. The study area is depicted in **Figure 2-1**.

## 2.2 Problem and Opportunity Statement

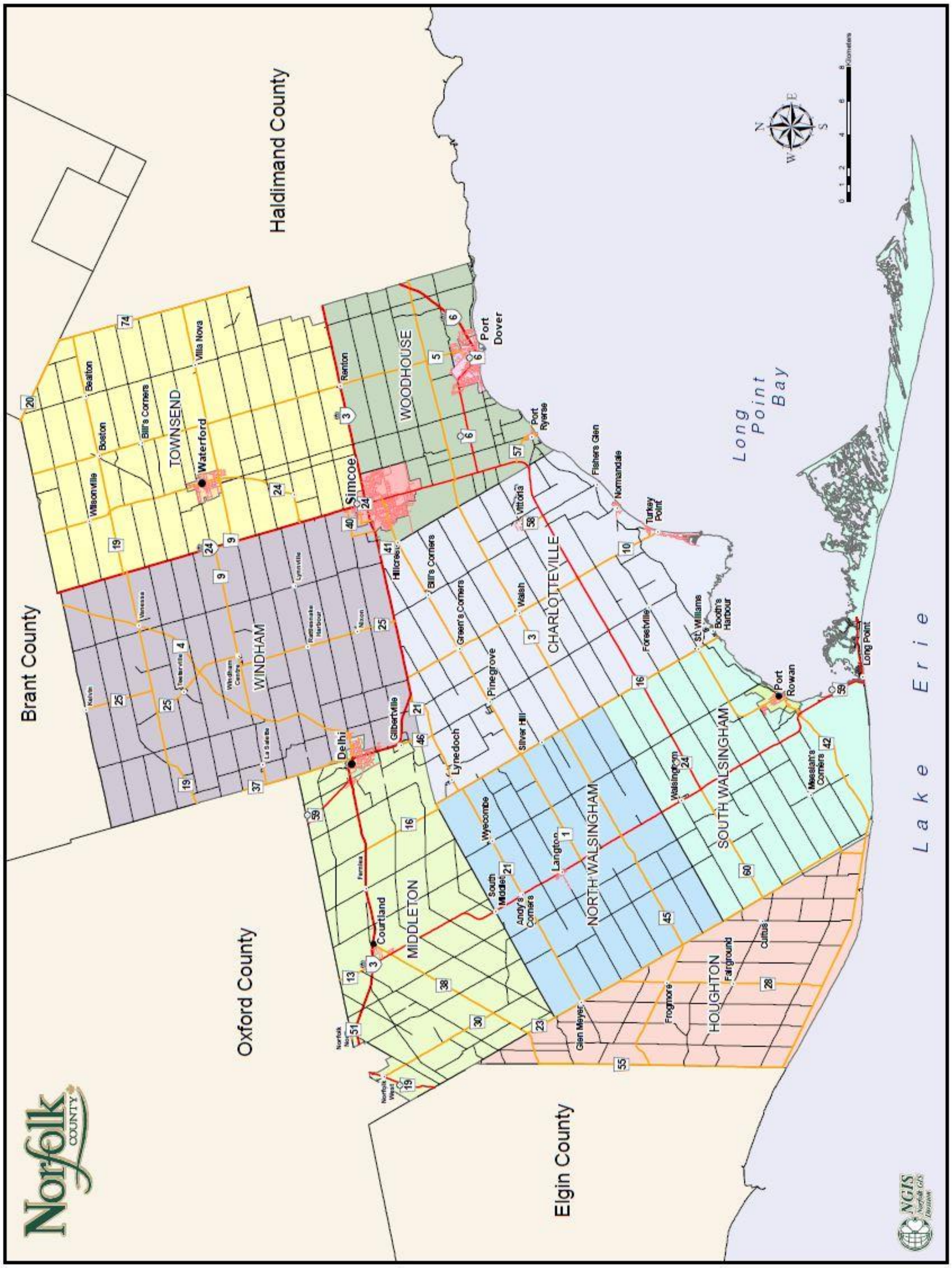
In order to address the need to be consistent with Phase 1 of the *MEA Class EA* (October 2000, as amended in 2011 and 2015), a problem / opportunity statement was developed to provide direction towards which the ISMP should be prepared. An overall problem / opportunity statement was developed by the Project Team, as well as problem / opportunity statements for each of the water and wastewater, transportation, and active transportation elements. The overall problem / opportunity statement that was presented at the first Public Information Centre was as follows:

> **"This study will propose a collection of active transportation, transportation, and water / wastewater municipal infrastructure improvements that will function as a tool for Norfolk County to prioritize projects and implement them in an integrated fashion, based on a planning horizon year of 2041 and supported by appropriate policies and procedures.**
>
> **The study will identify individual infrastructure needs for the above-noted elements, and will develop solutions that address these needs as well as their inter-relationships and financial sustainability, on a short, medium, and long-term basis."**

As such, the objectives of this study are to:

- Review existing information to establish the policy context for the Master Plan and identify opportunities and constraints County-wide;
- Assess options for the provision of a sustainable water supply and environmentally responsible wastewater treatment;
- Develop criteria and guidelines for the expansion of the existing water distribution and wastewater collection systems;
- Develop a transportation travel demand model to identify potential transportation improvements and preferred solutions;
- Develop an active transportation network and associated design guidelines, programs, and initiatives; and
- Develop a Master Plan which integrates the key elements from the water and wastewater, transportation, and active transportation reports.

Figure 2-1 – Study Area




NORFOLK INTEGRATED SUSTAINALE MASTER PLAN

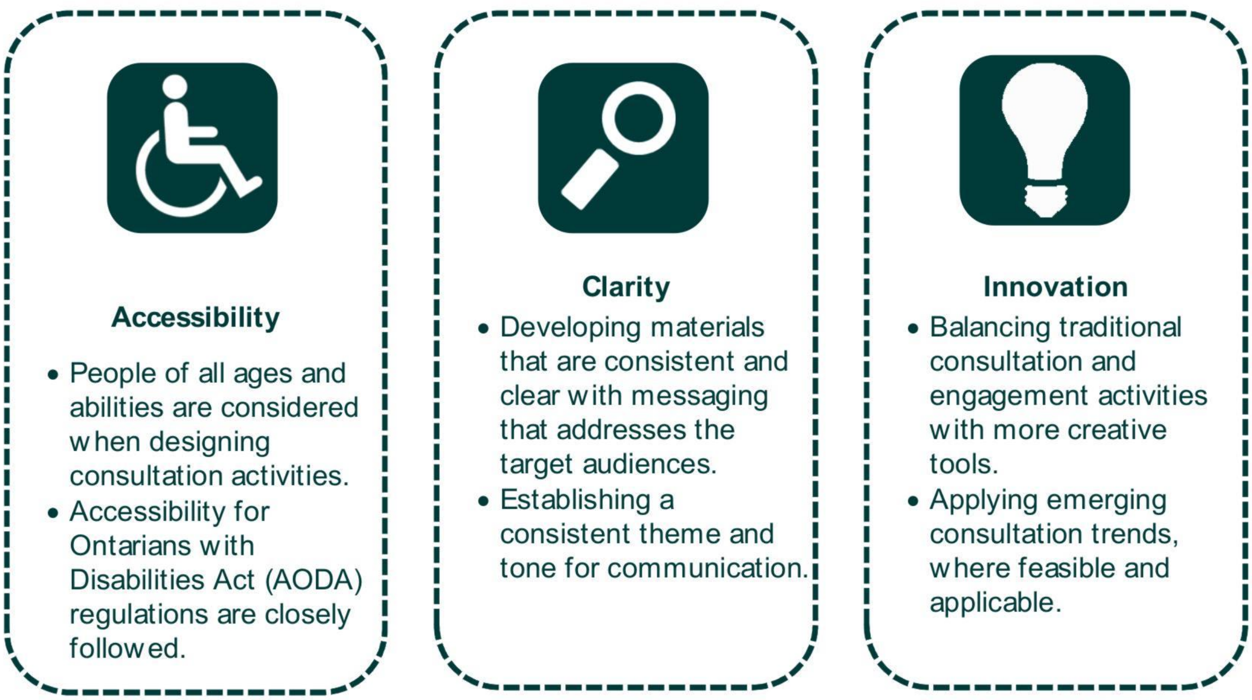
# 3.0 CONSULTATION

When developing a long-term master plan that is intended to set-out future infrastructure policies, processes and improvements, it is important to understand the wants and needs of those it will impact. Establishing an integrated master plan that will be used to shape the future of transportation, active transportation and water / waste water in Norfolk County required significant involvement by staff members involved in day to day decision making.

As noted in the Municipal Class EA process, the County is required to undertake two mandatory contact points to inform, engage and consult with public representatives. As such, public, stakeholder and staff engagement was a key component and consideration when developing the ISMP.

The consultation and engagement program was founded on three key principles which were developed per the policies and practices at the County and provincial level – see **Figure 3-1**.

**Figure 3-1 – Consultation and Engagement Principles**



## 3.1 What are the objectives?

Building upon the Municipal Class EA requirements as well as the engagement principles noted in **Figure 3-1**, the consultant team worked with Norfolk County staff to identify a consultation and engagement strategy that focused on the primary objective of integration. The consultation and engagement techniques that were undertaken were identified because of their ability to help achieve three key integration objectives: internal, public and political. The objectives are described in further detail in **Figure 3-2**.

**Figure 3-2 – Consultation and Communication Objectives**

| Internal | Public | Political |
|---|---|---|
| Engage in ongoing communication and consultation with County staff, the consulting team, Official Plan Project Team members, Steering Committee members and Technical Review Committee members. | Provide engagement and consultation opportunities that involve members of the public at key stages as well as ongoing promotion, outreach and education of specific community groups. | Establish opportunities for Council and local interest groups / stakeholders to become involved in day to day decision making about the future of the County. |

Defining consultation objectives early in the study process helped to efficiently shape the different consultation and engagement techniques that were used to gather input.

## 3.2 Who did we consult with?

Defining the different target audiences and their interests and concerns was one of the initial steps in the development of the consultation strategy. Actively engaging and partnering with staff, political representatives, members of the public and stakeholders is an effective approach to developing successful solutions to the key issues. It can also build local support, expertise and knowledge. Consultation and outreach should be meaningful for both the Project Team members as well as those who are participating.

For the Norfolk ISMP, the Project Team identified three key groups to engage. The three groups are illustrated in **Figure 3-3**.

At the beginning of the study, the Project Team prepared a study contact list that was updated and tracked as the study progressed. At key points, where consultation activities were confirmed and promoted or relevant information was available to review, the Project Team contacted each of these representatives. A full list of the key stakeholders engaged is provided in **Appendix A**.

**Figure 3-3 – Overview of Groups Engaged**

**Internal Staff**
Representatives from the County including staff from various departments that would be involved in day-to-day decision making regarding the ISMP implementation

**Public Representatives**
Public representatives from the County and its community areas that have an interest in the implementation of the ISMP, but do not directly impact implementation decisions.

**Political / Agency Stakeholders**
Agencies and ministries that have a political stake in the implementation of the ISMP. Some may be responsible for providing key technical input as the ISMP is implemented.

## 3.3 What was the process?

Consultation and engagement activities were undertaken between April and December 2015. For each of the stages of the project, the Project Team aimed to engage in activities that satisfied the three objectives noted in **Figure 3-3**.

**Figure 3-4** provides an overview of the different consultation activities undertaken based on the objectives and project stages.

**Figure 3-4 – Overview of Consultation Timeline**

| Timeline | Informal | Formal | Ongoing |
|---|---|---|---|
| April – June 2015 | ▶ Notice of Study Commencement & PIC #1<br>▶ Stakeholder Outreach Letters<br>▶ First Nations & Metis Letters | ▶ Stakeholder Focus Group Sessions<br>▶ Technical Review Committee (TRC) Meeting #1<br>▶ Public Information Centre #1<br>▶ Online Questionnaire | ▶ Project Webpage<br>▶ Promotion & Outreach |
| August – October 2015 | ▶ Notice of PIC #2<br>▶ Stakeholder Outreach Letters<br>▶ First Nations & Metis Letters | ▶ TRC Meeting #2<br>▶ Public Information Centre #2<br>▶ Stakeholder Focus Group Sessions | ▶ Above continued. |
| November 2015 – Summer 2016 | ▶ Notice of Study Completion<br>▶ Stakeholder Outreach Letters<br>▶ First Nations & Metis Letters | ▶ Council Information Session<br>▶ TRC Meeting #3 | ▶ Above continued. |

## 3.4 What did we hear?

The feedback that was received from the public, local agencies, stakeholders and staff was used to inform the development of the content of the ISMP including draft improvements, recommendations, strategies and tools. A detailed summary of the input received as a result of each of the consultation and engagement techniques is provided in **Appendix A**. Over the course of the project, the Project Team engaged and consulted more than 100 people using a number of different tools and techniques. The following sections provide some additional detail on the two formal points of consultation that occurred during the study, the Public Information Centres and additional meetings with staff and stakeholders.

The two rounds of Public Information Centres were formatted as informal drop-in sessions with multiple booths – one for each of the different areas of focus. Members of the Project Team were available to answer questions and to discuss any details of the plans with those in attendance. The goal was to identify high traffic community locations where there was a higher likelihood of people who may not have heard of the study to maximize exposure.

It is important to note that though the online questionnaire was intended to gather input from a wider range of public representatives, the in-person consultation proved to be the more successful method of engagement as there were fewer than 10 responses to the survey. Due to the low number of responses, the Project Team did not summarize the results. Should there be interest in reviewing the results that were submitted they can be provided if a formal request is made to the County.

### 3.4.1 Public Information Centre #1

The first Public Information Centre was held at two locations – Talbot Gardens (on Tuesday June 9th, 2015) and Langton Community Centre (on Thursday June 11th, 2015). Both sessions were held between 4:00 p.m. and 8:00 p.m. The majority of the comments received pertained to active transportation with some comments submitted for the transportation and water / wastewater components. There was significant interest in improving sidewalk and trail connectivity – specifically to accommodate youth, seniors and those with mobility limitations within the major communities. There were some comments received regarding the level of congestion of major roadways and discussion around the logistics of water / wastewater coordination. A total of 10 people attended.

### 3.4.2 Public Information Centre #2

Due to the limited turn-out at the first round of Public Information Centres, the Project Team selected a more centralized location for the second Public Information Centre. There were a total of two sessions held at the Simcoe Farmers' Market on Thursday October 1st and Thursday October 15th, 2015. Because of the high volume of people at the market the Project Team was able to interact and discuss the project with a number of members of the public. Comments were submitted on servicing and cost for water improvements, roadway improvements as well as increased opportunities for active transportation and the design of walking and cycling facilities. The Project Team spoke with approximately 50 people.

### 3.4.3 Technical Review Committee Meetings

Three Technical Review Committee meetings were held over the course of the project. The Technical Review Committee was made up of staff from the County from all departments. The meetings were held following the submission of key study deliverables. At each of the meetings key technical issues, opportunities or concerns were discussed and solutions were identified which were investigated further. The comments were documented and each addressed. The Technical Review Committee meetings allowed the team to better understand the opinions and interests of staff and confirm the preferred approach.

### 3.4.4 Pathways for People Workshops

Pathways for People was one of the key stakeholder groups that were engaged over the course of the project. With their help, the Project Team was able to identify active transportation routes, connections and facilities that support local opportunities, interests and preferences as well as strategic objectives. There were a total of three meetings held with Pathways for People. At each meeting maps were provided of the different stages of the active transportation network development process. Comments were gathered by marking up the maps and the group discussed how to improve active transportation County-wide.

## 3.5 How was the input used?

Consistent with the Municipal Class EA requirements, consultation was held at two points in the study process to review the problem / opportunity statement and to identify and assess the alternative solutions proposed. Public Information Centres were the primary method of gathering input on these two items and the interactive display materials noted above were the primary tool used to do so.

The input and information gathered at the first Public Information Centre, two Technical Review Committee meetings and the first meeting with Pathways for People was reviewed by the Project Team and used to refine the problem / opportunity statement. For each technical component of the Master Plan questions were asked which directly related to the next steps of the project. The responses helped to inform the development of:

- A transportation specific vision and the identification of transportation opportunities and challenges;
- The criteria used to identify and select preferred active transportation routes and potential active transportation routes which required additional investigation; and

- A water / wastewater specific vision and key opportunities and challenges for consideration by the team.

The input gathered at the second Public Information Centre, final two meetings with Pathways for People and the remaining Technical Review Committee meetings focused on the assessment of proposed alternative solutions, the selection of preferred solutions and ultimately the development of the Master Plan report.

Comments provided by staff were directly addressed and incorporated into the project deliverables. Comments provided by stakeholders and the public were reviewed and compared to the project / study objectives and overall vision for each strategy to determine their applicability.

The intent of the ISMP is to plan, design and strategically implement infrastructure improvements County-wide. By consulting with key groups, members of the public, and staff throughout the project, the Project Team was able to identify key concerns and opportunities and either address them or integrate them into the final results and recommendations making the outcome a made-in-Norfolk solution.

# 4.0 WATER / WASTEWATER STRATEGY

## 4.1 Introduction

The following section of the ISMP relates to Water, Wastewater and Stormwater Services in the County.

The Water and Wastewater strategy was developed with a vision to:

1. Assess the condition of the existing water and wastewater services in the County with regards to:
   - Capacity of the existing systems to fulfil the current and future (2041) water supply, storage and servicing needs of the County;
   - Compliance of the existing facilities with the applicable regulatory and safety codes; and,
   - Gaps between the existing conditions, and current and future servicing needs related to capacity and regulatory requirements.
2. Develop a planning road-map to upgrade the water and wastewater services that:
   - Enables the existing systems to provide servicing that is effective and reliable for the current servicing needs;
   - Brings all systems in compliance with the currently applicable regulatory and safety requirements; and,
   - Provides long-term, environmentally, socially and economically sustainable solutions for the future servicing needs.

The Water / Wastewater Strategy has been divided into the following three (3) components:

a. Water Supply Treatment, Storage and Distribution

This section deals with all three (3) aspects of water servicing, includin g treatment, storage and distribution in the County.

b. Wastewater Collection

This section addresses the collection component of the wastewater system s and includes sewers, combined sewage issues and pumping stations.

c. Wastewater Treatment

This section addresses the treatment component of wastewater servicing an d focuses on the five (5) wastewater treatment facilities in the County.

Each of the above three components are expanded upon in three (3) sub-sections including:

i. **Existing Conditions**

This sub-section provides a description of the existing systems with regard to their capacities, and servicing and regulatory discrepancies under current conditions.

ii. **Future Conditions**

Servicing needs for the planning period are projected and summarized under this sub-section. Based on the future servicing needs this sub-section also identifies the servicing gaps between the existing conditions, and current and future servicing needs with regards to capacity and regulatory requirements.

iii. **Implementation**

This sub-section covers the identification of alternative solutions and selection of preferred solutions to address the gaps identified. The sub-section also provides budget and schedule planning for the capital and maintenance projects over the planning period.

Stormwater resources and recommendations are reviewed in **Section 4.5**.

## 4.2 Water Treatment, Storage and Distribution

### 4.2.1 Existing Conditions

Port Rowan and Port Dover each currently have one surface water intake and one water treatment plant. A small, older surface water treatment plant in Delhi also provides limited supply to Delhi, which is mostly serviced by ground water. Simcoe and Waterford have multiple groundwater wells as their source. Courtland is supplied via a transmission main from Delhi. St. Williams is supplied via a transmission main from Port Rowan.

The County's current Official Plan (updated in 2011) states that:

> *"Municipal water systems exist in all six of the Urban Areas. The County intends to improve and extend municipal water services throughout the Urban Areas….The County will ensure that a cost-effective and adequate system of water supply and sewage treatment is provided to support, enhance and sustain existing and future residents and businesses in the County."*

The objective of the water supply section of the report was to evaluate the existing systems, and recommend alternatives that meet the regulations and guidelines of the Ministry of the Environment and Climate Change (MOECC), at an affordable price.

### *Governing Regulations, Procedures and Guidelines*

The design and operation of drinking water systems in Ontario are governed by the Safe Drinking Water Act and regulations under the act. Other acts cover water taking (the Ontario Water Resources Act) and source water protection (the Clean Water Act).

Ontario Regulation 170 under the Safe Drinking Water Act sets out requirements for municipal water systems, and includes a reference to an associated MOECC document entitled “Procedure for Disinfection of Drinking Water.”

The regulation and procedure documents also refer to the Ten State Standards.

The “Recommended Standards for Water Works” of the Great Lakes – Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers,” also known as the “10 States Standards” (Standards) has a number of requirements that directly impact Norfolk County as follows:

> *The total developed groundwater source capacity, unless otherwise specified by the reviewing authority, shall equal or exceed the design maximum day demand with the largest producing well out of service.* (Section 3.2.1.1)
>
> *A minimum of two sources of groundwater shall be provided, unless otherwise specified by the reviewing authority. Consideration should be given to locating redundant sources in different aquifers or different locations of an aquifer.* (Section 3.2.1.2)
>
> *Plants designed to treat surface water, groundwater under the direct influence of surface water, or for the removal of a primary drinking water contaminant shall have a minimum of two units each for coagulation, flocculation, and solids removal.* (Section 4.2)

The Ministry of the Environment and Climate Change (MOECC) also publishes the “Design Guidelines for Drinking-Water Systems.” These guidelines provide guidance for designers and Approvals Engineers for Drinking-Water Systems in Ontario.

The guidelines are prescriptive on some topics, but do allow some individual municipal discretion on other items, such as municipal fire protection.

The following are basic situations and policies that “ set the stage” for the development of the water portion of the ISMP.

### Water System Risk Assessments

All water systems in Norfolk County have some existing risks to their operation, beyond those covered by the policies. An initial risk assessment was performed as part of this ISMP. Results are presented in **Figure 4-23** and were used in the development of Capital Planning Recommendations. It is recommended that risk assessments be periodically updated for all water systems in the County.

### Surface Water Treatment Plants

For surface water treatment plants (Port Rowan, Port Dover and Delhi), it is recommended that the following policies be adopted by the County as they are required in the regulations and guidelines noted above:

- All pumping systems should have a firm capacity equal to the total of all pumps with the largest pump out of service.
- All pumps to be considered in the plant capacity must be operable without compromising the treatment of the drinking water.
- The filtration capacity should be considered as the capacity of the filters with the one filter out of service.
- At least two pre-treatment trains must exist. With three or more pre-treatment trains, the firm capacity would be equal to the capacity of all pre-treatment trains with one train out of service.

### Groundwater Systems

Groundwater wells have only one well pump with no internal redundancy. In accordance with the 10 State Standards, it is recommended that the groundwater based systems should have duty and standby wells, such that the firm capacity of the system equals the total capacity of the wells, with the largest well out of service. Furthermore, each groundwater based system should have wells based in at least two independent aquifers or at least in different parts of the same aquifer.

Groundwater wells within the County of Norfolk have a history of the following challenges:

- Plugging of the wells – usually due to iron precipitation or other fouling, with loss of pumping capacity over time, resulting in actual capacities that are lower than listed in the Permit to Take Water for the well, and lower than listed in the Drinking Water Works Permit for the system. Wells frequently need to be removed from service and run through rehabilitation procedures, which may take weeks or months to complete.

- Contamination from surface water sources, which in some Norfolk wells has led to high ammonia or nitrate levels, in some cases requiring wells to be shut down.
- Well contamination from industrial spills. Some wells have been taken out of service because of chemical contamination. There are reports in early 2016 that the Cedar St. wells in Simcoe may be at risk.
- Difficulty in locating new wells to replace older wells that are at risk of permanent plugging or contamination (for example, multiple test wells have been drilled in the vicinity of the aging Chapel St. well in Simcoe, but none has been found to produce adequate quantities of water).
- Difficulty in obtaining regulatory approval for new wells. The County has undertaken numerous groundwater studies and developed a number of new test wells. In recent years, the regulatory approvals requirements to obtain a new permit have been found to be very difficult to satisfy.

The Long Point Region Source Protection Plan also provides a comprehensive review of the risks and vulnerabilities associated with the groundwater wells in the County. These include risks due to contamination from agricultural and industrial activities, septic tanks, and spills. These reports have identified numerous threats associated with the various Norfolk groundwater based systems. It is recommended that the County periodically review and update these risk and vulnerability assessments.

The results of these challenges are that some existing groundwater sources within the County are at risk of loss of capacity or complete failure. As a result, each water system was evaluated using a risk analysis, as follows:

- County engineering and operations staff most familiar with each system be interviewed regarding the maintenance history of the wells, well fields and aquifers. From this evaluation, a "Practical Firm Capacity" was determined.
- The likelihood of a well or well-field failure was assessed.
- The consequence of any failure was assessed.

A risk matrix was prepared to evaluate the risk profile of each water system. The risk profile was considered in the development of the Water / Wastewater Strategy recommendations (see **Figure 4-23**).

Furthermore, apart from attempting to complete the permitting requirements for a third set of wells in Delhi and the new well north-west of Simcoe, it is recommended that the County focus on moving towards Lake Erie-based solutions for any future water supply needs.

## Design Fire Flow

### Fire Flow Determination

The MOECC allows the owner of a water distribution system to decide whether or not water mains and fire hydrants should be provided to assist with fire protection, and if so, what water flow rate should be provided. At present, Norfolk County provides piped water for fire protection in all of its municipally serviced areas except for St. Williams.

If a municipality decides that fire protection is to be included as part of the water supply system, the MOECC Guideline refers to the Fire Underwriters Survey (FUS) – "Water Supply for Public Fire Protection" which provides guidance on the selection of fire flows.

The FUS calculation for fire flow to be used for specific developments is complex, based on construction materials, size, distance from neighbours, use of sprinklers, and building usage. However, some typical ranges of fire flows required for individual locations, based on the FUS approach are as follows (all flows at a minimum of 140 kPa (20 psi).

- 67-83 L/s - modern residential subdivision
- 100-167 L/s - modern townhouse groups
- 117-250 L/s - apartment building
- 83-250 L/s - institutional building
- 233 L/s - industrial park
- 200-367 L/s - Commercial shopping centers
- 333-420 L/s - warehouse
- 233-417 L/s –old congested 2 and 3 family apartment buildings with less than 3 m separation running the length of a block.

### Recommended Fire Flows and Supply Pressure for Evaluation

Norfolk's practice has been to follow the Fire Underwriters Survey ("Water Supply for Public Fire Protection" 1999). According to the FUS, a design fire flow of 83 L/s for typical single family residences appears to be a reasonable target, and is well within the range of typical values used by municipalities throughout Ontario. It is recommended that this level continue to be used for typical new single family developments within the County. For all other developments, including multi-family dwellings, commercial, institutional and industrial developments, it is recommended that individual FUS calculations be performed to select the specific fire flow to be used for that development.

Fire flow modelling completed for this study was undertaken with the water level (or hydraulic grade line) at a level that would occur at the end of fire on the maximum day. This would correspond to an elevated tank or standpipe water level at the "bottom" of the equalization and fire storage level. It is recommended that this be the policy for future fire flow modelling within the County.

Water mains in some existing localized areas of the distribution systems are smaller than the recommended minimum diameter of 150 mm. In cases of undersized mains, the County should consider the installation of larger diameter mains as part of infrastructure renewal projects in the future. These needs have been identified in this report.

### *Fire Flow Size and Duration for Purposes of Sizing Distribution Water Storage*

Table 8-1 of "MOECC Guidelines for Drinking-Water Systems" (2008) provides suggested fire flows and durations for purposes of sizing water storage tanks, based on community populations.

For the purposes of the ISMP, fire flows which are the larger of 83 L/s or those from Table 8.1 of the MOECC Guidelines were used. The Fire Duration recommended by the MOECC for the corresponding fire flows was also used. The resulting recommendations are shown in **Figure 4-1**.

**Figure 4-1 – Recommended Fire Flow and Duration for Storage Sizing**

| Community | Present Conditions | | | 2041 Conditions | | |
|---|---|---|---|---|---|---|
| | Population | Fire Flow for Storage Sizing (L/s) | Fire Duration for Storage Sizing (h) | Population | Fire Flow for Storage Sizing (L/s) | Fire Duration for Storage Sizing (h) |
| Simcoe | 15,272 | 250 | 4.0 | 17,380 | 250 | 4.0 |
| Port Dover | 7,054 | 189 | 3.0 | 9,646 | 189 | 3.0 |
| Delhi | 5,110 | 159 | 3.0 | 5,350 | 159 | 3.0 |
| Waterford | 3,738 | 125 | 2.0 | 4,970 | 144 | 2.0 |
| Port Rowan | 1,316 | 83 | 2.0 | 1,970 | 95 | 2.0 |
| Courtland | 1,044 | 83 | 2.0 | 1,080 | 83 | 2.0 |

*Note that Delhi and Courtland are treated separately for fire protection calculations, since the transmission connection is not designed to carry peak flows necessary for a fire supply. Fire flows in these communities are provided by local storage and/or pumping. A piped water supply for firefighting is not currently provided to St. Williams, nor other areas outside urban boundaries.

### *Design System Pressures*

It is recommended that distribution systems be designed to achieve the system pressures as follows:

| Condition | Pressure Range at all Locations in the System (kPa) |
|---|---|
| Peak Hour Demand – Target | 350 – 550 (50 – 80 psi) |
| Peak Hour Demand – Min. and Max | 275 – 700 (40 – 100 psi) |
| Maximum Day + Fire | ≥140 (20 psi) |

The minimum and maximum pressures typically occur at areas with high and low ground elevations within the distribution system. If ground elevations result in pressures outside of the indicated range, either booster pumping stations or pressure reducing stations should be added.

### *Siting of Water Facilities and Water Main*

Per best practices, it is recommended that all water system facilities and water mains be located on municipally owned property or public right of ways. Easements should be avoided unless they are readily accessible during an emergency.

As a result, it is recommended that the County:

- Obtain easements for all existing water mains on private property;
- Construct access lanes above all water main easements to allow for access in the event of a water main break (including clearing trees, and ensuring truck access);
- If the two above points are not possible, construct replacement water mains on public right-of-ways. It is recommended that the County conduct risk assessments of all mains that are not in right-of-ways, or are not accessible in order to determine the urgency of their replacement (note, a comprehensive review all of such mains is beyond the scope of the ISMP project.)

## 4.2.2 Future Conditions

### *4.2.2.1 Water Supply*

The source of drinking water supply to a water system, whether it be a surface water treatment plant, a series of wells, or some combination of the two, should have the capacity to reliably supply treated water to the distribution system at the maximum day rate (i.e. the volume required for the largest one-day demand of the year). For the ISMP, the 2041 recommendations are based on the maximum day rate of 2041.

Historical average and maximum day demand were compiled for each service area in the County. Population growth figures were then used to project future demands and the existing supply systems were evaluated against both existing and future demands. A risk assessment of the existing water supplies was also undertaken.

### *Approach to Calculating Future Water Demands*

The procedure used to estimate future water demands was as follows:

- "Per Capita" water demands were evaluated (the approach taken to calculating per capita demands was to divide the total daily average demand by the population. Thus "per capita" demands included all residential, commercial, industrial and institutional water usage). A total of 9 years of historical water consumption data and per capita water use were reviewed for each water system.
- It was noted that per capita rates have been declining over the 9 year period. Thus, the per capita water use selected for projecting future development impacts was determined for each community by taking the average per capita demand of only the past 4 years. The average "maximum day demand" ($Q_m$) and "average day demand" ($Q_a$) over the past 4 years were also identified as starting points for the future demand projections.
- The impact of large water consumers was investigated, including the use of bulk water trucking within the County. It was assumed that industrial, commercial, industrial and institutional water demands would generally increase in proportion to population.
- Future demands were then calculated by multiplying population projections contained in the County's "Population Projection Study" by Hemson Consulting Ltd. (2014) by the per capita demands, and adjusting for the impact of large water consumers and bulk water sales.

### *Per Capita Water Demands*

**Figure 4-2** illustrates the per capita demands for each of the water systems. All of the systems have per capita demands that are in line with typical values recommended in the MOECC Guidelines. It should be noted that per capita figures have been generally declining over the past decade. This is typical for Ontario water systems, and is likely the result of a number of factors including:

- impacts of new plumbing codes and their requirements for water conserving fixtures;
- some reduction in manufacturing industries and water use reduction by other industries;

- municipal water conservation programs; and,
- general increases in the cost of water leading to conservation.

It should be noted that while a “per capita” figure has been used for overall population projections for each community, the design of water supplies to individual developments in the future should be determined on the basis of their specific land use.

**Figure 4-3** illustrates the Maximum Day Per-Capita Water demands over the same period.

**Figure 4-4** summarizes the per capita demand averages of the last 4 years, as well as the Maximum Day Factor (= [Maximum Day Flow]/[Average Day Flow]).

In all communities, the Maximum Day Factor was reasonable, as compared to typical values published in the MOECC Guidelines, which are based on community population.

It should be noted that in Port Rowan, as possibly Port Dover, demands include flows required for filter backwashing. It is recommended that the County start collecting daily backwash flow data, and that these values be deducted from the community water demands, since backwash demands are generally considered as an internal loss within a treatment plant. This will provide a more realistic understanding of the water use consumption in these communities. It will also assist with understanding how well the plant and backwash system are performing.

Data from **Figure 4-4** were used for projecting future demands.

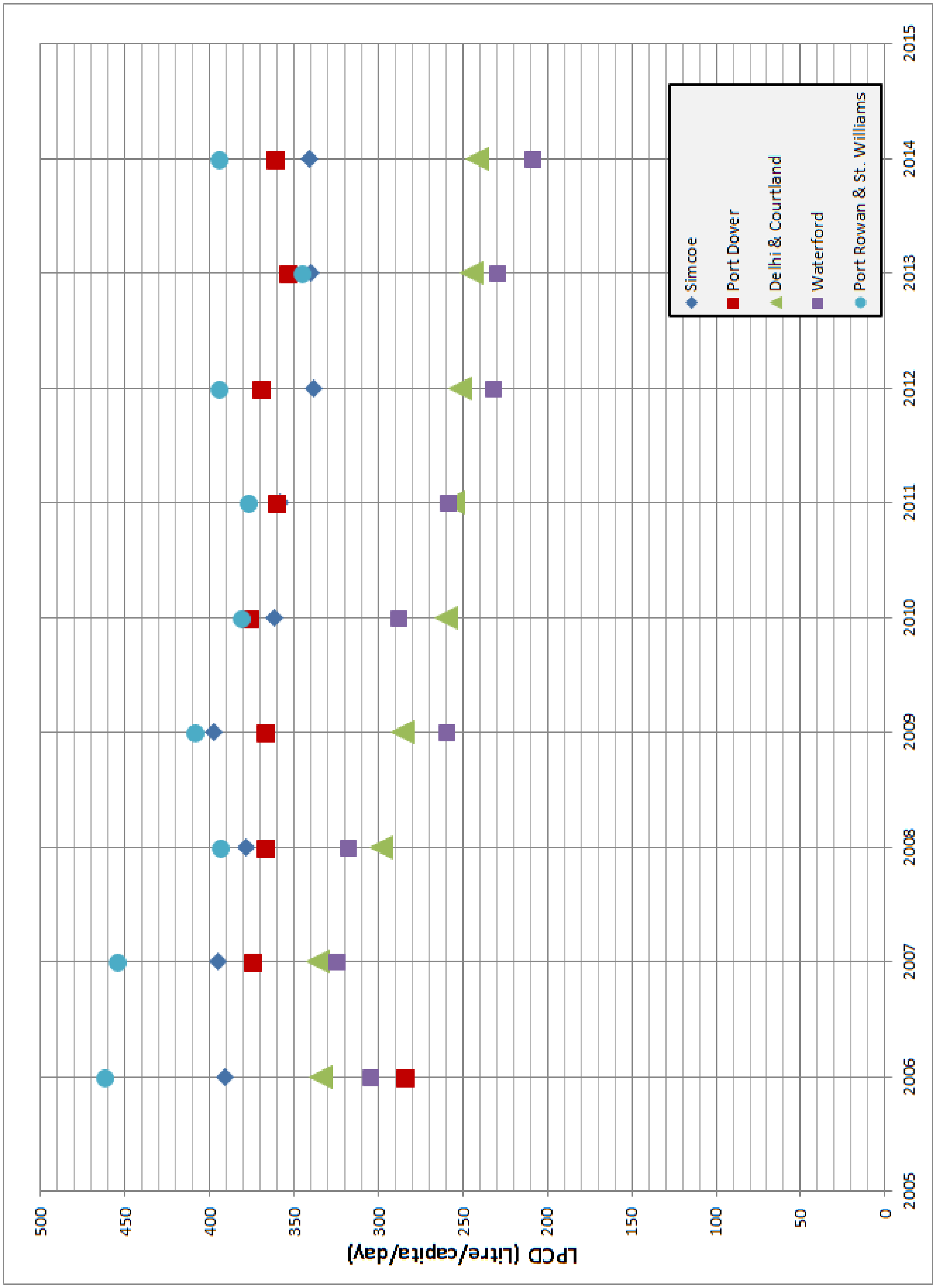



**Figure 4-2 – Average Day Per-Capita Water Demands (2006 to 2014)**

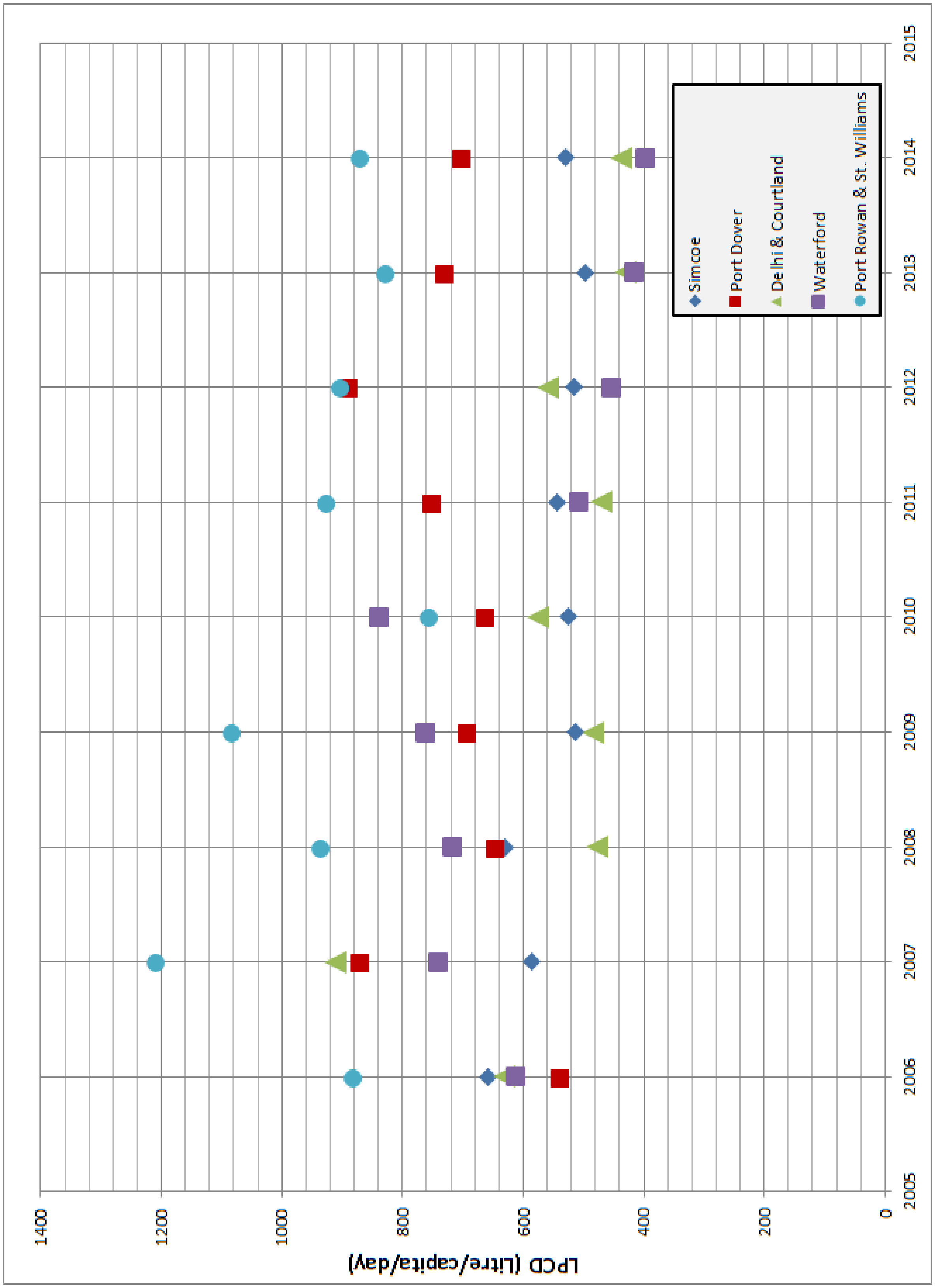



**Figure 4-3 – Maximum Day Per-Capita Water Demands (2006 to 2014)**

**Figure 4-4 – Water System Per-Capita Demands**

| Water System | (Lpcd) (Liters per capita per day) | Per Capita Maximum Day Demand used for additional future water demand calculations (Lpcd) | Typical Maximum Day Factor (max. day / ave. day) | MOECC Typical Maximum Day Factor |
|---|---|---|---|---|
| Simcoe | 344 | 523 | 1.52 | 1.9 |
| Port Dover | 360 | 750 | 2.08 | 2.0 |
| Delhi & Courtland | 248 | 477 | 1.92 | 2.0 |
| Waterford | 232 | 434 | 1.87 | 2.0 |
| Port Rowan & St. Williams | 376 | 849 | 2.26 | 2.5 |

### *Impact of Large Water Users and Bulk Rates*

A check of the impact of existing large water users and bulk water sales was undertaken to determine if any adjustments to projections should be made, based on the impact of water users and bulk water sales. Bulk water sales reports for each community, which included the volume taken on a year by year basis, were reviewed.

**Figure 4-5 – Bulk Water Demands by Community ($m^3$/ year)**

| Community | 2010 | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|
| Simcoe | 9,649 | 4,482 | 11,514 | 12,541 | 10,845 |
| Port Dover | 56,032 | 35,230 | 43,489 | 34,843 | 39,826 |
| Delhi & Courtland | 2,614 | 5,824 | 5,230 | 2,914 | 3,255 |
| Waterford | - | 1,678 | 21,572 | 22,981 | 16,216 |
| Port Rowan & St. Williams | 14,778 | 13,404 | 19,860 | 16,839 | 16,839 |

The bulk water demands listed in **Figure 4-5** were removed from the water demands used in the calculation of per capita demands in **Figure 4-4**.

A review of the largest 205 water users in the County was undertaken. Total water consumption of each of these users was tabulated and compared as a percentage of the total demand of the systems within which they were located. The results of this analysis are shown in **Figure 4-6**, and the largest 5 customers within each water system are highlighted. The remainder of the 205 large water users were found to have an insignificant impact, and were thus not reviewed further.

**Figure 4-6 – Impacts of Large Water Users**

| Water System | Total Daily Usage of Large Users, as provided by the County ($m^3$/ day) | Average Daily Flow (2011 – 2014) ($m^3$/ day) | Large Users - % of Total Average Day Flow | Significant Large Users - % of Total Average Day Flow | |
|---|---|---|---|---|---|
| Simcoe | 1985.5 | 5208 | 38.12% | #1: 10.00%<br>#2: 5.10%<br>#3: 1.86% | #4: 1.08%<br>#5: 0.92% |
| Port Dover | 276.36 | 2457 | 10.79% | #1: 3.87%<br>#2: 0.91%<br>#3: 0.76% | #4: 0.64%<br>#5: 0.39% |
| Delhi & Courtland | 257.67 | 1525 | 16.90% | #1: 2.48%<br>#2: 1.68%<br>#3: 1.49% | #4: 0.97%<br>#5: 0.76% |
| Waterford | 112.36 | 841 | 13.36% | #1: 3.66%<br>#2: 1.32%<br>#3: 1.15% | #4: 1.08%<br>#5: 0.66% |
| Port Rowan &<br>St. Williams | 99.76 | 717 | 13.91% | #1: 8.61%<br>#2: 1.21%<br>#3: 1.07% | #4: 0.69%<br>#5: 0.67% |

From this chart, it would appear that the only significant individual industrial water customers in Norfolk County are the #1 customer in Simcoe and the #1 customer in Port Rowan. With these exceptions, water demands were found to be well distributed amongst customers throughout the systems.

Future water demands were calculated including a growth in large water consumer usage proportional to the growth in population, and future bulk water sales were assumed to be the same as current bulk water sales. Also, it was assumed that bulk water sales would have the same Maximum Day Factor as the water system in which they were located. It is important to note that these assumptions did not have a large impact on the water projections.

### *Population Projections*

**Figure 4-7** contains the historical and projected population values from the Hemson Report which were used to develop future water use projections.

**Figure 4-7 – Population Projections**

| Community | 2006 | 2011 | 2021 | 2031 | 2041 |
|---|---|---|---|---|---|
| Simcoe | 14,890 | 15,000 | 15,680 | 16,800 | 17,380 |
| Port Dover | 6,500 | 6,690 | 7,600 | 8,770 | 9,640 |
| Delhi | 4,960 | 5,090 | 5,140 | 5,340 | 5,350 |
| Waterford | 3,460 | 3,570 | 3,990 | 4,560 | 4,970 |
| Port Rowan | 1,050 | 1,220 | 1,460 | 1,740 | 1,970 |
| Courtland | 1,050 | 1,040 | 1,050 | 1,080 | 1,080 |
| Delhi & Courtland (for combined system calculations) | 6010 | 6130 | 6190 | 6420 | 6430 |
| Port Rowan & St. Williams | 1700 | 1870 | 2110 | 2390 | 2620 |

### *Future Demand Projections*

Future water demand estimates were calculated by multiplying the per capita demands listed in **Figure 4-4** (which include contributions by large customers, but not bulk water sales) by the population projections given in **Figure 4-7**. Bulk water sales (with no change from current values) were then added to results, to generate the recommended future demand projections used in the ISMP's development.

**Figures 4-8 to 4-12** show the historical values for average and maximum day along with projections up to 2041 based on the methodology described above.

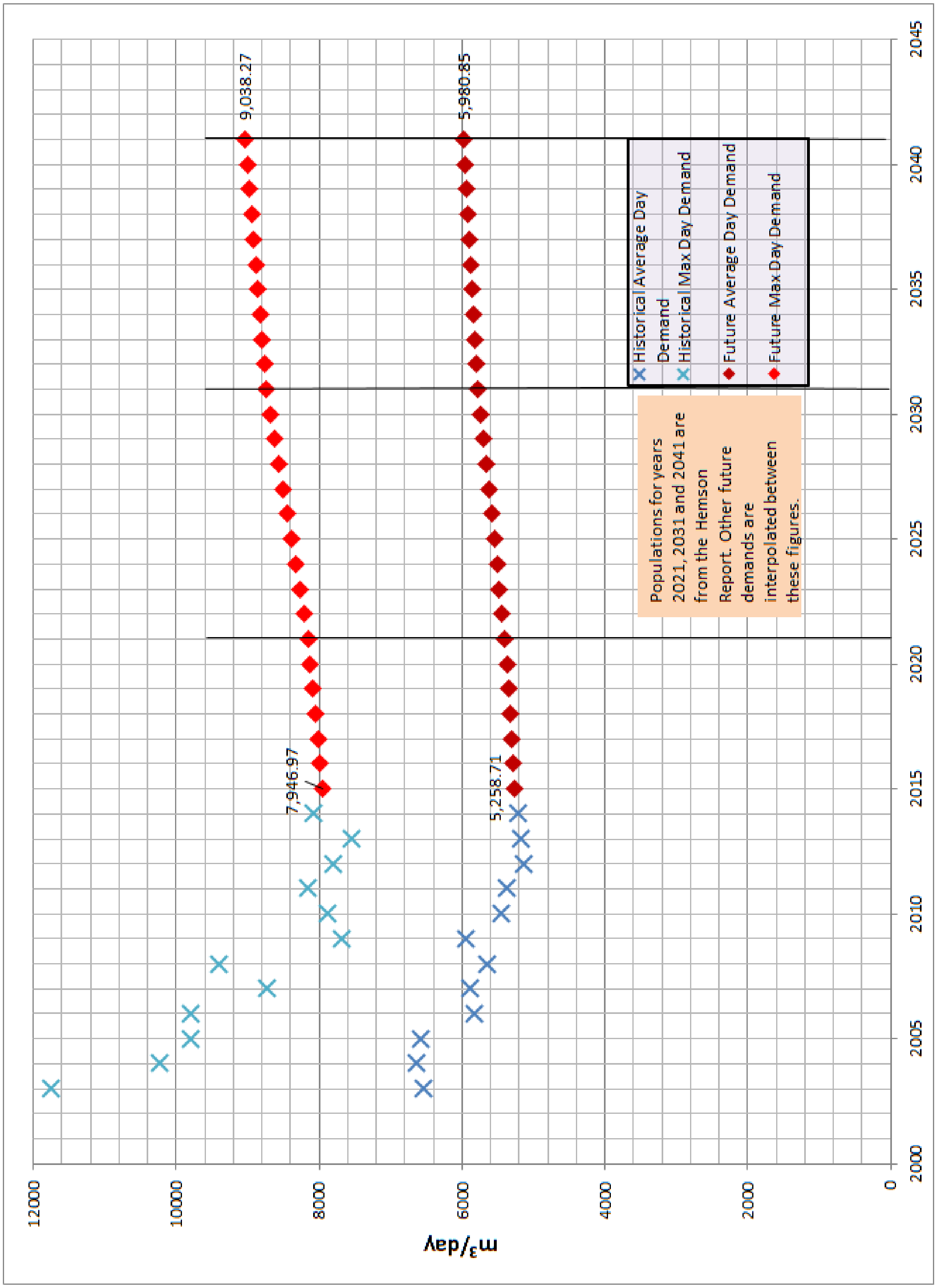



Figure 4-8 – Simcoe Historical and Projected Water Demands

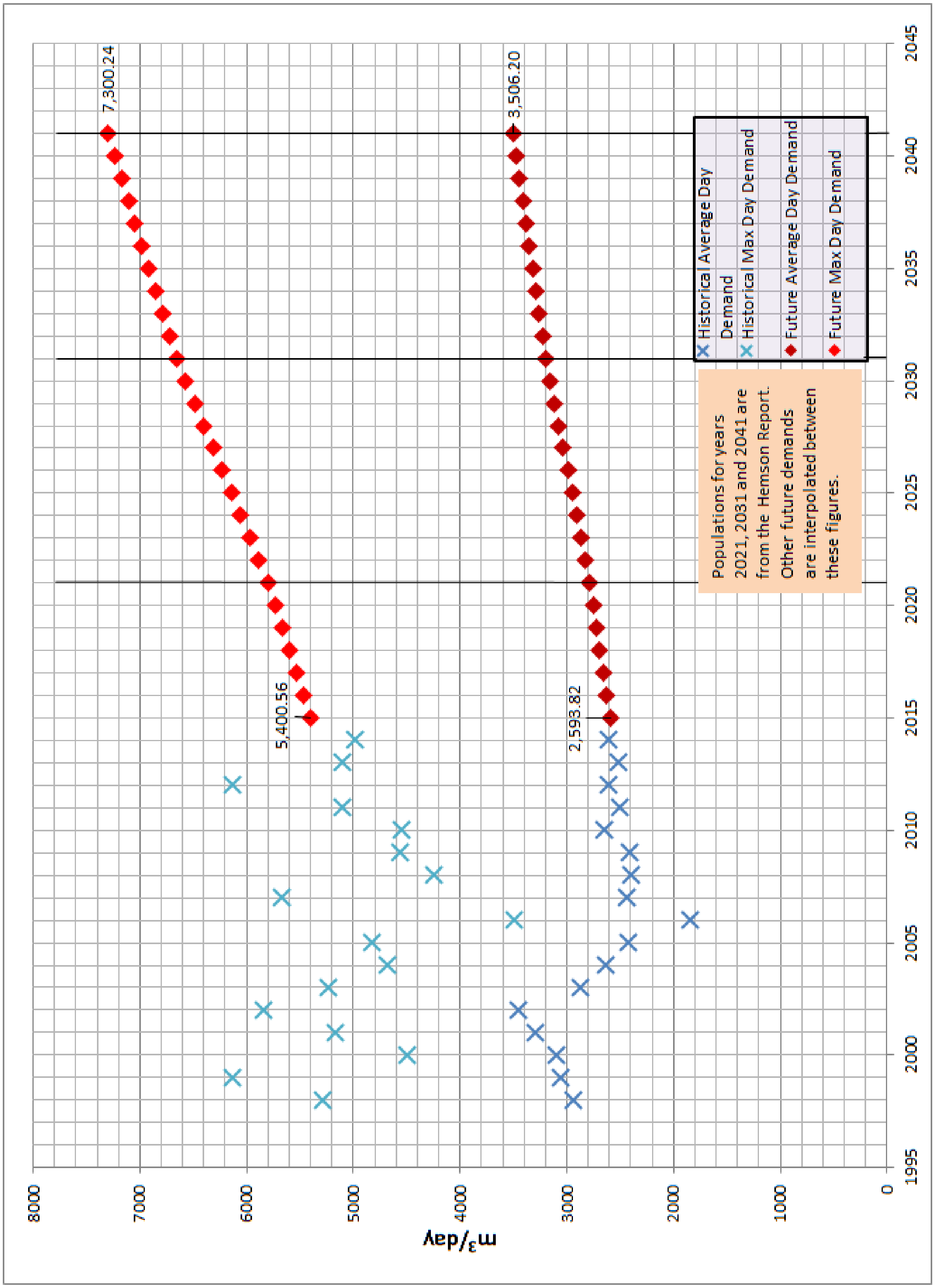



Figure 4-9 – Port Dover Historical and Projected Water Demands

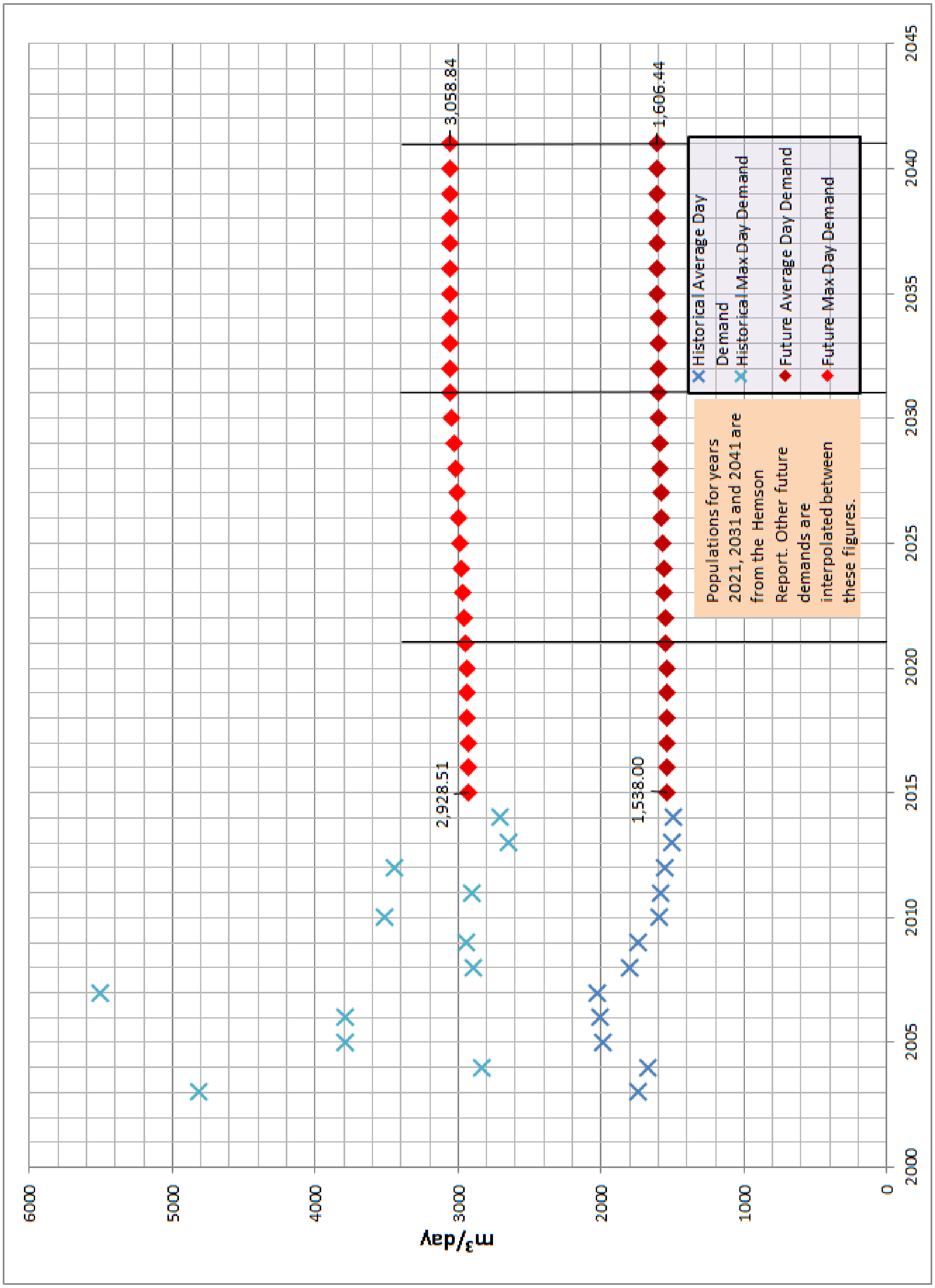



Figure 4-10 – Delhi & Courtland Historical and Projected Water Demands

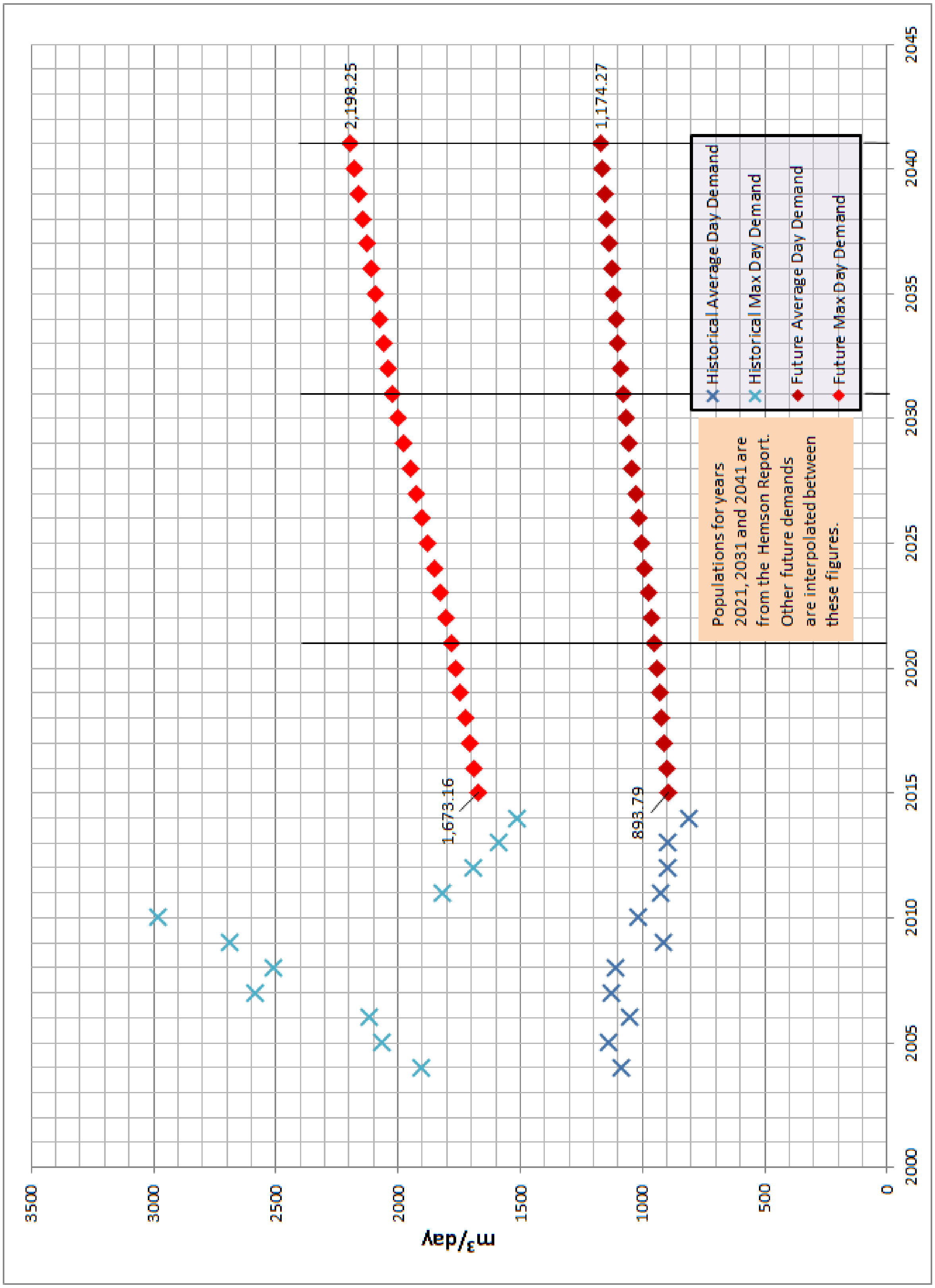



**Figure 4-11 – Waterford Historical and Projected Water Demands**

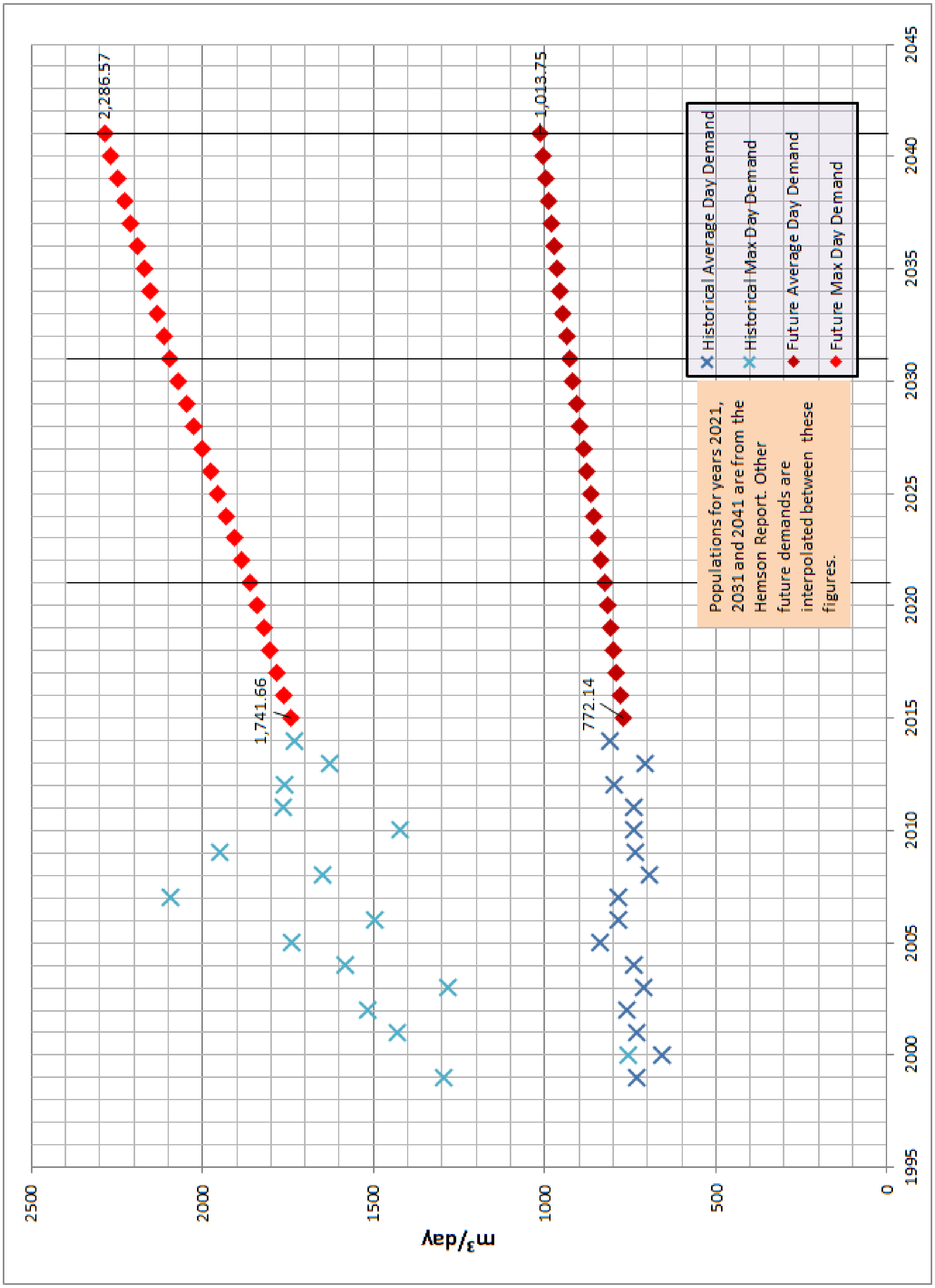



**Figure 4-12 – Port Rowan & St. Williams Historical and Projected Water Demands**

The final aspect of the demand analysis completed was the evaluation of current and future peak hour flows. Peak hour flows are made up of the flows being pumped into the distribution system along with flows entering the system from storage. Since this parameter is not metered and not recorded, it is necessary to estimate the peak hour demands using peak hour factors (i.e. Peak hour/ Average Day). The MOECC provides estimates of peak hour factors on the basis of community size.

**Figures 4-13 and 4-14** summarize peak hour flows for current and future conditions. These tables are also used to summarize the population, average day, and maximum day flows.

**Figure 4-13 – Current Average Day, Maximum Day, and Peak Hour Demands**

| Community | Current Water Demand (2015) | | | | |
|---|---|---|---|---|---|
| | Population | $Q_{ave}$ ($m^3/d$) | $Q_{max}$ ($m^3/d$) | Peak hour factor | $Q_{peak}$ ($m^3/d$) |
| Simcoe | 15,272 | 5,259 | 7,947 | 2.85 | 14,988 |
| Port Dover | 7,054 | 2,594 | 5,401 | 3.00 | 7,782 |
| Waterford | 3,738 | 894 | 1,673 | 3.00 | 2,682 |
| Delhi & Courtland | 6,154 | 1,538 | 2,929 | 3.00 | 4,614 |
| Port Rowan and St. Williams | 1,966 | 772 | 1,742 | 3.75 | 2,895 |

**Figure 4-14 – Future Average Day, Maximum Day, and Peak Hour Demands**

| Community | Future Water Demand (2041) | | | | |
|---|---|---|---|---|---|
| | Population | $Q_{ave}$ ($m^3/d$) | $Q_{max}$ ($m^3/d$) | Peak hour factor | $Q_{peak}$ ($m^3/d$) |
| Simcoe | 17,380 | 5,981 | 9,038 | 2.85 | 17046 |
| Port Dover | 9,640 | 3,506 | 7,300 | 3.00 | 10518 |
| Waterford | 4,970 | 1,174 | 2,198 | 3.00 | 3522 |
| Delhi & Courtland | 6,430 | 1,606 | 3,059 | 3.00 | 4818 |
| Port Rowan and St. Williams | 2,620 | 1,014 | 2,287 | 3.38 | 3427 |

### Current Available Water Supply Capacity

To undertake the evaluation of current capacity, the County's water supply systems were toured with senior operations and engineering staff. County operations staff were also asked to provide their recommendations as to the practical limitations of the existing facilities based on their operational experience. Notes of the site visits and staff input are attached in **Appendix B**.

By comparing Permit to Take Water (PTTW) and Drinking Water Works Permit (DWWP) values with those observed in the field, it was observed that actual water supply capacities were significantly different, for the following reasons:

- The actual capacity of wells and treatment capacities were in some cases less than permit values. For example, some wells have experienced partial plugging, and could only operate using reduced flows.
- Some wells had been taken offline due to contamination. For example, Simcoe North West Well #1 had been removed from service due to significant ammonia contamination.
- Some wells or other facilities had been taken off-line to allow for connecting water mains to be repaired. For example, during the site visit, one of the Simcoe Cedar St. wells was out of service, because the main connecting it to the reservoir had broken, and was awaiting repairs.
- Wells were found to have been periodically removed from service for maintenance. During the site visit, several wells were found to be undergoing maintenance. These activities can take weeks or months to complete.
- Some of the existing water supply facilities were found to be old and very difficult/risky to operate. For example, the old surface water treatment plant in Delhi could only operate at limited flows, only with considerable operator effort, and with risk of equipment failure resulting in adverse treatment conditions. Trying to run the plant at higher flows could result in malfunctions with the aging equipment, or create water quality challenges from the raw water reservoir.
- Both the Port Dover and Port Rowan Water Treatment Plants had operational limitations. The Port Dover plant could not operate at full design. The Port Rowan plant was reported to have some limitations due to the need for frequent backwashes.

For the Norfolk Water Supply Systems, **Figure 4-15** summarizes the various capacities adjusted for the reasons discussed above. The most important information in this table is the "Practical Firm Capacity" for each system, which was determined with the assistance of County operations personnel.

Figure 4-15 – Water System Capacities

| Water System | PTTW / DWWP Capacity ($m^3/d$) | "Practical Firm Capacity of System" (i.e. based on real operating capacities, and allowing for the largest unit to be out of service) ($m^3/d$) |
|---|---|---|
| Simcoe | 19,362 | 10,563 |
| Port Dover | 9,677 | 2,454 |
| Delhi & Courtland | 9,143 | 1,881 |
| Waterford | 5,875 | 2,933 |
| Port Rowan & St. Williams | 3,040 | 1,765 |

### *Additional Capacities Required for Current Demands and Future Growth*

When the information from the preceding sections (Future Demands and Current Available Capacities) was combined, the ability of the existing systems to meet current and future demands was determined.

**Figures 4-16 to 4-20** illustrate the situation graphically.

**Figures 4-21 and 4-22** summarize current and future additional capacities required for each system.

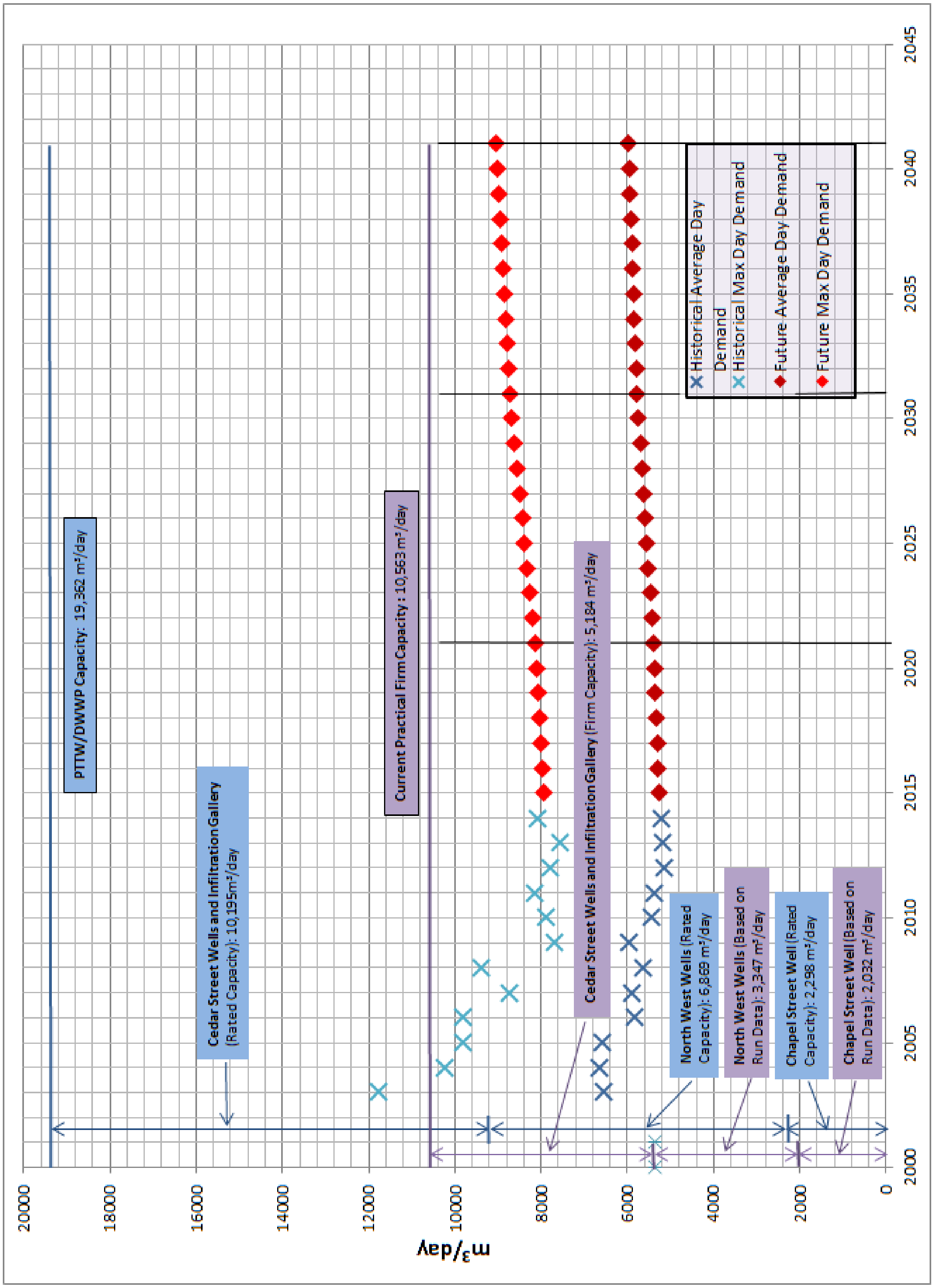



Figure 4-16 – Simcoe Water System Capacities and Demands

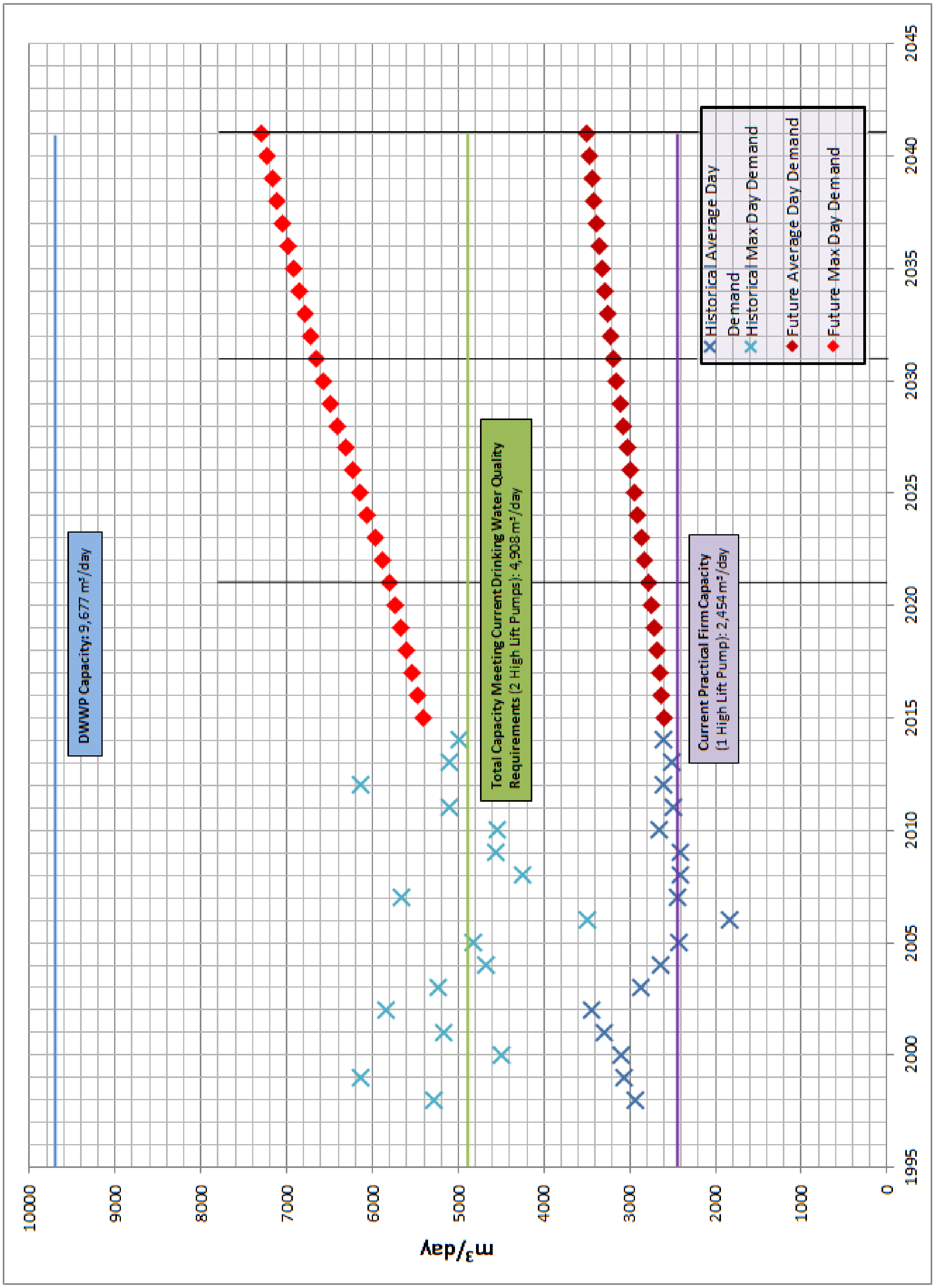



**Figure 4-17 – Port Dover Water System Capacities and Demands**

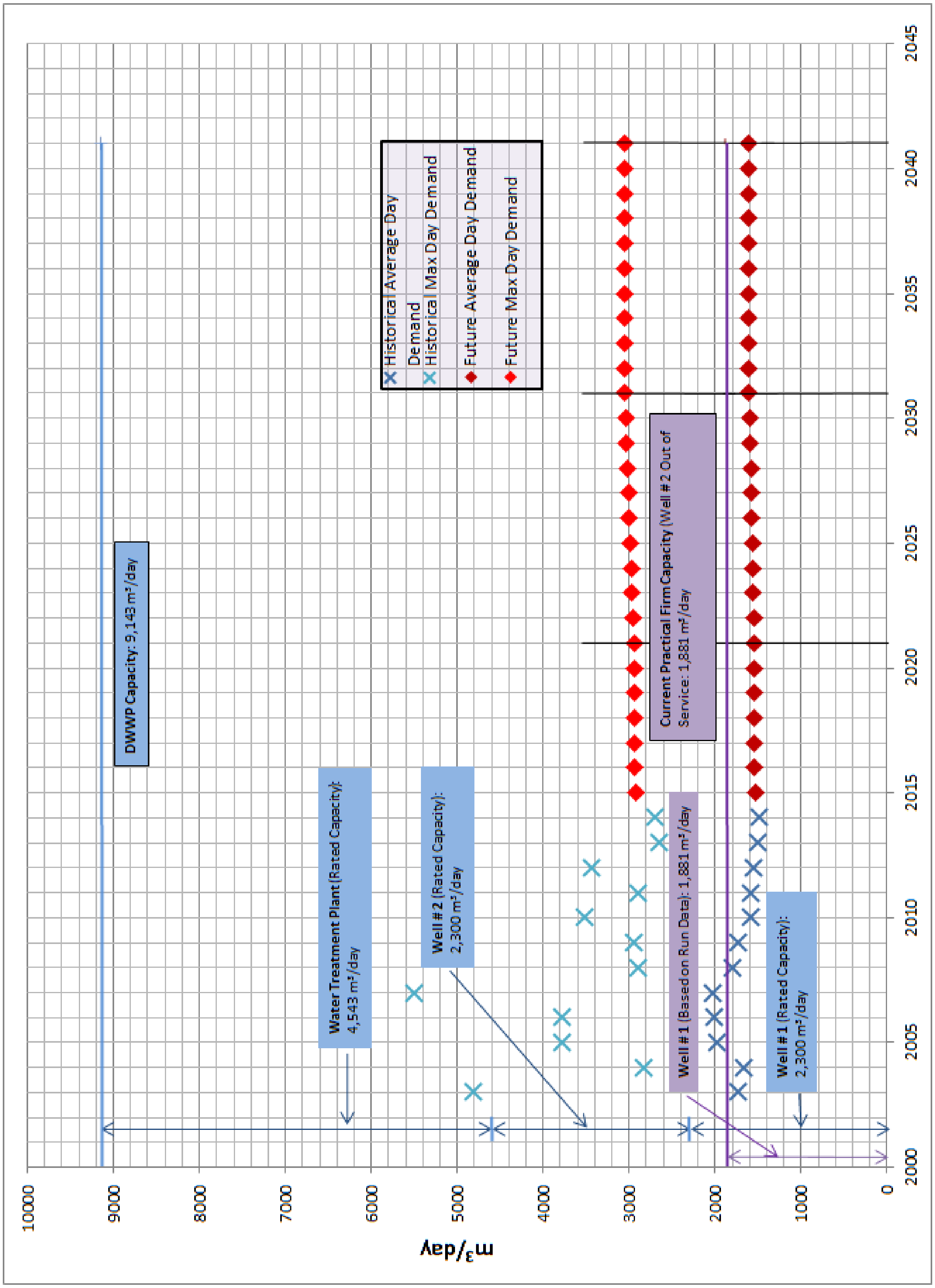



Figure 4-18 – Delhi & Courtland Water System Capacities and Demands

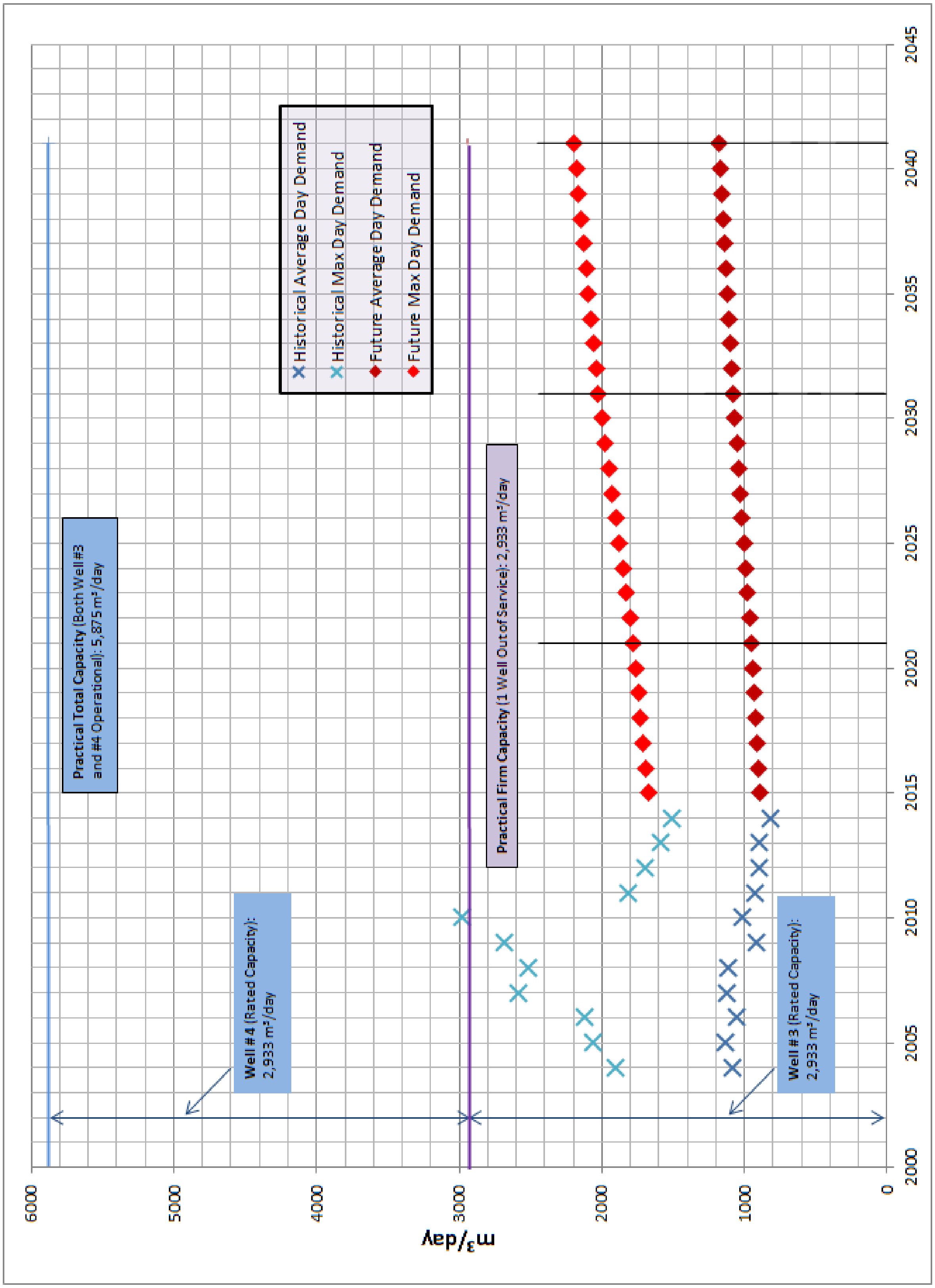



**Figure 4-19 – Waterford Water System Capacities and Demands**

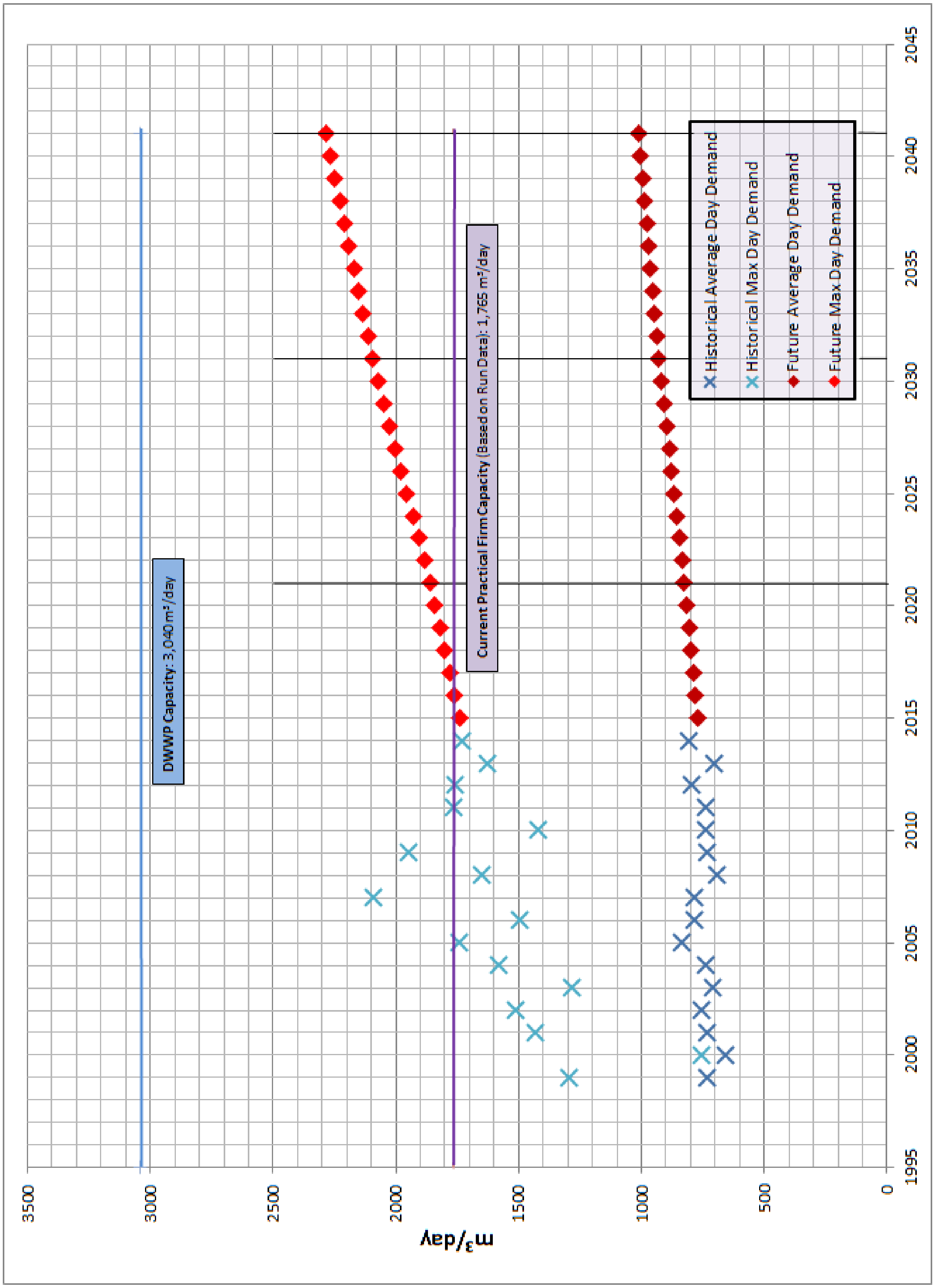



Figure 4-20 – Port Rowan & St. Williams Water System Capacities and Demands

**Figure 4-21 – Current Additional Supply Capacity Required**

| Water System | Current Max Day Water Demand ($m^3/d$) (2011 – 2014) | Current Practical Firm Capacity* ($m^3/d$) | Current Capacity Situation ($m^3/d$) |
|---|---|---|---|
| Simcoe | 7,901 | 10,563 | Surplus: 2,662 |
| Port Dover | 5,334 | 2,454 | Deficit: 2,880 |
| Delhi & Courtland | 2,926 | 1,881 | Deficit: 1,045 |
| Waterford | 1,654 | 2,933 | Surplus: 1,279 |
| Port Rowan & St. Williams | 1,722 | 1,765 | Surplus: 43 |
| **Total** | **19,537** | **19,596** | **Surplus: 59** |

***** See text prior to Figure 4-15 for description of how this was determined.

**Figure 4-22 – Future Additional Supply Capacity Required (2041)**

| Water System | Future Max Day Water Demand ($m^3/d$) | Current Practical Firm Capacity* ($m^3/d$) | 2041 Capacity Situation ($m^3/d$) |
|---|---|---|---|
| Simcoe | 9,039 | 10,563 | Surplus: 1,524 |
| Port Dover | 7,341 | 2,454 | Deficit: 4,887 |
| Delhi & Courtland | 3,060 | 1,881 | Deficit: 1,179 |
| Waterford | 2,207 | 2,933 | Surplus: 726 |
| Port Rowan & St. Williams | 2,298 | 1,765 | Deficit: 533 |
| **Total** | **23,945** | **19,596** | **Deficit: 3,283** |

* See text prior to Figure 4-15 for description of how this was determined.

### *Risk Analysis*

During the tour of water facilities and discussions with operations and engineering staff, numerous risks were identified that could have an important impact on the reliability of water supplies in the County. A water system risk review was then incorporated into the water supply portion of the ISMP. Evaluation of the risks then became a component of the evaluation of alternative solutions.

**Figure 4-23** presents the risk matrix that was developed. The following colour codes were used for the development of the risk matrix.

| **Colour Code** | |
|---|---|
| Low | |
| Medium | |
| High | |
| Unacceptable | |

For each situation of concern, an estimate of the probability of the situation occurring was selected along with an estimate of the severity of the event, should it occur. Using the following matrix, the risk scores were selected.

| | | RISK RATING LEGEND | | |
|---|---|---|---|---|
| PROBABILITY | High | | | |
| | Medium | | | |
| | Low | | | |
| | | Low | Medium | High |
| | | SEVERITY | | |

For example, a medium probability and a medium severity would yield a medium risk. A low probability and a high severity would yield a medium risk.

The red "unacceptable" risks noted indicate situations that, if they were to occur, would be difficult and slow to repair, and could result in a complete loss of water supply to the community. The less severe risks represent situations that have some, perhaps limited, redundancy, or could require less time to undertake emergency repairs.

**Figure 4-23 – Norfolk County Water Supply Risk Assessment**

| Hazard | Likelihood of Hazard | Severity of Outcome | Risk Rating (Likelihood x Severity) |
|---|---|---|---|
| **Simcoe Water System:** | | | |
| Permanent and/or Temporary Loss of multiple wells at any one time due to a well failure, mechanical failure ,or well-field contamination, leading to an overall water supply shortage in town. Wells at risk include: Chapel Street Well (mechanical failure, aquifer contamination, well screen failure); Multiple Cedar St. Wells; Cedar St. Infiltration Gallery; North West Wells #2 and or #3 (Well #1 already taken out of service) Note: Severity will increase over time. | | | |
| **Port Dover Water Supply** | | | |
| Water Treatment Plant Clarifier breaks down | | | |
| Failure of one of the two High Lift Pumps currently in operation. | | | |
| Inability to backwash filters if elevated tank needs to be taken out of service. | | | |
| Severe algae event in Lake Erie, leading to plugging in filters and loss of production or release of unacceptable levels of microcystin toxins. | | | |
| Frazil ice formation blocks the intake, and preventing the plant from producing treated water. | | | |
| **Delhi Water** | | | |
| Influx of contaminants to the Lehman Dam make Delhi Water Treatment Plant (WTP) unusable, eliminating WTP from service. Major mechanical failure of Delhi Water Treatment Plant | | | |
| Loss of Well 1 and/or Well 2 Pumphouse due to well a well failure, mechanical failure, or well-field contamination, eliminating wells from service | | | |
| Water main break between Wells and Delhi Distribution System | | | |
| **Courtland Water Supply** | | | |
| Loss of a large pump at time of a fire | | | |
| Water main break between Delhi and Courtland | | | |
| **Waterford Water Supply** | | | |
| Waterford Well Field becomes contaminated and unusable | | | |
| Break in inaccessible watermain feed from well field to distribution system | | | |

| Hazard | Likelihood of Hazard | Severity of Outcome | Risk Rating (Likelihood x Severity) |
|---|---|---|---|
| | | | |
| **Port Rowan Water Supply** | | | |
| No water at raw water intake, as a result low lake level and storm event. Such an event could disrupt water supply, and cause water quality problems. | | | |
| Severe algae event in Lake Erie, leading to plugging in filters and loss of production or release of unacceptable levels of microcystin toxins. | | | |
| **St. Williams Water Supply** | | | |
| Water main break between St. Williams and Port Rowan | | | |
| Power Failure in Booster Pumping Station leads to inadequate pressure in boosted pressure zone. | | | |

#### *4.2.2.2 Water Storage*

##### *Approach to Calculating Water Storage*

Water storage is required in communities for a number of reasons:

- To supply peak flows that are higher than the maximum day rate that can be provided by the water supply system. This can occur:
  - During the peak demand periods within a day – typically in the morning when people are getting up, and during evening meal preparation and clean-up; and
  - During a fire, when fire crews are using hydrants to supply large water flows for firefighting.
- To provide short term emergency supply for:
  - Temporary equipment maintenance shut-downs;
  - Emergency supplies, such as may occur during a power failure, equipment malfunction or water main break;
  - To provide time for operators to attend a water production facility to address an alarm or other condition that has caused a water supply shut-down; and,
  - To provide water during extreme short-term challenges with the raw water, such as may occur due to frazil ice plugging of the intake.

The MOECC provides a recommended calculation for sizing of water storage that has been successfully used for many years in Ontario. The calculation is as follows:

Total Treated Water Storage Requirement = A + B + C

Where:

A = Fire Storage (design fire flow x design fire duration);

B = Equalization Storage (25% of maximum day demand); and

C = Emergency Storage (25% of A + B).

The total water storage must be "useable" – i.e. it must be at an elevation sufficient to provide adequate pressure, or must be serviced by a pumping station with adequate firm capacity to draw down the storage during high-demand conditions. Storage can be "gravity" (i.e. an elevated tank, standpipe, or in-ground storage at an elevated location in the system) or "pumped" (i.e. with a pumping station that can deliver all necessary flows to the distribution system).

### *Recommended Storage Volumes*

Using the A+B+C formula, along with the maximum day demands listed in **Section 4.2** and the fire flows listed in **Figure 4-1**, required storage volumes for each community were calculated as shown in **Figures 4-24 to 4-27**.

**Figure 4-24 – Current Storage Requirements**

| Community | Present Conditions (2015) | | | | | | |
|---|---|---|---|---|---|---|---|
| | $Q_m$ ($m^3$/d) | Fire Flow* (L/s) | Fire Duration* (h) | A: Fire Storage ($m^3$) | B: Equalization, 25% Max Day Demand ($m^3$) | C: 25% (A + B), ($m^3$) | Total storage required= A + B + C ($m^3$) |
| Simcoe | 7,947 | 250 | 4 | 3,600 | 1,989 | 1,397 | 6,983 |
| Port Dover | 5,401 | 189 | 3 | 2,041 | 1,350 | 848 | 4,239 |
| Delhi | 2,432 | 159 | 3 | 1,717 | 608 | 581 | 2,906 |
| Waterford | 1,673 | 125 | 2 | 900 | 418 | 330 | 1,648 |
| Port Rowan | 1,752 | 83 | 2 | 598 | 438 | 259 | 1,295 |
| Courtland | 497 | 83 | 2 | 598 | 124 | 180 | 902 |

* Fire flows and durations based on MOECC recommendations for community size

**Figure 4-25 – 2041 Storage Requirements**

| Community | 2041 Conditions | | | | | | |
|---|---|---|---|---|---|---|---|
| | $Q_m$ ($m^3$/d) | Fire Flow* (L/s) | Fire Duration* (h) | A: Fire Storage ($m^3$) | B: Equalization, 25% Max Day Demand ($m^3$) | C: 25% (A + B), ($m^3$) | Total storage required= A + B + C ($m^3$) |
| Simcoe | 9,039 | 250 | 4 | 3,600 | 2,260 | 1,465 | 7,325 |
| Port Dover | 7,300 | 189 | 3 | 2,041 | 1,825 | 967 | 4,833 |
| Delhi | 2,545 | 159 | 3 | 1,717 | 636 | 588 | 2,941 |
| Waterford | 2,198 | 144 | 2 | 1,037 | 550 | 397 | 1,984 |
| Port Rowan | 2,571 | 95 | 2 | 684 | 643 | 332 | 1,659 |
| Courtland | 514 | 83 | 2 | 598 | 128 | 182 | 908 |

* Fire flows and durations based on MOECC recommendations for community size

**Figure 4-26 – Current Water Storage Requirements**

| Water System | Current Storage Requirement ($m^3$) | Current Total Storage ($m^3$) | Current Useable[1] Storage ($m^3$) | Storage Deficiency ($m^3$) |
|---|---|---|---|---|
| Simcoe | 6,983 | Elevated Tank Total: 3,409<br>Cedar Reservoir 4,500<br>Northwest Reservoir 4,500 | Elevated Tank Useable: 3,409<br>Cedar Reservoir 0 (no additional pumping capacity beyond reservoir input)<br>Northwest Reservoir 0 (same) | 3,574 |
| Port Dover | 4,239 | Elevated Tank Total: 5,000 | Elevated Tank Useable: 4,500 | 0 |
| Delhi | 2,906 | Standpipe Total: 3,955 | Standpipe Useable: 947 (top 10 m) | 1959 |
| Waterford | 1648 | Standpipe Total: 2,700 as measured from drawing (note: DWWP states 3,409) | Standpipe Useable: 657 (top 10 m) | 991 |
| Port Rowan | 1295 | Elevated Tank Total: 1,816 | Elevated Tank Useable: approx.1,600 | 0 |
| Courtland | 902 | Reservoir Total: 1,077[2] | Reservoir Total: 880[2] | 22 |

[1] The term "Useable" is taken as in-ground storage which can be drawn down by additional pumping capacity (beyond the well or treatment plant input flow) plus the top 10 m of any gravity (elevated) storage. [2] Some pump upgrades for firm capacity required. Available volume based on maximum pumps can draw down reservoir, according to G. Douglas Vallee Ltd. e-mail dated January 4, 2016.

**Figure 4-27 – Future Water Storage Requirements (2041)**

| Water System | Future Storage Requirement ($m^3$) | Current Total Storage ($m^3$) | Current Useable Storage ($m^3$) | Storage Deficiency ($m^3$) |
|---|---|---|---|---|
| Simcoe | 7,325 | Elevated Tank<br>Total: 3,409<br>Cedar Reservoir<br>4,500<br>Northwest Reservoir<br>4,500 | Elevated Tank<br>Useable: 3,409<br>Cedar Reservoir<br>0<br>Northwest Reservoir<br>0 | 3,751 |
| Port Dover | 4,833 | Elevated Tank<br>Total: 5,000 | Elevated Tank<br>Useable: 4,500 | 333 |
| Delhi | 2,941 | Standpipe<br>Total: 3,955 | Standpipe<br>Useable: 947 | 1994 |
| Waterford | 1,984 | Standpipe<br>Total: 2,700 | Standpipe<br>Useable: 657 | 1,327 |
| Port Rowan | 1659 | Elevated Tank<br>Total: 1,816 | Elevated Tank<br>Useable: 1,600 | 59 |
| Courtland | 908 | Reservoir<br>Total: 1,077 | Reservoir<br>Total: 880 | 28 |

### *Recommended Storage and High Lift Pumping Upgrades*

#### *Simcoe*

As can be seen in **Figures 4-26 and 4-27**, Simcoe has an existing storage deficiency of between 3,574 $m^3$ at present to 3,751 $m^3$ in 2041. This apparent shortfall could be solved by providing additional high lift pumping equipment at the Cedar Reservoir and Northwest Reservoir to provide firm capacity equal to the firm capacity of the wells or treatment plant supplying the reservoirs plus 50% of the design fire. The recommended firm pumping capacities are as follows:

- Cedar St High Lift Pumps: 185 L/s (which is a 28 L/s increase from the current firm capacity). Note, in early 2016, a potential for future contamination of the Cedar St. wells was discovered. Even if the Cedar St. wells were ultimately all taken out of service, the Cedar St. Reservoir and Pumping Station could continue to provide an on-going benefit to the water system. A small amount of additional equipment would need to be provided to ensure the water was properly turned over, and chlorine residuals were maintained.
- Northwest Reservoir High Lift Pumps: 164 L/s (which is a 112 L/s increase from the current firm capacity)

Additional modelling was performed in the vicinity of each of these pumping stations and it was found that no additional water mains were required to convey the additional flow from the stations.

### Port Dover

There is a small surplus storage capacity at present, and a small storage deficiency noted for 2041. It is not recommended that any additional storage be provided at this time.

### Delhi

Delhi is shown with a 1,959 $m^3$ deficiency now and a deficiency of 1994 $m^3$ in 2041. This deficiency can be resolved by installing 1 duty and 1 standby pump at the base of the standpipe, in the existing pumping station structure. Each pump would be sized for the design fire flow capacity of 159 L/s at a total dynamic head (TDH) of 45 m (to be confirmed during final design). These pumps would need to be supplied with a control system and variable frequency drive or pump control valve to allow them to maintain a discharge pressure roughly equal to the top water level in the standpipe. The control system would be also be required to close the normal inlet to the tower during pump operation, and have another pipe with a pressure sustaining valve to prevent depressurization of the system during re-filling of the tank following a high-flow event, such as a fire. A standby generator should also be provided, to provide emergency power to the pumping units.

### Courtland

As can be seen in **Figures 4-26** and **4-27**, the existing Courtland Reservoir has a small storage deficit.

Since Courtland utilizes direct-pumped storage, the pumping system also needs to be considered. At present the facility contains only one large pump, and thus the firm capacity of the existing pumping station does not meet the maximum day plus fire flow demand. Also, during the site tour, staff reported that the existing pumping station had a very slow pump start response that was not acceptable to the fire department. Concern over loss of pressure during power failures was also noted.

- A draft Schedule B Class Environmental Assessment was prepared by G. Douglas Vallee Limited, dated June 24, 2014 to address these concerns. This report identified two alternatives:
  - *Alternative 1:* A new 1, 500 $m^3$ elevated tank, with pumping station modifications to address the new system (Cost $3.0M).
  - *Alternative 2:* Modifications to the pumping station to provide new pumps to meet the firm fire flow capacity, along with a building and reservoir expansion, and electrical modifications (Cost $0.9M).
- The report recommended the elevated tank alternative on the basis of its improved operational performance, ability to provide instant response to a fire situation, and its security during a power failure.

At this time, it is suggested that a third alternative be added, as follows:

  - *Alternative 3:* Same as Alternative 2, with the addition of hydro-pneumatic vessels, a revised control system that would call for a rapid large-pump start, and additional standby power facilities. The tanks would provide surge protection, and allow pump starts and stops to occur without delaying a fire flow response. The tanks would also maintain pressure for several minutes, to allow time for a standby generator start during a power failure. It would be expected that these additions would resolve the concerns of the Fire Department, and reduce the risk of loss of system pressure (Cost $1.4M).

It should be noted that elevated tanks do need to be periodically removed from service for cleaning and re-painting. During these occasions it would be useful to continue to have the in-ground system in service. It would also be expected that Alternative 3 could provide a system with slightly less reliability than Alternative 1, but at a significantly reduced cost.

One final point is that the maximum capacity of the Delhi to Courtand transmission water main is at least 40 L/s. Since the 2041 maximum day demand in Courtland is estimated to be 514 $m^3$/d or 5.9 L/s, there will be 34 L/s of extra capacity available from the transmission main, that could be used to assist with firefighting events. Over a 2 hour design fire, the transmission main could deliver a total of 244 $m^3$ of additional supply, which could effectively eliminate any volume short-fall.

### Port Rowan and St. Williams

Port Rowan has adequate storage, and thus no additional storage is recommended.

### Waterford

Waterford has the same type of deficiency as Delhi – a tall, narrow standpipe, with a relatively small capacity at above the minimum useable water level. As shown in **Figures 4-26 and 4-27**, the deficiencies are 991 and 1,327 $m^3$ for 2015 and 2041.

There are three potential solutions that could be used to address this deficiency:

- A new booster pumping system be installed at the base of the standpipe, with two pumps, each capable of 144 L/s at a TDH of 35 (to be re-confirmed during final design). A similar control and re-fill system to that proposed for Delhi would be required.
- A 1,326 $m^3$ reservoir addition plus duty and standby 144 L/s pumps and an upgraded water main could be added at the existing Waterford Water Treatment Plant site. An upgrade of the standby power may also be required.
- A new 2000 $m^3$ elevated tank could be constructed.

It is recommend that the first option be selected, as this would be the least cost to provide the additional storage necessary, and the County advises that there is sufficient land surrounding the tower for the additional facility.

### 4.2.2.3 Water Distribution System Evaluation

To undertake an evaluation of the various water distribution systems, InfoWater Network Models were upgraded or developed as necessary to cover each of the systems. The models used were from the following sources:

- **Simcoe:** RVA developed and calibrated a skeletonized model for the 2011 Simcoe Water Distribution System Study. This model was updated with GIS water main information, and demands were adjusted to those calculated in this study. Future peak hour demands were distributed evenly throughout the model. The model was also updated with the new main on Norfolk St. N at the end of town.
- **Port Dover:** The Port Dover model was developed by others. The model was reviewed and a number of minor modifications were made, as follows:
  - Approximately 15 water main intersections were not connected – the model was adjusted to connect the crossing pipes
  - A new 300 mm main was added on Main St. from Thompson Dr. to Prospect St.
  - A new 250 mm water main on Main St. was added from Prospect St. to Harbour St.
  - The 250 mm main on Main St. was tied in to the existing 400 mm main on Harbour St.

- The demands were adjusted to suit those calculated through this study. Future peak hour demands were distributed evenly throughout the model.

- **Delhi:** The Delhi Model was developed by others. The model demands were adjusted to suit those calculated through this study. Future peak hour demands were distributed evenly throughout the model.
- **Waterford:** The Waterford Model was developed by others. Several "disconnected" pipe crossings in the model were connected. The model demands were adjusted to suit those calculated through this study. Future peak hour demands were distributed evenly throughout the model.
- **Port Rowan:** A new model was developed for Port Rowan using GIS shapefiles. Demands were adjusted to suit those calculated through this study. Future peak hour demands were distributed evenly throughout the model.
- **Courtland:** The Delhi model was expanded to include the Courtland reservoir, pumping station and distribution system. GIS shapefiles were used to plot the new mains. Demands were adjusted to suit those calculated through this study. Future peak hour demands were distributed evenly throughout the model.
- **St. Williams:** The model developed for Port Rowan was extended to include St. Williams, and the existing St. Williams Pumping Station. Demands were adjusted to suit those calculated through this study. Future peak hour demands were evenly distributed through the model.

Calibration testing was completed for new models, and the models were adjusted as necessary to be within typical acceptable tolerances. With the updated models, runs were undertaken for each water distribution system in for the following conditions:

- 2015 Peak Hour, as shown in **Figure 4-28**.
- 2015 Maximum Day plus Fire: Fire flow runs were conducted using maximum day demands.
- 2041 Peak Hour using 2041 demand projections, as shown in **Figure 4-29**.

  2041 Maximum Day plus Fire.

**Figure 4-28 – 2015 Peak Hour Flows**

| Community | Population | $Q_a$ ($m^3/d$) | $Q_m$ ($m^3/day$) | Peak hour factor ($Q_p/Q_a$) | Peak Hour Flow $Q_p$ ($m^3/d$) |
|---|---|---|---|---|---|
| Simcoe | 15,272 | 5,259 | 7,947 | 2.85 | 14,988 |
| Port Dover | 7,054 | 2,594 | 5,401 | 3.00 | 7,782 |
| Waterford | 3,738 | 894 | 1,673 | 3.00 | 2,682 |
| Delhi & Courtland | 6,154 | 1,538 | 2,929 | 3.00 | 4,614 |
| Port Rowan and St. Williams | 1,966 | 772 | 1,742 | 3.75 | 2,895 |

**Figure 4-29 – 2041 Peak Hour Flows**

| Community | Population | $Q_a$ ($m^3/d$) | $Q_m$ ($m^3/day$) | Peak hour factor ($Q_p/Q_a$) | Peak Hour Flow $Q_p$ ($m^3/d$) |
|---|---|---|---|---|---|
| Simcoe | 17,380 | 5,981 | 9,038 | 2.85 | 17,046 |
| Port Dover | 9,640 | 3,506 | 7,300 | 3.00 | 10,518 |
| Waterford | 4,970 | 1,174 | 2,198 | 3.00 | 3,522 |
| Delhi & Courtland | 6,430 | 1,606 | 3,059 | 3.00 | 4,818 |
| Port Rowan and St. Williams | 2,620 | 1,014 | 2,287 | 3.38 | 3,427 |

Selection of tank levels for the various runs was an important consideration. To be conservative, runs were made to simulate what would happen at the "end of the event." For example, peak hour runs were conducted assuming the storage had been depleted by the "equalization volume" (or the "B" volume) as recommended by the MOECC. Fire flow runs were conducted assuming the equalization and fire flow volumes had been depleted (volumes A + B). **Figure 4-30** summarizes the storage tank levels used for each model run.

**Figure 4-30 – Tank Levels Used for Modelling Runs**

| Community | Top Water Level (TWL) Metres above Sea Level (m) | 2015 Bottom of B Used for Peak Hour Runs (m) | 2015 Bottom of A+B Used for Fire Flow Runs (m) | 2041 Bottom of B Used for Peak Hour Runs (m) | 2041 Bottom of A+B Used for Fire Flow Runs (m) |
|---|---|---|---|---|---|
| Simcoe | 265.00 | 263.50[1] | 262.00[1] | 263.50[1] | 262.00[1] |
| Port Dover | 233.50 | 229.75 | 225.60 | 229.75 | 225.60 |
| Delhi | 285.00 | 279.00 | 277.00 | 279.00 | 277.00 |
| Waterford | 287.20 | 283.20 | 279.20 | 283.20 | 279.20 |
| Port Rowan | 241.00 | 235.00 | 233.00 | 235.00 | 233.00 |
| Courtland | 240.30 | 240.00 | 239.76 | 240.00 | 239.76 |

[1]The Simcoe levels assume the bulk of the equalization and fire flow storage comes from the in-ground reservoirs, and that the elevated tank's primary function is to provide pressure control on the system. This assumes that the upgrades to the high lift pumps at the Northwest Reservoir and the Cedar Street Reservoir have been completed, as discussed in Section 4.2.2.2 above. Without the pumping upgrades, the tower would be completely drained by a design fire flow event, and the fire protection flows available throughout Simcoe would be significantly less.

The output of all these runs was illustrated visually through a series of maps, contained in **Appendix C**. For the peak hour runs, pressures at each node in the model were plotted to indicate any areas with low or high pressure concerns. As discussed previously, target pressures were 350-550 kPa, with minimum and maximum pressures identified as 275-700 kPa. For the fire flow runs, available fire flow at each node were plotted to provide an indication of where any fire flow limitation would occur.

#### *4.2.2.4 Water Distribution System Model Findings and Recommendations*

***Simcoe***

The distribution system analysis conducted as part of this study generated results that were consistent with the Simcoe Water Distribution System Study undertaken by RVA in 2011.

The majority of the downtown area was found to be well serviced. There are some marginal pressures at the southwest and eastern portions of the system, primarily caused by higher ground elevations. Upon closer examination it was found that no node pressures were below 260 kPa (approximately 37 psi). There were also some isolated locations where fire flows were below standard, due to small diameter local mains.

The model was run to determine if any upgrades were required to manage the pump capacity increases proposed at the Cedar Reservoir and Pumping Station as well as the North West Reservoir and Pumping Station. It was found that no additional mains were required.

Figures 1 to 2 in **Appendix C** show the results of current peak hour and maximum day plus fire runs. Figures 3 and 4 show the results for 2041.

Recommendations for Simcoe are as follows:

- While there are significant areas below the 275 kPa recommended minimum pressure, no immediate actions are recommended, as these locations are close to the minimum recommended pressure.
- For any new developments adjacent to areas of marginal service, conduct detailed network modelling of the proposal, and establish if any network upgrades using replacement mains of a larger diameter will be required.
- At the time any streets are to be reconstructed or water mains replaced, consider upsizing undersized mains. A full list of undersized mains is provided in **Appendix D**.
- Maintain the Simcoe Elevated tank within a narrow band between the top water level (TWL) and 1-2 m below the TWL if possible. The control system should use the maximum pumping capacity at each of the pumping stations if the tank falls below this level.

### *Port Dover*

The majority of Port Dover is well serviced by the existing system. There are, however, two areas of concern:

- The northwest corner of the distribution system has marginal pressures and limited fire protection, due to higher ground elevations. In particular, new development proposed within the "red box" area shown on Figure 6 in **Appendix C** is at too high an elevation to be adequately serviced by the existing system. It is recommended that a booster pumping station be provided to service this area.
- There are numerous small areas with inadequate fire protection as shown on the figures, caused by undersized local water mains. It is recommended that these

areas be provided with larger diameter water mains as a part of any road or water main reconstruction work. Refer to **Appendix D** for a listing of undersized mains in Port Dover.

### *Delhi*

The Delhi runs were made assuming the old water treatment plant was out of service. Under these conditions, it was found that the majority of Delhi is well serviced; however, there are some marginal pressures at the Northwest corner of the distribution system, due to higher ground elevations. It is recommended that modelling be performed for any new developments, and that oversizing of some new water mains be considered to enhance the supply to this area.

There are also small areas with inadequate fire protection as shown on the figures, caused by undersized local water mains. It is recommended that these areas be provided with larger diameter water mains as a part of any road or water main reconstruction work. Refer to **Appendix D** for a listing of undersized mains in Delhi.

### *Courtland*

The existing Courtland system provides adequate peak hour pressures to all nodes for current and future conditions.

Any of the options discussed in **Section 4.2.2.2** would generally resolve the fire flow concern, without the need for network upgrades, except for dead ends in the existing system, as shown on Figure 14 and 16 of **Appendix C**. **Appendix D** provides a listing of looped water mains required to address fire flow. Total length is approximately 1400 m.

### *Port Rowan*

The results of the Port Rowan Model indicate that peak hour pressures are generally good, but the residential area in the north end adjacent to Lakeshore Rd. and Concession Rd. 1 has inadequate fire supply, as it is a large area with only a single supply pipe feeding it. It is recommended that this area be looped. As it appears that there are no easily available road routes, a main from the end of College Ave. to the west end of Aspen Ln. would help, although this would require the purchase of an easement and would not bring all locations up to the 83 L/s target. A loop around the sewage lagoon starting at the dead end of the water main on Hunter Dr. N., perhaps running through an easement at the RV parking area would be another possibility to further boost fire flow in this area, and would also improve the fire supply to the wastewater treatment plant. Other dead ends in the Port Rowan distribution system should be looped when possible.

There are also 200 m of undersized mains that should be replaced by larger mains as part of any road or water main reconstruction projects. They are listed in **Appendix D**.

### *Waterford*

Modelling of the Waterford distribution system showed lower pressures in the north end due to higher ground elevations. Recommendations are as follows:

- Construct a booster pumping station at the base of the standpipe to maintain a higher HGL under high demand conditions.
- Any new development areas – particularly in the north end should be carefully reviewed and the need for strengthening water mains considered (including looping Main St. N. from College St. W. to minimize head loss from the standpipe to the new area).
- A loop from Main St. N. to Woodley Rd. should be included to eliminate the dead end on Ross St. and to help with fire flows in the area (length about 385 m).
- During any road or water main reconstruction, consider replacing local mains to alleviate local conditions identified on the maps. Figure 18 of **Appendix C** illustrates these areas

**Appendix D** provides a listing of undersized water mains in Waterford.

### 4.2.3 Alternatives, Evaluations and Implementation

This sub-section of the ISMP reviews various alternative solutions to the challenges that have been previously identified with water supply, along with an evaluation of the alternatives and the recommendations resulting from the evaluation.

Recommended solutions were not always the "best" from a solely technical point of view. Rather, in consultation with the County, the recommended solutions were selected on the basis of affordability, ability to meet MOECC requirements, and their ability to reduce risks to acceptable levels.

Each water system is dealt with separately; however, the following "County-wide" System could apply to all water systems.

### *County-Wide System Alternative*

### *Summary of Needs*

This section considers needs of the County water system on a County-wide basis. The primary County-wide need is that of water supply availability and security. Each of the northern communities of Simcoe, Delhi, Courtland, and Waterford are dependent on groundwater supplies which have been found to:

- be at serious risk of aquifer contamination;
- be limited in growth, since approvals for new ground-water wells have been extremely difficult to obtain; and
- have frequent maintenance and plugging issues.

Both of the two lake-based systems (Port Dover and Port Rowan / St. Williams) have water intake and treatment plant limitations and risks.

The water supply demands for the County as a whole are:

- Current Maximum Day Water Demand: 19,537 $m^3$/d (20 MLD)
- Future (2041) Maximum Day Water Demand: 23,945 $m^3$/d (24 MLD)

### *Description of County-Wide System Alternative*

The one alternative that would address all of these deficiencies would be a centralized water supply that would consist of a new water intake, a new water treatment plant, and a system of transmission mains to convey treated water throughout the County.

To develop a feasibility level cost estimate, two alternatives were proposed. The first would include the following components:

- A water intake and treatment capacity for 24,000 $m^3$/d (24 MLD), sufficient for the 2041 needs of all of the serviced communities in the County, with the ability to be expanded for growth beyond 2041. The treatment system would be capable of meeting all current drinking water regulations, and also have the capability of addressing some future requirements, along with increased raw water quality challenges, including algae blooms, and algae generated toxin events.
- Pumping stations, as necessary to push the water from the lake to the higher elevation inland communities. Pumping stations for Port Dover, Port Rowan and Simcoe would all be part of the main treatment plant. Additional booster pumping stations would be required to supply water from Simcoe to Waterford, and from Simcoe to Delhi.
- Transmission mains to connect to each of the communities.

This central supply option was assumed to have included a new intake and low lift pumping station at the south end of Blueline Road, with a new treatment plant located on Blueline Road between Radical Road and County Road 6. From this location water could be pumped as follows:

- via a 500 mm diameter main, approximately 10.9 km from the new plant to Simcoe

- via a 400 mm diameter main, approximately 9.4 km from Simcoe to Waterford
- via a 400 mm diameter main, approximately 12.6 km from Simcoe to Delhi
- via a 500 mm diameter main, approximately 2.5 km to Port Dover
- via a 400 mm diameter main, approximately 31.1 km to Port Rowan

The cost of this solution is estimated to be as follows:

- Intake: $9 M
- Raw Water PS and Treatment Plant, and High Lift Pumping Facilities: $60 M
- Transmission Water Mains: $28 M
- Booster Pumping Stations: $6 M
- Decommission old Delhi Plant $0.5 M
- Storage Upgrades (as described below) $9 M
- Local Distribution Upgrades (as described below) $6 M
- Total $118.5 M
- **Rounded, TOTAL COST: $119 M**

A variation of the central solution would be to purchase water from an adjacent community, then convey the water with a different system of transmission mains. Options could include Haldimand County or the Elgin Area Water Supply System.

An expansion of the existing Nanticoke Water Treatment Plant in Haldimand County would likely be the lowest cost supply from a neighbouring community. Such an alternative would be able to delete the need for a new intake, and potentially significantly reduce the cost of the screening and low lift pumping station. In this case, it is possible that treatment plant costs could be about $40 M. An additional main between the Nanticoke and Port Dover would be required at an estimated cost of about $6 M. Overall this could result in a **total cost of $95 M.** However, prior to proceeding, an agreement would be necessary, and would likely require lengthy and complex negotiations. Development, or membership in a "shared services board" such as the Elgin Area Primary Water Supply System Joint Board of Management could also be a possibility.

It should be noted that any Central System Option would still require community water system storage improvements, pumping upgrades, as well as local water distribution upgrades as noted in the above sections.

### *Evaluation of County-Wide Alternative*

The County-Wide Alternative with a total capital cost of $95-119M was compared with a wide range of local system alternatives, which are described in the following sections.

While the County-Wide solution has a number of important benefits, overall it was found that a series of local system alternatives would address the needs of the County and meet the applicable regulations and guidelines at a cost of approximately $54M. These capital costs can also be spread out over a longer period of time, as compared with a high up-front cost for the County-Wide Alternative. As a result, the County-Wide Alternative is not recommended at this time.

However, there may come a time beyond the timeframe of the study when a County-Wide water supply system could become a preferred approach. For that eventuality, the local system upgrades have been selected with consideration to complement and benefit the County-Wide alternative in the future. For example, it is recommended that interconnections between the service areas be sized so that they could be used as part of a future County-Wide system.

Evaluations of the various local system alternatives are presented in the following sections. Overall however, the "Multiple Upgrade Option" made up of a series of local system upgrades (with consideration of a future County-Wide system) is the recommended water supply solution for Norfolk County."

### *Local System Alternatives (Contributing to the "Multiple Upgrade Option")*

The following sections consider alternatives that could be undertaken on a community by community basis, sometime in conjunction with adjacent communities in the County. For each water system, the needs have been broken down into address:

- supply constraints;
- existing risks;
- storage issues and shortfalls; and
- distribution needs.

### *Simcoe*

#### *Summary of Needs*

The water system needs and risks addressed for Simcoe are summarized in **Figure 4-31**.

**Figure 4-31 – Simcoe Needs Summary**

| Aspect of System | Current Practical Firm Capacity | Current Needs | 2041 Requirements | Needs Summary |
|---|---|---|---|---|
| Supply | 10, 563 m3/d* | 8,000 m3/d | 9,000 m3/d | None* |
| Risks | • Permanent or temporary loss of well field production due to mechanical failure or aquifer contamination | | | |
| Storage | 2,386 $m^3$ | 6,983 $m^3$ | 7,325 $m^3$ | 3,751 $m^3$ |
| Distribution | • Replace approximately 540 m undersized mains that may result in sub-standard fire protection in localized areas.<br>• Replace approx. 1,296 m additional undersized mains. | | | |

*Note: This includes 5,184 $m^3$/d of supply from the Cedar Street Wells and Infiltration Gallery. In early 2016, contamination of nearby groundwater was noted that places these wells at risk. Should this source fail completely, the firm capacity drops to 5,379, which is less than the current maximum day requirements by 2621 $m^3$/d and less than the future maximum day requirements by approximately 3621 $m^3$/d.

### *Alternative Solutions*

**Supply:** Simcoe is not in immediate need of source water, as it appears to have approximately 2,600 $m^3$/d spare capacity. If one of the larger wells or well field failed, the system would likely have adequate capacity, although some water use restrictions may be required. As demand grows over the next 25 years, however, the current level of spare capacity is projected to fall, and risk of inadequate supply will increase. Alternative solutions that address some or all of these concerns are as follows:

- ***S-0: Do Nothing:*** This option is mandatory for consideration under the Municipal Class EA process. While the system would be able to operate with sufficient capacity for the planned growth, doing nothing would not address the long term risks of well or well field failures. This option is not recommended as it does not address the risk issues that exist within the Simcoe System, and in particular the risk of the immediate threat to the Cedar Street supply.
- ***S-1: Develop and connect a new well to the North-East of Simcoe:*** The County has already been undertaking groundwater investigations. An additional well has been located and found to have adequate quality and quantity. The work to bring the well on line would include: engineering and hydrogeological modelling

to update the Wellhead Protection Mapping, construction of a new well pumphouse and treatment works, and a transmission water main connection to the Simcoe water distribution system. However, there have been considerable delays in the approval of the well due to MOECC concerns about impacts the new well may have on the local aquifer. The ability to resolve these concerns and the timing of any resolution is uncertain.

- ***S-2: Interconnection with Waterford:*** A pipeline interconnection with Waterford would allow the excess total capacity in Waterford to be utilized to supplement Simcoe in a time of shortfall. The Waterford wells and treatment plant are in good condition, and reliable. The added benefit is that this interconnection could act as an emergency supply to Waterford in the event of a well field failure in Waterford. This main could include a chamber with a bi-directional flow meter, and a SCADA-controlled flow control valve, that would allow flow to be automatically drawn from Waterford to supply Simcoe. The reverse supply from Simcoe to Waterford would require a booster pumping station. Should it need to be activated, the fluoride feed system in Simcoe should also be turned off, as the County does not have permission at this time to fluoridate the Waterford water supply system. The downside of this alternative is that it still depends on groundwater supplies, which have been found to be increasingly risky in recent years.
- ***S-3: Interconnection with Port Dover:*** A pipeline interconnection with Port Dover would allow water to be supplied from Port Dover, but this would require an additional expansion to the Port Dover WTP capacity, since it is already in need of capacity increase. If the Port Dover WTP was returned to its DWWP capacity of 9,677 $m^3$/d, it would have 4,200 $m^3$/d spare capacity in 2016, falling to 2,400 $m^3$/d spare capacity by 2041, if demand increases in Port Dover as projected.
- ***S-4: Interconnection with Delhi:*** Similar to S2, this option would allow excess total capacity from the Delhi wells to be supplied to Simcoe, and vice versa if need be with a booster pumping station. The same comments about fluoride and the risk of groundwater supplies in general apply to this alternative.
- ***S-5: County-Wide Water Supply:*** This alternative was presented above.
- ***S-6: Enhanced Water Conservation:*** A more aggressive County water conservation program could potentially reduce overall water demands by 10-15% from projected demands. This alternative could consist of full water metering, promoting water audits, promoting water efficient fixtures, providing pricing structures that promote conservation, expanding leak detection and unaccounted for water audits, and developing enhanced outdoor water use bylaws.
- ***S-7: Continue Proactive Well Maintenance Program:*** We understand that the Norfolk County already has a proactive well maintenance program. Any recommendation based on the continued use of the existing wells should require the proactive well maintenance program be maintained into the future.

**Storage:**

- ***S-10: Increase Firm Capacity of Cedar St. High Lift Pumps to 185 L/s:*** As previously discussed in the *Simcoe, Recommended Storage and High Lift Pumping Upgrades.*
- ***S-11: Increase Firm Capacity of Northwest Reservoir High Lift Pumps to 164 L/s:*** As previously discussed in the *Simcoe, Recommended Storage and High Lift Pumping Upgrades.*

**Distribution:**

- ***S-20: Replace Undersized Mains to Improve Fire Protection:*** Please see Table A in **Appendix D** for a detailed list of these water mains.
- ***S-21: Water Main Upgrades as Part of Road or Water Main Re-construction:*** Other undersized mains should eventually be replaced throughout Simcoe. See the second half of Table A in **Appendix D** for details.

### *Evaluation and Recommendations*

The Simcoe alternatives were evaluated on the basis of cost, reliability, environmental impacts, and the ability to address risks. The following recommendations are provided in order, with a summary of the justification:

**Figure 4-32 – Simcoe Recommendations**

| Recommendation (in priority) | Rationale |
|---|---|
| **Short Term (0-5 years)** | |
| S-7 Maintain Proactive Well Maintenance Program | • To minimize the number of wells out of service at any one time, to maximize overall reliability of existing wells, and maintain the current practical firm capacity as identified above, which is a critical aspect of the ISMP recommendation. |
| S-6 Enhanced Water Conservation | • Reduce rate of water demands increase<br>• Delay need for additional capital costs |
| S-3 : Interconnection with Port Dover | • Assuming that the Port Dover WTP is first restored to its full DWWP capacity, which can be done at a relatively low cost, this allows spare capacity of 2,400-4,200 $m^3$/d to be available to supplement Simcoe's stressed groundwater supplies.<br>• This installation would require a pipeline that could eventually become part of a future Regional Supply system. |
| S-10 and S-11 Increase Capacity of Cedar St. High Lift Pumps and Northwest Reservoir High Lift Pumps | • Relatively low cost means to address the significant storage shortfall, and make best use of existing storage assets. |
| **Medium Term (6-15 years)** | |
| S-2 Interconnection with Waterford | • This would provide a substantial new additional source of supply to Simcoe, and would also address a significant risk for Waterford.<br>• This installation would require a booster pumping station and pipeline that could eventually become part of a future Regional Supply system. |

| Recommendation (in priority) | Rationale |
|---|---|
| S-4 Interconnection with Delhi | • Additional source security for Simcoe, additional source security for Delhi |
| S-1 New Well to Northeast of Simcoe | • New well source, if demands are increasing and approvals can be obtained. |
| **Long Term (16-25 years)** | |
| S-20 Replace Undersized Water Mains to Improve Fire Protection, as Part of Road or Water Main Re-construction | • This would allow the marginal areas to be better serviced, but at a lower cost as a part of infrastructure renewal |
| S-21 Replace Other Undersized Water Mains Throughout Community | • Better long term service and standardized main sizes. |

### *Port Dover*

#### *Summary of Needs*

The water system needs and risks to be addressed for Port Dover are summarized in **Figure 4-33**.

Figure 4-33 – Port Dover Needs Summary

| Aspect of System | Current Practical Firm Capacity | Current Needs | 2041 Requirements | Needs Summary |
|---|---|---|---|---|
| Supply | 2,454 $m^3/d$ | 5,334 $m^3/d$ | 7,341 $m^3/d$ | 2,880 – 4,887 $m^3/d$ |
| Risk | • Water Treatment Plant Clarifier Breakdown<br>• High Lift Pump Lack of Redundancy<br>• Frazil ice blocking the intake<br>• Severe algae event in the raw water source<br>• Inability to remove elevated tank from service, due to inability to supply filter backwashes. If tank needs to be taken out of service for any sort of emergency, filter production will be impacted. | | | |
| Storage | 4,500 $m^3/d$ | 4,239 $m^3/d$ | 4,833 $m^3/d$ | none |
| Distribution | • Booster Pumping Station required for development in Northwest corner of the distribution system.<br>• Replace approximately 6,717 m of undersized mains that may result in sub-standard fire protection in localized areas.<br>• Replace an additional 1,239 m of undersized mains. | | | |

### *Alternative Solutions*

**Supply:** Port Dover has an immediate supply shortfall based on the inability of the treatment plant to operate to its full design capacity. Closely associated with this are the risks of a clarifier or high lift pump breakdown. Alternatives to address some or all of these needs are as follows:

- ***PD-0: Do Nothing:*** This option is mandatory for consideration under the Municipal Class EA process. This alternative does not address the supply short-falls or unacceptable risks identified for this system and is thus rejected.

- ***PD-1: Plant Upgrades:*** Plant upgrades to address the disinfection restriction in the clearwell, along with provision of redundancy for the clarifier would address the supply shortfalls and the risks identified above. Plant upgrades should also consider means to reduce the risks of algae blooms in the raw water, frazil ice blockage of the water intake, and provide the ability to backwash the filters during times that the elevated tank is out of service.
- ***PD-2 (S-3): Interconnection with Simcoe:*** A pipeline interconnection with Simcoe would allow water to be supplied from Simcoe. This would be the same solution as identified for Simcoe (S-3) but would allow a reverse flow. This solution would also assist with the operation of the Port Dover Water System when the elevated tank was out of service.
- ***PD-3 (S-5): County-Wide Water Supply:*** This alternative would be as presented above.
- ***PD-4: Enhanced Water Conservation:*** A more aggressive County water conservation program could potentially reduce overall water demands by 10-15% from projected demands. This could consist of full water metering, promoting water audits, promoting water efficient fixtures, providing pricing structures that promote conservation, expanding leak detection and unaccounted for water audits, and developing enhanced outdoor water use bylaws.

**Storage:** No changes or additions required.

**Distribution:**

- ***PD-20: Booster Pumping Station for Northwest Corner:*** Provide a new booster pumping station as necessary to provide both peak hour and fire flows to the northwest corner of Port Dover, in conjunction with any developments in this area, and/or in conjunction with PD-2.
- ***PD-21: Replace Undersized Mains to Improve Fire Protection:*** Please see Table B in **Appendix D** for a detailed listing of these water mains.
- ***PD-22: Water Main Upgrades as Part of Road or Water Main Re-construction:*** Other undersized mains should eventually be replaced throughout Port Dover. See the second half of Table A in **Appendix D** for details.

### *Evaluation and Recommendations*

The Port Dover alternatives were evaluated on the basis of cost, reliability, environmental impacts, and the ability to address risks. The following recommendations are provided in order, with a summary of the justification:

**Figure 4-34 – Port Dover Recommendations**

| Recommendation (in priority) | Rationale |
|---|---|
| **Short Term (0-5 years)** | |
| PD-1 Plant Upgrades | • The plant does not have sufficient capacity to meet current maximum day demands. It is recommended these upgrades be undertaken on an urgent basis. Upgrades to the disinfection, clarification, and intake will mitigate the risks identified. Upgrades will also allow the elevated tank to be taken out of service. |
| PD-4 Enhanced Water Conservation | • Reduce rate of water demands increase<br>• Delay need for additional capital costs in the future |
| PD-20 Booster Pumping Station in Northwest Corner of System | • This is required to supply any new development in this area. |
| PD-2 (S-3) Interconnection with Simcoe | • While this option would have the greatest value to Simcoe, it could also provide an emergency back-up supply to Port Dover, reducing risks of a plant shut-down due to frazil ice, or fire event with the elevated tank out of service. |
| **Medium Term (6-15 years)** | |
| - none - | |
| **Long Term (16-25 years)** | |
| PD-21 Replaced Undersized Water Mains to Improve Fire Protection, as Part of Road of Water Main Re-construction | • This would allow the marginal areas to be better serviced, but at a lower cost as a part of infrastructure renewal. |
| PD-22 Replace Other Undersized Water Mains Throughout Community | • Better long term service, and standardized main sizes. |

## Delhi

### Summary of Needs

The water system needs and risks to be addressed for Delhi are summarized in **Figure 4-35**.

**Figure 4-35 – Delhi Needs Summary**

| Aspect of System | Current Practical Firm Capacity | Current Needs | 2041 Requirements | Needs Summary |
|---|---|---|---|---|
| Supply | 1,880 $m^3$/d | 2,926 $m^3$/d[1] | 3,060 $m^3$/d[1] | 1,180 $m^3$/d[1] |
| Risks | • Potential contamination of Lehman Dam water supply<br>• Age of Delhi Water Treatment Plant, and risks of failure<br>• Permanent or temporary loss of well field production due to mechanical failure or aquifer contamination<br>• Water main break between wells and Delhi distribution system | | | |
| Storage | 947 $m^3$ | 2,906 $m^3$ | 2,941 $m^3$ | 1,994 $m^3$ |
| Distribution | • Replace approximately 1,072 m of undersized mains that may result in sub-standard fire protection in localized areas.<br>• Replace additional approx. 1,891 m of undersized mains. | | | |

[1]Note: Supply requirements include the supply to Courtland.

### Alternative Solutions

**Supply:** Delhi has a short-term need for an increase in capacity of safe, secure water. This is based on the team's recommendation that the existing Delhi Water Treatment Plant be decommissioned in the short term. Alternatives to address some or all of the needs are as follows:

- ***D-0: Do Nothing:*** This option is mandatory for consideration under the Municipal Class EA process. This alternative does not address the supply short-falls or unacceptable risks identified for this system and is thus rejected.
- ***D-1: Develop and Commission a Third Well in the vicinity of Windham West Quarter Line Rd. and Windham Rd. 14:*** The County has already completed investigations, and has a site selected for this well. A 7-day draw down test is planned for the spring of 2016. In addition, the work required would be the completion of land negotiations, design, approvals, and construction.

- **D-2: Decommission Existing Water Treatment Plant:** Once other upgrades have been made to provide a secure water supply to Delhi, the existing water treatment plant can be decommissioned.
- ***D-3: Interconnection with Simcoe (S-4):*** The interconnection with Simcoe could allow for emergency flow from Simcoe in the case of a failure of one or more of the existing wells. A booster pumping station would be required, and the fluoride system turned off in the event of its operation, since the residents of Delhi have not accepted the addition of fluoride to their water. This option could also be part of a future County-Wide Water System.
- ***D-4: Construct a New Surface Water Treatment Plant Using Lehman Reservoir as a Source:*** A new state-of-the art water treatment plant could utilize the existing water intake. It could be designed to have a robust treatment system with components such as ozone, advanced oxidation, or reverse osmosis to address potential upstream contaminants and spills.
- ***D-5 (S-5, PD-3): County-Wide Water Supply:*** This alternative would be as presented above.
- ***D-6: Enhanced Water Conservation:*** A more aggressive County water conservation program could potentially reduce overall water demands by 10-15% from projected demands. This could consist of full water metering, promoting water audits, promoting water efficient fixtures, providing pricing structures that promote conservation, expanding leak detection and unaccounted for water audits, and developing enhanced outdoor water use bylaws.

**Storage:**

- ***D-10: Install Pumps at the Delhi Standpipe:*** Install one duty and one standby pump, each with 159 L/s capacity, standby power, a control system and piping designed to allow for pressure control from the beginning of a high flow event through to its conclusion, including the refilling of the standpipe.
- ***D-11: Construct a new Elevated Tank:*** Construct a new 3,000 $m^3$ elevated tank that would eliminate the need for the existing standpipe. No additional pumping would be required to utilize the full storage.

**Distribution:**

- ***D-20: Replace Undersized Mains to Improve Fire Protection:*** Please see Table C in **Appendix D** for a detailed listing of these water mains.
- ***D-21: Water Main Upgrades as Part of Road or Water Main Re-construction:*** Other undersized mains should eventually be replaced throughout Delhi. See the second half of Table C in **Appendix D** for details.

### *Evaluation and Recommendations*

The Delhi Alternatives were evaluated on the basis of cost, reliability, environmental impacts, and the ability to address risks. The following recommendations are provided in order, with a summary of the justification:

**Figure 4-36 – Delhi Recommendations**

| Recommendation (in priority) | Rationale |
|---|---|
| **<u>Short Term (0-5 years)</u>** | |
| D-1 Develop New Well | • The new well will achieve an adequate firm capacity, without the use of the existing water treatment plant. This will be the lowest cost method to achieve this goal (note, if D-1 is stalled due to approvals, Alternative D-3 should be advanced to the Short Term to provide redundancy to the Delhi system. If there are any extended delays to the development of the well, Alternative D-3 should be moved to the Short Term Priority List) |
| D-2 Decommission Existing Water Treatment Plant | • This will save the County operating costs, and will reduce the risk of needing to operate the aging plant. |
| D-6 Enhanced Water Conservation | • reduce rate of water demands increase<br>• delay need for additional capital costs in the future |
| D-10 Install Pumps at the Delhi Standpipe: | • since the pumphouse and some of the piping already exist, this alternative can be installed for a lower cost than a new elevated tank |
| **<u>Medium Term (6-15 years)</u>** | |
| D-3 Interconnection with Simcoe | The interconnection with Simcoe would provide emergency backup for the Delhi Wells, and would provide additional back-up to Simcoe (note, move to Short Tem Priority List if there are delays in new well approval). |

| Recommendation (in priority) | Rationale |
|---|---|
| **Long Term (16-25 years)** | |
| D-20 Replace Undersized Water Mains to improve fire protection, as part of road or water main re-construction. | • This would allow the marginal areas to be better serviced, but at a lower cost as a part of infrastructure renewal. |
| D-21 Replace Other Undersized Water Mains Throughout Community | • Better long term service, and standardized main sizes. |

## Port Rowan

### Summary of Needs

The water system needs and risks to be addressed for Port Rowan are summarized in **Figure 4-37**.

**Figure 4-37 – Port Rowan Needs Summary**

| Aspect of System | Current Practical Firm Capacity | Current Needs | 2041 Requirements | Needs Summary |
|---|---|---|---|---|
| Supply | 1,765 $m^3$/d | 1,750 $m^3$/d | 2,300 $m^3$/d | 535 $m^3$/d |
| Risks | • No water at intake due to low water conditions in Lake Erie.<br>• Severe algae bloom in the raw water could plug the filters or cause unacceptable levels of toxins. | | | |
| Storage | 1,600 $m^3$ | 1,295 $m^3$ | 1,659 $m^3$ | 59 $m^3$ |
| Distribution | • Add 600 m of loops to north end development.<br>• Replace approximately 185 m of undersized mains that may result in sub-standard fire protection in localized areas. | | | |

### *Alternative Solutions*

**Supply:**

While the Port Rowan Water Treatment Plant (WTP) can meet current demands, it is recommended that some capacity be added to the system to provide for future growth (note that it was previously recommended no development proceed until additional supply capacity is made available). The following alternatives address some or all of the various needs identified:

- ***PR-1: Do Nothing:*** This option is mandatory for consideration under the Municipal Class EA process. While the system would be able to operate, no growth would be possible, and the risk issues would not be addressed.
- ***PR-2: Plant Upgrade:*** A treatability Alternatives Evaluation Report prepared by XCG Consultants Ltd. (December 18, 2014) indicated that there are multiple capacity limiting factors associated with the existing water treatment plant. This option would include preliminary design to evaluate treatment process alternatives, followed by detailed design and a plant upgrade, potentially consisting of replacement of the existing package plant units with modern units of a higher firm operating capacity. A building expansion would be required. The upgrade would allow the plant to operate at its full DWWP level, which would provide adequate supply for 2041 predicted flows.
- ***PR-3*** (***W-3, S-5, PD-3, D-5): County-Wide Water System:*** This alternative was presented above.
- ***PR-4: Enhanced Water Conservation:*** A more aggressive County water conservation program could potentially reduce overall water demands by 10-15% from projected demands. This could consist of full water metering, promoting water audits, promoting water efficient fixtures, providing pricing structures that promote conservation, expanding leak detection and unaccounted for water audits, and developing enhanced outdoor water use bylaws.
- ***PR-5: New Intake Into Lake Erie:*** An Intake and Low Lift Study for the Port Rowan Water System was prepared in 2006 by Wiebe Engineering Group Ltd., which recommended a preferred alternative of a new intake, low lift pumping station and low lift main from the south side of the Long Point peninsula along Highway 59 to the existing plant. The estimated cost of the work in 2005 dollars was $9M.

- ***PR-6: Deepening the Existing Intake***: The Wiebe report considered an option they referred to as "chambering" which would include a lowered intake connecting to a chamber in a dredged depression in the bay. This alternative could include a small opening into the intake chamber designed to minimize sand entry, and would require an opening to allow for periodic cleaning. This alternative was discussed with Dean Construction – a firm does a variety of water intake construction on the Great Lakes. They suggested that a steel pipe "can" be vibrated into the muck, and a concrete plug could be tremied into the bottom. The intake could be connected to draw water from the inside of the can, which could be fitted with a cap and opens to allow water to enter the can at a low velocity. We estimate that such a solution could be undertaken for $0.5M. The possibility of adding a fish-friendly rock causeway to the intake was also discussed to allow ease of access for maintenance. All of these alternatives would require extensive discussions and negotiations with local environmental groups and the Ministry of Environment and Climate Change (MOECC), Ministry of Natural Resources and Forestry (MNRF), and Department of Fisheries and Oceans (DFO) as regulatory bodies.

**Storage:**

- The indicated deficiency of 59 $m^3$ is small. No additional storage is recommended.

**Distribution:**

- ***PR-20: Add Loops to Service North Portion of System:*** Details of this option were discussed in the Port Rowan, Water Distribution System Model Findings and Recommendations section, above. The concept is also shown on Figure 24 in **Appendix C** (length about 600 m).
- ***PR-22: Replace Undersized Water Mains to Improve Fire Protection as Part of Road or Water Main Re-construction:*** See Table F in **Appendix D** for details.

### *Evaluation and Recommendations*

The Port Rowan alternatives were evaluated on the basis of cost, reliability, environmental impacts, and the ability to address risks. The following recommendations are provided in order, with a summary of the justification:

**Figure 4-38 – Port Rowan Recommendations**

| Recommendation (in priority) | Rationale |
|---|---|
| **Short Term (0-5 years)** | |
| PR-4 Enhanced Water Conservation | • Reduce rate of water demands increase<br>• Could delay need for plant upgrades |
| PR-2 Plant Upgrade | • The plant upgrade could achieve a number of goals: increase plant capacity to its DWWP approved capacity; provide enhanced treatment to deal with poor water quality from the shallow intake; and provide enhanced treatment to deal with algae blooms in Lake Erie |
| PR-6 Deepening Existing Intake | • We agree with Wiebe Engineering's assessment that the Lake Erie intake option would provide the best technical solution. However, the new intake alternative would be expensive, and could create challenging land issues, and potentially challenging issues with the residents of Long Point who would not benefit from the construction in their neighbourhood. Operations staff report that there has never been a time that the plant has needed to be off line for more than several hours, and existing treated water storage has been sufficient to get through the condition. PR-6 would reduce the risk for water loss, and could be suitable as a long-term solution, at a fraction of the cost of the " best technical" solution. If the County had sufficient funds, PR-5 would be the better alternative. |
| **Medium Term (6-15 years)** | |
| PR-20 Add Loops to Service North Portion of System | • The subdivision at the North End of Port Rowan needs better fire protection. In the medium term, improvements should be made, or possibly made in conjunction with some other adjacent land development. |

| Recommendation (in priority) | Rationale |
|---|---|
| **<u>Long Term (16-25 years)</u>** | |
| PR-21 Replace Undersized Water Mains to Improve Fire Protection as Part of Road or Water Main Reconstruction. | • This would allow marginal areas to be better serviced, but at a lower cost as a part of infrastructure renewal. |

### Waterford

#### Summary of Needs

The water system needs and risks to be addressed for Waterford are summarized in **Figure 4-39**.

**Figure 4-39 – Waterford Needs Summary**

| Aspect of System | Current Practical Firm Capacity | Current Needs | 2041 Requirements | Needs Summary |
|---|---|---|---|---|
| Supply | 2,933 $m^3$/d | 1,680 $m^3$/d | 2,200 $m^3$/d | none |
| Risks | • Permanent or temporary loss of well field production due to mechanical failure or aquifer contamination<br>• Break in inaccessible water main feed from the treatment plant to distribution system. | | | |
| Storage | 657 $m^3$ | 1,648 $m^3$ | 1,984 $m^3$ | 1,327 $m^3$ |
| Distribution | • Add a loop from Main St. to Woodley Rd (approximately 385 m)<br>• Replace approximately 3,544 m of undersized mains that may result in sub-standard fire protection in localized areas.<br>• Replace an additional 285 m of undersized mains. | | | |

### *Alternative Solutions*

**Supply:**

Waterford is not in need of an immediate water supply expansion, however the risk analysis provided in **Section 4.2.2.2** indicates an unacceptable risk for Waterford with respect to its dependence on one well field. Alternatives to address this concern are:

- ***W-1: Do Nothing:*** This option is mandatory for consideration under the Municipal Class EA process. While the system would be able to operate with sufficient capacity for the planned growth, doing nothing would not address the risks of well or well field failures. This option is not recommended as it does not address the risk issues that exist within the Waterford system.
- ***W-2 (S-2): Interconnection with Simcoe:*** W-2 would provide an emergency supply to Waterford in the event of a well field failure in Waterford. This solution would consist of a booster pumping station and water main from the north-east corner of the Simcoe Distribution System to the south end of the Waterford system. This option could also be part of a future County-Wide Water System.
- ***W-3 (S-5, PD-3, D-5): County-Wide Water System:*** This alternative was presented above.
- ***W-4: Enhanced Water Conservation:*** A more aggressive County water conservation program could potentially reduce overall water demands by 10-15% from projected demands. This could consist of full water metering, promoting water audits, promoting water efficient fixtures, providing pricing structures that promote conservation, expanding leak detection and unaccounted for water audits, and developing enhanced outdoor water use bylaws.

**Storage:**

- ***W-10: A New Booster Pumping Station at the Base of the Standpipe:*** This booster pumping station would be similar to the concept presented for D-10 for Delhi, but it would require a complete new structure. The firm capacity of the pumping station would be 144 L/s.
- ***W-11: Reservoir Expansion and Additional Pumps at the Waterford Water Treatment Plant Site:*** Up to 1,326 $m^3$ of additional storage and 144 L/s of firm pumping capacity would be required as an addition to the existing facility.
- ***W-12: A New 2200 $m^3$ Elevated Tank:*** This would replace the function of the standpipe, and address the storage shortfall.
- ***W-13: Upgrade W-2 to Provide Additional 144 L/s Fire Flow Capacity:*** In this alternative, the pumping station and transmission main proposed in W-2 would be upgraded to handle the full Waterford Fire Flow.

**Distribution:**

- ***W-20: Loop from Main St. to Woodley Rd. to eliminate dead end*** (length about 385 m).
- ***W-21: Additional feeder main from the treatment plant to the distribution system.*** Assuming the main runs from the Treatment Plant to Thompson Rd. W., then to east to Washington St. (length about 1900 m).
- ***W-22: Replace Undersized Mains to Improve Fire Protection:*** Please see Table E in **Appendix D** for details.
- ***W-23: Water Main Upgrades as Part of Road or Water Main Re-construction:*** Other undersized mains should eventually be replaced throughout Waterford. See the second half of Table E in **Appendix D** for details.

### *Evaluation and Recommendations*

The Waterford alternatives were evaluated on the basis of cost, reliability, environmental impacts, and the ability to address risks. The following recommendations are provided in order, with a summary of the justification:

**Figure 4-40 – Waterford Recommendations**

| Recommendation (in priority) | Rationale |
|---|---|
| **<u>Short Term (0-5 years)</u>** | |
| W-4 Enhanced Water Conservation | • Reduce rate of water demands increase.<br>• Delay need for additional capital costs in the future. |
| **<u>Medium Term (6-15 years)</u>** | |
| W-2 Interconnection with Simcoe | • This would address a significant risk for Waterford and provide a substantial new source of supply to Simcoe. In the short term, this solution will also reduce the storage deficiency, as in a high-demand situation; the supplementary supply from Simcoe could also be engaged. |
| W-10 New Booster Pumping Station at the Base of the Standpipe | • This option is expected to have the least cost, and can be done most simply. |
| W-20 Loop from Main St. to Woodley Rd. to eliminate dead end | • Resolves sub-standard fire protection due to dead end. |
| **<u>Long Term (16-25 years)</u>** | |
| W-20, W-22 and W-23 Upgrade Local Areas with Inadequate Fire Protection | • The County should gradually work towards elimination of sub-standard areas within the system as part of any new development or infrastructure renewal.<br>• The additional feeder main between the Water Treatment Plant would not be critical if the supplementary feed from Simcoe has been completed to provide back-up supply, thus is not recommended. |

### Courtland

#### Summary of Needs

The water system needs and risks to be addressed for Courtland are summarized in **Figure 4-41**.

**Figure 4-41– Courtland Needs Summary**

| Aspect of System | Current Practical Firm Capacity | Current Needs | 2041 Requirements | Needs Summary |
|---|---|---|---|---|
| Supply | - supplied by Delhi | - | | |
| Risks | • Loss of fire pump operation at time of fire<br>• Water main break between Delhi and Courtland | | | |
| Storage | 1,077 $m^3$ | 902 $m^3$ | 908 $m^3$ | none |
| Distribution | • Add approximately 1400 m of water main to loop dead ends. | | | |

#### Alternative Solutions

**Supply:**

While the existing system has adequate capacity, there are supply risks associated with a water main break along the supply line from Delhi to Courtland. Alternative solutions are:

- ***C-1: Do Nothing:*** This option is mandatory for consideration under the Municipal Class EA process. This would not address the risk noted and is not recommended.
- ***C-2: Develop Enhanced Response Time to Water Main Break:*** For this option, the County would review its existing response time for any water main break between Delhi and Courtland, to ensure that repairs could always be performed well before the Courtland reservoir ran out of water.
- ***C-3: Install Second Main Between Delhi and Courtland:*** This option would include a Class EA, investigation, design and construction of a second water transmission main from Delhi to the Courtland Reservoir.

**Storage and Distribution Risk:**

- **C-10: A new 1,500 $m^3$ Elevated Tank:** As per the Vallee Report, as described in **Section 4.2.2.2**.
- **C-11: Modifications to existing Courtland Pumping Station:** As per Vallee Report.
- **C-12: C-5 Plus Additions:** This option would include additional hydro-pneumatic tanks and control system equipment to partially address quick response and back-up power concerns.

**Distribution:**

- **C-20: Complete Distribution Loops:** Construct approximately 1400 m of water mains to complete loops on long dead ends, and improve fire protection.

### *Evaluation and Recommendations*

The Courtland alternatives were evaluated on the basis of cost, reliability, environmental impacts, and the ability to address risks. The following recommendations are provided in order, with a summary of the justification:

**Figure 4-42 – Courtland Recommendations**

| Recommendation (in priority) | Rationale |
|---|---|
| **Short Term (0-5 years)** | |
| C-2 Develop Enhanced Response Time to Water Main Break | • Provided the existing water main is easily accessible and the County has a robust response plan that would allow any main break to be repaired quickly, this would reduce the risk of Courtland running out of water should the transmission main break. Since the reservoir in Courtland would provide substantial time for a main break repair, and could be supplemented by tanker trucks in an emergency, the second main was not considered necessary. The need for a second main could be re-evaluated should more development occur than that contemplated within the study period. |
| C-12: Modifications to Existing Courtland Pumping Station | • Many water systems around the world rely on in-ground reservoirs and direct pumped distribution systems. To be successful, such systems need to have solid redundancy built in, and the ability to deal with changes in flow and power failures smoothly. This solution does not have the same reliability as the elevated tank option, but will provide an improved service level and address the fire department's concerns at a significantly reduced cost. |
| **Medium Term (6-15 years)** | |
| - none - | |
| **Long Term (16-25 years), subject to Master Plan Update** | |
| C-20: Complete Distribution Loops | • To improve fire protection in the long term, eliminating the long dead ends is recommended. |

### *St. Williams*

#### *Summary of Needs*

The water system needs and risks to be addressed for St. Williams are summarized in **Figure 4-43**.

**Figure 4-43 – St. Williams Needs Summary**

| Aspect of System | Current Practical Firm Capacity | Current Needs | 2041 Requirements | Needs Summary |
|---|---|---|---|---|
| Supply | - supplied by Port Rowan - | | | |
| Risks | • Water main break between Port Rowan and St. Williams<br>• Power failure in Booster Pumping Station leads to inadequate pressures in boosted pressure zone | | | |
| Storage | - supplied by Port Rowan - | | | |
| Distribution | - none - | | | |

- Figures 25 and 26 in **Appendix C** show system pressures in the St. Williams water distribution system during present and 2041 conditions. No pressures are noted that are below 275 kPa (40 psi).
- It is noted that the County retained L. A. Girard Engineering (Ontario) Ltd to prepare a Class EA for a new Booster Pumping Station for St. Williams (October 2012, updated July 23, 2013). This report states that "there have been a few complaints of low pressure from residents supplied from the transmission line south of the booster station" (where the pressure is not augmented by the booster station.) It also notes that the County has had difficulty in maintaining chlorine residuals, and the booster pumping station is "outdated" and does not have a permanent standby power system. During the site visit by RVA staff for this project, it was noted that the pumps in the St. Williams Booster Pumping station had been recently replaced, and the station looked in satisfactory condition. No mention was made of the concern related to chlorine residual maintenance.
- Our evaluation of the distribution system indicates that pressures are usually maintained above 275 kPa, and that during a power failure, there would likely still be sufficient pressure to keep the distribution system at a pressure above 140 kPa.

At this time, there does not appear to be evidence for the need of an upgrade of the St. Williams system. It is recommended, however, that the County install pressure loggers on the suction and discharge of the pumping station to confirm this conclusion.

### *Alternative Solutions*

- ***SW-1: Do Nothing:*** This option is mandatory for consideration under the Municipal Class EA process. This would not address the risk noted and is not recommended.
- ***SW-2: Develop Enhanced Response Time to Water Main Break:*** For this option, the County would review its existing response time for any water main break between Port Rowan and St. Williams, to ensure that repairs could always be performed well before the Courtland reservoir ran out of water. This could include running tankers to the St. Williams Booster Pumping Station.
- ***SW-3: Install a Generator at the St. Williams Booster Pumping Station:*** The generator would also have an automatic transfer switch. In the event of a power failure, the generator would automatically start, and the power supply would be automatically transferred over to the generator.

### *Evaluation and Recommendations*

**Figure 4-44 – St. Williams Recommendations**

| Recommendation (in priority) | Rationale |
|---|---|
| **<u>Short Term (0-5 years)</u>** | |
| SW-2 Develop Enhanced Response Time to Water Main Break | • Provided the existing water main is easily accessible and the County has a robust response plan that would allow any main break to be repaired quickly, this would reduce the risk of St. Williams running out of water should the transmission main break. Beyond the time frame of this study, should St. William grow significantly beyond its current size, or should the County decide to provide fire protection to St. Williams, installing a second transmission main, and/or a storage reservoir in St. Williams should be considered. |
| SW-3: Install a Generator at the St. Williams Booster PS | • This is a relatively low cost installation that would prevent a loss of pressure during a power failure, and is recommended. |
| **<u>Medium Term (6-15 years)</u>** | |
| - none - | |
| **<u>Long Term (16-25 years), subject to Master Plan Update</u>** | |
| - none - | |

## 4.3 Wastewater Collection

### 4.3.1 Existing Conditions

The following provides detailed information on the existing wastewater collection systems in Norfolk County. It should be noted that the communities of Simcoe, Port Dover, Delhi, Waterford and Port Rowan are serviced by municipal wastewater collection systems. The community of Courtland is serviced by private systems.

#### *Wastewater Collection System Description*

Currently, wastewater is generated, collected and conveyed to wastewater treatment in a total of five communities in the County: Simcoe, Port Rowan, Port Dover, Delhi, and Waterford. A sixth community, Courtland, is serviced by private wastewater systems and additional analyses to assess existing and future servicing constraints were not completed. The following sub-sections present an overview of each system.

#### *Simcoe*

Simcoe is located in the centre of Norfolk County along Highway 3. It is the largest urban area, in terms of population and has an existing population of 14,644 persons. Simcoe is serviced by sanitary sewers ranging in diameter from 150 mm to 900 mm. In total, there are 95,523 m of sanitary sewer located in the vicinity of Pond Street and Water Street. Simcoe has three pumping stations; **Figure 4-44** presents information on the capacity of each station. Wastewater generated in Simcoe is treated at the Simcoe Wastewater Treatment Plant (WWTP). **Figure 4-45, Appendix F** presents the location of sanitary sewers, pumping stations and forcemains within the Simcoe urban area.

**Figure 4-44 – Simcoe Pumping Station Information**

| Pumping Station (PS) | Description | Rated Capacity |
|---|---|---|
| PS – Decou Road | 2 pumps with a capacity of 12 L/s, each. | Total capacity = 18 L/s<br>Firm capacity = 12 L/s |
| PS2 – Talbot Street North | No information available. | No information available. |
| PS1 – Second Avenue West | No information available. | No information available. |

Note: Information obtained from Decou PS C of A 3-0470-74, dated June 10, 1974

### *Port Dover*

Port Dover is located along Highway 6 along Lake Erie. It is the second largest urban area in Norfolk County, in terms of population, and has an existing population of 6,530 persons. Port Dover also has an active tourism industry. Port Dover is serviced by sanitary sewers ranging in size from 200 mm to 525 mm. Port Dover has eight pumping stations; **Figure 4-46** presents information on the capacity of each station. Wastewater generated in Port Dover is conveyed and pumped to the Port Dover WWTP. **Figure 4-47, Appendix F** presents the location of sanitary sewers, pumping stations and forcemains within the Port Dover urban area.

**Figure 4-46 – Port Dover - Pumping Station Information**

| Pumping Station | Description | Rated Capacity |
|---|---|---|
| PS1 – St. Patrick Pumping Station | 2 wet wells with 45 $m^3$ of storage each<br><br>2,000 $m^3$ equalization storage tank<br><br>3 pumps with a capacity of 62.5 L/s each, capacity is 129.8 L/s each. | Total capacity of 129.8 L/s (based on draw down results).<br><br>Firm capacity of 129.8 L/s (based on draw down test results). |
| PS2 – Lynn Street | 2 pumps with capacities of 15.8 L/s and 31.5 L/s with a wet well volume of 4 $m^3$. | Total capacity of 35.5 L.s (based on draw down test results).<br><br>Firm capacity of 15.8 L/s (based on draw down test results) |
| PS3 – River Drive Pumping Station | 2 pumps, each with a capacity of 26.9 L/s. | Total capacity of 40.4 L/s (calculated based on 75% of sum of pump capacities).<br><br>Firm capacity of 33 L/s (based on draw down test results) |
| PS4 – Harbour Street | 2 pumps with capacity of 25 L/s and 32 L/s with a wet well volume of 6.3 $m^3$. | Total capacity of 43 L/s (calculated based on 75% of sum of capacity).<br><br>Firm capacity of 25 L/s. |

| Pumping Station | Description | Rated Capacity |
|---|---|---|
| PS5 – Nelson Pumping Station (North Shores) | 2 pumps each with capacities of 176 L/s. Wet well volume of 69 $m^3$. | Total capacity of 264 L/s (calculated based on 75% of the sum of pump capacities).<br>Firm capacity of 176 L/s. |
| PS6 – Woodhouse Pumping Station | No information available. | No information available. |
| PS7 – Ryerse Crescent Pumping Station | 3 Pumps with capacities of 26.5 L/s (duty), 80.3 L/s and 80.3 L/s. Wet well volume of 41.1 $m^3$. | Total capacity of 121.6 L/s (calculated based on 65% of the sum of the pump capacities).<br>Firm capacity of 80.1 L/s (based on 75% of the sum of pump capacities). |
| PS8 – Don Jon Pumping Station | 2 pumps with capacities of 23 L/s and 21 L/s. (based on draw down tests) | Firm capacity of 21 L/s<br>Total capacity of 33 L.s (based on 75% of sum of pump capacities) |

Notes:

1. Information for St. Patrick Pumping Station obtained from C of A 7893-84JGR2 dated April 26, 2010 and Draft Norfolk County SPS Assessments Report, 2014.
2. Information for Lynn Street Pumping Station obtained from C of A 2244-5FVJDZ dated November 18, 2002, Draft Norfolk County SPS Assessments Report, 2014 and Port Dover Pumping Stations; Assessment of Capacity and Upgrading Requirements, 1994.
3. Information for River Drive Pumping Station obtained from ECA 5735-9MZVVX dated August 29, 2014 and Draft Norfolk County SPS Assessments Report, 2014.
4. Information for Harbour Drive Pumping Station obtained from C of A 2244-5FVJDZ dated November 18, 2002 and Port Dover Pumping Stations: Assessment of Capacity of Upgrading Requirements, 1994.
5. Information for Nelson Pumping Station obtained from C of A 7105-66LMCW dated April 25, 2005 and Port Dover Pumping Stations: Assessment of Capacity of Upgrading Requirements, 1994.
6. Information for Ryerse Pumping Station obtained from C of A 2547-5KZPHN dated April 14, 2003 and Draft Norfolk County SPS Assessments Report, 2014.
7. Information for Don Jon Pumping Station obtained from Draft Norfolk County SPS Assessments Report, 2014.
8. Bypasses during wet weather have been recorded at PS-1. County Staff indicate that 2 to 3 bypasses typically occur each year at this pumping station.

Historical flow monitoring data has been collected in Port Dover as part of the Optimization Study for Sanitary Sewers. This study included flow monitoring at seven locations and also reported on smoke testing and physical survey results. The study concluded that inflow of rainfall into the sanitary sewer system was the major source of wet weather flow impacting the system and recommended that the County concentrate their efforts on accommodating the peak flows within the system as opposed to removing inflow. A major recommendation of the study was the construction of a 2,000 $m^3$ storage tank at the St. Patrick Pumping Station. The study also identified further investigation of private connections identified through smoke testing and the completion of maintenance activities. The County should continue to track the frequency of bypasses and overflows at its pumping stations and treatment facilities and should install flow monitoring equipment to monitor bypass volumes at PS-1. If necessary, the County should consider additional flow monitoring to characterize current peak flows in the system. Initiatives to rehabilitate sanitary sewers and manholes should be considered where infrastructure is in poor structural condition. Longer term initiatives to consider and address private property connections, such as roof and foundation drains and sump pumps, can be developed. It is anticipated that foundation drain and sump pump connections contribute wet weather flow to the sanitary sewer system in Port Dover in areas where the groundwater table is high. In areas where reconstruction of sanitary and storm sewers proceeds, the County should consider the construction of storm sewer connections to existing properties. In other areas, the County can consider implementing a voluntary or mandatory program of foundation drain and sump pump disconnection.

### *Delhi*

Delhi is located in the northwest part of the County along Highway 3. Delhi has an existing population of 4,970 persons. Delhi is serviced by sanitary sewers ranging in size from 150 mm to 600 mm. Delhi also has 6 pumping stations within the system. Wastewater generated in Delhi is conveyed by gravity to the Delhi WWTP and there is no pumping station at the plant. **Figure 4-48** presents information on the capacity of each station. **Figure 4-49, Appendix F** presents the location of sanitary sewers, pumping stations and forcemains within the Delhi urban area.

**Figure 4-48 – Delhi - Pumping Station Information**

| Pumping Station | Description | Rated Capacity |
|---|---|---|
| PS1 – Hillside Avenue | No information available | No information available |
| PS2 – Industrial Rd | No information available | No information available |
| PS3 – Talbot Rd | 2 pumps with 8.5 L/s each at a TDH of 15.25 m | Total capacity = 12.8 L/s<br>Firm capacity = 8.5 L/s |
| PS4 – St. Michaels St. | 2 pumps rated at 14.26 L/s each at a TDH of 13.1m. | Total capacity = 21.39 L/s<br>Firm capacity = 14.26 L/s |
| PS5 – Western Ave. | No information available | No information available |
| PS6 – Main Street | 2 pumps rated at 45 L/s each at a TDH of 24.4 m. | Total capacity = 64.8 L/s<br>Firm capacity = 45 L/s |

Notes:

1. Information for Talbot Road PS obtained from C of A 3-0954-98-006 dated July 22, 1998,
2. Information for St. Michaels PS obtained from C of A 3-1461-91-006 dated October 22, 1991.
3. Information for Main Street PS obtained from C of A 3-0815-94-005 dated July 13, 1995

### *Port Rowan*

Port Rowan is located in the south west part of the County and has an existing population (2011) of 1,192 persons in the existing urban area. There are 9,890 m of sanitary sewers in Port Rowan ranging in diameter from 200 mm to 250 mm. There are three pumping stations in Port Rowan. All sanitary sewers in Port Rowan discharge to the Port Rowan Pumping Station which pumps all flows through a forcemain to the Port Rowan WWTP. **Figure 4-50** presents information on the capacity of pumping stations in Port Rowan. **Figure 4-51, Appendix F** presents the location of sanitary sewers, pumping stations and forcemains within the Port Rowan urban area.

**Figure 4-50 – Port Rowan - Pumping Station Information**

| Pumping Station | Description | Capacity |
|---|---|---|
| Port Rowan Pumping Station 1 | 2 pumps, each with a rated capacity of 51.3 L/s<br><br>Wet well storage volume of 78 $m^3$ and an additional underground storage overflow tank with a volume of 200 $m^3$.<br><br>200 mm diameter forcemain to Port Rowan WWTP | Total capacity of 76.9 L/s<br><br>Firm capacity of 51.3 L/s |
| Mallard Walk Pumping Station | 2 pumps. Draw down tests completed in 2014. Pump 1 capacity of 6.6 L/s, Pump 2 capacity of 12.4 L/s. Report recommended replacement of pump 1 to achieve a firm capacity of 12 L/s. | Total capacity of 19.5 L/s.<br><br>Firm capacity of 6.6 L/s. |
| Ducks Landing Pumping Station | No information available | No information available |

Notes:

1. Information obtained from Certificate of Approval Number 9513-7TZRBD, issued August 19, 2009.
2. Information obtained from Draft Report Norfolk County SPS Assessments, January 31, 2014.

### *Waterford*

Waterford is located in the north part of the County along Highway 24. Waterford has an existing population of 3,485 persons. Waterford is serviced by sanitary sewers ranging in size from 150 mm to 450 mm. Waterford also has three pumping stations; see **Figure 4-52** for information on the capacity of each station. Wastewater generated in Waterford is conveyed and pumped to the Waterford WWTP. **Figure 4-53, Appendix F** presents the location of sanitary sewers, pumping stations and forcemains within the Waterford urban area.

**Figure 4-52 – Waterford - Pumping Station Information**

| Pumping Station | Description | Rated Capacity |
|---|---|---|
| Mechanic Pumping Station | 2 pumps, each rated for 98.5 L/s. | Total capacity = 147.75 L/s<br>Firm capacity = 98.5 L/s |
| Deer Park Road Pumping Station | 2 pumps, each rated for 2.31 L/s. Pumps have dedicated forcemains | Total capacity = 4.62 L/s<br>Firm capacity = 2.31 L/s |
| Blueline Rd Pumping Station | 2 pumps, each rated for 7.6 L/s | Total capacity =11.4 L./s<br>Firm capacity of 7.6 L/s. |

Notes:

1. Information for Mechanic Pumping Station obtained from C of A 2160-5RUQN9 dated January 16, 2004.
2. Information for Deer Park Pumping Station obtained from ECA 2160-5RUQN9 dated September 18, 2012 and Deer Park Road Pumping Station and Sanitary Sewer Design Report, RVA, 2011.
3. Information on the Blueline Road Pumping Station obtained from C of A 2160-5RUZN9 dated January 16, 2004.

### *Wastewater Collection Assessment Methodology and Results*

To assess system capacity, models of the existing systems were developed. A separate model was developed for each of the five serviced urban areas. The models were constructed within the PC-SWMM model framework.

PC-SWMM is a fully dynamic wastewater collection system model capable of calculating depth, velocity and flow within a wastewater collection system in response to dry weather and wet weather conditions. To complete a fully dynamic analysis, significant data on the physical system is required including sewer invert and rim elevations, pipe sizes and material. In addition, flow information is generally required to calibrate the models.

Given the County does not have sewer invert and rim elevation data, pipe information (including sewer diameters and slopes) was utilized and predicted flows were assessed against system capacities calculated using the Mannings equation. These capacities are the full flow capacities of the pipes. It is recommended that the County collect the necessary invert and rim elevation data and update the models in future.

The models were populated with the following data:

- The sanitary sewer networks were included in the model based on a database provided by the County. Key pipe attribute data included in the models were pipe diameter and pipe slope. Dummy invert elevations were added into the model to match the slope data provided. Manhole invert elevations were developed to match the dummy pipe invert elevations. Manhole rim elevations were selected based on contour information provided. It is recommended that the County include invert elevations and manhole rim elevations in GIS in the future.
- Data on pumping stations was obtained from a number of sources including the Draft Norfolk County SPS Assessments Report, completed in 2014, the Port Dover Pumping Stations Assessment of Capacity and Upgrading Requirements report, completed in 1994, Environmental Compliance Approval (ECA) and Certificate of Approval (C of A) documents obtained from the MOECC Access Ontario website. This site contains the majority of approvals provided since 2000. In addition, County Staff provided information for four additional pumping stations. There were a number of pumping stations where an approval document could not be located. For these stations, it is recommended that the County collect information on the pumps, forcemain, inlet, and storage details. Completion of draw down tests should also be completed to assess pumping station capacity.
- The contributing area to each manhole in the systems was determined and sub-catchment mapping was prepared for each system. Based on the sub-catchment boundaries and the number of lots contained within each sub-catchment, a population was assigned to each sub-catchment.
- Flows in each sub-catchment were input as constant flows and calculated based on the County's design standards and the sub-catchment populations developed. **Figure 4-45** presents the County's sanitary sewer design standards, which were used to develop input flows. These criteria are contained in Section 9 of the County's Design Criteria, last updated in 2009.
- Model assessments were completed using sanitary sewer design flows to establish capacity constraints at design flow conditions. Future growth flows were also calculated using the County's sanitary sewer design standards and input into the model to reflect future conditions.
- Peak flows for each sub-catchment in the systems were calculated as follows:
    - Q = Average sewage flow x Peaking Factor + Infiltration Allowance,
    - Calculated peak flows for each pipe were compared against the Manning full flow capacity to identify capacity constraints.
- It is noted that the County's design flow allowances are consistent with the MOECC Design Guidelines for Sewage Works (2008).

**Figure 4-54 – Norfolk County Sanitary Design Criteria**

| Criteria | Value |
|---|---|
| Residential Development Population Density | 2.75 persons per lot |
| Commercial Development Equivalent Population Density | 90 persons per hectare |
| Industrial Development Equivalent Population Density | 120 persons per hectare |
| Residential Development Average Per Capita Flow | 450 Lpcd |
| Commercial Development Per Capita Flow | 40 $m^3$/ha/d |
| Industrial Development Per Capita Flow | 55 $m^3$/ha/d |
| Residential Area Peaking Factor | Harmon, M=1+14/(4+P0.5)), 2<M<5 |
| Commercial and Industrial Peaking Factor | Modified Harmon, Me=0.8* (1+14/(4+Pe0.5)) |
| Infiltration Allowance | 0.28 L/s/ha |

### *Opportunities and Challenges*

The following sub-sections present the results of the existing systems capacity assessment and identify existing opportunities and challenges.

### *Simcoe*

The capacity of the Simcoe wastewater collection system was assessed using the developed PC-SWMM model. The analysis identified the following capacity deficiencies at existing design flow conditions:

- The existing 200mm diameter sanitary sewer on Main Street west of Colborne Street to Colborne Street and on Colborne Street to south of Windham Street was identified as having insufficient capacity to convey existing peak design flows. The section on Main Street is a 250mm diameter and discharges into a 200mm on Colborne Street. The peak flow through these sections is 31 L/s while the design capacity of these four sewers ranges from 26.5 L/s to 27.7 L/s. It should be noted that it is good design practice to maintain or increase pipe diameters through downstream pipes. It is not considered good design practice to install a smaller diameter pipe downstream of a larger diameter pipe.

- Three sections of 300 mm diameter existing sanitary sewer on Victoria Street between Oakwood and Potts and west of Oakwood were identified as having insufficient capacity to convey existing peak design flows. The peak flow through these sections is 43 L/s while the design capacities range from 40.9 L/s to 42.1 L/s.

**Figure 4-55, Appendix F** presents a thematic mapping showing the comparison of peak flow in each pipe against the full flow capacity of each pipe. As shown on the figure, the sewer sections identified above all had peak flows more than 1.2 times the full flow capacity. **Figure 4-56** presents a comparison of predicted peak design flows and rated and total capacity at each pumping station. It should be noted that pumping station capacity information on two of the three pumping stations could not be located. It is recommended that the County collect information on these stations.

**Figure 4-56 – Comparison of Predicted Peak Flows with Pumping Station Capacities, Simcoe**

| Pumping Station | Predicted Peak Flow (L/s) | Rated Capacity |
|---|---|---|
| Decou PS | 5 L/s | Total capacity = 18 L/s |
| | | Firm capacity = 12 L/s |
| PS1 – Second Avenue West | 11 L/s | N/A |
| PS2 – Talbot Street North | 5 L/s | N/A |

As indicated in **Figure 4-56**, the Decou Pumping Station has sufficient rated and total capacity to pump the predicted existing peak design flow. Further information is needed for the Second Avenue West (PS1) and Talbot Street North (PS2) pumping stations.

In addition to the above, County Staff indicated a history of capacity issues in the Northwest quadrant of Simcoe downstream of the Industrial Park. The capacity assessment completed did not identify any issues at design flows. As flows from industrial areas can vary significantly depending on the water use and discharge of the industries, a short term flow monitoring program would provide the information necessary to characterize flows from this area and identify capacity constraints.

### *Port Dover*

The capacity of the Port Dover wastewater collection system was assessed using the developed PC-SWMM model. The analysis identified the following capacity deficiency at existing design flow conditions:

- An existing 25.3 m of 450 mm diameter sanitary sewer located immediately upstream of the Nelson Pumping Station (PS No. 5) was identified as having insufficient capacity to convey the existing peak design flow. The peak flow in this section is 98 L/s while the full flow capacity is 57 L/s.
- An existing 31m of 200mm diameter sanitary sewer on Grace/ Water Street was identified as having insufficient capacity to convey the existing peak design flow. The peak flow in this section 28 L/s while the full flow capacity is 20.6 L/s. It should be noted that the sanitary sewers located immediately upstream and downstream of this sewer are 300mm in diameter. It is recommended that the County confirm the diameter of this section before proceeding to replacement.
- It also noted that there is an existing 450mm diameter sanitary sewer on Main Street north of Greenock Street West which discharges into a 250mm diameter sanitary sewer. It should be noted that it is good design practice to maintain or increase pipe diameters through downstream pipes. It is not considered good design practice to install a smaller diameter pipe downstream of a larger diameter pipe.

**Figure 4-57, Appendix F** presents a thematic mapping showing the comparison of peak flow in each pipe against the full flow capacity of each pipe. As shown on **Figure 4-57, Appendix F**, the sewer sections identified all had peak flows more than 1.2 times the full flow capacity. **Figure 4-58** presents a comparison of predicted peak flows and rated and total capacity at each pumping station.

**Figure 4-58 – Comparison of Predicted Peak Flows with Pumping Station Capacities, Port Dover**

| Pumping Station | Predicted Peak Flow (L/s) | Rated Capacity |
|---|---|---|
| PS1 – St. Patrick Pumping Station | 129 L/s | Total capacity of 129.8L/s<br>Firm capacity of 129.8 L/s |
| PS2 – Lynn Street Pumping Station | 5 L/s | Total capacity of 35.5 L.s<br>Firm capacity of 15.8 L/s |
| PS3 – River Drive Pumping Station | 11 L/s | Total capacity of 51 L/s<br>Firm capacity of 33 L/s |
| PS4 – Harbour Street Pumping Station | 2 L/s | Total capacity of 43 L/s<br>Firm capacity of 25 L/s |
| PS5 – Nelson (North Shores) Pumping Station | 112 L/s | Total capacity of 264 L/s<br>Firm capacity of 176 L/s |
| PS6 – Woodhouse Pumping Station | N/A | No information available |
| PS7 – Ryerse Crescent Pumping Station | 61 L/s | Total capacity of 121.6 L/s<br>Firm capacity of 80.1 L/s |
| PS8 – Don Jon Pumping Station | 29 L/s | Total capacity of 33 L/s<br>Firm capacity of 21 L/s |

As indicated in **Figure 4-58**, all of the stations, except Don Jon PS, have sufficient firm and total capacity to pump peak flows under existing peak design conditions. Don Jon PS has insufficient firm capacity to pump the existing peak design flow.

### *Delhi*

The capacity of the Delhi wastewater collection system was assessed using the developed PC-SWMM model. The analysis identified the following capacity deficiencies at existing design flow conditions:

- An existing 200 mm diameter sanitary sewer on Aberdeen Avenue from Lansdowne Avenue to Adams Avenue was identified as having insufficient capacity to convey the existing peak design flow. Peak flow in this section is 32 L/s while the full flow capacity is 23 L/s.

- An existing 200 mm diameter sanitary sewer on Lansdowne Avenue from Churchill Avenue to Aberdeen Avenue was identified as having insufficient capacity to convey the existing peak design flow. Peak flow in this section is 32 L/s while the full flow capacity is 24.2 L/s.
- An existing 200 mm diameter sanitary sewer on East Street from Imperial Street to Ann Street was identified as having insufficient capacity to convey the existing peak design flow. Peak flow in this section is 30 L/s while the full flow capacity is 23.4 L/s.
- An existing 375 mm diameter sanitary sewer on Main Street from Gilbert Avenue to Eastern Avenue was identified as having insufficient capacity to convey the existing peak design flow. Peak flow in this section is 77 L/s while the full flow capacity is 61.6 L/s.

**Figure 4-59, Appendix F** presents a thematic mapping showing the comparison of peak flow in each pipe against the full flow capacity of each pipe. As shown in **Figure 4-59, Appendix F**, the sewer sections identified above all had peak flows more than 1.2 times the full flow capacity. **Figure 4-60** presents a comparison of predicted peak flows and rated and total capacity at each pumping station. As indicated in **Figure 4-60**, all pumping stations had sufficient total capacity to pump the predicted peak flow.

**Figure 4-60 – Comparison of Predicted Peak Flows with Pumping Station Capacities, Delhi**

| Pumping Station | Predicted Peak Flow (L/s) | Rated Capacity |
|---|---|---|
| PS1 – Hillside Avenue | 1 L/s | No information available |
| PS2 – Industrial Rd | 6 L/s | No information available |
| PS3 – Talbot Rd | 5 L/s | Total capacity = 12.8 L/s |
| | | Firm capacity = 8.5 L/s |
| PS4 – St. Michaels St. | 11 L/s | Total capacity = 21.39 L/s |
| | | Firm capacity = 14.26 L/s |
| PS5 – Western Ave. | N/A | No information available |
| PS6 – Main Street | 62 L/s | Total capacity = 64.8 L/s |
| | | Firm capacity = 45 L/s |

It should be noted that pumping station capacity information for the Hillside, Industrial Road and Western Avenue Pumping Stations could not be located. It is recommended that the County collect information on these stations.

### *Port Rowan*

The capacity of the Port Rowan wastewater collection system was assessed using the developed PC-SWMM model. The analysis identified the following capacity deficiencies at existing design flow conditions:

- Existing 200 mm diameter sanitary sewers on an easement between Mallard Walk and Bay Street and on Bay Street from Mallard Walk to south of Aspen were identified as having insufficient capacity to convey the existing peak design flow. The peak flow in these three sections ranged from 23 L/s to 24 L/s. The full flow capacity of these sewers ranged from 20.5 L/s to 20.6 L/s.
- An existing 200 mm diameter sanitary sewer on Bay Street from Church Street to Wolven Street and an existing 250 mm diameter sanitary sewer on Bay Street from Wolven Street to Front Road were identified as having insufficient capacities to convey existing peak design flows. Peak flows in these sewers were 29 L/s and 42 L/s; respectively while full flow capacities are 20.4 L/s and 31.6 L/s; respectively. These sections were constructed with lower slopes than upstream sections.
- An existing 250mm diameter sanitary sewer on Ellis Street from Front Road to the Port Rowan Pumping Station was identified as having insufficient capacity to convey the existing peak design flow. The peak flow in this sewer 55 L/s while the full flow capacity is 43.2 L/s.

**Figure 4-62, Appendix F** presents a thematic mapping showing the comparison of peak flow in each pipe against the full flow capacity of each pipe. As shown in **Figure 4-62, Appendix F**, the three sewer sections identified above all had peak flows more than 1.2 times the full flow capacity. **Figure 4-61** presents a comparison of predicted peak flows and rated and total capacity at each pumping station. As indicated in **Figure 4-61**, the Mallard Walk Pumping Station does not currently have sufficient firm capacity to pump the predicted peak flow.

**Figure 4-61 – Comparison of Predicted Peak Flows with Pumping Station Capacities, Port Rowan**

| Pumping Station | Predicted Peak Flow (L/s) | Rated Capacity |
|---|---|---|
| Port Rowan Pumping Station | 67 L/s | Firm capacity of 51.3 L/s<br>Total capacity of 76.9 L/s |
| Mallard Walk Pumping Station | 22 L/s | Total capacity of 19.5 L/s<br>Firm capacity of 6.6 L/s |
| Ducks Landing | NA | NA |

### *Waterford*

The capacity of the Waterford wastewater collection system was assessed using the developed PC-SWMM model. The analysis identified the following capacity deficiencies at existing design flow conditions:

- Two sections of existing 200 mm diameter sanitary sewer located on an easement south of Thompson Road West were identified as having insufficient capacity to convey existing peak design flows. The peak flow in these sections was 26 L/s while the full flow capacity is 20.3 L/s and 20.6 L/s.
- Two sections of existing 200 mm diameter sanitary sewer located on an easement east of Blueline Road south of the Blueline Pumping Station were identified as having insufficient capacity to convey existing peak design flows. The peak flow in these sections was 33 L/s while the full flow capacity is 21.7 L/s and 40.9 L/s.
- One section of 250 mm diameter sanitary sewer on Blueline Road south of the Blueline Pumping Station was identified as having insufficient capacity to convey the existing peak design flow. The peak flow in this section is 34 L/s while the full flow capacity is 23.9 L/s.

**Figure 4-63, Appendix F** presents a thematic mapping showing the comparison of peak flow in each pipe against the full flow capacity of each pipe. As shown in **Figure 4-63, Appendix F**, the sewer sections identified above all had peak flows more than 1.2 times the full flow capacity.

**Figure 4-64** presents a comparison of predicted peak flows and rated and total capacity at each pumping station. As indicated in **Figure 4-64**, the Deer Park Pumping Station has sufficient firm capacity to pump predicted peak flows. The Mechanic Pumping Station has sufficient total capacity to pump predicted peak flows. The Blueline Pumping Station has insufficient firm and total capacity to pump predicted peak flows. It is recommended that the County confirm the capacity of the Blueline Pumping Station through a pumping station review and draw down tests.

**Figure 4-64 – Comparison of Predicted Peak Flows with Pumping Station Capacities, Waterford**

| Pumping Station | Predicted Peak Flow (L/s) | Rated Capacity |
|---|---|---|
| Mechanic Pumping Station | 140 L/s | Total capacity = 147.75 L/s<br>Firm capacity = 98.5 L/s |
| Deer Park Road Pumping Station | 2.3 L/s | Total capacity = 4.62 L/s<br>Firm capacity = 2.31 L/s |
| Blueline Rd Pumping Station | 48 L/s | Total capacity = 11.4 L/s<br>Firm capacity = 7.6 L/s |

### 4.3.2 Future Conditions

The County completed a Population Projection Study in 2014 which defined population forecasts for the County up to the year 2041. The study forecast both residential and employment populations. The study concluded modest growth for the County with an estimated population growth of 6,580 persons over the period from 2006 (census) to 2041.

**Figure 4-65** presents the urban area growth projections for residential population for the period from 2011 to 2041. **Figure 4-66** presents the estimated increased urban area employment lands for the period from 2011 to 2041. In total, residential population is projected to increase in all of the urban areas in the County between 2011 and 2041. In total, employment lands in the County are projected to increase by 735 ha in the period from 2011 to 2041 with the majority of the increase identified as within the Simcoe urban area.

To assess the impact of future development on the existing wastewater collection system, the growth planned for 2041 was distributed in proportion to the sewershed area within each of the five communities.

**Figure 4-65 – Residential Growth by Urban Area**

| Urban Area | 2011 | 2021 | 2031 | 2041 | Growth 2011-2041 |
|---|---|---|---|---|---|
| Simcoe | 14,640 | 15,300 | 16,400 | 16,960 | 2,320 |
| Port Dover | 6,530 | 7,420 | 8,550 | 9,410 | 2,880 |
| Delhi | 4,970 | 5,020 | 5,210 | 5,220 | 250 |
| Waterford | 3,490 | 3,890 | 4,450 | 4,850 | 1,360 |
| Port Rowan | 1,190 | 1,420 | 1,700 | 1,930 | 740 |
| Courtland | 1,020 | 1,020 | 1,060 | 1,050 | 30 |
| Rural | 31,340 | 30,770 | 30,980 | 30,160 | (1,180) |
| Totals | 63,180 | 64,840 | 68,340 | 69,580 | 6,400 |

**Figure 4-66 – Employment Land Growth by Urban Area**

| Urban Area | Projected Growth from 2011 to 2031 (ha) | Projected Growth from 2031 to 2041 (ha) | Projected Growth from 2011 to 2041 (ha) |
|---|---|---|---|
| Simcoe | 180 | 205 | 385 |
| Port Dover | 20 | 40 | 60 |
| Delhi | 65 | 85 | 150 |
| Waterford | 50 | 60 | 110 |
| Port Rowan | 0 | 0 | 0 |
| Courtland | 15 | 15 | 30 |
| Rural | 0 | 0 | 0 |
| Totals | 330 | 405 | 735 |

### *Future Conditions Assessment*

To project future flows from the projected growth, the County's Sanitary Sewer Design Criteria were used. As noted earlier, these criteria are consistent with the MOECC Design Guidelines for Sewage Works (2008). The following sub-sections present the results of the capacity assessment completed for 2041 conditions.

### *Simcoe*

Residential population in Simcoe is projected to increase from 2011 to 2031 by 1,760 persons and by 560 persons between 2031 and 2041. Employment lands are also projected to increase by 180 ha by 2031 and by 385 ha by 2041. The performance of the wastewater collection system in Simcoe was completed with residential population growth only as the location of future employment lands is unknown. For the purposes of the analysis, it was assumed that population growth would occur uniformly across Simcoe and that the current density of development would be maintained.

The capacity of the Simcoe wastewater collection system under 2041 conditions was assessed using the developed PC-SWMM model. The analysis identified the following servicing constraints:

- The existing 200 mm diameter sanitary sewers on Main Street west of Colborne Street to Colborne Street and on Colborne Street to south of Windham Street were identified as having insufficient capacity to convey 2041 peak design flows. The section on Main Street is a 250mm diameter and discharges into a 200mm on Colborne Street. The peak flow through these sections is 32 L/s while the design capacity of these four sewers ranges from 26.5 L/s to 27.7 L/s.
- Three sections of 300 mm diameter existing sanitary sewer on Victoria Street between Oakwood and Potts and west of Oakwood were identified as having insufficient capacity to convey 2041 peak design flows. The peak flow through these sections is 44 L/s and 45 L/s while the design capacities range from 40.9 L/s to 42.1 L/s.

**Figure 4-67** presents a comparison of the 2041 peak flow predicted at each pumping station against the firm and total capacities of these stations. As noted in **Figure 4-67**, the Decou Pumping Station has adequate firm capacity to pump peak flows in 2041. Further information is needed for the Second Avenue West (PS1) and Talbot Street North (PS2) pumping stations.

**Figure 4-67 – Comparison of Predicted Peak Flows with Pumping Station Capacities, Simcoe (2041)**

| Pumping Station | 2041 Predicted Peak Flow (L/s) | Rated Capacity |
|---|---|---|
| Decou PS | 6 L/s | Total capacity = 18 L/s<br>Firm capacity = 12 L/s |
| PS1 | 11 L/s | N/A |
| PS2 | 5 L/s | N/A |

In addition to the above, County Staff indicated a history of capacity issues in the Northwest quadrant of Simcoe downstream of the Industrial Park. The capacity assessment completed did not identify any issues at design flows. As flows from industrial areas can vary significantly depending on the water use and discharge of the industries, a short term flow monitoring program would provide the information necessary to characterize flows from this area and identify capacity constraints.

To address these capacity constraints and other issues, the following improvements have been identified:

- Replacement of 159m of existing 200mm diameter sanitary sewer on Colborne Street between Main Street to south of Windham Road with new 250mm diameter sanitary sewer.
- Replacement of 325.9m of existing 300mm diameter sanitary sewer on Victoria Street from Donly Drive South to east of Potts Road with a new 375mm diameter sanitary sewer.
- Collect additional information on PS1 and PS2 including details of pumping station configuration and capacities. Draw down testing should also be considered to establish station firm and total capacities.
- Short term flow monitoring program in the sanitary sewer system servicing the Industrial Park to characterize flows from the industrial area and update the model with this information to identify capacity constraints and servicing needs.

### Port Dover

Residential population is expected to increase by 2,020 persons between 2011 and 2031 and increase by 870 persons between 2031 and 2041. Employment lands are also projected to increase by 60 ha by 2041. The performance of the wastewater collection system in Port Dover was completed with residential population growth only as the location of future employment lands is unknown. For the purposes of the analysis, it was assumed that population growth would occur uniformly across Port Dover and that the current density of development would be maintained.

The capacity of the Port Dover wastewater collection system under 2041 conditions was assessed using the developed PC-SWMM model. The analysis identified the following servicing constraints:

- An existing 25.3m of 450 mm diameter sanitary sewer located immediately upstream of the Nelson Pumping Station (PS No. 5) was identified as having insufficient capacity to convey the 2041 peak design flow. The peak flow in this section is 120 L/s while the full flow capacity is 57 L/s.
- An existing 31m of 200mm diameter sanitary sewer on Grace/ Water Street was identified as having insufficient capacity to convey the 2041 peak design flow. The peak flow in this section 30 L/s while the full flow capacity is 20.6 L/s. It should be noted that the sanitary sewers located immediately upstream and downstream of this sewer are 300mm in diameter. It is recommended that the County confirm the diameter of this section before proceeding with replacement.
- It also noted that there is an existing 450mm diameter sanitary sewer on Main Street north of Greenock Street West which discharges into a 250mm diameter sanitary sewer. It should be noted that it is good design practice to maintain or increase pipe diameters through downstream pipes. It is not considered good design practice to install a smaller diameter pipe downstream of a larger diameter pipe.

**Figure 4-68** presents a comparison of the 2041 peak flow predicted at each pumping station against the firm and total capacities of these stations. As shown in **Figure 4-68**, all of the pumping stations have adequate total capacity to pump peak flows in 2041. The predicted peak flow at the Don Jon Pumping Station (PS8) exceeds the firm capacity of the station. This station does have adequate total capacity to pump peak flows. All other stations have adequate firm capacity to pump peak flows in 2041.

To address these capacity constraints and identified issues, the following improvements will be required:

- Replacement of 25m of existing 450mm diameter sanitary sewer immediately upstream of the Nelson Pumping Station (PS 5) with a 600mm diameter sanitary sewer.
- Replacement of 31m of 200mm diameter sanitary sewer on Grace/ Water Street with a new 300mm diameter sanitary sewer. It is recommended the County confirm the diameter of the existing sanitary sewer before proceeding as the upstream and downstream sanitary sewers are 300mm in diameter.
- Increase firm capacity of the Don Jon Pumping Station to a firm capacity of 31 L/s.
- County should consider upsizing the existing 250mm diameter sanitary sewer on Main Street downstream of Greenock Street West to match the upstream 450mm diameter sanitary sewer when replacement is required.

**Figure 4-68 – Comparison of Predicted Peak Flows with Pumping Station Capacities, Port Dover (2041)**

| Pumping Station | 2041 Predicted Peak Flow | Rated Capacity |
|---|---|---|
| PS1 – St. Patrick Pumping Station | 129 L/s | Total capacity of 129.8L/s<br>Firm capacity of 129.8 L/s |
| PS2 – Lynn Street Pumping Station | 5 L/s | Total capacity of 35.5 L.s<br>Firm capacity of 15.8 L/s |
| PS3 – River Drive Pumping Station | 13 L/s | Total capacity of 51 L/s<br>Firm capacity of 33 L/s |
| PS4 – Harbour Street | 2 L/s | Total capacity of 43 L/s<br>Firm capacity of 25 L/s |
| PS5 – Nelson (North Shores) Pumping Station | 120 L/s | Total capacity of 264 L/s<br>Firm capacity of 176 L/s |
| PS6 – Woodhouse Pumping Station | N/A | No information available |
| PS7 – Ryerse Crescent Pumping Station | 66 L/s | Total capacity of 121.6 L/s<br>Firm capacity of 80.1 L/s |
| PS8 – Don Jon Pumping Station | 31 L/s | Total capacity of 33 L/s<br>Firm capacity of 21 L/s |

### *Delhi*

Residential population growth of 240 persons is anticipated for Delhi by 2031. Growth between 2031 and 2041 is projected to be minimal at 10 persons. Employment lands are also projected to increase by 65 ha by 2031 and by 150 ha and by 2041. The performance of the wastewater collection system in Delhi was completed with residential population growth only as the location of future employment lands is unknown. For the purposes of the analysis, it was assumed that population growth would occur uniformly across Delhi and that the current density of development would be maintained.

The capacity of the Delhi wastewater collection system under 2041 conditions was assessed using the developed PC-SWMM model. The analysis identified the following servicing constraints:

- An existing 200 mm diameter sanitary sewer on Aberdeen Avenue from Lansdowne Avenue to Adams Avenue was identified as having insufficient capacity to convey the 2041 peak design flow. Peak flow in this section is 32 L/s while the full flow capacity is 23 L/s.
- An existing 200 mm diameter sanitary sewer on Lansdowne Avenue from Churchill Avenue to Aberdeen Avenue was identified as having insufficient capacity to convey the 2041 peak design flow. Peak flow in this section is 32 L/s while the full flow capacity is 24.2 L/s.
- An existing 200 mm diameter sanitary sewer on East Street from Imperial Street to Ann Street was identified as having insufficient capacity to convey the 2041 peak design flow. Peak flow in this section is 30 L/s while the full flow capacity is 23.4 L/s.
- An existing 375 mm diameter sanitary sewer on Main Street from Gilbert Avenue to Eastern Avenue was identified as having insufficient capacity to convey the 2041 peak design flow. Peak flow in this section is 77 L/s while the full flow capacity is 61.6 L/s.

**Figure 4-69** presents a comparison of the 2041 peak flow predicted at each pumping station against the firm and total capacities of these stations.

**Figure 4-69 – Comparison of Predicted Peak Flows with Pumping Station Capacities, Delhi (2041)**

| Pumping Station | 2041 Predicted Peak Flow (L/s) | Rated Capacity |
|---|---|---|
| PS1 – Hillside Avenue | 1 L/s | No information available |
| PS2 – Industrial Rd | 6 L/s | No information available |
| PS3 – Talbot Rd | 6 L/s | Total capacity = 12.8 L/s<br>Firm capacity = 8.5 L/s |
| PS4 – St. Michaels St. | 11 L/s | Total capacity = 21.39 L/s<br>Firm capacity = 14.26 L/s |
| PS5 – Western Ave. | N/A | No information available |
| PS6 – Main Street | 62 L/s | Total capacity = 64.8 L/s<br>Firm capacity = 45 L/s |

The Talbot Road and St. Michaels Pumping Stations have sufficient firm capacity to pump peak flows in 2041. The Main Street Pumping Station has sufficient total capacity to pump peak 2041 flows but insufficient firm capacity to pump 2041 peak flows. It should be noted that additional information is required for the Hillside, Industrial and Western Pumping Stations.

To address these capacity constraints and other issues, the following improvements will be required:

- Replacement of 84m of existing 200mm diameter sanitary sewer on Aberdeen Avenue between Lansdowne Avenue and Adams Avenue with a 250mm diameter sanitary sewer.
- Replacement of 98m of existing 200mm diameter sanitary sewer on Lansdowne Avenue from Churchill Avenue to Aberdeen Avenue with a 250mm diameter sanitary sewer.
- A review of the existing 375mm diameter sanitary sewer on Main Street between Eastern Avenue and Gilbert Avenue identified that both the upstream and downstream sewers are 450mm in diameter. It is recommended that County Staff confirm the existing diameter. Should the existing diameter be confirmed as 375mm, replacement of this section should proceed.
- Replacement of 96 m of existing 200 mm diameter sanitary sewer on East Street between Ann Street and Imperial Street with a new 250mm diameter sanitary sewer.

- Increase the firm capacity of the Main Street Pumping Station to 62 L/s.
- Collect additional information on the Hillside, Industrial and Western Avenue Pumping Stations including details of pumping station configuration and capacities. Draw down testing should also be considered to establish station firm and total capacities.

In addition to the above, it is noted that wastewater collection system capacity requirements will need to be defined to service the planned 150 ha of employment lands growth once the location of these lands has been identified.

### Port Rowan

The residential population is projected to increase in Port Rowan by 510 persons by 2031 and by 740 persons by 2041 No growth in industrial / commercial / institutional lands is anticipated in Port Rowan to the year 2041. For the purposes of the analysis, the population growth was distributed uniformly across the Port Rowan urban area.

The capacity of the Port Rowan wastewater collection system under 2041 conditions was assessed using the developed PC-SWMM model. The analysis identified the following servicing constraints:

- Existing 200mm diameter sanitary sewers on an easement between Mallard Walk and Bay Street and on Bay Street from Mallard Walk to south of Aspen were identified as having insufficient capacity to convey the 2041 peak design flow. The peak flow in these four sections ranged from 23 L/s to 25 L/s. The full flow capacity of these sewers ranged from 20.5 L/s to 20.6 L/s.
- An existing 200mm diameter sanitary sewer on Bay Street from College Street to Church Street was identified as having insufficient capacity to convey the 2041 peak design flow. Peak flow in this sewer is 31 L/s while the full flow capacity is 30.3 L/s.
- An existing 200 mm diameter sanitary sewer on Bay Street from Church Street to Wolven Street and an existing 250 mm diameter sanitary sewer on Bay Street from Wolven Street to Front Road were identified as having insufficient capacity to convey the 2041 peak design flows. Peak flows in these sewers were 31 L/s and 45 L/s; respectively while full flow capacities are 20.4 L/s and 31.6 L/s; respectively. These sections were constructed with lower slopes than upstream sections.
- An existing 250mm diameter sanitary sewer on Ellis Street from Front Road to the Port Rowan Pumping Station was identified as having insufficient capacity to convey the 2041 peak design flow. The peak flow in this sewer 60 L/s while the full flow capacity is 43.2 L/s.

**Figure 4-70** presents a comparison of the 2041 peak flow predicted at each pumping station against the firm and total capacities of these stations. As shown in **Figure 4-70**, the Port Rowan Pumping Station has sufficient firm capacity to pump 2041 peak flows. The Mallard Walk Pumping Station has insufficient firm and total capacity to pump 2041 peak design flows. It should be noted that additional information is required for the Ducks Landing Pumping Station.

**Figure 4-70 – Comparison of Predicted Peak Flows with Pumping Station Capacities, Port Rowan**

| Pumping Station | Predicted Peak Flow (L/s) | Rated Capacity |
|---|---|---|
| Port Rowan Pumping Station | 70 L/s | Firm capacity of 51.3 L/s<br>Total capacity of 76.9 L/s |
| Mallard Walk Pumping Station | 24 L/s | Total capacity of 19.5 L/s<br>Firm capacity of 6.6 L/s |
| Ducks Landing | NA | NA |

To address these capacity constraints and other issues, the following improvements will be required:

- An improvement to the Mallard Walk Pumping Station is required to increase the station and total capacity to 24 L/s.
- Replacement of 107m of existing 200mm and 89m of existing 250mm sanitary sewer on Bay Street from Church Street to Front Road with 300mm diameter sanitary sewer.
- Replacement of 27m of existing 250mm diameter sanitary sewer with 300mm diameter sanitary sewer on Ellis Street from Front Road to the Port Rowan Pumping Station.
- Replacement of 1,134m of existing 200mm diameter sanitary sewer on an easement between Mallard Walk and Bay Street and on Bay Street from Mallard Walk to Church Street with a 250mm diameter sanitary sewer.
- Collect additional information on the Ducks Landing including details of pumping station configuration and capacity. Draw down testing should also be considered to establish station firm and total capacity.

## Waterford

Between 2011 and 2031, the residential population in Waterford is expected to increase by 960 persons to 4,450 persons. Between 2031 and 2041, a further population growth of 400 persons is projected resulting in a 2041 residential population of 4,850 persons. Employment lands are projected to increase by 50 ha between 2011 and 2031 and by 110 ha by 2011 and 2041. The performance of the wastewater collection system in Waterford was completed with residential population growth only as the location of future employment lands is unknown. For the purposes of the analysis, it was assumed that population growth would occur uniformly across Waterford and that the current density of development would be maintained.

The capacity of the Waterford wastewater collection system under 2041 conditions was assessed using the developed PC-SWMM model. The analysis identified the following servicing constraints:

- Two sections of existing 200mm diameter sanitary sewer located on an easement south of Thompson Road West were identified as having insufficient capacity to convey 2041 peak design flows. The peak flow in these sections was 26 L/s while the full flow capacity is 20.3 L/s and 20.6 L/s.
- Two sections of existing 200mm diameter sanitary sewer located on an easement east of Blueline Road south of the Blueline Pumping Station were identified as having insufficient capacity to convey 2041 peak design flows. The peak flow in these sections was 33 L/s while the full flow capacity is 21.7 L/s and 40.9 L/s.
- One section of 250mm diameter sanitary sewer on Blueline Road south of the Blueline Pumping Station was identified as having insufficient capacity to convey the 2041 peak design flow. The peak flow in this section is 34 L/s while the full flow capacity is 23.9 L/s.

**Figure 4-71** presents a comparison of the peak flow predicted at each pumping station against the firm and total capacities of these stations. As shown in **Figure 4-71**, the Deer Park Road Pumping Station has adequate firm capacity to pump 2041 peak flows. The Mechanic Pumping Station has adequate station capacity to pump 2041 peak flows. The Blueline Road Pumping Station has insufficient firm and station capacity to pump 2041 peak flows. It is recommended that the County confirm the capacity of the Blueline Pumping Station through a pumping station review and draw down tests.

**Figure 4-71 – Comparison of Predicted Peak Flows with Pumping Station Capacities, Waterford (2041)**

| Pumping Station | 2041 Predicted Peak Flow (L/s) | Rated Capacity |
|---|---|---|
| Mechanic Pumping Station | 147 L/s | Total capacity = 147.75 L/s<br>Firm capacity = 98.5 L/s |
| Deer Park Road Pumping Station | 1 L/s | Total capacity = 4.62 L/s<br>Firm capacity = 2.31 L/s |
| Blueline Rd Pumping Station | 48 L/s | Total capacity = 11.4 L/s<br>Firm capacity = 7.6 L/s |

To address these capacity constraints and other issues, the following improvements will be required:

- An improvement to the Blueline Road Pumping Station is required to increase the station and total capacity. A firm capacity of 48 L/s will be sufficient for 2041 conditions.
- An improvement to the Mechanic Pumping Station to provide sufficient firm capacity to pump 2041 peak design flows.
- Replacement of 421m of existing 200mm diameter sanitary sewer on two easements located south of Thompson Road West and east of Blueline Road with 250mm diameter sanitary sewer.
- Replacement of 77m of existing 250mm diameter sanitary sewer with 300mm diameter sanitary sewer on Blueline Road south of the Blueline Road Pumping Station.

As an alternative to sewer replacement within the easements listed above, it is recommended that the County consider construction of a new sanitary sewer along Thompson Road West from Main Street to Leamon Street (104m – 250mm) and replacement of 155m of the existing 200mm diameter sanitary sewers on Thompson Road West from Leamon Street to Blueline Road with a new 250mm diameter sanitary sewer. This alternative eliminates construction within easements, will allow the County to decommission three sections of sanitary sewer located within an existing easement and can be completed at a lower cost due to the shorter length of replacement required. County Staff have indicated a preference for eliminating infrastructure in easements, where feasible, to reduce operations and maintenance issues. As a result, this alternative has been included as a 10 year capital project.

### *Alternatives and Evaluation*

### *Summary of Recommendations and Policy Recommendations*

**Figure 4-72** presents the recommended improvements necessary to service growth in the communities of Simcoe, Port Dover, Delhi, Waterford and Port Rowan to the year 2041.

**Figure 4-72 – Recommended Improvements for Servicing Growth to the Year 2041**

| Community | Recommended Improvements |
|---|---|
| Simcoe | • Replacement of 159 m of existing 200 mm diameter sanitary sewer on Colborne Street North between Main Street North to south of Windham Street with new 250mm diameter sanitary sewer.<br>• Replacement of 325.9m of existing 300mm diameter sanitary sewer on Victoria Street from Donly Drive South to east of Potts Road with a new 375mm diameter sanitary sewer.<br>• Collect additional information on PS1 and PS2 including details of pumping station configuration and capacities. Draw down testing should also be considered to establish station firm and total capacities.<br>• Short term flow monitoring program in the sanitary sewer system downstream of the Industrial Park to characterize flows and assess capacity constraints. |
| Port Dover | • Replacement of 25m of existing 450mm diameter sanitary sewer immediately upstream of the Nelson Pumping Station (PS 5) with a 600mm diameter sanitary sewer.<br>• Replacement of 31m of 200mm diameter sanitary sewer on Grace/ Water Street with a new 300mm diameter sanitary sewer. It is recommended the County confirm the diameter of the existing sanitary sewer before proceeding as the upstream and downstream sanitary sewers are 300mm in diameter.<br>• Increase firm capacity of the Don Jon Pumping Station to a firm capacity of 31 L/s.<br>• County should consider upsizing the existing 250mm diameter sanitary sewer on Main Street downstream of Greenock |

| Community | Recommended Improvements |
|---|---|
| | Street West to match the upstream 450mm diameter sanitary sewer when replacement is required. |
| Delhi | • Replacement of 84m of existing 200mm diameter sanitary sewer on Aberdeen Avenue between Lansdowne Avenue and Adams Avenue with a 250mm diameter sanitary sewer.<br>• Replacement of 98m of existing 200mm diameter sanitary sewer on Lansdowne Avenue from Churchill Avenue to Aberdeen Avenue with a 250mm diameter sanitary sewer.<br>• A review of the existing 375mm diameter sanitary sewer on Main Street between Eastern Avenue and Gilbert Avenue identified that both the upstream and downstream sewers are 450mm in diameter. It is recommended that County Staff confirm the existing diameter. Should the existing diameter be confirmed as 375mm, replacement of this section should proceed.<br>• Replacement of 96 m of existing 200 mm diameter sanitary sewer on East Street between Ann Street and Imperial Street with a new 250mm diameter sanitary sewer.<br>• Increase the firm capacity of the Main Street Pumping Station to 62 L/s.<br>• Collect additional information on the Hillside, Industrial and Western Avenue Pumping Stations including details of pumping station configuration and capacities. Draw down testing should also be considered to establish station firm and total capacities. |
| Waterford | • An improvement to the Blueline Road Pumping Station is required to increase the station and total capacity. A firm capacity of 48 L/s will be sufficient for 2041 conditions.<br>• An improvement to the Mechanic Pumping Station to provide sufficient firm capacity to pump 2041 peak design flows.<br>• Construction of 104m of 250mm diameter sanitary sewer on Thompson Road West between Main Street and Leamon Street.<br>• Replacement of 155m of 200mm diameter sanitary sewer on Thompson Road West between Leamon Street and Blueline |

| Community | Recommended Improvements |
|---|---|
| | Road with a new 250mm diameter sanitary sewer. |
| Port Rowan | • An improvement to the Mallard Walk Pumping Station is required to increase the station and total capacity to 24 L/s.<br>• Replacement of 107m of existing 200mm and 89m of existing 250mm sanitary sewer on Bay Street from Church Street to Front Road with 300mm diameter sanitary sewer.<br>• Replacement of 27m of existing 250mm diameter sanitary sewer with 300mm diameter sanitary sewer on Ellis Street from Front Road to the Port Rowan Pumping Station.<br>• Replacement of 1,134m of existing 200mm diameter sanitary sewer on an easement between Mallard Walk and Bay Street and on Bay Street from Mallard Walk to Church Street with a 250mm diameter sanitary sewer.<br>• Collect additional information on the Ducks Landing Pumping Station including details of pumping station configuration and capaciy. Draw down testing should also be considered to establish station firm and total capacity. |

In addition to the above, the following policy / recommendations are made:

- The County should collect information for all pumping stations for which documentation could not be located. In the absence of C of A or ECA documents, site visits, surveys and draw down tests can be used to confirm pumping station configurations, wet well volumes and pumping station firm and station capacities. These stations include Talbot Road (PS1) and Second Avenue (PS2) in Simcoe, Woodhouse (PS6) in Port Dover, Hillside (PS1), Industrial (PS2) and Western Avenue (PS5) in Delhi and Ducks Landing in Port Rowan.
- The County's growth projections identified employment lands growth of 735 ha within the urban areas of Simcoe, Port Dover, Delhi and Waterford. Future needs associated with servicing new employment lands should be identified once the location of employment growth areas has been identified.
- The County's database of information for sanitary sewers should be expanded to include information on invert and manhole rim elevations.

### 4.3.3 Implementation

**Figures 4-73 and 4-74** present proposed 10 year capital projects and projects beyond the 10 year horizon.

**Figure 4-73 – 10 Year Capital Projects**

| Community | Recommended Improvements |
| --- | --- |
| Simcoe | • Replacement of 159m of existing 200mm diameter sanitary sewer on Colborne Street North between Main Street North to south of Windham Street with new 250mm diameter sanitary sewer.<br>• Replacement of 325.9m of existing 300mm diameter sanitary sewer on Victoria Street from Donly Drive South to east of Potts Road with a new 375mm diameter sanitary sewer.<br>• Collect additional information on PS1 and PS2 including details of pumping station configuration and capacities. Draw down testing should also be considered to establish station firm and total capacities.<br>• Short term flow monitoring program in the sanitary sewer system downstream of the Industrial Park to characterize flows and assess capacity constraints. |
| Port Dover | • Replacement of 25m of existing 450mm diameter sanitary sewer immediately upstream of the Nelson Pumping Station (PS 5) with a 600mm diameter sanitary sewer.<br>• Replacement of 31m of 200mm diameter sanitary sewer on Grace/ Water Street with a new 300mm diameter sanitary sewer. It is recommended the County confirm the diameter of the existing sanitary sewer before proceeding as the upstream and downstream sanitary sewers are 300mm in diameter.<br>• Increase firm capacity of the Don Jon Pumping Station to a firm capacity of 31 L/s. |
| Delhi | • Replacement of 84m of existing 200mm diameter sanitary sewer on Aberdeen Avenue between Lansdowne Avenue and Adams Avenue with a 250mm diameter sanitary sewer.<br>• Replacement of 98m of existing 200mm diameter sanitary sewer on Lansdowne Avenue from Churchill Avenue to Aberdeen Avenue with a 250mm diameter sanitary sewer.<br>• Replacement of 96 m of existing 200 mm diameter sanitary sewer on East Street between Ann Street and Imperial Street with a new 250mm diameter sanitary sewer. |

| Community | Recommended Improvements |
|---|---|
| | • Increase the firm capacity of the Main Street Pumping Station to 62 L/s. |
| Waterford | • An improvement to the Blueline Road Pumping Station is required to increase the station and total capacity. A firm capacity of 48 L/s will be sufficient for 2041 conditions.<br>• An improvement to the Mechanic Pumping Station to provide sufficient firm capacity to pump 2041 peak design flows.<br>• Construction of 104m of 250mm diameter sanitary sewer on Thompson Road West between Main Street and Leamon Street.<br>• Replacement of 155m of 200mm diameter sanitary sewer on Thompson Road West between Leamon Street and Blueline Road with a new 250mm diameter sanitary sewer. |
| Port Rowan | • An improvement to the Mallard Walk Pumping Station is required to increase the station and total capacity to 24 L/s.<br>• Replacement of 107m of existing 200mm and 89m of existing 250mm sanitary sewer on Bay Street from Church Street to Front Road with 300mm diameter sanitary sewer.<br>• Replacement of 27m of existing 250mm diameter sanitary sewer with 300mm diameter sanitary sewer on Ellis Street from Front Road to the Port Rowan Pumping Station.<br>• Replacement of 328m of existing 200mm diameter sanitary sewer on an easement between Mallard Walk and Bay Street and on Bay Street from Mallard Walk to Aspen Lane with a 250mm diameter sanitary sewer. |

**Figure 4-74 – Projects Beyond the 10 Year Horizon**

| Community | Recommended Improvements |
| --- | --- |
| Simcoe | • No projects identified. |
| Port Dover | • County should consider upsizing the existing 250mm diameter sanitary sewer on Main Street downstream of Greenock Street West to match the upstream 450mm diameter sanitary sewer when replacement is required. |
| Delhi | • A review of the existing 375mm diameter sanitary sewer on Main Street between Eastern Avenue and Gilbert Avenue identified that both the upstream and downstream sewers are 450mm in diameter. It is recommended that County Staff confirm the existing diameter. Should the existing diameter be confirmed as 375mm, replacement of this section should proceed.<br>• Collect additional information on the Hillside, Industrial and Western Avenue Pumping Stations including details of pumping station configuration and capacities. Draw down testing should also be considered to establish station firm and total capacities. |
| Waterford | • No projects identified. |
| Port Rowan | • Replacement of 806m of existing 200mm diameter sanitary sewer on Bay Street from Aspen Lane to Church Street with a 250mm diameter sanitary sewer |

## 4.4 Wastewater Treatment

### 4.4.1 Existing Conditions

Norfolk County is currently serviced by five (5) Wastewater Treatment Facilities (WWTFs). These facilities include, Simcoe, Port Dover, Port Rowan, Delhi and Waterford WWTFs. All of these facilities have either been recently upgraded or are currently undergoing upgrades.

This sub-section of the ISMP is written with the following general objectives:

- Document the current conditions of the Norfolk WWTFs;
- Identify gaps, if any, between available capacities and future servicing needs;
- Plan for future capital and maintenance needs; and,
- Develop policy to evaluate feasibility of proposed development in future.

In line with these general objectives, the information provided by this sub-section of the ISMP includes:

1. Projected wastewater flows for the planning period
2. Capacity assessment of the WWTFs to serve the 2041 flows with regards to the rated capacities of the liquid trains; and processing and storage capacities of the biosolids trains.
3. Conditions of the WWTFs with regard to:
    a. Compliance with the applicable codes and regulations;
    b. Major assets;
4. Budget planning for capital upgrades and maintenance for the WWTFs
5. Utilized and available capacities for residential and non-residential development
6. An excel sheet based tool to:
    a. Determine the feasibility of a proposed development and identify issues if any with that;
    b. Objectively guide decision makers to reconcile the proposed development with the residual capacity if and as required;
    c. Evaluate and track residential and non-residential development individually; and;
    d. Track utilizable residual capacities available for future development.

As a result of the recent or ongoing upgrades, all WWTFs are or would be providing treatment to the current norms of full nitrification and reduced $cBOD_5$, TSS and TP limits. The upgraded effluent limits are likely to remain unchanged during the projected period. However, any substantial changes in the effluent criteria during the projection period may affect the following conclusions.

#### *4.4.1.1 Rated Capacity Concept*

The rated capacity of a WWTF is defined as the average daily flow which the facility has been approved to handle while meeting the applicable effluent criteria. The average daily flow is calculated as the cumulative total sewage flow to the sewage works during a calendar year divided by 365. The rated capacity of a WWTF is equivalent to the Design Average Daily Flow of the plant.

The rated capacity implicitly carries the organic loading and hydraulic loading capacity of the plant in it. This is because the organic and hydraulic loadings have a defined correlation with the average flows, and are incorporated in the design of the WWTFs. This correlation is normally assumed to remain unchanged unless there are significant loading or hydraulic contributors (such as an industry) which can alter the correlation. As such the adequacy of rated capacity to handle the average flow implies that the WWTF is capable of handling both the organic loading and the hydraulic loading associated with the average flow. However in this report, while assessing the WWTF capacities, the adequacy of individual WWTFs to handle both projected hydraulic and organic loads is explicitly mentioned for clarity of information and as an indication of the above mentioned correlation to remain unchanged over the projection period.

### *Simcoe*

#### *General Description*

The Simcoe WWTF is a conventional activated sludge facility with a rated capacity of 15,400 $m^3$/d. The overall facility comprises of the following key components:

- A headworks and preliminary treatment facility comprising screening raw sewage pumping and grit removal;
- A hauled waste receiving facility;
- A leachate receiving facility;
- Two liquid trains called plant 1 and plant 2 with individual capacities of 2,671 $m^3$/d and 12,729 $m^3$/d respectively;
- Common chlorination/dechlorination based disinfection system;
- Common tertiary filtration system; and,
- Anaerobic digestion based sludge stabilization and storage facility.

**Figure 4-75** shows the WWTF effluent limits and objectives per the ECA.

**Figure 4-75 – Simcoe WWTF Effluent Criteria**

| Parameter | Unit | Objective | Limit |
|---|---|---|---|
| $BOD_5$ | mg/L | 7.5 | 10 |
| Total Suspended Solids | mg/L | 5 | 15 |
| Total Phosphorus | mg/L | 0.15 | 0.45 |
| Total Ammonia Nitrogen | mg/L | 0.75 | 1.0 (May 1 to Oct 31) |
| | | 3.0 | 5.0 (Nov 1 to Apr 30) |
| E-Coli | CFU/100 mL | 150 | 200 |

Effluent pH maintained between 6.5 to 8.5 inclusive, at all times

### Recent Upgrades

- Plant 1 - Old abandoned liquid train called plant 1 was refurbished and recommissioned in 2008 with an individual rated capacity of 2,671 $m^3$/d.
- Plant 2 - Upgrades including aeration tank concrete repair, reconfiguration of the primary and secondary clarifier flow distribution and replacement of sludge removal mechanisms, completed in 2014.
- Upgrade of aeration system with new blowers, fine bubble aeration system and DO control.
- Installation of screening and grit removal facilities.
- Addition of dechlorination process to the existing chlorination based disinfection system.
- Pre-treatment of industrial load - Major industrial load contributor has installed a pre-treatment system in 2015, which is expected to reduce the plant loadings in general along with mitigating the loading peaks at the WWTF.

### Ongoing and Planned Upgrades

- Electrical systems upgrades – the existing electrical system is currently undergoing major upgrades, including replacement of MCCs, addressing classification issues in buildings undergoing upgrades, along with some other electrical safety, HVAC and communication related upgrades. These upgrades would be completed within 2015.

### *Capacity Assessment*

The WWTF is currently operating at 49% of its rated capacity of 15,400 $m^3$/d and is expected to reach 56% of its capacity by 2041. The plant has adequate capacity to treat the projected organic and hydraulic loadings. The pre-treatment of the wastewater by the ice-cream plant in Simcoe is expected to reduce the plant loads significantly. This would help facilitate the WWTF to utilize its full flow capacity or realize its full servicing potential and mitigate the risk of a pre-mature expansion. Also the planned upgrades of the sludge processing and storage facility will provide the required capacity to handle the biosolids for the planning period.

### *Projected Future Upgrades*

With the completion of the ongoing and currently planned upgrades, there would be no major upgrades required at the Simcoe WWTF over the projected planning period. Equipment will have to be replaced once the useful life of the components is reached. The expected equipment maintenance and replacement cost till 2041 is estimated at $500,000.

### *Code Compliance*

Three major components at the Simcoe WWTF with code compliance issues are:

- Anaerobic Digester;
- Headworks;
- Administration building; and
- Filter building.

<u>Anaerobic Digester</u>

In 2014, RVA completed the Simcoe WWTF Code Deficiency Report identifying areas of the digester system which are not in compliance with the most recent TSSA code and regulations. **Figure 4-76** gives a summary of priority work items from this report. For a complete list of compliance items, refer to the Simcoe Digester Code Deficiency Report (RVA, 2014).

**Figure 4-76 – Priority Work Items for Digester Code Compliance**

| Code Reference | Description |
|---|---|
| 6.1.1 & 6.3.3 | Boilers and waste gas burner not TSSA approved/certified |
| 6.1.2 | Replace existing drip traps with continuous flow drip traps |
| 7.1.1 | Boiler room combustion air supply not adequate |
| 7.2 | Automated damper for combustion air required with interlock control |
| 8.1.1 | Biogas piping changes – piping material; J-T expander; connection at secondary digester |
| 8.3.2 & 8.5.1 | Replace underground piping from primary digester into gas room |
| 8.6.8 | Provide vents for casings for each end of biogas piping crossing paved areas |
| 8.9.5 | Replace continuous flow drip traps with S.S. units and provide water connections into tank |
| 8.10.1 | Provide a backpressure control device on gas supply to boiler |
| 8.10.2 | Provide gas manometers for digesters and boilers |
| 8.13.1 & .4 | Revise location of pressure relief vents |
| 8.13.6 | Relief valves and regulators to be vented outside |
| 9.2.1 | Interior concrete in contact with gas shall have liner or coating |
| 9.3.2 | Secondary digester and holding tank require new 1050mm diameter access hatches |
| 9.4.2 | Gas piping from secondary digester to be modified to exterior draw-off from cover |
| 9.6.2 | Overflow piping on all three tanks to be increased in size |
| 10.1.1 | Ventilation of gas room to be increased |
| 10.2.2 | Location of emergency gas shut-off valve for boilers to be revised |
| 10.3.1 | Gas room to be made gas tight and meet Class 1-Div. 1 |
| 10.3.4 | Sample sinks to have hoods with exterior ventilation and primed water traps |

| Code Reference | Description |
|---|---|
| 10.4.3 | Provide combustible gas detection and interlocks for ventilation and lights |
| 10.4.4 | Provide back-up power supply for gas detection equipment |
| 13.1 | Biogas system shall have operation and maintenance procedures and written instructions/records |

On the other hand, RVA also evaluated the option of switching the current anaerobic process for sludge digestion to aerobic process by constructing new aerobic digesters and repurpose the existing anaerobic digesters for storage of Simcoe Biosolids and excess biosolids from other communities in future. The evaluation determined that this option would not only address the code issues related to the anaerobic digesters, but would also provide a cost effective and sustainable solution for overall biosolids management in the County over the planning horizon. The estimated capital cost of this upgrade would be $7.0M, and would include new aerobic digesters, repurposing of the existing anaerobic digesters, and a sludge thickening facility.

Headworks

The existing headworks structure has a number of operational issues. The wet well volume is far less than that recommended in the MOECC guidelines. This makes it difficult to manage power outages and plant maintenance without risk of basement flooding. The existing dry well does not meet the current NFPA 820 codes for electrical classification. The Electrical Safety Authority has identified this issue and Norfolk County is required to rectify it by the end of 2017. The headworks building structure is in very poor condition. The existing wood frame roof has deteriorated significantly, the concrete block walls are experiencing cracking and failure at a number of locations. The building has been identified as requiring replacement in the very near future. The existing electrical room is too small for any additional equipment. The control panel is full and it is not possible to add any additional controls to the system. Upgrades to the existing structure have been completed over the past 10 years to extend the life of the building but it has now reached the point where it must be replaced in the immediate future. The estimated cost of this upgrade would be $1.3 M.

Administration Building

The current Administration building is original to the facility. It has a wood frame roof that is failing, and the buried heating lines in the floor slab are failing or have failed. The attached plant 2 return activated sludge pump room is required to be separated under NFPA 820. The exterior stucco finish is spalling and failing at a number of locations. There is no office space for the workers and they are using a desk in the electrical room. The locker room is very small and does not accommodate the current staff at the plant. The existing lab has out of date and does not have current sinks and counters. The building has been on the planned replacement list for a number of years and should be replaced in the immediate future. The estimated cost of this upgrade would be $2.0 M.

Filter Building

The existing filter building does not meet the Ontario Building Code in a variety of aspects including structural design as a "Post Disaster" structure, fire protection, occupant safety and accessibility, and HVAC. A new building would have to be constructed in order to meet compliance with these above requirements, as these compliance upgrades are not possible with the existing building structure. The approximate cost of a new building to enclose the filter would be $1.0M. However, if the County decides to switch the current chlorination/dechlorination disinfection process to a UV system, the cost may increase by $0.5M to $1.5M. Based on that, the County should budget $2.0 M for the filter building. Also given the fact that the current building is non-compliant on several aspects, the new building is recommended to be planned for construction by 2021.

The regulatory requirements of the applicable codes at the WWTFs are known to become more stringent incrementally with time. The applicable regulatory requirements are recommended to be assessed every ten (10) years. With three (3) assessments between 2016 and 2041, and a budget of $10,000 per assessment, $30,000 should be budgeted for this item over the projection period.

### Port Dover

#### General Description

The Port Dover WWTF is a conventional activated sludge facility with a rated capacity of 5,400 $m^3$/d, and is comprised of the following key components:

- Headworks and preliminary treatment facility comprising screening, raw sewage pumping and grit removal;

- Liquid train comprising three primary clarifiers, two aeration tanks and two secondary clarifiers;
- Hauled waste receiving facility;
- Chlorination based disinfection system;
- Anaerobic digester; and
- Biosolids storage facility.

**Figure 4-77** shows the WWTF effluent limits and objectives per the ECA.

**Figure 4-77 – Port Dover WWTF Effluent Criteria**

| Parameter | Unit | Objective | Limit |
|---|---|---|---|
| $cBOD_5$ | mg/L | 15 | 25 |
| Total Suspended Solids | mg/L | 15 | 25 |
| Total Phosphorus | mg/L | 0.8 | 1.0 |
| E-Coli | CFU/100 mL | 200 | NA |

Effluent pH maintained between 6.5 to 9.0 inclusive, at all times

### *Recent Upgrades*

There have been no major upgrades at the Port Dover WWTF. However, a Sanitary Sewer Equalization Tank (SSET) was installed in the collection system in 2010 to mitigate the by-passes in the collection system as well as at the WWTF. Since the installation of the SSET the frequency and intensity (volume) of by-passes has reduced significantly, however by-passes still persist in the system. Further, since a higher volume of raw sewage now gets collected and conveyed to the WWTF, the raw sewage flow to the plant has increased by more than 30% since the installation of the SSET.

### *Ongoing and Planned Upgrades*

- WWTF Expansion – With the increase in the average plant flows following the installation of the SSET, the capacity of the liquid train needs to be increased to 5,800 $m^3$/d to meet the servicing needs for the planning period per the Class EA completed in 2012. This expansion is currently underway and expected to be completed by 2017.
- WWTF Upgrade – With the new federal regulation for ammonia toxicity expected to be enforced at the WWTF in the near future, the existing mechanical aeration system will be replaced by a fine-bubble aeration system by 2017.

### Capacity Assessment

The WWTF is currently operating at 78% of its rated capacity of 5,400 $m^3$/d. The currently planned expansion is aimed to increase the rated capacity to 5,800 $m^3$/d, based on the servicing needs until 2034 as per the Class EA completed on 2012. However, with the Master Plan objective to address the servicing needs until 2041, the rated capacity needs to be increased to 6,062 $m^3$/d. As such, the ongoing expansion of the WWTF should be completed to meet the updated twenty five (25) year projection per the Master Plan. However since this revised capacity is more than the value recommended by the Class EA, an addendum to the Class EA would have to be issued to indicate this change and fulfil the Class EA requirements.

The currently planned upgrades include addition of a secondary clarifier, aeration equipment and a headworks facility to increase the rated capacity of the WWTF to 5,800 $m^3$/d. However, under the current Master Plan, the design flow has been revised to 6,062 $m^3$/d which is 5% higher than the design flow adopted in the ongoing expansion. This flow translates into an Aeration Tank HRT of 5.3h which is lower than the MOECC design guideline of a minimum 6h for a nitrifying system. In addition, recent historic data since 2011 indicates that the average TSS in the WWTF influent has increased significantly which is likely due to an increased capture of storm flows (after installation the SSET in 2011) and the accompanying high solids from floral debris in spring and fall. The high influent solids would limit the secondary treatment capacity under design peak loadings. Both these factors necessitate construction of additional aeration tankage. Although the required additional aeration volume would be 15% (200 $m^3$) of the existing aeration tankage, it would be practical to add a third tank identical in size (667 $m^3$) adjacent to one of the existing tanks from operational efficiency and flexibility standpoints

The estimated cost of this upgrade is $500,000.

The expected equipment maintenance and replacement cost till 2041 is estimated at $300,000.

### Projected Future Upgrades

With the completion of the ongoing upgrade and expansion of the WWTF, there would be no future upgrade requirements in the projection period.

### Code Compliance

Two major components at the Port Dover WWTF with potential code compliance issues are:

- Headworks Building; and,
- Anaerobic Digester.

Out of these, the headworks building, is included in the currently planned expansion and upgrade of the Port Dover WWTF, and would be designed in compliance with the applicable codes.

The existing anaerobic digester at the WWTF was constructed in 1993 and has not been inspected since for the changed compliance requirements. It is therefore likely to have compliance deficiencies with regard to the current TSSA code. It is recommended to have the digester inspected for code compliance within 2016 so that upgrades if required can be planned and budget for. As such, other than the potential compliance deficiencies with the anaerobic digester, no major code deficiencies are envisaged for the Port Dover WWTF over the projection period.

The regulatory requirements of the applicable codes at the WWTFs are known to become stringent incrementally with time. The applicable regulatory requirements are recommended to be assessed every ten (10) years. With three (3) assessments between 2016 and 2041, and a budget of $10,000 per assessment, $30,000 should be budgeted for this item over the projection period.

## Delhi

### General Description

The Delhi WWTF is a conventional activated sludge facility with a rated capacity of 3,182 $m^3$/d, and is comprised of the following key components:

- Headworks and preliminary treatment facility comprising screening raw sewage pumping and grit removal;
- Liquid train comprising two primary clarifiers, two aeration tanks and two secondary clarifiers;
- Chlorination/dechlorination based disinfection system; and,
- Aerobic sludge digester.

**Figure 4-78** shows the WWTF effluent limits and objectives per the ECA.

**Figure 4-78 – Delhi WWTF Effluent Criteria**

| Parameter | Unit | Current Effluent Criteria (without tertiary filtration) | | 2017 Effluent Criteria (following tertiary filter installation) | |
|---|---|---|---|---|---|
| | | Objective | Limit | Objective | Limit |
| $BOD_5$ | mg/L | 15 | 20 | 10 | 20 |
| TSS | mg/L | 15 | 20 | 10 | 20 |
| TP | mg/L | 0.4 | 0.6 | 0.25 | 0.6 |
| TAN | | | | | |
| Apr 1 - Nov 30 | mg/L | 3.0 | 4.0 | 3.0 | 4.0 |
| Dec 1 - Mar 31 | mg/L | 6.0 | 8.0 | 6.0 | 8.0 |
| E-Coli | CFU/100 mL | 150 | 200 | 150 | 200 |

Effluent pH maintained between 6.0 to 9.0 inclusive, at all times

### Recent Upgrades

The old plant originally constructed in 1947 has been decommissioned and demolished and has been replaced with a new plant including both a liquid and solids train. The new plant has the same rated capacity as the old plant (3,182 $m^3$/d) but is designed to meet more stringent effluent criteria.

### Ongoing and Planned Upgrades

The new facility is a secondary level facility with chlorination/dechlorination disinfection. A new tertiary filtration facility and a new UV disinfection facility (to replace the chlorination/dechlorination) is planned to be completed by 2017.

### Capacity Assessment

The new WWTF is currently operating at 46% of its rated capacity of 3,182 $m^3$/d. The flow is expected to be 49% of the current rated capacity by 2041. As such, the plant has adequate capacity to treat the projected organic and hydraulic loadings. Also, with the new plant, the sludge processing and storage facility has the required biosolids processing and storage capacity for the planning period.

### Projected Future Upgrades

With the completion of the new plant and currently planned upgrades, there would be no major upgrades required at the Delhi WWTF over the projected planning period till 2041. Some equipment including pumps, blowers or aeration diffusers may have to be replaced as these reach their useful lives. The County should allocate a budget of $300,000 for equipment replacement and maintenance over the next twenty years.

### Code Compliance

The new WWTF at Delhi completed in 2015 meets all current applicable codes and regulatory requirements. The regulatory requirements of the applicable codes at the WWTFs are known to become stringent incrementally with time. The applicable regulatory requirements are recommended to be assessed every ten (10) years. With two (2) assessments between up to 2041, and a budget of $ 10,000 per assessment, $20,000 should be budgeted for this item over the projection period.

## Port Rowan

### General Description

The Port Rowan WWTF is a membrane-filtration based activated sludge facility with a rated capacity of 1,140 $m^3$/d and is comprised of the following key components:

- Headworks and preliminary treatment facility comprising screening raw sewage pumping and grit removal;
- Hauled waste and leachate receiving and storage facility
- Equalization facility for wet weather flows
- Liquid treatment train comprising two primary clarifiers, two aeration tanks and two membrane filtration tanks;
- Chlorination/dechlorination based disinfection system;
- Aerobic sludge digester; and,
- Two, Biofilters-based odour control facilities

**Figure 4-79** shows the WWTF effluent limits and objectives per the ECA.

**Figure 4-79 – Port Rowan WWTF Effluent Criteria**

| Parameter | Unit | Objective | Limit |
|---|---|---|---|
| $BOD_5$ | mg/L | 2.5 | 5.0 |
| Total Suspended Solids | mg/L | 1.0 | 2.0 |
| Total Phosphorus | mg/L | 0.06 | 0.12 |
| Total Ammonia Nitrogen | | | |
| May 1 to Nov 30 | mg/L | 1.0 | 2.0 |
| Dec 1 to April 30 | mg/L | 2.0 | 4.0 |
| E-Coli | CFU/100 mL | 12 | 200 |

Effluent pH maintained between 7.0 to 8.5 inclusive, at all times

### Recent Upgrades

The old lagoon based facility was replaced with the current membrane filtration based mechanical WWTF in 2012. The new plant has a higher rated capacity and is designed to meet a much more stringent effluent criteria.

### Ongoing and Planned Upgrades

There are currently no ongoing or planned upgrades at the Port Rowan WWTF.

### Capacity Assessment

The new WWTF is currently operating at 46% of its rated capacity of 1,140 $m^3$/d. The flow is expected to be 75% of the current rated capacity by 2041. As such, the plant has adequate capacity to treat the projected organic and hydraulic loadings. Also, with the new plant, the sludge digester has adequate treatment capacity for the projected future and design flows. There is currently a storage deficit of 500 $m^3$ which is projected to increase to 1,170 $m^3$ by 2041.

### Projected Future Upgrades

- The membranes at the Port Rowan WWTF have a ten (10) year warranty. As such the installed membranes are expected to last till 2022 at minimum. Partial or full replacement of the membranes can be expected between 2023 to 2027.
- The biofilter media in the odour control biofilters is expected to last for five (5) years. It is therefore expected to be replaced in 2017, 2022, 2027, 2032 and 2037 during the planning period. With two (2) biofilters on-site this amounts to ten (10) replacements in the next 20 years.
- The membrane diffusers in the aeration tank aeration system are subject to harsh conditions due to the strong nature and large quantities of hauled wastes and leachate. The currently installed membrane diffusers have a life of up to five (5) years under these operating conditions. This translates into up to six (6) replacements of the aeration diffusers up to 2041. On the other hand replacing the current membrane diffusers with chemical resistant diffusers (PTFE coated or Silicone based), will have a higher capital cost but a significantly longer life and potentially higher oxygen transfer efficiency over their life span, thereby resulting in a potentially lower life cycle cost. It is therefore recommended to replace the current membranes with the PTFE coated membranes at the first replacement and subsequently as required in future. Based on the typical life span of these diffusers 10-15 years, these are likely to be replaced twice over the projection period.

Budgetary costs of the above items are given below:

- Full replacement of membrane modules $ 500,000
- Replacement cost of biofilter media (5 times) $ 250,000
- Aeration tank membrane diffusers (2 times) $ 200,000
- Contingency (25%) $ 200,000

**Total $ 1,150,000**

### Code Compliance

The Port Rowan WWTF was completed in 2012 and meets all current applicable codes and regulatory requirements. The regulatory requirements of the applicable codes at the WWTFs are known to become stringent incrementally with time. The applicable regulatory requirements are recommended to be assessed every ten (10) years. With two (2) assessments between up to 2041, and a budget of $ 10,000 per assessment, $20,000 should be budgeted for this item over the projection period.

## Waterford

### General Description

The Waterford plant is rated for an average flow of 2,137 $m^3$/d and consists of:

- Two (2) aerated lagoon cells operated in parallel; and,
- A facultative polishing pond.

The aerated lagoons have two (2) cells with a total volume of 19,256 $m^3$. With a design capacity of 2137 $m^3$/d the aerated lagoons have a nine-day retention time and are able to remove approximately 68% of the BOD delivered to the plant. The facultative pond with a volume of 88,000 $m^3$ and a rated capacity of 2,137$m^3$/d, has an average retention of 41 days.

The effluent criteria for the plant were established by the Ministry of Environment and recorded in the Certificate of Approval dated January 16, 2004; this information is included in **Figure 4-80**.

**Figure 4-80 – Waterford WWTF Current Effluent Criteria**

| Parameter | Limits mg/L | Objectives mg/L |
|---|---|---|
| Carbonaceous $BOD_5$ | 30.0 | 25.0 |
| Suspended Solids | 40.0 | 30.0 |
| Total Phosphorus | - | 1.0 |

### *Recent Upgrades*

There have been no recent upgrades at the facility.

### *Ongoing and Planned Upgrades*

The facility is currently undergoing a major upgrade for increased capacity and treatment ability and for more stringent effluent criteria.

### *Capacity Assessment*

The new WWTF is currently operating at 46% of its rated capacity of 2,137 $m^3$/d. However with the ongoing upgrades, the plant will have a rated capacity of 2,200 $m^3$/d and the ability to meet compliance with the future effluent criteria given in **Figure 4-81**. The flow is expected to reach 68% of the future rated capacity of 2,200 $m^3$/d by 2041. As such, the plant would have adequate capacity to treat the projected organic and hydraulic loadings at the imminent effluent criteria following ongoing upgrades.

**Figure 4-81 – Waterford WWTF Future Effluent Criteria**

| Parameter | Unit | Objective | Limit |
|---|---|---|---|
| $BOD_5$ | mg/L | 4 | 6 |
| Total Suspended Solids | mg/L | 7 | 10 |
| Total Phosphorus | mg/L | 0.08 | 0.10 |
| Total Ammonia Nitrogen | mg/L | 0.6 | 0.7 (July 1 to Sep 30) |
| | | 1.0 | 2.0 (Oct 1 to Nov 30; and Apr 1 to June 30) |
| | | 3.0 | 5.0 (Dec 1 to Mar 31) |
| pH | | 6.0-8.5 | 6.0-9.5 |
| E-Coli | mg/L | 100 organisms per 100 mL | 200 organisms per 100 mL |
| Total residual chlorine | mg/L | Non-detect | 0.02 |

### *Projected Future Upgrades*

With the completion of the ongoing upgrades, there would be no major upgrades required at the Waterford WWTF over the projected planning period till 2041. Some equipment including pumps, blowers or aeration diffusers may have to be replaced as these reach their useful lives. In addition, the media in the Submerged Attached Growth Reactor (SAGR™), which is a part of the ongoing upgrades, may have to be replaced at least once within the projected growth period. The estimated media replacement cost for SAGR™ is $200,000.

The County should allocate a budget of $400,000 for replacement cost of equipment and media for the projection period.

### *Code Compliance*

The Waterford WWTF is currently undergoing expansion and upgrades. Upon completion of the ongoing project, the WWTF is expected to meet current applicable codes and regulatory requirements. The regulatory requirements of the applicable codes at the WWTFs are known to become stringent incrementally with time. The applicable regulatory requirements are recommended to be assessed every ten (10) years. With two (2) assessments between up to 2041, and a budget of $ 10,000 per assessment, $20,000 should be budgeted for this item over the projection period.

### *4.4.1.2 Biosolids Master Plan*

The County completed a Biosolids Master Plan (BMP) in 2007. The County currently disposes of biosolids via "Class B" liquid land application and this was confirmed as the most sustainable solution by the BMP.

The County has an informal understanding with Haldimand County to store biosolids from the Delhi and Simcoe WWTFs at the Townsend Lagoons on a seasonal basis, until conditions for spreading at approved sites are suitable. However, a centralized storage facility within Norfolk County was recommended to eliminate reliance on Haldimand County for seasonal storage. In addition, the BMP also recommended that the centralized facility be sized to allow enhanced biosolids processing to comply with possible future legislation.

Since completion of the BMP in 2007, the County's existing biosolids situation has undergone several changes due to upgrades and/or operational changes at the Simcoe, Port Rowan and Delhi WWTFs as indicated in the previous sections. Further, the regulation on storage requirements has undergone a significant change since the completion of the 2007 Biosolids Master Plan.

A Biosolids Implementation Plan has recently been completed in order to incorporate the recent regulatory changes, revised biosolids quantities and storage requirements while keeping in line with the general recommendation of providing additional storage and retaining land application as the preferred disposal option. The recommended strategy for implementation is – Aerobic digestion and thickening of Simcoe Biosolids, and repurposing of the Simcoe WWTF anaerobic digesters for storage of biosolids from Simcoe, and excess biosolids from Port Rowan and Port Dover WWTFs in future. This recommendation has been integrated with the Norfolk ISMP as indicated in **Section 4.4**.

### 4.4.2 Future Conditions

***Future Flow Projections***

**Figure 4-82** summarizes the projected wastewater flows of the five (5) WWTFs. The projected 2041 flows are based on the corresponding populations indicated by the recently concluded Population Projection Study by Hemson Consulting 2014.

**Figure 4-83** shows the current and future wastewater flows, along with the rated capacities of the WWTFs in the County. All WWTFs with the exception of Port Dover are within their respective rated capacities for the projected 2041 flows.

**Figure 4-82 – WWTFs Current and Projected Flows**

| WWTF | Current flow $m^3/d$ (1) | 2014 Population (2) | Per capita flow (LPCD) | 2041 population (3) | 2034 flow $m^3/d$ |
|---|---|---|---|---|---|
| **Simcoe** | 7,478 | 15,000 | 499 | 17,380 | 8,665 |
| **Port Dover** | 4,207 | 6,690 | 629 | 9,640 | 6,062 |
| **Delhi** | 1,470 | 5,090 | 289 | 5,350 | 1,545 |
| **Port Rowan** | 531 | 1,220 | 435 | 1,970 | 857 |
| **Waterford** | 984 | 3,570 | 276 | 4,970 | 1,370 |

Average day flows based on 2011 to 2013 data
2014 populations indicated in Table 21 of Hemson Report, 2014
Based on projected growth values in Table 21 of Hemson Report, 2014

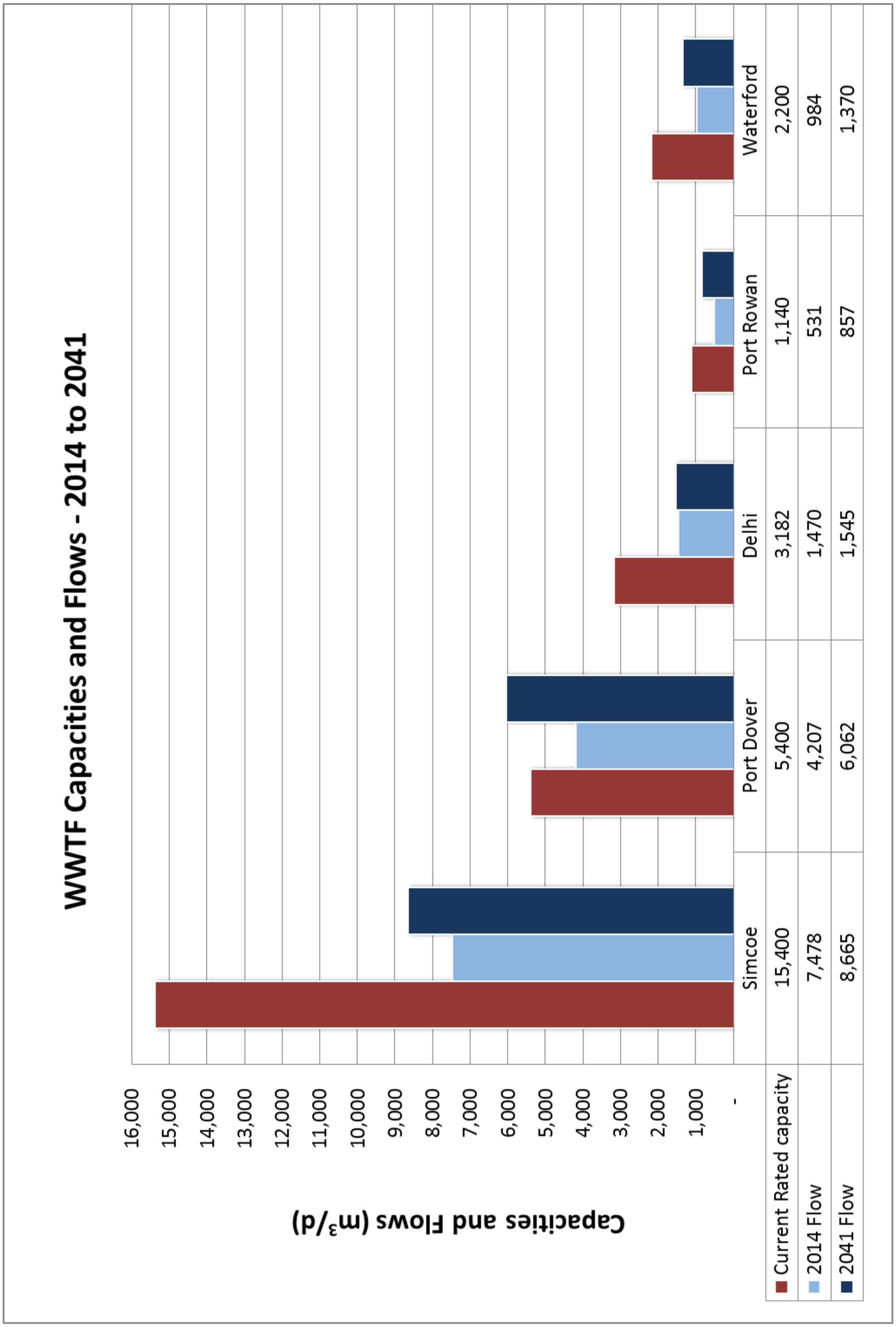



Figure 4-83 – WWTF Capacities and Flows

### *Capacity Utilization Profiles*

**Figures 4-84** and **4-85** show the current and future capacity utilization profiles. The following observations can be made from these figures.

- All WWTFs are currently utilizing approximately 50% of their rated capacities, with the exception of Port Dover which is at 80% utilization.
- Simcoe and Delhi have less than 10% growth in the projected period and will have 35-40% of utilizable residual capacities available in 2041.
- Port Rowan, Port Dover and Waterford show moderate growth with approximately 20-25% increase in wastewater flows. However, while Port Rowan and Waterford will have 15-30% utilizable residual capacities still available in 2041, Port Dover is projected to fully consume its utilizable capacity before 2041.
- Port Dover WWTF flows are projected to increase by 25% between 2014 to 2041, which translates into an average increase of 1% per year. At this rate the current capacity of 5,400 $m^3$/d would be consumed by 2029. While the currently planned expansion to 5,800 $m^3$/d would provide the capacity until 2035, expansion to 6,062 $m^3$/d would fulfil the servicing needs for the projection period till 2041.

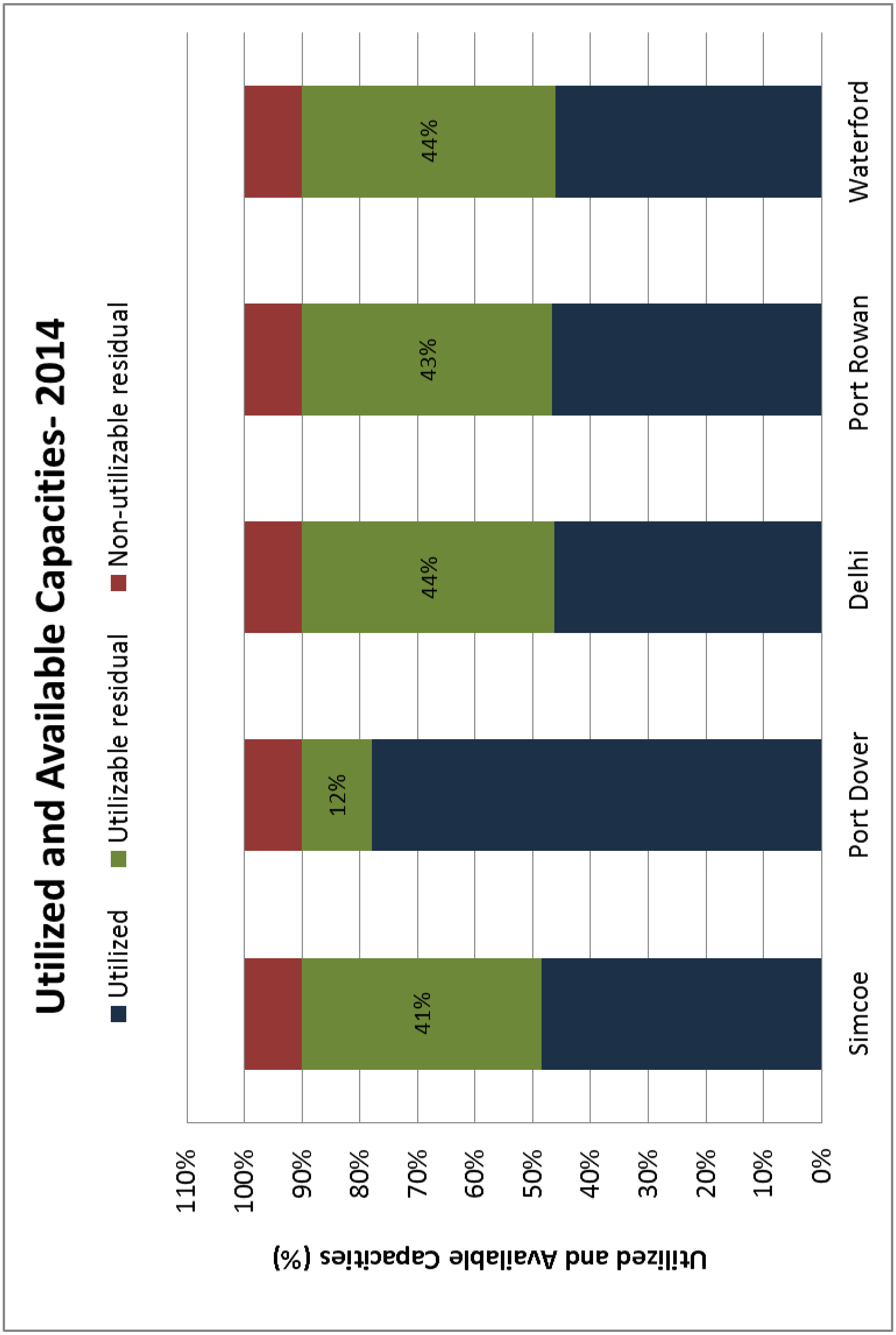



**Figure 4-84 – Utilized and Available Capacities – 2014**

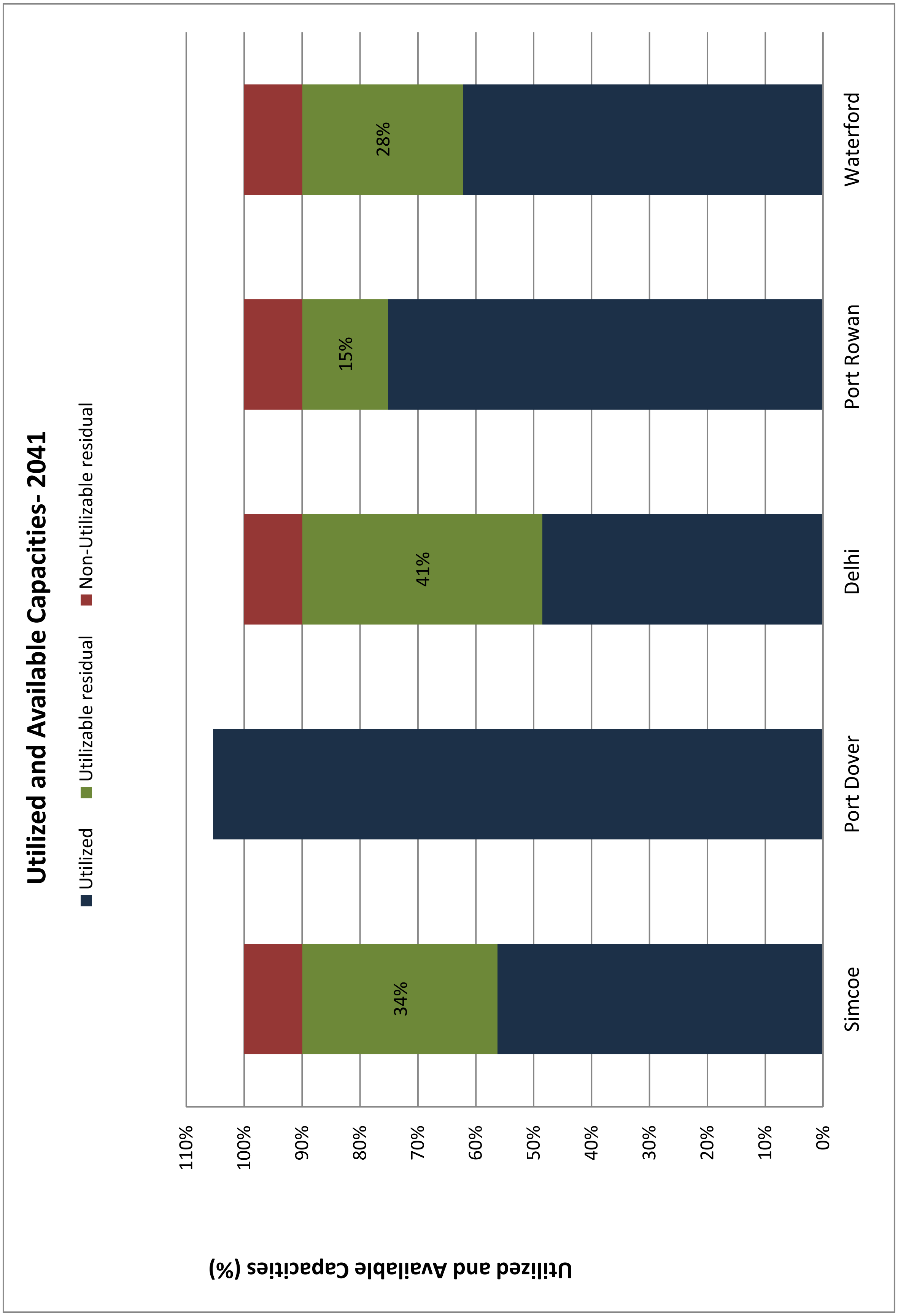



**Figure 4-85 – Utilized and Available Capacities – 2041**

### 4.4.3 Implementation

***Future Capital Projects and Budget Summary***

A budget summary of future capital and maintenance projects at the Norfolk WWTFs is provided in **Appendix E**.

***Policy Guidelines for Capacity Allocation***

***Capacity Allocation Policy Premises***

The capacity allocation policy is based on five (5) key premises described below.

1. **Rated Capacity of a Facility:** This indicates the total treatment capacity of the facility and defined as the average daily flow which the sewage treatment works have been approved to handle.

2. **Utilizable Capacity of a Facility:** This is the effective capacity of a facility available for utilization and is lower than the rated capacity of a facility. The recommended best practice in the industry is to allocate 90% of the rated capacity as utilizable. The reason for considering lower than rated capacity as utilizable is that upon reaching 90%, the organic and hydraulic peak loadings at the facility may exceed the treatment capacity of the facility and lead to exceedances of the effluent criteria. Also, as a facility approaches 100% utilization, it becomes much more difficult to operate it smoothly and meet the effluent criteria in a consistent manner.

3. **Utilized Capacity:** This indicates the capacity that is already utilized by the existing flows and therefore no longer available for servicing needs for new development.

4. **Residual Utilizable Capacity:** This indicates the effective residual capacity at a given time and represents the capacity available for growth.

5. **Residual Utilizable Capacity Distribution:** This indicates the distribution of the residual utilizable capacity for residential and other intrinsic sources including industrial and hauled wastes, which are denoted as "Intrinsic Loads from Additional Sources" (INLOADS) in this report. The percentage of INLOADS in the wastewater flows, along with their basis are given in **Figure 4-86**.

**Figure 4-86 – INLOADS Capacity at WWTFs**

| Community | INLOADS (%) 2014 | INLOADS (%) 2041 | Basis of selection |
|---|---|---|---|
| Simcoe | 40% | 40% | Based on the current influent $cBOD_5$ concentration of 336 mg/L and a base raw sewage $cBOD_5$ of 200 mg/L (typical for municipal sewage) |
| Port Dover | 5% | 5% | Allocated a minimum of 5% due to low INLOADS potential indicated by the historic data |
| Delhi | 29% | 30% | Based on the current influent $cBOD_5$ concentration of 280 mg/L and a base raw sewage $cBOD_5$ of 200 mg/L (typical for municipal sewage) |
| Port Rowan | 38% | 38% | Basis of design for the WWTF |
| Waterford | 5% | 30% | Based on the difference between 2011 to 2014 average BOD concentration of 135 mg/l and Tetratech Design Concentration of 191 mg/L including hauled waste loads |

### *Utilized and Residual Capacity Distribution*

**Figure 4-87** shows the utilized and residual capacity distribution of the WWTFs in Norfolk. As indicated, the chart splits the rated capacity into the following:

- Utilized – 2014: Currently utilized or most updated utilization
- Utilizable residual – Residential: Capacity usable for residential and commercial development.
- Utilizable residual – INLOADS: Capacity usable for industrial and hauled wastes
- Unavailable residual: Capacity that cannot be allocated for development

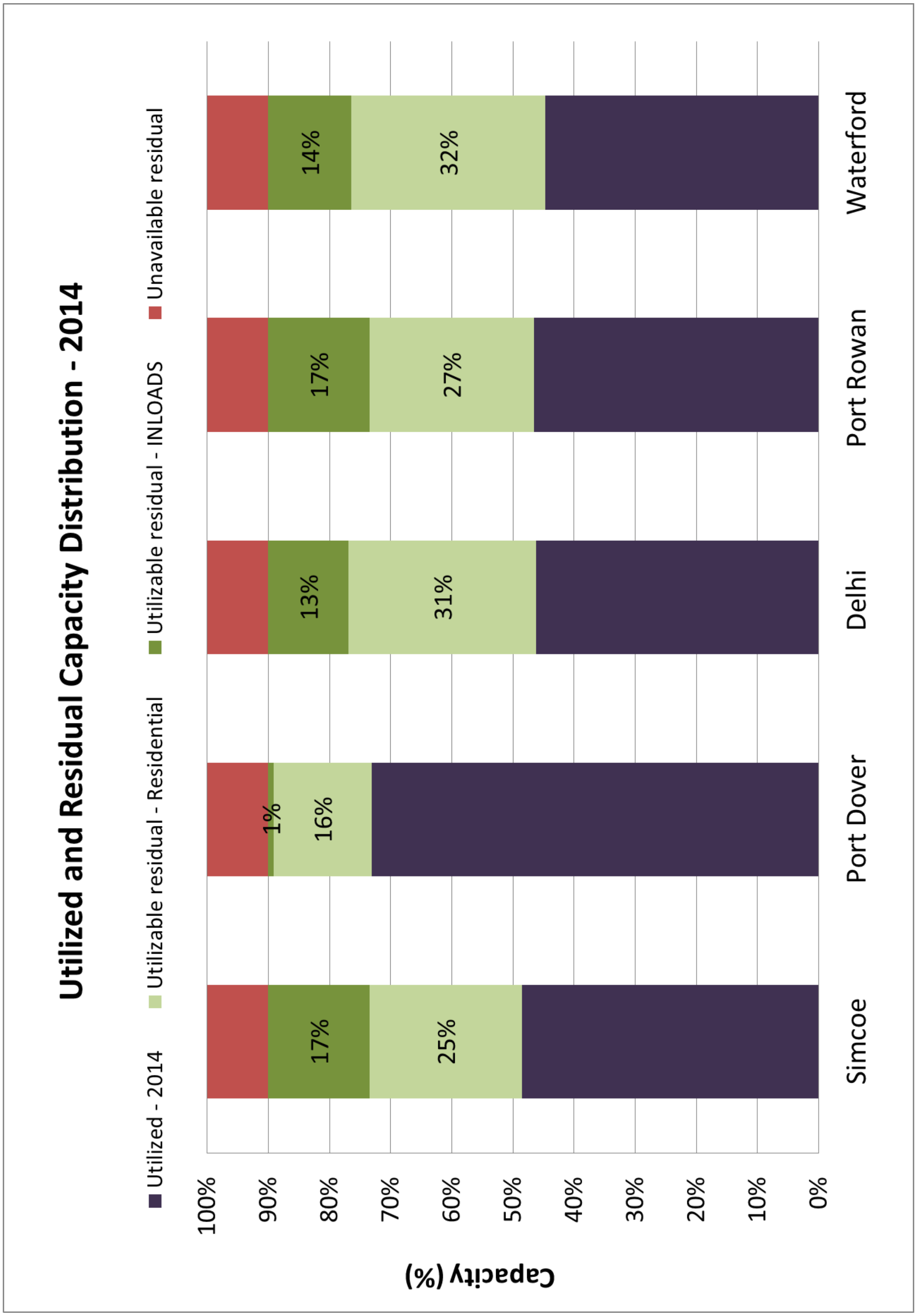



Figure 4-87 – Utilized and Residual Capacity Distribution - 2014

### Capacity Review and Allocation

An excel sheet based tool has been prepared for determining the feasibility of proposed development and capacity allocation. The tool was designed to answer the following questions:

1. Is the proposed residential development fully viable? If Not, then:
    - What is the maximum residential development possible and whether it affects the allocated capacity for INLOADS?
2. Is the proposed INLOADS development fully viable? If Not, then:
    - What is the maximum INLOADS development possible based on the flow and loading of the proposed INLOADS addition?
3. How much of the residual/INLOADS capacity will the proposed development utilize?
4. How much utilizable residual is left for residential and INLOADS development if the proposed development is approved?

The tool is divided into the following four (4) parts:

**a. Existing Conditions**

This section includes user input on historic flows, strength and utilizable residual capacities for residential and INLOADS development. While the residual capacity input is required for evaluating each proposed development, the flow and strength inputs are to be revised only once every five year, based on the historic data of the most recent five (5) years.

**b. Proposed Residential Development**

This section requires user input on the number of residential units proposed and the expected flow from any proposed commercial development. Based on these inputs it calculates the flow allocation and capacity utilization for the proposed development.

**c. Proposed INLOADS Development**

This section requires user input on the flow and strength of the proposed "INLOADS-contributing" development. Based on this input it calculates the flow allocation and capacity utilization for the proposed INLOADS development.

**d. Capacity Allocation and Updated Conditions**

Based on the input and outputs in the first three sections, this section determines if the proposed development is fully viable or not, and if not, what are the capacity related issues. The identified issues appear as remarks which guide the user how to address the issues. In addition, this section also calculates the updated residual capacities for residential and INLOADS after the proposed development. These updated vales subsequently become the input values for existing conditions for evaluation of the next proposal of development.

A copy of the excel tool in a USB key is included with the Master Plan

See **Figure 4-88** for further details.

**Figure 4-88 – WWTF Capacity Allocation Tool**

| Existing Conditions | Unit | Value |
|---|---|---|
| Rated capacity of the plant | $m^3/d$ | 15400 |
| Historic per capita flow | LPCD | 499 |
| No of residents per house | | 2 |
| Historic combined influent $BOD_5$ | mg/L | 336 |
| Base $BOD_5$ concentration of raw sewage | mg/L | 200 |
| Existing utilizable residual-residential | % | 25% |
| Existing utilizable residual-INLOADS | % | 17% |
| **Proposed residential development** | | |
| No of houses in proposed residential development | | 400 |
| Proposed commercial flow | $m^3/d$ | 20 |
| Actual flow contribution by proposed residential development | $m^3/d$ | 399 |
| Equivalent flow contribution by proposed residential development | $m^3/d$ | 214 |
| Flow allocation to new residential development | $m^3/d$ | 419 |
| Residential Capacity utilized by proposed development | % | 2.7% |
| **Proposed INLOADS development** | | |
| Average flow contribution by proposed INLOADS development | $m^3/d$ | 600 |
| Average expected $BOD_5$ from the INLOADS wastewater | mg/L | 1000 |
| Equivalent flow contribution by proposed development | $m^3/d$ | 1786 |
| Allocated flow to new residential development | $m^3/d$ | 1786 |
| Utilization by proposed INLOADS development | % | 12% |
| **Capacity allocation and updated conditions** | | |
| Is proposed development fully viable | | YES |
| Updated utilizable residual capacity-residential | % | 22.3% |
| Updated utilizable residual capacity-INLOADS | % | 5.4% |
| Updated total utilizable residual capacity | % | 27.7% |

## 4.5 Stormwater

The overarching goal of the stormwater component of the Master Plan is to develop a long term plan for the safe and effective management of stormwater runoff from the County's urban areas while improving the ecosystem health and ecological sustainability for rural areas and receiving watercourses. Drainage within rural areas will continue to be addressed through the Municipal Drainage Act.

The systematic approach that is undertaken within the Class EA process will enable Norfolk County to identify stormwater management opportunities, and individual works which, over time, collectively become part of a County-wide stormwater management system.

### *Existing Conditions*

### *Problem Statement*

As part of the impact of urban development, pervious land surfaces are converted to impervious surfaces. Runoff from impervious surfaces, including buildings, roadways, parking surfaces etc. reduce the volume of precipitation lost to the natural hydrologic pathways such as infiltration and evapotranspiration.

As a result, the following environmental impacts are generally observed:

- Runoff volumes and peak flows are increased following precipitation events;
- Hydrologic response times to precipitation events are reduced;
- Base flow conditions are impaired, and groundwater recharge is reduced; and
- The fluvial geomorphic processes of erosion and deposition are altered. Watersheds with significant development are more prone to both erosion and flooding which can lead to degraded riparian habitat and infrastructure damage.

The following figure illustrates representative changes in the proportion of precipitation entering different flow pathways, when land use changes from native vegetation to an urban landscape. In general, for a given storm event, the total volume of stormwater runoff reaching a stream increases three to five fold compared to rural or forested watersheds, accompanied with an increase in magnitude and duration of peak runoff and a significant decrease (greater than 50%) in infiltration.

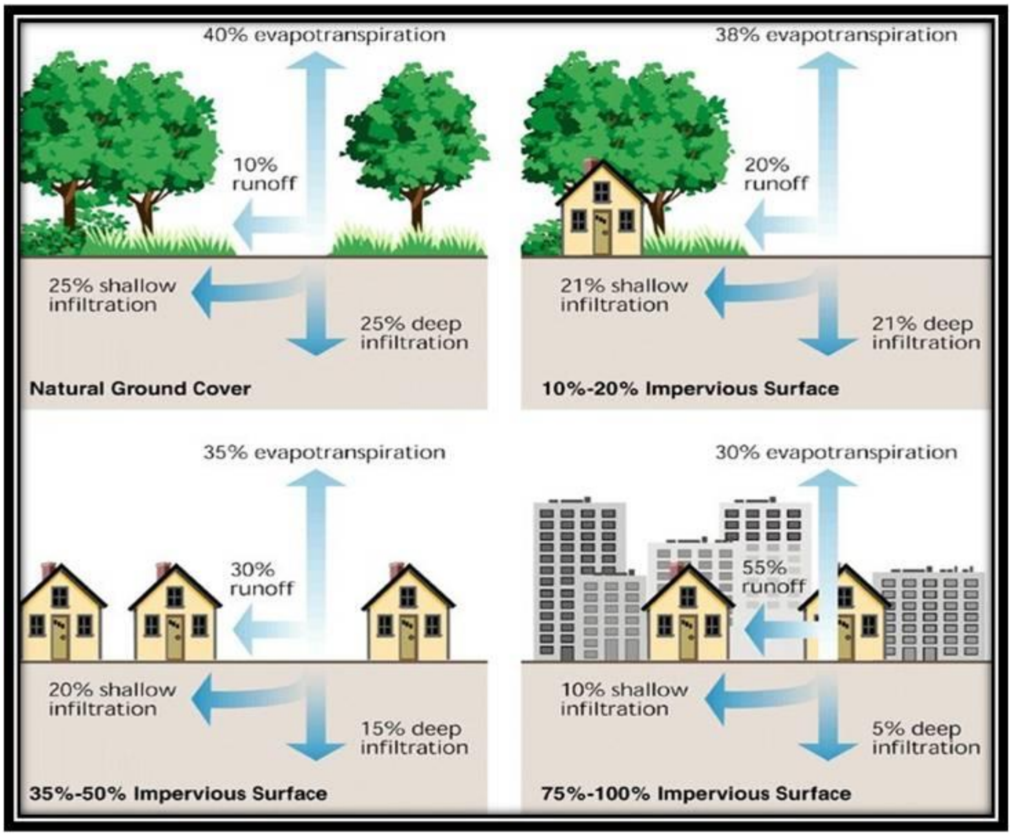



**Figure 4-89. Impact of Urban Development on Water Balance**

Implications of these impacts include the following areas of concern:

- Water Balance - The increase in impervious surfaces within the new development areas will result in the reduction in infiltration and evapotranspiration due to the reduction in permeable surfaces and natural soil and vegetation cover. Reduction in baseflow contribution to watercourses is also anticipated with specific concern in headwater and first order reaches;
- Water Quality – impacts are anticipated as a result of increasing imperviousness, and changing landuse types. Among expected changes are:
  - Changes in pollutant loadings: including phosphorus loadings, and Total Suspended Sediment loading, and
    - Changes in thermal regime in receiving watercourses, consequently affecting cool water fish species;

- Water Quantity:
  - Flooding – larger runoff volumes and increased peak flows are anticipated as pervious land surfaces are converted to impervious surfaces.
  - Erosion – without mitigation, the fluvial geomorphic processes of erosion and deposition will be altered and increased rates of erosion can be anticipated.

Based on a comprehensive review of existing technical and policy background concerning the Norfolk County stormwater management system, it can be concluded that the existing drainage infrastructure within the County does not meet current provincial and regional stormwater management and engineering standards. Moreover, it is apparent that previous studies are outdated and were not able to adequately assess the drainage system within the study area in a comprehensive manner in terms of environmental context and urban planning context.

The Stormwater Management component of the Norfolk County Sustainable Integrated Master Plan document will provide a valuable strategy and policy input to the County's Official Plan and asset management operations and maintenance. In order for the County to fulfill its strategic priorities including well-planned communities, infrastructure sustainability, and ecosystem protection, a comprehensive Master Drainage Plan is needed. Most importantly, an evaluation of the current level of services provided by the existing drainage infrastructure is needed, and management strategies are necessary to provide an up-to-date direction that includes but not limited to inventories and capacity assessment, stormwater policy review and input, and integrated management strategies that include traditional and innovative stormwater management measures including Low Impact Development (LID) measures and techniques.

### *SWM Policies and Guidelines*

There are numerous Acts, regulations, policies and watershed plans aimed at maintaining or improving environmental features and functions, provincially (e.g. Ontario and Conservation Authority jurisdictions) and locally (e.g. Norfolk County Official Plan). In order to understand the function of each document, it is important to understand the scale of implementation and the key objectives behind each document. Provincial and Municipal policy documents were reviewed with special focus on policies pertaining to Stormwater Management (Water Quality/Quantity), and guidelines were also reviewed in order to set the basis for linkages between policies and practices.

### Provincial Policies and Guidelines

#### The Planning Act and the Provincial Policy Statement, MMAH

The *Provincial Policy Statement* (PPS) is issued by the Ministry of Municipal Affairs and Housing under Section 3 of the Planning Act. The Planning Act sets out the ground rules for land use planning in Ontario and describe how land uses may be controlled, and who may control them.

It requires that decisions affecting planning matters in Official Plans "shall be consistent with" the PPS. The *PPS* provides "for appropriate development while protecting resources of provincial interest, public health and safety, and the quality of the natural environment". The *PPS* focuses growth within settlement areas and away from significant or sensitive resources. It directs planning authorities to identify and promote opportunities for intensification and redevelopment where this can be accommodated, taking into account existing building stock, including existing or planned infrastructure. The *PPS* provides a higher degree of protection for employment lands against conversions to residential uses. The new policies also provide for intensifications and brownfields development to ensure the maximum use of sewer, water and energy systems, roads and transit. The Official Plan is the most important tool to implement the *PPS*.

Section 2.2 of the *PPS (2014)* addresses water, stating that planning authorities shall protect, improve or restore the quality and quantity of water, using the watershed as the ecologically meaningful scale for planning. Planning authorities shall ensure that stormwater management practices minimize stormwater volumes and contaminant loads, and maintain or increase the extent of vegetative and pervious surfaces.

In addition to Section 2.2, Section 1.6.6.7 of the PPS provides guidance for stormwater management, specifically in terms of minimizing contaminant load, minimizing changes to water balance and erosion, protecting properties from damage, maximizing vegetative cover, and promoting stormwater best management practices.

The *PPS* acknowledges that, in addition to approvals under the *Planning Act*, necessary infrastructure may require approvals under the EA, CEAA, EPA, OWRA, *the Conservation Authorities Act* and *the Safe Drinking Water Act*, and provincial plans (e.g. *Niagara Escarpment Planning & Development Act* or the *Oak Ridge Moraine Conservation Act*). Conservation Authorities have Memoranda of Understanding with municipalities to ensure that the quality and quantity of water are protected through proper planning. Applicable Provisions of the *Planning Act*

- Section 24: Zoning By-law,
- Section 41: Site Plan Control Areas and
- Section 51: Plan of Subdivision Approvals.

The relevance to stormwater, is in regards to Site Plan and Subdivision Approvals at the municipal level. Site Plan and Subdivision Approvals are:

- Subject to Conditions
    - Grading and alterations to land, including storm and surface waters
    - Sediment and erosion control requirements
- Criteria for conservation of natural resources and flood control
- Requires entry into legal agreements
- Requires compliance with imposed conditions
- Can impose financial securities
- Linked to other regulatory approvals (i.e. Conservation Authorities)

*ONTARIO REGULATION 178/06: Long Point Region Conservation Authority: Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses*

According to Ontario Regulation 178/06, no person shall undertake development or permit another person to undertake development in or on the areas within the jurisdiction of the Authority that are:

a) adjacent or close to the shoreline of the Great Lakes-St. Lawrence River System or to inland lakes that may be affected by flooding, erosion or dynamic beaches
b) river or stream valleys that have depressional features associated with a river or stream, whether or not they contain a watercourse
c) hazardous lands;
d) wetlands; or
e) other areas where development could interfere with the hydrologic function of a wetland

### *Municipal Drainage Act*

The Drainage Act (1990) provides landowners with the ability to obtain legal drainage, and it is generally regarded as a tool to resolve drainage problems in rural areas within Ontario. Municipal Drains are drains that are constructed, repaired or maintained under the guidelines of Ontario's Municipal Drainage Act and under the authority of a Municipal By-Law. According to the Drainage Act, all lands in Ontario have the right of drainage.

### *Endangered Species Act, MNRF*

The *Endangered Species Act* came into effect in 2007 and provides for broader protection for species at risk and their habitats. In general the purpose of the act includes the preservation and rehabilitation of habitat and the enhancement of other areas so that they can become habitat. Under the act, habitat may be described by specific boundaries, features or "in any other manner" and may prescribe areas where species live, used to lie or is believed to be capable of living and beyond.

Section 10: A person shall not damage or destroy the habitat of a species that is listed as an endangered or threatened species

Policies under this legislation have relevance to urban development and stormwater management. As an example, the impacts to habitat can be as a result of:

- Alteration to hydrologic regimes (increased runoff, flow regime change and decreased infiltration) and increased water temperature (through increasing impervious surfaces and end-of-pipe discharges);
- Increased sedimentation and erosion through site grading and excavation;
- Releases of untreated stormwater which carry pollutants; and
- General habitat losses through the loss of riparian vegetation, in-stream habitat features, wetland and groundwater sources.

Any species at risk and their habitat should be considered on a site specific basis during the development and implementation of individual stormwater management projects as applicable.

### *Stormwater Management Planning and Design Manual, MOE 2003*

The Ministry of Environment Stormwater Management Planning and Design Manual (MOE, 2003) is a document which updates earlier stormwater management manuals released by the Ministry of Environment (MOE) in 1991 and 1994, with an overarching objective to provide guidance for the selection and design of appropriate stormwater management practices. The key components of the 2003 manual include the following:

- Providing direction for sizing of the stormwater quality control component of stormwater management facilities in order to achieve water quality objectives which protect fisheries habitat;
- Incorporating in-stream erosion control and water balance objectives in addition to flood and water quality objectives into the selection and design of Stormwater Management Practices (SWMPs);
- Providing information on SWMPs such as sand filters, bioretention filters, wet swales and hybrid wet pond/wetlands;

- Providing design examples for SWMPs; and,
- Providing an appendix which deals with integrated planning for stormwater management.

### *Municipal Policies and Guidelines*

Under Chapter 6 (Sustainable Natural Heritage) of, the Norfolk County Official Plan it is noted that:

"The County shall require the use of stormwater management facilities downstream of new developments, where appropriate, to mitigate development impacts on stormwater quantity and quality. The County shall promote naturalized and unfenced stormwater management facilities, constructed with gentle slopes. Applications for development may be required to be supported by a stormwater management study".

As part of Development Criteria (Section 6.3.2.8), where stormwater or drainage controls are required for any development, such studies shall be integrated with source protection measures for WHPAs.

Under Chapter 8 (Networks and Infrastructure), the Norfolk County Official Plan provides important policies for SWM onsite control as follows:

- All stormwater shall be managed on-site for new development. No new development shall have a negative impact on the drainage characteristics of adjacent land;
- Stormwater management facilities shall be designed to manage stormwater quality and quantity, at an appropriate level, as defined in consultation with the appropriate Conservation Authority. The integration of natural vegetative features in new facilities shall be required and the naturalization of existing stormwater management facilities is encouraged;
- Prior to the approval of a development application, the County shall require the preparation and approval of a stormwater management plan which either implements the management concept of the Subwatershed Study, if prepared, or is completed in accordance with guidelines of the appropriate Conservation Authority and the current Ministry of Environment Stormwater Planning and Design Manual. At its sole discretion, the County may, defer these requirements to the detailed design phase, and implement the policies of this Subsection as a condition of development approval;

- Prior to development approval, the development proponent shall consider, where appropriate, enhancing the vegetation, wildlife habitats and corridors in and along the stormwater management system and the receiving watercourses. Additionally, the proponent shall provide, where appropriate, public access to and along the stormwater management system and the receiving watercourse where such areas can be used to form part of a trail or open space system. In order to ensure that the size, configuration and grade of the land surrounding the facility can be efficiently programmed as a component of a trail or open space system, it may be necessary to prepare a landscape design prior to development approval;
- The County shall ensure that the design of stormwater management facilities considers long-term maintenance and safety requirements; and
- The Ministry of Transportation shall be consulted in relation to stormwater management plans and facilities in proximity to Provincial Highways.

### *Watershed Context*

Norfolk County is located within the jurisdiction of Long Point Region Conservation Authority (LPRCA). **Figure 4-90** provides snapshot information on the location of each Norfolk community, in addition to key environmental conditions according the Long Point Region's 2013 Watershed Report Card. The grading scheme used in the Watershed Report Card is as follows:

- A: Excellent
- B: Good
- C: Fair
- D: Poor
- E: Very Poor

The environmental grading for each community within Norfolk County (**Figure 4-90**) shows that the majority of the settlement areas are located within subwatersheds that have Fair to Very Poor conditions in terms of surface water quality, wetland cover, and forest conditions. Therefore, stormwater management strategies are needed to protect, enhance, and improve environmental resources within Norfolk County Communities.

**Figure 4-90. Summary of Environmental Conditions within Norfolk County Communities**

| Community | Population | Subwatershed | Environmental Conditions |
|---|---|---|---|
| Simcoe | 15,272 | Lynn-Black Creek | Surface Water Quality Conditions: C<br>Wetland Cover: D<br>Forest Conditions: C |
| Waterford | 3,738 | Nanticoke Creek | Surface Water Quality Conditions: D<br>Wetland Cover: F<br>Forest Conditions: D |
| Port Dover | 7,054 | Lynn-Black Creek | Surface Water Quality Conditions: C<br>Wetland Cover: D<br>Forest Conditions: C |
| Delhi | 5,110 | Big Creek | Surface Water Quality Conditions: C<br>Wetland Cover: C<br>Forest Conditions: C |
| Port Rowan | 1,316 | Dedrick-Young Creek | Surface Water Quality Conditions: C<br>Wetland Cover: A<br>Forest Conditions: A |
| Courtland | 1,044 | Little Otter Creek | Surface Water Quality Conditions: C<br>Wetland Cover: F<br>Forest Conditions: C |

### *Existing Storm Drainage Infrastructure*

The following discussion provides a summary to the drainage system within the six (6) settlement areas (i.e. communities) within Norfolk County. Appendix G includes illustrations of storm sewer distribution, sizing, outlets, and delineated catchments based on trunk sewer system approach (i.e. greater than 400 mm).

Based on our review of the surface water features and storm sewer system within Norfolk County, we understand that there are large urban areas that are actually municipal drains. These municipal drains were evaluated as part of the major drainage system, and only storm sewer trunks (i.e. greater than 400 mm) were evaluated as minor drainage system.

### *Simcoe*

The drainage system within Simcoe includes natural watercourses (i.e. Lynn River main branch and tributaries), swales and ditches, in addition to a storm sewer system that incorporates pipe sizes that range from 250 mm to 1500 mm (**Appendix G**). Based on the delineation of the trunk sewer system (i.e. greater than 400 mm), thirty three (33) sewersheds (i.e. catchments) were delineated. Many catchments drain directly to the Lynn River system, others run on adjacent catchments before outletting to the Lynn River. There is a traditional stormwater management system that includes wet and dry ponds. Based on the GIS shapefiles received from the County, there are three (3) SWM facilities (wet ponds) within the community.

According to surficial geology maps (**Appendix G**), the soils within Simcoe can be classified as fine textured glaciolacustrine deposit, which are mostly comprised of silt and clay, with minor sand and gravel.

### *Waterford*

The Waterford community is located within the Nanticoke Creek Subwatershed. The drainage system comprises the Nanticoke Creek, swales and ditches, and a storm sewer system that is primarily surrounding Regional Road 24 and Concession 8 Townsend. There are nine (9) catchments that encompass the trunk storm sewer system (**Appendix G**). Catchments W2 and W4 are the largest, and they outlet to Nanticoke Creek with a 1067 mm and a 1219 mm storm sewer, respectively.

According to the Waterford Area Drainage Study Update (Stantec, 2010), the Waterford Area is bisected north and south by Nanticoke Creek which has been dammed across within the town limits, creating a reservoir area known as Waterford Ponds to the west of the urban limits. Based on the GIS shapefiles received from the County, there are two (2) SWM facilities that are draining to Nanticoke Creek in the south.

According to surficial geology maps (Appendix G), the soils within Waterford can be classified as course textured glaciolacustrine deposit, which are mostly comprised of sand and gravel with minor silt and clay. These soils are well drained and provide good opportunity for infiltration-based stormwater management measures (i.e. Low Impact Development (LID) measures).

### *Port Dover*

Port Dover is the second biggest community in Norfolk County following Simcoe. It has a complex drainage system due to its location at the mouth of Lynn River and Black Creek, in addition to Silver Lake, which occupies the centre of the area within the Lynn River system.

Based on the delineation of the trunk sewer system (i.e. greater than 400 mm), thirty one (31) sewersheds (i.e. catchments) were delineated. Most of these catchments drain directly to the Lynn River and Black Creek systems. A number of recently constructed stormwater management facilities (wet ponds) exist in the east and west of Port Dover. Based on the GIS shapefiles received from the County, there are seven (7) SWM facilities. Four (4) of these facilities are draining to the Black Creek system, two (2) are draining to the Lynn River system, and one (1) is draining via a storm sewer trunk to Lake Erie.

According to surficial geology maps (Appendix G), the soils within Port Dover can be classified as fine textured glaciolacustrine deposit, which are mostly comprised of silt and clay, with minor sand and gravel.

### *Delhi*

The Delhi community is located within the Big Creek Subwatershed. The major trunk sewer systems are located within Regional Road 4 and Regional Road 37. There is one (1) SWM facility located in the north west portion.

According to surficial geology maps (**Appendix G**), the soils within Delhi can be classified as course textured glaciolacustrine deposit, which are mostly comprised of sand and gravel with minor silt and clay. These soils are well drained and provide good opportunity for infiltration-based stormwater management measures (i.e. Low Impact Development (LID) measures)

### *Port Rowan*

Port Rowan is located within the Dedrick-Young Creek Subwatershed. The existing trunk sewer system is located within the Main Street and Front Street system. According to a storm sewer report completed in 1991, Port Rowan had suffered from inadequate drainage (G. Douglas Vallee, 1991).

### *Courtland*

Courtland is a community within Norfolk County that is located within the Little Otter Creek Subwatershed. The stormwater management system was not characterized in this study due to an absence of information concerning storm sewers and SWM facilities (As part of the recommended solutions (refer to Alternatives, Evaluation, and Implementation), a stormwater database management plan is proposed to collect missing information).

## *SWM Model Development*

The EAP SWMM modeling platform was used to simulate the hydrology and hydraulics of the stormwater management system within five (5) communities within Norfolk County (i.e. Simcoe, Waterford, Port Dover, Delhi, and Port Rowan).

Two scenarios were developed:

1. **Existing Conditions**: with the current land uses within each community.
2. **Future Conditions**: with future growth projections including Industrial/Business Park areas and future residential areas according to the Norfolk County Official Plan (2011) designations (Schedules B-15, B-16, B-17, B-18, and B-19).

Both scenarios were run under the 5-year, 25-year, and 100-year design storm events as proposed in the Norfolk County's Design Criteria document (2012) for drainage assessments of minor and major systems. The Chicago Storm distribution with a duration of 3 hours and a time step of 5 minutes was used for the development of the design storms. The Norfolk County's Design Criteria document (2012) was used to specify rainfall IDF curves information and imperviousness values for new residential development and commercial/industrial development. The Horton infiltration model was used to assess infiltration capacity of the study area.
Three (3) key stormwater management analyses were performed:

1. **Peak flow Analysis**: including the evaluation of each peak flow generated at each catchment
2. **Hydraulic Analysis**: including the assessment of capacity of trunk storm sewers and hydraulic parameters including depths and velocities.
3. **Flood Analysis**: including the identification of areas with potential flooding issues. The focus of the flood analysis was directed to the minor drainage system. The assessment of the dual drainage system (minor and major) would require much more detailed data in terms of topography information and storm sewer system configuration.

Gaps prevailing while developing the existing conditions models were communicated and discussed with the County engineers in order to arrive to recommendations and suggestions that could be applied to help build the stormwater management models. These gaps have included stage-storage relationships for existing SWM facilities, rim and invert elevations (except for Port Dover), and detailed topographic information. Therefore, the modeling effort has made assumptions including:

- Representing areas with SWM facilities based on existing conditions assuming control of peak flows to pre-development conditions
- Representing rim and invert elevations based on contour lines and minimum cover
- Representing trunk storm sewers greater than 400 mm
- Soil characteristics have been described using existing soil maps that cover the County and settlement areas. Characteristics of existing conditions can be highly varied and a site specific geotechnical investigation is recommended when modeling on a site by site basis.

Since this study is a Master Plan with an overarching objective to evaluate overall drainage issues and identify solutions, these assumptions are deemed appropriate for the objectives and scale of this study. As part of the recommended solutions (refer to

Alternatives, Evaluation, and Implementation), a stormwater database management plan is proposed to collect missing information.

### *Existing Conditions Assessment*

#### *Simcoe*

Peak flows generated from each catchment depend on the severity of the storm event, with flood potential increasing with the increase of storm event return period. For example, flooding volume along Ireland Road within Catchment S11 would increase from 3.699 x 10^6 Litre under the 5-year and 25-year storm conditions to 13.483 x 10^6 Litre under the 100-year storm event conditions.

Moreover, some flow nodes (i.e. manholes or outfalls) that are not susceptible to flooding under more frequent storms (5-year storms) are under the risk of flooding following less frequent storms (100-year storm) (example: Norfolk St. N). Nineteen (19) flow nodes are expected to flood under the 5-year storm conditions, compared to twenty three (23) nodes under the 25-year conditions and twenty four (24) nodes under the 100-year storm conditions.

**Figure 4-91. Flooding Areas of Concern within Simcoe (refer to Appendix G)**

| 5-Year Storm | | | 25-Year Storm | | | 100-Year Storm | | |
|---|---|---|---|---|---|---|---|---|
| Location | Catch-ment | Flood Volume 10^6 Litre | Location | Catch-ment | Flood Volume 10^6 Litre | Location | Catch-ment | Flood Volume 10^6 Litre |
| Highway 3 | S3 | 2.63 | Highway 3 | S3 | 4.486 | Highway 3 | S3 | 6.619 |
| Hawthorne Ave. | S4 | 0.511 | Hawthorne Ave. | S4 | 0.92 | Hawthorne Ave. | S4 | 1.354 |
| Riverside Road | S2 | 0.082 | Riverside Road | S2 | 0.549 | Riverside Road | S2 | 1.087 |
| Maple St | S6 | 0.781 | Maple St | S6 | 1.515 | Maple St | S6 | 2.689 |
| Sheridan Blvd | S7 | 0.04 | Sheridan Blvd | S7 | 0.326 | Sheridan Blvd | S7 | 0.72 |
| Adams Lane | S7 | 2.436 | Adams Lane | S7 | 4.66 | Adams Lane | S7 | 7.974 |
| Argyle St | S8 | 0.777 | Argyle St | S8 | 1.706 | Argyle St | S8 | 2.845 |
| Anderson Ave. | S10 | 0.366 | Anderson Ave. | S10 | 1.588 | Anderson Ave. | S10 | 3.053 |
| Ireland Road | S11 | 3.699 | Ireland Road | S11 | 8.295 | Ireland Road | S11 | 13.483 |
| Sherman Ave | S13 | 0.102 | Sherman Ave | S13 | 0.553 | Sherman Ave | S13 | 1.13 |
| Cedar St | S14 | 0.981 | Cedar St | S14 | 1.852 | Cedar St | S14 | 2.969 |
| Robinson St | S17 | 0.67 | Robinson St | S17 | 1.38 | Robinson St | S17 | 2.413 |
| Dean St. | S19 | 0.67 | Dean St. | S19 | 1.652 | Dean St. | S19 | 2.858 |
| Brock St. | S20 | 6.673 | Brock St. | S20 | 12.471 | Brock St. | S20 | 23.464 |
| Brock St. | S20 | 1.483 | Brock St. | S20 | 2.904 | Brock St. | S20 | 4.242 |
| Holden Ave. | S15 | 6.629 | Cherry St. | S22 | 0.033 | Cherry St. | S22 | 0.213 |

| 5-Year Storm | | | 25-Year Storm | | | 100-Year Storm | | |
|---|---|---|---|---|---|---|---|---|
| **Location** | **Catch-ment** | **Flood Volume 10^6 Litre** | **Location** | **Catch-ment** | **Flood Volume 10^6 Litre** | **Location** | **Catch-ment** | **Flood Volume 10^6 Litre** |
| Colborne St. S | S18 | 1.441 | Evergreen Hill | S22 | 0.166 | Evergreen Hill | S22 | 1.114 |
| Gilberstone Dr. | S29 | 0.434 | Simson Ave. | S23 | 0.147 | Simson Ave. | S23 | 0.442 |
| Second Avenue West | S32 | 1.189 | Holden Ave. | S15 | 11.906 | Holden Ave. | S15 | 19.83 |
| | | | Colborne St. S | S18 | 3.628 | Colborne St. S | S18 | 6.043 |
| | | | Union St. | S16 | 0.703 | Union St. | S16 | 1.791 |
| | | | Gilberstone Dr. | S29 | 0.886 | Gilberstone Dr. | S29 | 1.42 |
| | | | Second Avenue West | S32 | 2.253 | Norfolk St. N | S30 | 0.165 |
| | | | | | | Second Avenue West | S32 | 3.339 |

### *Waterford*

Three (3) flow nodes are expected to flood under the 5-year storm conditions, compared to four (4) nodes under the 25-year conditions and five (5) nodes under the 100-year storm conditions.

Figure 4-92. Flooding Areas of Concern within Waterford (refer to Appendix G)

| 5-Year Storm | | | 25-Year Storm | | | 100-Year Storm | | |
|---|---|---|---|---|---|---|---|---|
| Location | Catch-ment | Flood Volume 10^6 Litre | Location | Catch-ment | Flood Volume 10^6 Litre | Location | Catch-ment | Flood Volume 10^6 Litre |
| Auty St. | W3 | 0.438 | Alice St. | W2 | 0.026 | Alice St. | W2 | 0.304 |
| Concession 8 and Factory Alley | W5 | 0.912 | Auty St. | W3 | 1.062 | Auty St. | W3 | 1.815 |
| Concession 8 and Regional Road 24 | W7 | 0.246 | Concession 8 and Factory Alley | W5 | 1.853 | Concession 8 and Factory Alley | W5 | 4.998 |
| | | | Concession 8 and Regional Road 24 | W7 | 0.614 | Concession 8 and Regional Road 24 | W7 | 1.09 |
| | | | | | | Bruce St. | W8 | 0.078 |

### Port Dover

Nine (9) flow nodes are expected to flood under the 5-year storm conditions, compared to ten (10) nodes under the 25-year conditions and eleven (11) nodes under the 100-year storm conditions.

**Figure 4-93. Flooding Areas of Concern within Port Dover (refer to Appendix G for details)**

| 5-Year Storm | | | 25-Year Storm | | | 100-Year Storm | | |
|---|---|---|---|---|---|---|---|---|
| Location | Catch-ment | Flood Volume 10^6 Litre | Location | Catch-ment | Flood Volume 10^6 Litre | Location | Catch-ment | Flood Volume 10^6 Litre |
| Thompson Dr. | PD4 | 0.849 | Thompson Dr. | PD4 | 2.076 | Thompson Dr. | PD4 | 3.512 |
| Main St. | PD8 | 0.341 | Main St. | PD8 | 0.879 | Main St. | PD8 | 1.467 |
| Main St. | PD9 | 4.343 | Main St. | PD9 | 7.663 | Main St. | PD9 | 12.033 |
| Main St. | PD6 | 2.148 | Main St. | PD6 | 4.02 | Main St. | PD6 | 6.62 |
| Lynn Park Ave. | PD3 | 0.455 | Lynn Park Ave. | PD3 | 1.064 | Lynn Park Ave. | PD3 | 1.847 |
| Denby Road | PD29 | 0.406 | Denby Road | PD29 | 0.843 | Denby Road | PD29 | 1.505 |
| Greenock St. W. | PD30 | 0.916 | Greenock St. W. | PD30 | 1.746 | Greenock St. W. | PD30 | 3.082 |
| St. Patrick St. | PD11 | 1.067 | St. Patrick St. | PD11 | 2.2 | St. Patrick St. | PD11 | 3.499 |
| St. George St. | PD28 | 0.075 | St. George St. | PD28 | 0.225 | John St. | PD14 | 0.121 |
| | | | Main St. | PD10 | 0.198 | St. George St. | PD28 | 0.485 |
| | | | | | | Main St. | PD10 | 0.566 |

### *Delhi*

Eleven (11) flow nodes are expected to flood under the 5-year storm conditions, compared to twelve (12) nodes under the 25-year conditions and thirteen (13) nodes under the 100-year storm conditions.

**Figure 4-94. Flooding Areas of Concern within Delhi (refer to Appendix G for details)**

| Location | Catch-ment | Flood Volume 10^6 Litre | Location | Catch-ment | Flood Volume 10^6 Litre | Location | Catch-ment | Flood Volume 10^6 Litre |
|---|---|---|---|---|---|---|---|---|
| Big Creek Dr. | D3 | 0.443 | Big Creek Dr. | D3 | 1.126 | Big Creek Dr. | D3 | 2.054 |
| Highway 3 | D7 | 0.984 | Highway 3 | D7 | 2.154 | Western Ave. | D5 | 0.089 |
| Lansdowne Ave. | D11 | 0.59 | Lansdowne Ave. | D11 | 2.474 | Highway 3 | D7 | 3.35 |
| James St. | D11 | 2.822 | James St. | D11 | 4.728 | Lansdowne Ave. | D11 | 5.103 |
| James St. | D13 | 1.436 | James St. | D13 | 2.583 | James St. | D11 | 8.654 |
| James St. | D16 | 0.271 | James St. | D16 | 0.619 | James St. | D13 | 3.877 |
| Crosier St. | D15 | 0.603 | Crosier St. | D15 | 1.653 | James St. | D16 | 1.125 |
| Main Street of Delhi | D19 | 0.111 | Main Street of Delhi | D19 | 0.444 | Crosier St. | D15 | 2.895 |
| William St | D14 | 1.145 | William St | D14 | 1.683 | Main Street of Delhi | D19 | 0.61 |
| Viola Ct | D17 | 0.407 | Viola Ct | D17 | 1.208 | William St | D14 | 2.457 |
| William St | D14 | 0.561 | William St | D14 | 1.644 | Viola Ct | D17 | 2.126 |
| | | | Main Street of Delhi | D19 | 0.258 | William St | D14 | 2.942 |
| | | | | | | Main Street of Delhi | D19 | 0.805 |

### *Port Rowan*

Seven (7) flow nodes are expected to flood under all flow conditions. The volumes vary based on the severity of the storm (**Appendix G**).

**Figure 4-95. Flooding Areas of Concern within Port Rowan (refer to Appendix G for details)**

| 5-Year Storm | | | 25-Year Storm | | | 100-Year Storm | | |
|---|---|---|---|---|---|---|---|---|
| **Location** | **Catch-ment** | **Flood Volume 10^6 Litre** | **Location** | **Catch - ment** | **Flood Volume 10^6 Litre** | **Location** | **Catch-ment** | **Flood Volume 10^6 Litre** |
| Regional Road 42 | PR13 | 0.011 | Regional Road 42 | PR13 | 0.324 | Regional Road 42 | PR13 | 0.722 |
| Regional Road 42 | PR4 | 0.459 | Regional Road 42 | PR4 | 1.115 | Regional Road 42 | PR4 | 1.736 |
| Regional Road 42 | PR5 | 0.21 | Regional Road 42 | PR5 | 0.537 | Regional Road 42 | PR5 | 0.887 |
| Regional Road 42 | PR6 | 5.261 | Regional Road 42 | PR6 | 7.128 | Regional Road 42 | PR6 | 8.488 |
| Ellis St. | PR12 | 0.014 | Ellis St. | PR12 | 0.216 | Ellis St. | PR12 | 0.47 |
| Ellis St. | PR9 | 0.566 | Ellis St. | PR9 | 1.651 | Ellis St. | PR9 | 2.779 |
| Backus Dr. | PR2 | 0.126 | Backus Dr. | PR2 | 0.665 | Backus Dr. | PR2 | 1.378 |

### Key Findings and Conclusions

- There are flooding concerns under the 5-year storm and the 25-year storm conditions where residential and trunk storm sewers are generally designed to convey minor drainage within Norfolk County. It is apparent that many storm sewers are undersized and therefore incapable of conveying the design storms they had been designed to convey. This agrees with previous storm sewer capacity assessments within Norfolk County, including the G. Douglas Vallee (1991) report showing inadequate drainage in Main St. and local streets.
- There are flooding concerns under the 100-year flow conditions where the major drainage system is required to convey surface runoff following extreme rainfall events. The flooding concerns through major drainage pathways were not assessed in detail because detailed topography and delineation would be needed. It is recommended that this level of analysis is pursued in the near future to understand the functionality of the dual drainage system within the study area.
- Existing stormwater management measures are not sufficient to treat stormwater generated from existing development. A combination of SWM facilities and storm sewer upgrades will be needed to mitigate or prevent flooding and water quality degradation concerns. This is discussed in more detail in the upcoming sections.

### Future Conditions

As discussed earlier, as part of the Problem Statement, implications of urban development impacts include the following key areas of concern:

- Water Balance - The increase in impervious surfaces within the new development areas will result in the reduction in infiltration and evapotranspiration due to the reduction in permeable surfaces and natural soil and vegetation cover. Reduction in baseflow contribution to watercourses is also anticipated with specific concern in headwater and first order reaches;
- Water Quality – Impacts are anticipated as a result of increasing imperviousness, and changing land use types. Among expected changes are:
    - Changes in pollutant loadings: including phosphorus loadings, and Total Suspended Sediment loading, and
    - Changes in thermal regime in receiving watercourses, consequently affecting cool water fish species;

- Water Quantity:
    - Flooding – larger runoff volumes and increased peak flows are anticipated as pervious land surfaces are converted to impervious surfaces.
    - Erosion – without mitigation, the fluvial geomorphic processes of erosion and deposition will be altered and increased rates of erosion can be anticipated.

Following the direction and recommendations of the Norfolk County Official Plan (2011), additional development areas where added to the EPA SWMM model in order to evaluate the impact of future development on the capacity of the existing stormwater management system.

### Future Urban Growth

In order to evaluate the impact of future development on storm sewer capacity and performance within Norfolk County, we reviewed the Norfolk County Official Plan (2011) and summarized information related to future expansion and area coverage. The analysis of impact of future development was based on a landscape or " management area" concept where the parameters for analysis were primarily based on future areas served (in hectares), in addition to physical characteristics of these served areas (e.g. imperviousness, soils, and geometry). Accordingly, the locations and areas of these future development areas and the projected land use (i.e. commercial/industrial or residential, which would give us an idea about future imperviousness) were extracted and summarized and integrated into the future scenario model.

#### Simcoe

According to the Norfolk County Official Plan (2011), the community is expected to grow significantly towards the northern and southern borders of the urban boundaries, where employment lands are primarily proposed in the north. Four (4) additional catchments were added to the EPA SWMM model to estimate the impact of future urban growth on the hydrology and hydraulics within Simcoe.

#### Waterford

Five (5) additional catchments (mostly in the west and the south) were added to the EPA SWMM model to estimate the impact of future urban growth on the hydrology and hydraulics within Waterford.

### *Port Dover*

The largest future development areas are primarily located in the western and eastern portion of the town, in addition to a large area north of Dover Mills Road. Seven (7) additional catchments were added to the EPA SWMM model to estimate the impact of future urban growth on the hydrology and hydraulics within Port Dover.

### Delhi

The largest future development areas are primarily located in the eastern portion of the town, with 45.3 hectares are designated vacant employment lands. Seven (7) additional catchments were added to the EPA SWMM model to estimate the impact of future urban growth on the hydrology and hydraulics within Delhi.

### *Port Rowan*

Port Rowan will experience major increase in urban living space in the southern and western portions of the town. Five (5) additional catchments were added to the EPA SWMM model to estimate the impact of future urban growth on the hydrology and hydraulics within Port Rowan.

## *Future Conditions Assessment*

### *Simcoe*

Flooding concerns are expected in areas where additional surface runoff volumes are generated from future growth. This includes catchments S10, S11, S12, and S28.

**Figure 4-96. Flooding Areas of Concern under Future Conditions within Simcoe (refer to Appendix G for details)**

| 5-Year Storm | | | 25-Year Storm | | | 100-Year Storm | | |
|---|---|---|---|---|---|---|---|---|
| **Location** | **Catch-ment** | **Flood Volume 10^6 Litre** | **Location** | **Catch-ment** | **Flood Volume 10^6 Litre** | **Location** | **Catch-ment** | **Flood Volume 10^6 Litre** |
| Highway 3 | S3 | 2.63 | Highway 3 | S3 | 4.486 | Highway 3 | S3 | 6.619 |
| Hawthorne Ave. | S4 | 0.511 | Hawthorne Ave. | S4 | 0.92 | Hawthorne Ave. | S4 | 1.354 |
| Riverside Road | S2 | 0.082 | Riverside Road | S2 | 0.549 | Riverside Road | S2 | 1.087 |
| Maple St | S6 | 0.781 | Maple St | S6 | 1.515 | Maple St | S6 | 2.689 |
| Sheridan Blvd | S7 | 0.04 | Sheridan Blvd | S7 | 0.326 | Sheridan Blvd | S7 | 0.926 |
| Adams Lane | S7 | 2.436 | Adams Lane | S7 | 4.66 | Adams Lane | S7 | 7.974 |
| Argyle St | S8 | 0.777 | Argyle St | S8 | 1.706 | Argyle St | S8 | 2.845 |
| Anderson Ave. | S10 | 0.366 | Anderson Ave. | S10 | 1.588 | Ireland Road | S10 | 0.593 |
| Ireland Road | S11 | 3.699 | Ireland Road | S11 | 8.295 | Anderson Ave. | S10 | 5.595 |
| Sherman Ave | S13 | 0.102 | Sherman Ave | S13 | 0.553 | Ireland Road | S11 | 17.024 |
| Cedar St | S14 | 0.981 | Cedar St | S14 | 1.852 | Sherman Ave | S13 | 1.13 |
| Robinson St | S17 | 0.67 | Robinson St | S17 | 1.38 | Cedar St | S14 | 2.969 |
| Dean St. | S19 | 0.67 | Dean St. | S19 | 1.629 | Robinson St | S17 | 2.413 |
| Brock St. | S20 | 6.673 | Brock St. | S20 | 12.471 | Dean St. | S19 | 2.858 |
| Brock St. | S20 | 1.483 | Brock St. | S20 | 2.904 | Brock St. | S20 | 23.464 |
| Holden Ave. | S15 | 6.629 | Cherry St. | S22 | 0.033 | Brock St. | S20 | 4.242 |

| 5-Year Storm | | | 25-Year Storm | | | 100-Year Storm | | |
|---|---|---|---|---|---|---|---|---|
| Location | Catch-ment | Flood Volume 10^6 Litre | Location | Catch-ment | Flood Volume 10^6 Litre | Location | Catch-ment | Flood Volume 10^6 Litre |
| Colborne St. S | S18 | 1.441 | Evergreen Hill | S22 | 0.166 | Cherry St. | S22 | 0.213 |
| Gilberstone Dr. | S29 | 0.434 | Simson Ave. | S23 | 0.147 | Evergreen Hill | S22 | 1.114 |
| Second Ave. W. | S32 | 1.189 | Holden Ave. | S15 | 11.906 | Simson Ave. | S23 | 0.442 |
| | | | Colborne St. S | S18 | 3.628 | Holden Ave. | S15 | 22.129 |
| | | | Union St. | S16 | 0.703 | Holden Ave. | S16 | 0.908 |
| | | | Gilberstone Dr. | S29 | 0.886 | Chapel St. | S18 | 3.962 |
| | | | Second Ave. W. | S32 | 2.253 | Colborne St. S | S18 | 2.159 |
| | | | | | | Union St. | S16 | 1.791 |
| | | | | | | Gilberstone Dr. | S29 | 1.42 |
| | | | | | | Norfolk St. N | S30 | 0.165 |
| | | | | | | Second Ave. W. | S32 | 3.339 |

### *Waterford*

Flooding concerns are expected in areas where additional surface runoff volumes are generated from future growth. This includes catchments W1, W2, and W8.

**Figure 4-97. Flooding Areas of Concern under Future Conditions within Waterford (refer to Appendix G for details)**

| 5-Year *Storm* | | | 25-Year Storm | | | 100-Year Storm | | |
|---|---|---|---|---|---|---|---|---|
| **Location** | **Catch-ment** | **Flood Volume 10^6 Litre** | **Location** | **Catch-ment** | **Flood Volume 10^6 Litre** | **Location** | **Catch-ment** | **Flood Volume 10^6 Litre** |
| Washington St. | W2 | 0.229 | Washington St. | W2 | 0.595 | Washington St. | W2 | 0.977 |
| Auty St. | W3 | 0.438 | Alice St. | W2 | 0.252 | Alice St. | W2 | 0.798 |
| | | | | | | | | |
| Concession 8 and Regional Road 24 | W7 | 0.246 | Concession 8 and Factory Alley | W5 | 1.853 | Concession 8 and Factory Alley | W5 | 4.998 |
| Russel St. | W8 | 0.457 | Concession 8 and Regional Road 24 | W7 | 0.614 | Concession 8 and Regional Road 24 | W7 | 1.09 |
| Bruce St. | W8 | 0.019 | Russel St. | W8 | 1.103 | Russel St. | W8 | 1.86 |
| | | | Bruce St. | W8 | 0.25 | Bruce St. | W8 | 0.608 |
| | | | | | | Thompson Road | W1 | 0.14 |

### Port Dover

Flooding concerns are expected in areas where additional surface runoff volumes are generated from future growth. This includes catchments PD1, PD2, and PD24.

**Figure 4-98. Flooding Areas of Concern under Future Conditions within Port Dover (refer to Appendix G for details)**

| 5-Year Storm | | | 25-Year Storm | | | 100-Year Storm | | |
|---|---|---|---|---|---|---|---|---|
| Location | Catch-ment | Flood Volume 10^6 Litre | Location | Catch-ment | Flood Volume 10^6 Litre | Location | Catch-ment | Flood Volume 10^6 Litre |
| | | | | | | | | |
| Main St. | PD8 | 0.341 | Main St. | PD8 | 0.879 | Main St. | PD8 | 1.467 |
| Main St. | PD9 | 4.343 | Main St. | PD9 | 7.663 | Main St. | PD9 | 12.033 |
| Main St. | PD6 | 2.148 | Main St. | PD6 | 4.02 | Main St. | PD6 | 6.62 |
| Lynn Park Ave. | PD3 | 0.455 | Lynn Park Ave. | PD3 | 1.064 | Lynn Park Ave. | PD3 | 1.847 |
| Denby Road | PD29 | 0.406 | Denby Road | PD29 | 0.843 | Denby Road | PD29 | 1.505 |
| Greenock St. W. | PD30 | 0.916 | Greenock St. W. | PD30 | 1.746 | Greenock St. W. | PD30 | 3.082 |
| St. Patrick St. | PD11 | 1.067 | St. Patrick St. | PD11 | 2.2 | St. Patrick St. | PD11 | 3.499 |
| St. George St. | PD28 | 0.075 | St. George St. | PD28 | 0.225 | John St. | PD14 | 0.121 |
| | | | Main St. | PD10 | 0.198 | Woodhouse Ave. | PD24 | 0.084 |
| | | | | | | St. George St. | PD28 | 0.485 |
| | | | | | | Main St. | PD10 | 0.566 |

### *Delhi*

Flooding concerns are expected in areas where additional surface runoff volumes are generated from future growth. This includes catchments D11, D8, and D18.

**Figure 4-99. Flooding Areas of Concern under Future Conditions within Delhi (refer to Appendix G for details)**

| 5-Year Storm | | | 25-Year Storm | | | 100-Year Storm | | |
|---|---|---|---|---|---|---|---|---|
| Location | Catch-ment | Flood Volume 10^6 Litre | Location | Catch-ment | Flood Volume 10^6 Litre | Location | Catch-ment | Flood Volume 10^6 Litre |
| Big Creek Dr. | D3 | 0.443 | Big Creek Dr. | D3 | 1.126 | Big Creek Dr. | D3 | 2.054 |
| Highway 3 | D7 | 0.984 | Highway 3 | D7 | 2.154 | Western Ave. | D5 | 0.089 |
| Lansdowne Ave. | D11 | 17.456 | Lansdowne Ave. | D11 | 27.028 | Highway 3 | D7 | 3.35 |
| Lansdowne Ave. | D11 | 0.886 | Lansdowne Ave. | D11 | 2.992 | Lansdowne Ave. | D11 | 36.462 |
| | | | | | | | | |
| James St. | D13 | 1.436 | James St. | D16 | 2.583 | James St. | D13 | 10.17 |
| James St. | D16 | 0.271 | James St. | D15 | 0.619 | James St. | D16 | 3.877 |
| Crosier St. | D15 | 0.603 | Crosier St. | D19 | 1.653 | James St. | D15 | 1.125 |
| Main Street of Delhi | D19 | 0.111 | Main Street of Delhi | D14 | 0.444 | Crosier St. | D19 | 2.895 |
| William St | D14 | 1.145 | William St | D17 | 1.683 | Main Street of Delhi | D14 | 0.61 |
| Viola Ct | D17 | 0.407 | Viola Ct | D14 | 1.208 | William St | D17 | 2.457 |
| William St | D14 | 0.561 | William St | D19 | 1.644 | Viola Ct | D14 | 2.126 |
| | | | Main Street of Delhi | D19 | 0.258 | William St | D19 | 2.942 |
| | | | | | | Main Street of Delhi | D14 | 0.805 |

### *Port Rowan*

Flooding concerns are expected in areas where additional surface runoff volumes are generated from future growth, primarily along Regional Road 42.

**Figure 4-100. Flooding Areas of Concern under Future Conditions within Port Rowan (refer to Appendix G for details)**

| 5-Year Storm | | | 25-Year Storm | | | 100-Year Storm | | |
|---|---|---|---|---|---|---|---|---|
| Location | Catch-ment | Flood Volume 10^6 Litre | Location | Catch-ment | Flood Volume 10^6 Litre | Location | Catch-ment | Flood Volume 10^6 Litre |
| Regional Road 42 | PR13 | 3.321 | Regional Road 42 | PR13 | 6.629 | Regional Road 42 | PR13 | 9.823 |
| Regional Road 42 | PR4 | 1.912 | Regional Road 42 | PR4 | 3.281 | Regional Road 42 | PR4 | 4.626 |
| Regional Road 42 | PR5 | 0.259 | Regional Road 42 | PR5 | 0.63 | Regional Road 42 | PR5 | 1.006 |
| Regional Road 42 | PR6 | 8.611 | Regional Road 42 | PR6 | 10.538 | Regional Road 42 | PR6 | 11.655 |
| Ellis St. | PR12 | 0.014 | Ellis St. | PR12 | 0.216 | Ellis St. | PR12 | 0.47 |
| Ellis St. | PR9 | 0.566 | Ellis St. | PR9 | 1.651 | Ellis St. | PR9 | 2.779 |
| Backus Dr. | PR2 | 0.126 | Backus Dr. | PR2 | 0.665 | Backus Dr. | PR2 | 1.378 |

### *Key Findings and Conclusions*

- Flooding concerns are expected to exacerbate under future conditions. The level of severity will depend on the routing of drainage from future development. While some future catchments are directly draining to watercourses (based on existing topography), some catchments which are draining to existing catchments would increase the risk of flooding within existing development. Specifically, where drainage from future development is primarily directed to watercourses, it is expected that less pressure will be imposed on the existing storm sewer system. Otherwise, existing built-up areas with no flooding concerns under existing conditions will be susceptible to flooding unless adequate SWM measures (SWM facilities and/or storm sewer upgrades) are implemented.

  Areas where future development may impose flooding risk include:

  - **Simcoe**: Based on existing topography, major growth to the north of Highway 3 (Schedule B-15) is expected to drain directly to the Lynn River system, therefore, impact to existing storm sewer system is expected to be minimal. However, stormwater management should still be implemented for areas discharging directly to the Lynn River.
  - **Waterford**: It is expected that the future Industrial/Business Park (Schedule B-18) will drain to Thompson Road. Adequate SWM measures need to be integrated into the new development.
  - **Port Dover**: Future increase in residential land use to the west (Schedule B-16) is expected to negatively impact Catchments PD1 and PD2 and the channel system downstream unless SWM measures are implemented. Subwatershed studies are recommended for future development areas west of Port Dover; subwatershed studies should consider the need for an erosion threshold assessment for deeply incised/confined receiving watercourses.
  - **Delhi**: Future development (Industrial/Business) is expected to drain from east to west where Catchment D11 and Lansdowne Ave. would be impacted, except for two areas in the east (Schedule B-17) that would be draining to the adjacent watercourses based on existing topography.

- ○ **Port Rowan**: Development to the east of Regional Road 42 (i.e. Main St.) is expected to negatively impact the capacity of the existing storm sewer system along the street (Schedule B-19).

- ► Future development areas need to provide adequate stormwater management measures to alleviate flooding within new development areas and within existing development where cumulative impacts are expected.
- ► Upgrading and designing new storm sewer systems should take into consideration the receiving watercourse during times of flooding. The receiving watercourse has the potential to impact infrastructure by flooding and backwater effects.

### *Alternatives, Evaluation, and Implementation*

#### *Alternative Solutions*

Identifying and assessing alternative solutions (i.e. options) to the problems identified earlier, and selecting a preferred option constitute the second phase (Phase 2) of the Class EA process. In line with the findings of the existing conditions modeling and the future conditions modeling and based on issues observed as part of the overall analysis of stormwater management and drainage within Norfolk County, alternative solutions are presented hereafter.

Numerous studies and assessments have provided evidence that an integrated stormwater management approach is key to meet general water quality, water balance, and water quantity objectives, in addition to providing sustainable stormwater infrastructure. Specifically, proposing conventional stormwater management facilities (wet ponds and dry ponds) in addition to innovative Low Impact Development measures would go a long way in achieving environmental objectives in addition to municipal objectives, which would collectively provide sustainable drainage infrastructure within Norfolk County. The policy framework provided earlier provides vision and guidance towards implementing stormwater management measures within the urban settlement areas of the county.

This study has identified a list of conventional and innovative stormwater management facilities, which have the potential of addressing water balance, water quality, and water quantity issues within Norfolk County. The list includes the following three (3) general stormwater management categories:

1. Source (Lot-level) Controls;
2. Conveyance Controls;
3. End-of Pipe Controls;

In the following sections, these three categories are discussed in detail in terms of general characteristics, drainage functions, and environmental benefits. It should be noted that the implementation of Low Impact Development measures should consider Wellhead Protection Areas.

Source control measures are small-scale stormwater management measure located at the beginning of a drainage system where stormwater is captured and treated on-site or close to where the rainfall lands. Source control measures are constructed within different land use types, including residential, commercial, industrial, and institutional land uses.

In Canada, the implementation of source control measures has become commonplace in the last decade. Integrating these measures as part of a treatment train approach would help mimic natural features and processes and protect water resources at many scales.

**Figure 4-101 List of Potential Source Control Measures**

| LID Source Control Measure | Description |
|---|---|
| Disconnection of Roof Leader | A stormwater management control where roof leaders (eavestroughs) drain to the lawn or to a rain barrel. Naturalized gardens and bioretention techniques can be utilized in conjunction with disconnected roof leaders. |
| Bioretention Areas | A stormwater management control that uses engineered sand filter. Bioretention areas are relatively inexpensive to build, easy to maintain, and can add aesthetic value to a site, without consuming large amounts of valuable land area. |
| Permeable Driveways | A stormwater management control that designs driveways using permeable pavements to allow rain water to drain through the pavement and into the ground. |
| Green Rooftop Technology | Units constructed on top of buildings to reduce runoff volume (via increased evapotranspiration) and improve water quality. |

Conveyance control measures are designed to treat stormwater quantity and quality as it travels overland or through pipes. These measures include traditional systems such as curbs, gutters and pipes that carry stormwater away from an urban area to a receiving water body, and innovative LID systems that include bioswales and perforated pipes.

Environmental benefits of LID conveyance control measures include decreasing stormwater volume and flow rate prior to entering the storm sewer network. In addition, these measures help slow the erosive velocity of stormwater and filter out pollutants before entering watercourses downstream.

**Figure 4-102 List of Potential Conveyance Control Measures**

| LID Conveyance Control Measure | Description |
| --- | --- |
| **Bioswales** | Bioswales are bioretention areas that are placed within the Right of Way for stormwater quantity and quality treatment. These measures use plants and soil to trap and treat contaminants such as heavy metals, nutrients, sediments and other pollutants that typically accumulate on asphalt surfaces. |
| **Perforated Pipe System** | These systems promote infiltration of road drainage as it is conveyed along road right-of-way. |
| **Vegetated Filter Strip** | Densely vegetated strip of land engineered and constructed to improve water quality by permitting sediment deposition during shallow flow conditions. |

End-of-pipe measures are the most commonly used stormwater management measure in Ontario. Municipalities use these measures to provide treatment for the collected drainage at the end of conveyance system prior to discharge to receiving watercourses. In terms of functionality of stormwater treatment, End-of-pipe measures are generally categorized as:

1. **Dry Ponds:** generally used for stormwater quantity control (attenuate flow rates without improving water quality). Dry ponds can be retrofitted so that a permanent pool of water is incorporated into the design to provide water quality treatment.
2. **Engineered Wetlands and Oil & Grit Separators:** Stormwater Quality Control (generally refer to wetlands and facilities designed to remove pollutants such as OGS units). These measures have limited water quantity control due to their limited storage volume and shallow water depth.

3. **Wet Ponds:** Stormwater Quantity and Quality Control (generally refer to wet ponds; where a permanent pool promotes the settling of sediments and pollutants to the bottom of the facility as stormwater travels through the facility). Based on previous experience, most wet ponds achieve 60-80% suspended solids (TSS) removal and 40-50% total phosphorus (TP) removal.

### *Preferred Alternative*

The alternative solutions discussed above are a mix of traditional and innovative stormwater management measures that have different environmental and municipal servicing benefits. Moreover, the implementation of these measures may demand policy and by-law considerations, social acceptance, and phasing considerations to account for the feasibility and applicability of each solution. Therefore, the evaluation and final recommendations are tailored as follows:

- Short Term: 0–5 years
- Medium Term: 6-15 years
- Long Term: 16-25 years

*Short Term Implementation (0 – 5 years):*

It is understood that some of measures need to be implemented immediately in order to alleviate or prevent major flooding issues, operation and maintenance obstacles, and overall decision making hurdles. The focus of the short term implementation includes the following key activities:

- County-wide measures, including:
  - SWM database management
  - Policy review and updates
  - Update the county-wide hydrology/hydraulics model (EPA SWMM platform)
  - Establishing an operation and maintenance program for stormwater management facilities
- Community-based measures, including:
  - Upgrading of storm sewer pipes with significant flooding risk
  - Maintenance of existing stormwater management facilities
  - Construction of a number of SWM facilities
  - Retrofitting of a number of SWM facilities (The least expensive and most practical way to improve stormwater treatment for a certain drainage area is converting a dry pond into a wet pond facility).

*Medium Term Implementation (6 – 15 years):*

The medium term implementation will incorporate the implementation of future studies and measures that are needed to provide more input to stormwater managers in Norfolk County, in addition to strengthening the environmental side of stormwater management in cooperation with the Long Point Region Conservation Authority (LPRCA). The focus of the medium term implementation includes the following key activities:

- County-wide measures, including:
  - Implement Low Impact Development measures
  - Assess climate change concerns and adaptation measures
    Implement a county-wide stream erosion master plan
- Community-based measures, including:
  - Upgrading of storm sewer pipes with flooding risk
  - Construction of a number of SWM facilities
  - Retrofitting of a number of SWM facilities

New SWM opportunities and retrofit opportunities are not mapped as part of this study. A future SWM Assessment and Remediation Study is needed to evaluate the performance and functionality of existing SWM facilities (including dry and wet ponds) and SWM facilities within new development. The scope and scale of the SWM Assessment and Remediation Study will be determined following the development of a County-wide SWM database management system and an operation and maintenance program, as proposed in the short-term implementation plan.

*Long Term Implementation (16 – 25 years):*

The long term implementation will incorporate updating the stormwater management master plan to reflect advances in policy framework and future development projections and implementing large scale Low Impact Development measures following provincial and regional advances in SWM legislation and environmental planning. The focus of the long term implementation includes the following key activities:

- County-wide measures, including:
  - Update the stormwater management master plan
  - Implement large scale Low Impact Development measures
- Community-based measures, including:
  - Upgrading of storm sewer pipes with flooding risk

- Construction of a number of SWM facilities
- Retrofitting of a number of SWM facilities

**Figure 4-103 – Recommended Solutions – Short Term (0 – 5 years)**

| Community | Recommended Improvements |
|---|---|
| County-Wide | • Update stormwater management database, including existing SWM facilities design basis and existing storm sewer plan and profile information using ArcGIS.<br>• Refine and update current policies and by-laws that have conflict with implementing stormwater management measures that require water ponding and infiltration.<br>• Update the county-wide hydrology/hydraulics model (EPA SWMM platform)<br>• Develop a SWM operation and maintenance program. |
| Simcoe | • Upgrading of storm sewers with significant flooding concerns:<br>○ Highway 3 (Catchment S3)<br>○ Adams Lane (Catchment S7)<br>○ Ireland Road (Catchment S11)<br>○ Brock St. (Catchment S20)<br>○ Holden Ave. (Catchment S15)<br>○ Colborne St. S (Catchment S18)<br>○ Second Avenue West (Catchment S32)<br>• Maintain the following SWM Facilities:<br>○ Harvest Glen Subdivision Phase 1 (Facility 16): Inlet conveyance and forebay maintenance.<br>○ Orchard Park Subdivision Phase 4 (Facility 17): vegetation growth maintenance.<br>○ Judd Industrial Park (Facility 18): vegetation growth maintenance<br>○ Norview (Facility 19): vegetation growth maintenance<br>○ Lyndale Heights North Phase 1 (Facility 22): Fix damage to outlet structure.<br>• Construct one (1) new SWM facility where no stormwater control is provided.<br>• Retrofit one (1) dry pond to improve stormwater quality management. |

| Community | Recommended Improvements |
|---|---|
| Port Dover | • Upgrading of storm sewers with significant flooding concerns:<br>○ Main St. (Catchment PD9)<br>○ Main St. (Catchment PD6)<br>○ Thompson Dr. (Catchment PD4)<br>○ Lynn Park Ave. (Catchment PD3)<br>○ St. Patrick St. (Catchment PD11)<br>○ Greenock St. West (Catchment PD30)<br>• Maintain the following SWM Facilities:<br>○ Silver LAKE Estates Subdivision Phase 1 (Facility 4): vegetation growth maintenance.<br>○ Inglewood Subdivision Phase 1 (Facility 5): vegetation growth maintenance.<br>○ Somerset Subdivision Phase 1 and 4 (Facility 6): erosion issues downstream of outlet pipe.<br>○ Lynn River Heights Subdivision Phase 1 (Facility 8): vegetation growth maintenance.<br>○ Dover Landing (Facility 14): vegetation growth maintenance<br>○ Ellwanger Drain (Facility 30): erosion downstream of outlet structure.<br>○ Silver Lake Estates Phase 3 (Facility 32): forebay maintenance.<br>• Construct one (1) new SWM facility where no stormwater control is provided.<br>• Retrofit one (1) dry pond to improve stormwater quality management. |
| Delhi | • Upgrading of storm sewers with significant flooding concerns:<br>○ James St (Catchment D11)<br>○ James St (Catchment D13)<br>○ William St (Catchment D14)<br>• Maintain the following SWM Facilities:<br>○ Argyle Avenue Drain (Facility 28): vegetation growth maintenance |

| Community | Recommended Improvements |
|---|---|
| | • Construct one (1) new SWM facility where no stormwater control is provided.<br>• Retrofit one (1) dry pond to improve stormwater quality management. |
| Waterford | • Upgrading of storm sewers with significant flooding concerns:<br>○ Concession 8 and Factory Alley (Catchment W5)<br>• Maintain the following SWM Facilities:<br>○ Yin Phase 5 (Facility 21): erosion issues<br>○ Waterford South Drain: vegetation growth maintenance<br>• Construct one (1) new SWM facility where no stormwater control is provided.<br>• Retrofit one (1) dry pond to improve stormwater quality management. |
| Port Rowan | • Upgrading of storm sewers with significant flooding concerns:<br>○ Regional Road 42 (Catchment PR4)<br>○ Regional Road 42 (Catchment PR6)<br>○ Ellis St. (Catchment PR9)<br>• Maintain the following SWM Facilities:<br>○ Villages of Long Point Bay (Facility 27): vegetation growth maintenance<br>• Construct one (1) new SWM facility where no stormwater control is provided.<br>• Retrofit one (1) dry pond to improve stormwater quality management. |

**Figure 4-104 – Recommended Solutions – Medium Term (6 – 15 years)**

| Community | Recommended Improvements |
|---|---|
| County-Wide | • Implement pilot scale Low Impact Development measures, including source control measures within residential land use areas and conveyance control measures within commercial and industrial areas.<br>• Assess climate change concerns and adaptation measures by implementing studies to evaluate current Intensity-Duration-Frequency (IDF) rainfall data and the impact of future climate projections on the capacity of the drainage system.<br>• Develop a county-wide stream erosion master plan. |
| Simcoe | • Upgrading of storm sewers with flooding concerns:<br>○ Hawthorne Ave. (Catchment S4)<br>○ Maple St. (Catchment S6)<br>○ Argyle St. (Catchment S8)<br>○ Cedar St. (Catchment S14)<br>○ Robinson St. (Catchment S17)<br>○ Dean St. (Catchment S19)<br>○ Union St. (Catchment S16)<br>○ Gilberstone Dr. (Catchment S29)<br>• Construct one (1) new SWM facility where no stormwater control is provided.<br>• Retrofit one (1) dry pond to improve stormwater quality management. |
| Port Dover | • Upgrading of storm sewers with flooding concerns:<br>○ Main St. (Catchment PD8)<br>○ Denby Road (Catchment PD29)<br>• Construct one (1) new SWM facilities where no stormwater control is provided.<br>• Retrofit one (1) dry pond to improve stormwater quality management |
| Delhi | • Upgrading of storm sewers with flooding concerns:<br>○ James St (Catchment D11)<br>○ James St (Catchment D13)<br>○ William St (Catchment D14) |

| Community | Recommended Improvements |
|---|---|
| | ○ Highway 3 (Catchment D7)<br>○ Lansdowne Ave. (Catchment D11)<br>○ Big Creek Dr. (Catchment D3)<br>○ Crosier St. (Catchment D15)<br>• Construct one (1) new SWM facility where no stormwater control is provided.<br>• Retrofit one (1) dry pond to improve stormwater quality management. |
| Waterford | • Upgrading of storm sewers with flooding concerns:<br>○ Auty St. (Catchment W3)<br>○ Concession 8 and Regional Road 24 (Catchment W7)<br>• Construct one (1) new SWM facility where no stormwater control is provided.<br>• Retrofit one (1) dry pond to improve stormwater quality management. |
| Port Rowan | • Upgrading of storm sewers with flooding concerns:<br>○ Regional Road 42 (Catchment PR5)<br>○ Regional Road 42 (Catchment PR13)<br>○ Ellis St. (Catchment PR12)<br>• Construct one (1) new SWM facility where no stormwater control is provided.<br>• Retrofit one (1) dry pond to improve stormwater quality management. |

**Figure 4-105 – Recommended Solutions – Long Term (16 – 25 years)**

| Community | Recommended Improvements |
|---|---|
| County-Wide | • Update the stormwater management master plan<br>• Implement large scale Low Impact Development measures |
| Simcoe | • Upgrading of storm sewers with flooding concerns:<br>○ Riverside Road (Catchment S2)<br>○ Sheridan Blvd (Catchment S7)<br>○ Anderson Ave. (Catchment S10)<br>○ Sherman Ave.(Catchment S13)<br>○ Cherry St. (Catchment S22)<br>○ Evergreen Hill (Catchment S22)<br>○ Simson Ave. (Catchment S23)<br>• Construct one (1) new SWM facility where no stormwater control is provided.<br>• Retrofit one (1) dry pond to improve stormwater quality management. |
| Port Dover | • Upgrading of storm sewers with flooding concerns:<br>○ St. George St. (Catchment PD28)<br>○ Main St. (Catchment PD10)<br>• Construct one (1) new SWM facility where no stormwater control is provided.<br>• Retrofit one (1) dry pond to improve stormwater quality management. |
| Delhi | • Upgrading of storm sewers with flooding concerns:<br>○ James St. (Catchment D16)<br>○ Main Street of Delhi (Catchment D19)<br>• Construct one (1) new SWM facility where no stormwater control is provided.<br>• Retrofit one (1) dry pond to improve stormwater quality management. |
| Waterford | • Upgrading of storm sewers with flooding concerns:<br>○ Alice St. (Catchment W2)<br>• Construct one (1) new SWM facility where no stormwater control is provided. |

| Community | Recommended Improvements |
|---|---|
| | • Retrofit one (1) dry pond to improve stormwater quality management. |
| Port Rowan | • Upgrading of storm sewers with flooding concerns:<br>○ Backus Dr. (Catchment PR2)<br>• Construct one (1) new SWM facility where no stormwater control is provided.<br>• Retrofit one (1) dry pond to improve stormwater quality management. |

### *Implementation Plan*

*Overview*

The Implementation Plan provides recommendations on the actions needed to implement the SWM Strategy in order to fulfill the goals and objectives the Norfolk County Integrated Sustainable Master Plan.

In preparing the Implementation Plan, the following objectives and drivers have been considered:

- Municipal Objectives: The Implementation Plan is consistent with the County's Municipal programs, policies and standards; and recognizes existing and proposed land uses.
- Environmental Objectives: The Implementation Plan addresses environmental features and functions within Norfolk County in the light of the Long Point Region Conservation Authority (LPRCA) publications including the Watershed Report Card and related monitoring plans. While the implementation of the SWM Strategy will provide many environmental benefits related to controlling stormwater quality and quantity, other detailed studies will have to be undertaken in order to augment these benefits as part of an integrated environmental planning process.

For each element of the Strategy, the following implementation considerations are discussed:

- Policy/Standards: Existing or proposed policies and/or standards that need to be reviewed or updated;

- Future Study Requirements: required in order to implement each type of measure which constitutes the recommended strategy;
- Operations & Maintenance Considerations: Operation and maintenance activities and costs associated with the implementation of the proposed measures;
- Cost: Total cost over the proposed period of the program and or unit cost to implement recommend works;
- Stormwater Management Funding Considerations: General funding alternatives that were considered;
- New Development SWM Considerations; and,
- Climate Change Considerations.

*Policy and Standards*

Regional and municipal stormwater policies have promoted the management of stormwater quantity and quality. Under Chapter 6 (Sustainable Natural Heritage) of, the Norfolk County Official Plan it is noted that:

"The County shall require the use of stormwater management facilities downstream of new developments, where appropriate, to mitigate development impacts on stormwater quantity and quality. The County shall promote naturalized and unfenced stormwater management facilities, constructed with gentle slopes. Applications for development may be required to be supported by a stormwater management study".

In order to materialize the vision of Norfolk County and provide a sustainable stormwater management master plan, the following actions are encouraged:

- In general, the prioritized SWM retrofit projects will be required to comply with the criteria of the Ministry of Environment Stormwater Management Planning and Design Manual (MOE, 2003). Additional policy requirements include the facilities within regulated floodplains and facilities discharging to Redside Dace watercourses. In regard to Redside dace watercourses, the study team found no evidence in previous studies and documents of the presence of Redside dace habitat.
- Refine and update current policies and by-laws that have conflict with implementing stormwater management measures that require water ponding and infiltration;
- Pursue strategic partnerships with local agencies and public outreach programs, including the Long Point Region Conservation Authority (LPRCA).

*Future Study Requirements*

The Stormwater Management Strategy is focused on providing a short list of capital and operation and maintenance projects that are tailored to address specific municipal and environmental issues. Implementing the measures proposed in the Strategy may require complementary studies and assessments to address related issues. These studies include:

- SWM Facility Retrofit Projects: The proposed SWM retrofits will be subject to the Municipal Class Environmental Assessment Process. Typically, Stormwater Management Facility retrofit projects can be classified as either Schedule A+ or Schedule B according to the following criteria:
    - Schedule A+: Schedule A+ projects are pre-approved; however the public is to be advised prior to the project implementation. Schedule A+ does not allow for the expansion of the existing facility, therefore the alteration/upgrade or retrofit must be confined to the existing facility footprint or stormwater management block limits.
    - Schedule B: Creation of a new stormwater facility or the improvements and/or minor expansion to existing facilities beyond the existing facility footprint or stormwater management block limits. With these types of activities there is potential for some adverse environmental impacts and therefore the proponent is required to proceed through a screening process including consultation with those who may be affected.

General project tasks associated with retrofit of existing SWM facilities include, but not limited to:

- Review of background knowledge and information related to the existing facility;
- Completion of site inventory and topographic surveys,
- Geotechnical Investigation
- Completion of Class EA, per the associated Schedule as detailed above;
- Preparation of preliminary designs;
- Public Information Center (Schedule B – required; optional under Schedule A+);
- Approvals – MOE Environmental Compliance Approval (ECA) and necessary construction permits as required (LPRCA);
- Preparation of detailed design drawing packages, tender and specification; and

- Construction, construction administration and construction supervision services;

- Low Impact Development (LID) Projects: In general, LID control measures within the existing Right-of-Way fall within the Municipal Class EA process, specifically Part B- Municipal Road Projects. The specific Class EA Schedule of individual projects is determined in relation to the specifics of the road reconstruction process per Part B of the Municipal Engineers Association Class Environmental Assessment document (MEA 2000, as amended in 2011 and 2015), and should be reviewed in conjunction with the project schedules in Appendix I of the aforementioned document. Additional study requirements for the implementation of LID measures, specifically conveyance control measures, include but are not limited to the following:

    1. Perform geotechnical investigation – These studies would be focused on the local soils information gathered through subsurface geotechnical investigations and undertaken for the purposes of structural design stormwater management facilities and in the design of LID infiltration techniques.
    2. In-Situ Hydraulic Conductivity Testing - designs using LID infiltration techniques will require on-site soil testing using the Guelph Permeameter test.

- County-wide Stream Erosion Assessment: An assessment that covers the whole county may be needed in the medium term (6-15 years) to address erosion issues downstream of urban areas and at the outlets of stormwater management facilities. The objective of the county-wide stream erosion study would be to undertake a comprehensive assessment and remediation program which builds on the findings of previous technical studies. The study would be undertaken following Approach 2 of the Master Plan process and would result in a prioritized plan for undertaking future stream works. The purpose of the study would be to:

    1. To identify and prioritize erosion restoration sites along the Norfolk County's watercourses which may pose a risk to public health and safety and environment, and to develop a restoration plan to address the erosion sites.
    2. To short-list remediation and restoration projects that will be eventually included in the Capital Plan.

*Operation and Maintenance Considerations*

- Operation and Maintenance of SWM Facilities

There are numerous activities that are required in order to properly operate and maintain the stormwater management end-of-pipe facility. Typical activities include the following:

- Regular inspection of control structure, manholes and orifices (as applicable);
- Hydraulic operation of the facility monitoring;
- Unclogging of outlets and controls;
- Pipe repairs;
- Grass Cutting;
- Weed Control;
- Vegetation Management;
- Sediment Removal (vacuum truck);
- Maintenance of Access Routes; and
- Control of Nuisance Issues.

Typical maintenance requirements are presented in **Figure 4-106**. Additional operation and maintenance guidance is provided in Chapter 6 of the 2003, MOE Stormwater Management Planning and Design Manual.

**Figure 4-106 Maintenance Requirements for Stormwater Management Facilities (MOE, 2003)**

| Operation or Maintenance Activity | Wet Pond | Wetland | Hybrid | Dry Pond | Underground Storage |
|---|---|---|---|---|---|
| Inspection | ■ | ■ | ■ | ■ | ■ |
| Grass Cutting | □ | □ | □ | ■ | ■ |
| Weed Control | ■ | ■ | ■ | ■ | |
| Upland Vegetation Replanting | □ | □ | □ | □ | |
| Shoreline Fringe & Flood Fringe Veg. Replanting | □ | □ | □ | | |
| Aquatic Veg. Replanting | □ | □ | □ | | |
| Removal of Accumulated Sediments | ■ | ■ | ■ | ■ | ■ |
| Outlet Valve Adjustment | □ | □ | □ | □ | □ |
| Trash Removal | ■ | ■ | ■ | ■ | ■ |
| ■ Normally Required | | □ May be Required | | | |

- Operation and Maintenance of LID Measures

Maintenance requirements for most LID measures including source and conveyance controls are similar to landscaped and natural areas, and do not require new or specialized equipment (EPA, 2007). Regular maintenance activities require that maintenance personnel and inspectors are cognizant of the intended function and maintenance requirements of each LID measure. In addition, the training of the individuals servicing LID measures is vital to their continued and sustainable operation. **Figure 4-107** provides a summary of the maintenance requirements for typical LID Conveyance Control measures.

**Figure 4-107 Maintenance Requirements for LID Conveyance Controls**

| Activity | Applicable to: | | Maintenance Interval (years) |
|---|---|---|---|
| | Perforated Pipes | Bioretnetion/ Bioswales | |
| Litter Removal | √ | √ | ½ |
| LID Litter Removal | √ | √ | ½ |
| Weed Control | | √ | 1 |
| LID Weed Control | | √ | 1 |
| Grass Cutting | √ | √ | * |
| Landscape Restoration (Terrestrial Vegetation) | | √ | 10 |
| LID Landscape Restoration | | √ | ½ |
| Sediment Removal and Disposal (Heavy machinery) | | √ | 10 |
| Sediment Removal and Disposal (Vacuum Truck ) | √ | √ | ½ |
| LID Sediment Removal (manual) | √ | √ | ½ |
| Soil sampling and infiltration testing | | √ | 10 |
| Inspection of Inlet/Outlet | √ | √ | 1 |
| Pervious pipe/ underdrain cleanout (8-10m/hr) | √ | √ | ** |
| Infiltration media restoration (tilling and re-vegetation) | | √ | ** |
| Shrub Replacement | | √ | ** |

*Stormwater Management Funding Considerations*

Future provincial direction in regards to the development of municipal stormwater management (SWM) Master Plans calls for the need to incorporate the principles of stormwater asset management and Level of Service (LOS), and integrate sustainability values by linking watershed objectives and targets for water, wastewater and stormwater. Addressing provincial requirements in that regard will likely be a future requirement to access funding sources from Provincial and Federal agencies.

Stormwater funding models for some of the cities and towns in Southern Ontario (e.g. Mississauga, Kitchener, London, and Stratford) provide a roadmap in regard to factors and parameters to consider in developing a stormwater funding model for Norfolk County. For example, the City of Kitchener has a funding model through the establishment of a stormwater utility in 2010, and has recently conducted a SWM policy review to fully integrate the implementation of their comprehensive Stormwater Management Master Plan with policies and funding mechanisms. In conjunction with a succinct and feasible stormwater management strategy and an integrated policy framework, a stormwater funding model will implement prioritized drainage works as part of an overall stormwater management program that could help to sustain the County's drainage infrastructure and the environment surrounding the urban fabric.

*Stormwater Management Funding Options*

In general, the allocation of sufficient funds will permit full implementation of the stormwater management preferred strategy, following the selection of a preferred alternative for stormwater management works. The discussion below provides direction pertaining to funding mechanisms for financing Capital and Operation & Maintenance projects. In this regard, there are five (5) key alternatives:

- **Alternative #1: Grants** – a variety of environmentally based grants and granting agencies (both private and public) are available and may be a potential source of funds for community based pilot projects, education programs and training expenses. Examples include RBC Blue-Water, TD Green Funds, etc.
- **Alternative #2**: **Tax Levy Fund** – tax based funds are reallocated from the general fund. A dedicated tax levy can be administered specifically to raise revenue for stormwater services, such that a fixed property tax rate is applied and itemized on the property owner's annual tax bill. A by-law would be required to dedicate these funds specifically to the stormwater management program;
- **Alternative #3**: **Stormwater Management Rate** – shift from funding stormwater using a tax based systems to a rate based system. At least three municipalities in Ontario (i.e., London, St. Thomas, and Aurora) have implemented a special stormwater user fee that charges a flat rate to residential

properties and an area-based charge to commercial/industrial properties. This includes:

- ○ Tiered Flat Rate: based on a property's zoning/land use classification
- ○ User Rate: measured by the amount of impervious area contained on each property

- ► **Alternative #4**: **Development Charges** – a portion of charges paid by developers (generally used to pay the cost of new capital projects required as a result of growth) is allocated for SWM retrofits, sediment removal and Low Impact Development (LID) implementation;
- ► **Alternative #5**: **A Combination Fee Structure** – blended revenue from tax and stormwater rate, or any combination of the above-mentioned alternatives.

For the implementation of any of these funding alternatives, or any combination thereof, a phasing strategy (over 3 to 5 years) is important to ease the transition from the current system.

*Linking Stormwater Management Strategies and Policies to Funding Options*

As noted earlier, a successful stormwater funding model will need to be cross-referenced with a long-term strategy that includes a list of projects to implement in the next 10 to 20 years. A matrix including components of the stormwater management strategy should link funding options and sources in a manner that respects the nature of each proposed stormwater management measure, where it is implemented, and possible constraints and opportunities. Specifically, some stormwater management measures demand different funding sources and considerations than others. For example, the implementation of LID source control measures (i.e. stormwater management measures implemented at the property scale, such as rain gardens and permeable pavements) would require property owners' acceptance to implement these measures with some contribution from the County in the form of subsidies and incentives and/or marketing strategies. On the other hand, the implementation of End-of-Pipe measures such as Wet Ponds and Engineered Wetlands would primarily require Development Charges, which is a portion of charges paid by developers.

*New Development and Redevelopment SWM Considerations*

The Stormwater Management Strategy is primarily proposed for existing development areas, where stormwater and drainage issues need to be addressed in order to address environmental and socio-economic concerns. In order to achieve the greatest water quantity and quality benefits throughout Norfolk County, it is necessary to implement similar concepts and measures, including stormwater management measures and Treatment Train practices as part of new development/re-development within the county.

- New-Development and SWM

The recommendations of Functional Servicing Plans and Stormwater Management Reports should be followed for new subdivisions and development sites. Future Conditions - Overland flow paths should be clearly shown on new development plans.

The following information (as a minimum) should be integrated into an electronic database system that covers Norfolk County:

- Facility ID
- Location
- Drainage Area
- Facility type and design basis
- Storage volumes

In general, the implementation of traditional SWM facilities (e.g. Wet Ponds) and innovative LID source and conveyance controls within new developments should be done in the spirit of this master plan and relevant guidelines that include the Ontario Ministry of the Environment's 2003 Stormwater Management Planning and Design Manual and LID Manuals proposed by Conservation Authorities within Ontario including Toronto and Region Conservation Authority (TRCA) and Credit Valley Conservation (CVC) LID Manuals.

- Redevelopment and SWM

Urban intensification associated with future re-development pressures have the potential to add additional demands to the existing stormwater system within Norfolk County. Redevelopment projects can range in size from the construction of a single lot to the complete redevelopment of large areas. Key consequence of such activity is higher levels of imperviousness (e.g., more pavement), that would consequently increase runoff rates and pollutant loading and decrease infiltration to the ground.

Constraints that re-development projects generally present with respect to implementing stormwater management solutions include:

- sites are typically constrained because of the extent of potential open space available;
- land cost often limit stormwater management options;
- the presence of other service infrastructure beneath and around the site may limit potential excavation depths and opportunities for infiltration.

Opportunities to integrate stormwater management measures into re-development projects should be based on a holistic understanding of the Treatment Train Approach. In addition, educating the public through campaigns, leaflets, and workshops to implement Low Impact Development measures on their private properties and in public spaces is key to decreasing the negative impact of urban intensification.

*Climate Change and SWM Infrastructure Considerations*

It is critical to tailor the implementation of stormwater management practices to a comprehensive awareness of the impact of climate change. In that regard, the following implications need to be examined when assessing drainage issues or identifying drainage remediation and improvement measures:

- More extreme thermal impacts on aquatic and terrestrial ecology (i.e. water temperatures thresholds for aquatic species);
- Increased seasonal evapotranspiration rates from open waterbodies, potentially leading to reduced water quality as a result of lower water levels;
- Uncertainty in hydrologic predictions/ models
- Possibility for more extreme high contaminant concentrations, and
- Increased demand on surface water causing increased stress on water supply and treatment, algae blooms affecting water quality.

In order to address these implications, Norfolk County is encouraged to pursue the following strategies:

- Implement LID and green infrastructure practices to mimic natural processes where successive treatment rather than flushing is promoted
- Accurately represent major drainage system pathways and their interaction with minor drainage system; and
- Develop a comprehensive stormwater management asset database, including SWM facilities, storm sewers, manholes, catchbasins, LID measures, and major flow pathways (including roads, yards, and watercourses)

## 4.6 Water, Wastewater and Stormwater Strategy Summary

**Section 4.6** provides a summary of the recommended strategies for water, wastewater and stormwater identified throughout Section 4.0. **Figure 4-108** outlines these recommendations.

### 4.6.1 Water Summary

Norfolk County currently has five (5) separate water systems as follows:

- Simcoe
- Port Dover
- Delhi, which also supply's Courtland
- Waterford, and
- Port Rowan, which also supply's St. Williams

For the existing requirements, and water demands up to the horizon year of 2041, each of these systems was evaluated for adequacy of water supply, water storage, local water distribution and system risks. Numerous needs were discovered in all of the communities.

Two overall alternatives were developed to address all of the identified needs – a "Central Option" and a "Multiple Upgrade Option." Costs for these two alternatives can be summarized as follows:

| Component | Central Option Costs ($M) | Multiple Upgrade Option Costs ($M) |
|---|---|---|
| New or Upgraded Treatment (25,000 $m^3$/d capacity) | 40-69 | 17 |
| Interconnecting Mains | 35-40 | 22 |
| Storage Upgrades | 9 | 9 |
| Local Distribution Upgrades | 6 | 6 |
| **Total Cost** | **96-119** | **54** |

The Central Option provides a new treatment system, and maximizes the reduction of identified risks, while the multiple upgrade alternative addresses all existing deficiencies and provides a significant improvement in risks, however not to the degree possible with the Central alternative.

Cost estimates for the new water treatment plant were based on historic cost curve information, and are therefore at a feasibility level only. The lower costs are based on a treatment plant expansion at the Nanticoke WTP and a transmission main running to Port Dover. The higher cost estimate is based on a new raw water intake and new water treatment plant located within the County – at a location just west of Port Dover. No discussions have taken place with Haldimand County on this alternative, nor on the details of routing a transmission main through Haldimand to Port Dover.

The Central Option would require the expenditure of $85-110M in the Short Term (0-5 year time frame), with other costs spread out over the medium and long term. The Multiple Upgrade Option would have costs better spread out, and would require an expenditure of $28M in the Short Term (0-5 year time frame), $20M in the Medium Term (6-15 year time frame), and $6M in the Long Term (16-25 year time frame).

If the County were to select the Multiple Upgrade Option, approximately $38M of the $54M total would be required as part of the Central Option. Thus, should the County move towards the Central option in the future, a substantial portion of the required upgrade work would have already been completed.

If the County could afford a Central Option approach, it would provide the County with significant long term benefits. On the other hand, a lower-cost alternative would be to focus on maintaining, upgrading, and inter-linking the existing facilities to better treatment, and better redundancy.

### 4.6.2 Wastewater Summary

Norfolk County currently has five (5) separate wastewater systems, as follows:

- Simcoe
- Port Dover
- Delhi
- Waterford, and
- Port Rowan.

For the existing requirements, and wastewater demands up to the horizon year of 2041, each of these systems was evaluated for adequacy of wastewater treatment, wastewater collection system conveyance and pumping. Needs were discovered in all of the communities.

For the wastewater treatment facilities, it was determined that all WWTFs are currently utilizing approximately 50% of their rated capacities, with the exception of Port Dover which is at 80% utilization. Based on growth projections, WWTFs serving Simcoe, Delhi, Port Rowan and Waterford will have residual capacities still available in 2041. At Port Dover, there is a planned expansion to 5,800 m3/d. To meet the needs to 2041, this upgrade should be increased to a capacity of 6,052 m3/d.

For the wastewater collection system, there are recommendations to replace a number of existing sewers to provide additional capacity to meet both existing and future conditions. In addition, pumping station capacity increases are recommended for 4 pumping stations (Blueline and Mechanic PSs in Waterford, Main Street PS in Delhi and Mallard Walk PS in Port Rowan).

Norfolk County currently has five (5) separate wastewater treatment facilities (WWTFs):

- Simcoe
- Port Dover
- Delhi
- Waterford, and
- Port Rowan.

For the existing requirements, and wastewater servicing requirements up to the horizon year of 2041, each of these facilities was evaluated for its capacity to treat the projected flows and meet the expected effluent quality.

Out of these facilities, major upgrades have been completed at the Simcoe and Port Rowan WWTFs over the last five years. The Waterford and Delhi WWTFs facilities are currently undergoing upgrades. In addition, a upgrade requirement of the Simcoe WWTF biosolids train has been identified and recommended in this report. Once the ongoing and the recommended upgrades are completed, the County would be equipped with a robust wastewater treatment infrastructure for the planning period. A summary of the ongoing and recommended upgrade costs for the WWTFs is given in the table below.

| **Facility** | **Ongoing and planned upgrades** | **Recommended upgrades** | **Maintenance upgrades (2016 to 2041)** |
|---|---|---|---|
| Simcoe WWTF | - | $ 12.6 M | $ 2.53 M |
| Port Dover WWTF | $ 8.5 M | $ 0.5 M | $ 1.58 M |
| Delhi WWTF | $ 4.5 M | $ 0.0 M | $ 0.32 M |
| Port Rowan WWTF | - | $ 0.0 M | $ 1.55 M |
| Waterford WWTF | $ 6.0 M | $ 0.0 M | $ 0.40 M |
| **Total** | **$19.0 M** | **$ 13.1 M** | **$ 6.38** |

### 4.6.3 Stormwater Summary

Provided below are cost estimates (based on 2015 fees / costs) for the implementation of the SWM Master Plan projects per area within the County.

Cost Breakdown of SWM Master Plan Projects for all Phases

| Area | Short Term ($) | Medium Term ($) | Long Term ($) |
|---|---|---|---|
| County-Wide | 365,000 | 270,000 | 600,000 |
| Simcoe | 3,020,000 | 3,800,000 | 2,450,000 |
| Port Dover | 2,870,000 | 2,900,000 | 2,250,000 |
| Delhi | 2,450,000 | 3,000,000 | 2,250,000 |
| Waterford | 2,110,000 | 2,250,000 | 2,100,000 |
| Port Rowan | 2,405,000 | 2,400,000 | 2,100,000 |
| **Total** | **13,220,000** | **14,620,000** | **11,750,000** |

**Figure 4-108 – Summary of Water, Wastewater and Stormwater Recommendations**

| | Recommendation | Improvement Type | Location |
|---|---|---|---|
| Annual | Maintain all SWM Facilities (annual operation and maintenance) | Infrastructure | County-Wide |
| Short Term (0 5 years) | Risk assessments should be periodically updated for all water systems in the County. *(Note, these risk assessments are <u>in addition</u> to risk assessments required as part of the Clean Water Act and 2015 Long Point Region Source Protection Plan for the area).* | Policy | County-Wide |
| | Adopt the following best practices surface water treatment policies:<br>• All pumping systems should have a firm capacity equal to the total of all pumps with the largest pump out of service.<br>• All pumps to be considered in the plant capacity must be operable without compromising the treatment of the drinking water. | Policy | County-Wide |
| | Groundwater based systems should have duty and standby wells, such that the firm capacity of the system equals the total capacity of the wells, with the largest well out of service. | Policy | County-Wide |
| | Norfolk should continue to follow the recommendations of the FUS for determining design fire flows. The current fire flow of 83 L/s for typical single family residences should continue to be used for new single family developments. For all other developments, it is recommended that individual FUS calculations be performed to select the specific fire flow to be used for that development. | Policy | County-Wide |

| Recommendation | Improvement Type | Location |
| --- | --- | --- |
| Fire flow modelling should be undertaken with the water level (or hydraulic grade line) at a level that would occur at the end of fire on the maximum day.<br><br>In cases of undersized mains (less than 150 mm dia.), the County should consider the installation of larger diameter mains as part of infrastructure renewal projects in the future.<br><br>All future developments should include consideration of water quality degradation through the water distribution system. In other words, care should be taken that watermains not be oversized, and new developments should only be serviced with looped watermains. | | |
| Distribution systems should be designed to achieve the following system pressures:<br>• Peak Hour Demand – Target: 350 – 550 kPa (50 – 80 psi)<br>• Peak Hour Demand – Min. and Max.: 275 – 700 kPa (40 – 100 psi)<br>• Maximum Day + Fire: ≥140 kPa (20 psi)<br><br>If ground elevations result in pressures outside of the indicated ranges, either booster pumping stations or pressure reducing stations should be added. | Policy | County-Wide |
| All water system facilities and water mains should be located on municipally owned property or public right of ways. Easements should be avoided unless they are readily accessible during an emergency.<br><br>The County should:<br>• obtain easements for all existing water mains on private property; | Policy | County-Wide |

| Recommendation | Improvement Type | Location |
|---|---|---|
| • construct access lanes above all existing water main easements to allow access; and<br>• construct replacement water mains where the previous two points are not possible. | | |
| The existing storage deficiency in Simcoe could be resolved by providing additional high lift pumping equipment at the Cedar Reservoir and Northwest Reservoir. | Infrastructure | Simcoe |
| The existing storage deficiency in Delhi could be resolved by installing 1 duty and 1 standby pump at the base of the standpipe, in the existing pumping station structure. These pumps would need to be supplied with a control system and variable frequency drive or pump control valve. A standby generator should also be provided, to provide emergency power to the pumping units. | Infrastructure | Delhi |
| To address potential future issues at the Courtland Reservoir, the draft Schedule B Class Environmental Assessment prepared by G. Douglas Vallee Limited should be revisited and a third alternative (Alternative 2, with the addition of hydro-pneumatic vessels, a revised control system, and additional standby power facilities) be considered. | Policy | County-Wide |
| For any new developments adjacent to areas of marginal service, conduct detailed network modelling of the proposal, and establish if any network upgrades using replacement mains of a larger diameter will be required. | Policy | County-Wide |
| At the time any streets are to be reconstructed or water mains replaced, | Policy | County-Wide |

| Recommendation | Improvement Type | Location |
|---|---|---|
| consider replacing undersized mains. Refer to **Appendix D**. | | |
| Maintain the Simcoe Elevated tank within a narrow band between the top water level (TWL) and 1-2 m below the TWL if possible. The control system should use the maximum pumping capacity at each of the pumping stations if the tank falls below this level. | Policy | Simcoe |
| Provide a booster pumping station to service the northwest corner of the water distribution system. The booster station will need to have VFD control to allow for the large swings in the system pressure during filter backwashes at the water treatment plant. | Infrastructure | Port Dover |
| In the North West corner of the water distribution system, perform modelling for any new developments and oversizing of some new water mains be considered to enhance the supply to this area. | Policy | Delhi |
| Review opportunities to loop dead ends, when possible. | Policy | Courtland |
| The County should collect sewer invert and rim elevation data. | Policy | County-Wide |
| The County should complete draw down testing to confirm pumping station capacity, particularly for those pumping stations where approval documents cannot be located. | Policy | County-Wide |
| The County should collect pumping station capacity information at PS1 and PS2. | Policy | Simcoe |
| Simcoe WWTF recommendations:<br>• Construct new aerobic digesters at the WWTF and re-purpose the existing anaerobic digesters to biosolids storage tanks | Infrastructure | Simcoe |

| | Recommendation | Improvement Type | Location |
|---|---|---|---|
| | • Replace Headworks facility<br>• Replace administration building<br>• Replace equipment, once the useful life of the components is reached.<br>• Construct new filter building. | | |
| | Port Dover WWTF recommendations:<br>• The currently planned upgrade to 5,800 $m^3$/d should be carried out for a rated capacity of 6,062 $m^3$/d.<br>• The digester should be inspected for code compliance within 2016. | Infrastructure/Policy | Port Dover |
| | Install pressure loggers to monitor suction and discharge pressures at the St. Williams PS to determine if there any concerns at this location. | Infrastructure | St. Williams |
| | Update stormwater management database | Policy | County-Wide |
| | Refine and update current policies and by-laws | Policy | County-Wide |
| | Develop a SWM operation and maintenance program | Policy | County-Wide |
| | Update the county-wide hydrology/hydraulics model | Policy | County-Wide |
| | Upgrading of storm sewers with significant flooding concerns | Infrastructure | Simcoe |
| | Maintain SWM Facilities with current issues | Infrastructure | Simcoe |
| | Construct one (1) new SWM facility | Infrastructure | Simcoe |

| | Recommendation | Improvement Type | Location |
|---|---|---|---|
| | Retrofit one (1) dry pond | Infrastructure | Simcoe |
| | Upgrading of storm sewers with significant flooding concerns | Infrastructure | Port Dover |
| | Maintain SWM Facilities with current issues | Infrastructure | Port Dover |
| | Construct one (1) new SWM facility | Infrastructure | Port Dover |
| | Retrofit one (1) dry pond | Infrastructure | Port Dover |
| | Upgrading of storm sewers with significant flooding concerns | Infrastructure | Delhi |
| | Maintain SWM Facilities with current issues | Infrastructure | Delhi |
| | Construct one (1) new SWM facility | Infrastructure | Delhi |
| | Retrofit one (1) dry pond | Infrastructure | Delhi |
| | Upgrading of storm sewers with significant flooding concerns | Infrastructure | Waterford |
| | Maintain SWM Facilities with current issues | Infrastructure | Waterford |
| | Construct one (1) new SWM facility | Infrastructure | Waterford |
| | Retrofit one (1) dry pond | Infrastructure | Waterford |

| | Recommendation | Improvement Type | Location |
|---|---|---|---|
| | Upgrading of storm sewers with significant flooding concerns | Infrastructure | Port Rowan |
| | Maintain SWM Facilities with current issues | Infrastructure | Port Rowan |
| | Construct one (1) new SWM facility | Infrastructure | Port Rowan |
| | Retrofit one (1) dry pond | Infrastructure | Port Rowan |
| **Medium Term (6 15 years)** | Adopt the following best practices surface water treatment policies for surface water treatment plants:<br>• The filtration capacity should be considered as the capacity of the filters with the one filter out of service.<br>At least two pre-treatment trains must exist. | Policy | County-Wide |
| | Groundwater based system should be supplied from a minimum of two aquifers.<br>Groundwater risk assessments and vulnerability reviews should be reviewed and updated on a regular basis.<br>Apart from completing permitting requirements for current groundwater Permit to Take Water applications, future County water supplies should be based on Lake Erie-based solutions. | Policy | County-Wide |
| | The existing storage deficiency in Waterford should be resolved by installing a new booster pumping station connected at the base of the standpipe containing 1 duty and 1 standby pump. These pumps would need to be supplied with a control system and variable frequency drive or pump control | Infrastructure | Waterford |

| | Recommendation | Improvement Type | Location |
|---|---|---|---|
| | valve. A standby generator should also be provided, to provide emergency power to the pumping units. | | |
| | The water distribution system for the residential area in the north end adjacent to Lakeshore Rd. and Concession Rd. 1 requires looping. Other dead ends in the water distribution system should be looped, when possible. | Infrastructure | Port Rowan |
| | Construct a booster pumping station at the standpipe to maintain a higher HGL throughout the water distribution system. | Infrastructure | Waterford |
| | Any new development areas, particularly in the north end, should be carefully reviewed and the need for strengthening water mains considered (including looping Main St. N. from College St. W. to minimize head loss from the standpipe to the new area). | Infrastructure | Waterford |
| | A loop from Main St. N. to Woodley Rd. should be included in the water distribution system. | Infrastructure | Waterford |
| | Port Rowan WWTF recommendation:<br>• Replacement of 2 biofilters in the next 20 years. | Infrastructure | Port Rowan |
| | The applicable WWTF regulatory requirements are recommended to be assessed once every 10 years. | Policy | County-Wide |
| | Port Rowan WWTF recommendations:<br>• Partial or full replacement of the membranes can be expected between 2023 to 2027.<br>• Replace the current membranes with PTFE coated membranes at the first replacement, and subsequently as | Infrastructure | Port Rowan |

| | Recommendation | Improvement Type | Location |
|---|---|---|---|
| | required in future. | | |
| | Waterford WWTF recommendations:<br>• Equipment, including pumps, blowers or aeration diffusers, may require replacement as they reach their useful lives.<br>• Media in the Submerged Attached Growth Reactor (SAGRTM) may have to be replaced at least once within the projected growth period. | Infrastructure | Waterford |
| | Implement pilot scale Low Impact Development measures | Infrastructure | County-Wide |
| | Assess climate change concerns and adaptation measures | Policy | County-Wide |
| | Develop a county-wide stream erosion master plan | Policy | County-Wide |
| | Upgrading of storm sewers with flooding concerns | Infrastructure | Port Dover |
| | Construct one (1) new SWM facility | Infrastructure | Port Dover |
| | Retrofit one (1) dry pond | Infrastructure | Port Dover |
| | Upgrading of storm sewers with flooding concerns | Infrastructure | Delhi |
| | Construct one (1) new SWM facility | Infrastructure | Delhi |
| | Retrofit one (1) dry pond | Infrastructure | Delhi |
| | Upgrading of storm sewers with flooding concerns | Infrastructure | Waterford |
| | Construct one (1) new SWM facility | Infrastructure | Waterford |
| | Retrofit one (1) dry pond | Infrastructure | Waterford |

| | Recommendation | Improvement Type | Location |
|---|---|---|---|
| | Upgrading of storm sewers with flooding concerns: | Infrastructure | Port Rowan |
| | Construct one (1) new SWM facility | Infrastructure | Port Rowan |
| | Retrofit one (1) dry pond | Infrastructure | Port Rowan |
| Long Term (16 25 years) | Replace undersized local mains as part of road or water main reconstruction works. See **Appendix D** for a listing. | Infrastructure | Port Dover |
| | Replace undersized mains in local areas with larger diameter water mains as part of any road or water main reconstruction work. **See Appendix D** for a listing. | Infrastructure | Delhi |
| | Replace undersized mains in local areas with larger diameter water mains as part of any road or water main reconstruction work. See **Appendix D** for a listing. | Infrastructure | Port Rowan |
| | Delhi WWTF recommendation:<br>• Equipment, including pumps, blowers or aeration diffusers, may require replacement as they reach their useful lives. | Infrastructure | Delhi |
| | Update the stormwater management master plan | Policy | County-Wide |
| | Implement large scale Low Impact Development measures | Infrastructure | County-Wide |
| | Upgrading of storm sewers with flooding concerns | Infrastructure | Simcoe |
| | Construct one (1) new SWM facility | Infrastructure | Simcoe |
| | Retrofit one (1) dry pond | Infrastructure | Simcoe |

| Recommendation | Improvement Type | Location |
|---|---|---|
| Upgrading of storm sewers with flooding concerns | Infrastructure | Port Dover |
| Construct one (1) new SWM facility | Infrastructure | Port Dover |
| Retrofit one (1) dry pond | Infrastructure | Port Dover |
| Upgrading of storm sewers with flooding concerns | Infrastructure | Delhi |
| Construct one (1) new SWM facility | Infrastructure | Delhi |
| Retrofit one (1) dry pond | Infrastructure | Delhi |
| Upgrading of storm sewers with flooding concerns | Infrastructure | Waterford |
| Construct one (1) new SWM facility | Infrastructure | Waterford |
| Retrofit one (1) dry pond | Infrastructure | Waterford |
| Upgrading of storm sewers with flooding concerns | Infrastructure | Port Rowan |
| Construct one (1) new SWM facility | Infrastructure | Port Rowan |
| Retrofit one (1) dry pond | Infrastructure | Port Rowan |

# 5.0 TRANSPORTATION STRATEGY

## 5.1 Introduction

The intention of the Transportation Strategy for the Norfolk County ISMP is to prepare a set of principles and guidelines to maintain and develop existing and future transportation infrastructure in the County, identifying infrastructure requirements to the 2041 horizon year.

In order to integrate with other transportation policies and strategies under development, the Transportation Strategy primarily deals with the roadway network in the County. Active transportation and trails within the County have been addressed through standalone Strategies and Master Plans, and as a result only a review of these documents has been provided in this Strategy.

In keeping with the goals and objectives of the Transportation Strategy, and to provide a basis for which to develop the Strategy, the Vision Statement developed for the ISMP is:

> *"Norfolk County's Transportation System will support the efficient movement of people and goods within and beyond the County, the effective use of resources in maintaining the Transportation System, and the ability for users of the System to choose the transportation mode which best suits their needs."*

The proposed vision will be achieved through the implementation of objectives which reflect the key principles that the County aims to achieve through the Transportation Strategy. The key objectives revolve around the areas of **Maintenance, Planning** and **Implementation**.

**1 Maintenance**

- Existing transportation infrastructure will be reviewed and identified as key parts of the County Road network, in order to ensure that available funding is being used as efficiently as possible.
- Maintenance standards will meet local and provincial requirements.

**2 Planning**

- New transportation infrastructure, including new roads, road widenings, active transportation and transit facilities, are identified as part of the land use planning process.
- A "skeleton" network of vehicle and active transportation facilities will connect the urban and rural areas of the County together and to major areas outside of the County.

**3 Implementation**

- The implementation of new transportation infrastructure will be planned appropriately, taking into consideration proposed Water/Wastewater and Active Transportation improvements so that they are undertaken with minimal disruption.
- Timelines for implementation will be based on need, as identified through a detailed and transparent evaluation process, using information readily available to the County.

This section of the report has been developed with the intention of building upon the current conditions within Norfolk County in order to identify the areas of need, with respect to infrastructure as well as to standard County practices and guidelines, in order to develop a plan which will support the County's continued growth and ensure that the Transportation industry's best practices are being used appropriately.

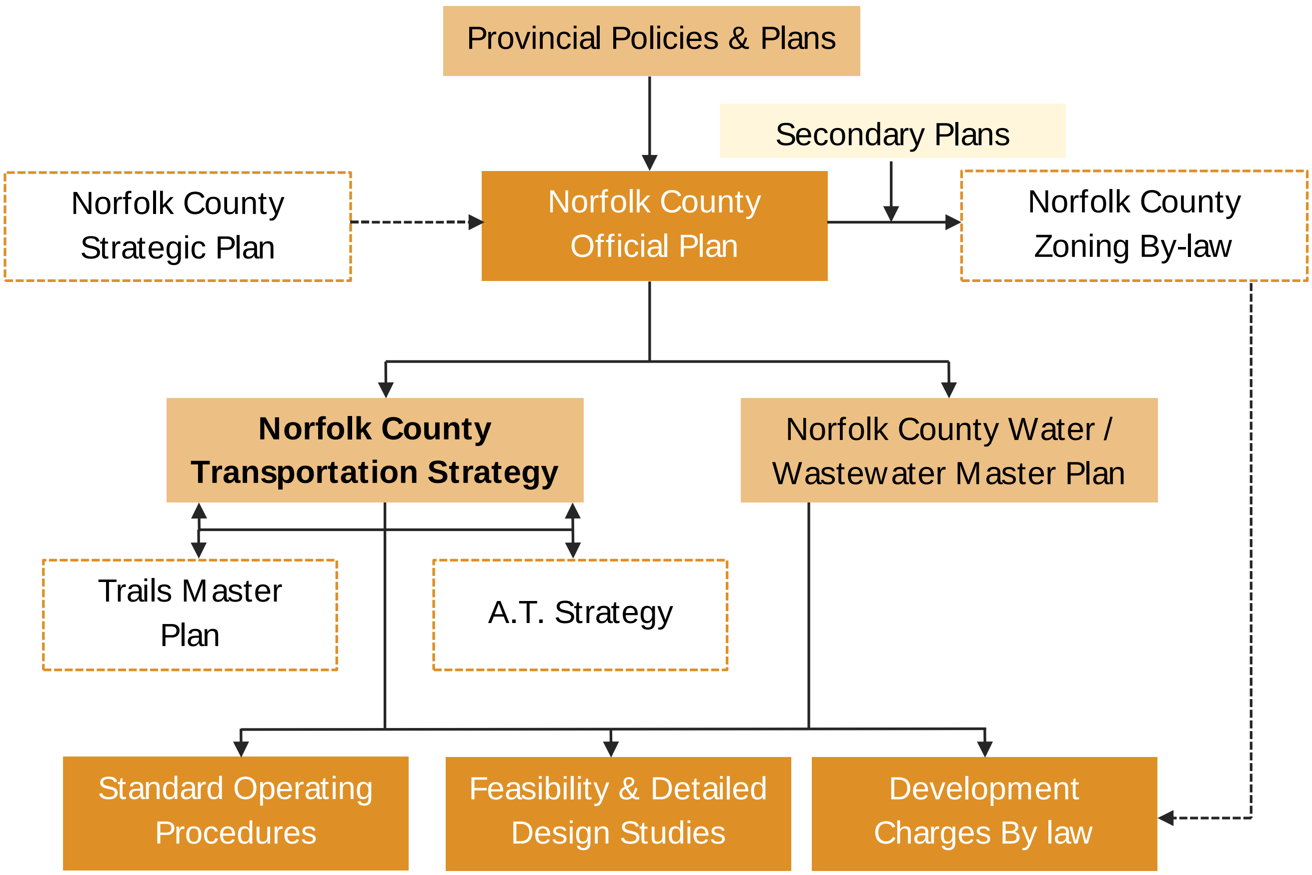
As a result, the Transportation Strategy has been structured into three key sub-sections.

- The first sub-section (**Existing Conditions**) presents the existing conditions within the County, reviews the capacity of the existing transportation network, current transportation policies and guidelines in force within the County, and provides a summary of the opportunities and challenges that will be addressed.
- The second sub-section (**Planning for the Future**) provides an overview of the future vision for the County. First to be investigated is the projected future transportation network volumes and capacities, which were determined using current growth estimates, and a travel demand forecasting model developed specifically for the County. The review of the future projected network volumes and capacities results in the identification of improvements to the road network through the application of a multiple account evaluation process, with the goal that these improvements maintain the levels of service County residents currently enjoy. In addition, the future conditions also outline policies and guidelines that will support and enhance the County's existing standard operating procedures.
- The final sub-section (**Recommendations**) outlines the plan for implementation of the proposed improvements and policies as determined based on the need of the improvement for a specific horizon year, using the defined evaluation process.

**Figure 5-1** below illustrates the interaction of this Transportation Strategy in context with other policies in the County.

**Appendices H** (Transportation Model Validation) **and I** (Future Transportation Condition Results) include further supporting data for the Transportation Strategy.

**Figure 5-1 – Norfolk County Policy Overview**




## 5.2 Existing Conditions

### 5.2.1 Transportation Policies and Guidelines

The following sub-section details the transportation policies and guidelines currently in force within the County, providing a basis for future policy and guideline recommendations.

***Provincial Policies***

The integration of transportation and land use planning is a recurring theme that can be found in many provincial policies. The 2014 *Provincial Policy Statement* (PPS) provides policy direction on matters of provincial interest related to land use planning and development. The PPS provides for appropriate development while protecting resources of provincial interest, public health and safety, and the quality of the natural and built environment. It supports improved land use planning and management, which contributes to a more effective and efficient land use planning system.

At a more detailed level, provincial policies can also provide guidance on various aspects of design. For example, the *Ontario Ministry of Transportation's Transit-Supportive Design Guidelines* provide direction on land use planning, urban design, facility design and operational procedures in order to create an environment that supports greater use of transit. *Ontario Traffic Manual Book 18: Cycling Facilities* provides guidance on the design of cycling networks and facilities. In addition, the *Accessibility for Ontarians with Disabilities Act* outlines design requirements that make the built environment, including transit vehicles and facilities, more accessible.

### *Local Policies*

Several local policies were reviewed and considered in the development of the Norfolk Transportation Strategy. Land use in the County is guided by the *Norfolk County Official Plan* (OP). The OP provides the essential tool to enhance future growth, development and change in the County, all while creating the community envisioned by local residents. The plans, principles and polices ensure the planning framework and tools are in place to ensure that Norfolk remains a healthy and successful community.

Outlined in the Official Plan is the comprehensive secondary planning process. This process provides for the opportunity to further study a specific area and recognize the unique local land use arrangements that could not be addressed in full detail through the Official Plan. Currently there is one secondary plan in Norfolk County, the Lakeshore Secondary Plan, which was developed in 2009. The County's lakeshore is an ecological resource and a significant component of "Ontario's South Coast", which provides diverse tourism and recreational opportunities. Since the lakeshore offers many different uses and environments in proximity, it is imperative that waterfronts are planned to achieve a balance between the many uses of this resource.

In 2014, the County commissioned Hemson Consulting Ltd. to complete a population projection study. The purpose of the report was to present long-term forecasts of population, housing and employment for Norfolk County. The forecasts took into account census data and other relevant information. Forecasts were prepared for 2031 and 2041 horizons which correspond with census years and provide a basis for planning within the 20-year Provincial planning policy horizon.

The County is forecast to grow from a 2011 population of 64,700 to 70,000 in 2031 and to 71,300 in 2041. Households are expected to grow from 25,000 in 2011 to 28,500 in 2031 and to 30,500 in 2041. The County is expect to recover from the recent recession by the 2031 horizon with total employment growing from 22,850 in 2011 to 24,250 in 2031 and to 25,580 in 2041. These projections were used as inputs for the future travel demand models.

The *Norfolk County Strategic Plan* (January 2015) was developed with two purposes in mind. First, it is meant to clearly define a common vision for the County and its diverse communities that will define the success. Secondly, the Strategic Plan is intended to provide Council and staff with a framework for decision making. The plan prioritizes the key programs, services and initiative based on the needs, values and aspirations of community members, while balancing the service delivery realities of managing the County.

Norfolk County has developed Asset Management Plans for both roads and bridges. These plans, prepared in response to the Ontario Ministry of Infrastructure's Building Together initiatives, provide the County with a medium-term business plan for ensuring long-term sustainability of the County's Infrastructure. It was noted that the County's Public Works assets have a replacement value of $2.2 billion. The road network accounted for 63.5% ($1.4 billion) while bridges and culverts accounted for 10% ($212 million).

The *Norfolk Trails Master Plan* was created with the objective to provide a framework for future trails development throughout Norfolk County. It proposed a county-wide trail system which would integrate communities, parks and open spaces. The combination of off-road trails and linkages along major waterways provides trails to be used by both residents and tourists alike.

### *Design Criteria*

The Norfolk design criteria document was developed to provide a clear and concise description of the County's Engineering review processes and design standards. All development-related Engineering design proposals are to be prepared in a manner than conforms to the design criteria contained in the document. The document is periodically updated to include revisions where required. The most current version of the document was updated in 2009. Some of those criteria include:

Engineering Review for Planning Approvals

The County is responsible for review and approval of engineering design plans for development proposals, including but not limited to severances, site plans and subdivisions. Depending on the type of development applications and/or the scale of the project, an escalating level of detail is required to be provided by the Developer's Engineer concerning engineering design.

Functional Servicing Report

A functional servicing report (feasibility study) is typically required as background information for Draft Approval for a Plan of Subdivision. A functional report may also be required at the discretion of the Manager of Engineering for other mid to large-scale developments which potentially have an impact on servicing, grading and drainage, water quality or quantity, and traffic. It should be noted that requirements for traffic are not outlined in the same detail as for servicing.

Engineering Review for Development

After approval of a planning application, the initial submission of engineering drawings for review by the County's Engineering Division shall contain:

- The approved draft plan
- The proposed plan for registration showing all lot and block numbering and dimensioning
- A declaration from the Consulting Engineer indicating that he/she has been retained to design and supervise the construction of the work in the development according to the terms of the Preservicing and/or Subdivision Agreement(s)
- General Plan of Services
- Lot Grading Plan
- Area Rough Grading Plan
- Siltation & Erosion Control Plan
- Storm Drainage Plan
- Storm Sewer Design Sheets
- Storm Water Management Report
- Sanitary Drainage Plan (including all existing servicing in the area)
- Sanitary Sewer Design Sheets
- Water Distribution Plan (including all existing servicing in the area)
- Plan and Profile Drawings

- Park Grading Plan, if necessary
- Hydro Distribution System and Street Lighting
- Composite Utility Plan
- Street Signage and Traffic Control Plan
- All detail drawings other than the O.P.S. Detail Drawings
- All drawings pertinent to the design
- All other calculations necessary to check the design; and
- A copy of a Geotechnical Investigation report prepared by a qualified Soils Consulting Engineer

Roadways

All roadways in new developments shall be classified according to the traffic volume expected and the intended use of the roadway. For predominantly residential areas three classifications shall be noted as follows: Local, Minor Collector or Major Collector. For industrial areas the streets shall be classified Local or Collector dependent upon length of street, traffic volume expected and percentage of truck traffic. Arterial roadways shall be classified as divided or undivided. The proposed classification of all streets in the development shall be confirmed with Norfolk County prior to the commencement of the design.

Multiple Unit Dwellings, Commercial, Industrial or Institutional Lands

In cases where a subject property is affected by site plan control in the applicable zoning by-law, developers of multiple unit dwellings, commercial or institutional lands may be required to enter into Site Plan Agreement with Norfolk County prior to the commencement of construction of any building or service within the parcel of land.

### *Road Classification*

The County road network to-date has been assessed and classified using two primary sources: the *MTO Inventory Manual for Municipal Roads* and the *Minimum Maintenance Standards for Municipal Highways* (O. Reg. 239/02).

The road inventory includes information such as the classification of the road, which is based largely on the volume of traffic on the road, the type of flow (interrupted versus uninterrupted), and the design speed. Other inventory information includes right-of-way width, horizontal and vertical alignment, terrain type, drainage, surface type, curb and gutter, shoulder width and surface type, etc. This information is intended to inform the County of their existing assets. The road inventory information is contained within a GIS database created by the County.

The Minimum Maintenance Standards (MMS) identify the level to which roadways must be cleared in the winter time of snow and ice. The MMS classifications are based solely on collected AADT information and posted speed limits.

As part of the Transportation Strategy, a third source of information known as a Road Rationalization was developed for the County which identified the important links within the County network that are needed for the efficient movement of people and goods. The development of the Road Rationalization was based on information from the Ontario Good Roads Association and the previously mentioned road inventory. The Road Rationalization provides information on the importance of roads using the criteria shown in **Figure 5-2**.

**Figure 5-2 – Road Rationalization Criteria**

| Criteria | Description |
|---|---|
| Urban Center Connector | Connects Major Urban Centers |
| Kings Highway / Upper Tier Connector | Extends Kings Highway to major commercial/ industrial, schools, hospitals, municipal boundaries, border crossings and provincial boundaries. Roads with 1000 AADT are considered major. |
| Heavy Industry Service | Provides service adjacent to a designated industrial area. |
| Barrier Service | Provides connections over physical barriers such as rivers or controlled-access highways. |
| Resort Criterion | Provides connection to park space or resort. |
| Traffic Speed | Posted Speed > 80km/h |
| Road Surface | Roads with asphalt pavement |
| Traffic Volume | Roadway AADT > 1000 |

The scoring for each of these criteria was conducted in the GIS Database developed for the County. Overall, the road rationalization allows for the identification of a primary, secondary and tertiary road network, which will be used as information to determine the priority of road network improvements. In addition, a goods movement network can be identified by selecting key criteria such as Heavy Industry Service, Kings Highway/Upper Tier Connector and Road Surface. The primary, secondary, tertiary, and goods movement networks are identified in **Figure 5-3, Appendix L**.

### *Goods Movement*

The County does not have a formal Goods Movement network identified at this time. Through the work completed to identify the primary road network in the road rationalization, a goods movement network can be created by identifying the primary road links that serve current or future planned industrial areas in the County. The result of this synthesis is shown as the proposed goods movement network in **Figure 5-4, Appendix L**.

The network represents recommendations of routes that would facilitate the movements of goods between major industrial parks and MTO highways. The recommendations were made in conjunction with roadways that were determined to be part of the primary network, as per the aforementioned road rationalization criteria. For the proposed routes, the roadways identified are currently constructed to a half load standard. This may be sufficient for current operations in the industrial areas. Furthermore, these roads have been identified as in good condition based on the linear asset database, with rehabilitation not required for several years. As a result, should a requirement for an unrestricted truck road arise, the roads identified as part of the network should be given priority for improvements. In addition, future additions to the goods movement network can occur once additional primary roads are rehabilitated or reconstructed and no longer have truck restrictions placed on them.

### *Active Transportation*

This Transportation Strategy has been developed in direct collaboration with the Active Transportation Strategy outlined in **Section 6.0**. Although the Transportation Strategy will not review in detail the Active Transportation network, it should be noted that Active Transportation policies and infrastructure will have a direct impact on the Transportation Strategy’s success. Furthermore, Active Transportation infrastructure may actually lessen the need for, or change the requirements of, additional road infrastructure. Further details on the recommendations for Active Transportation can be found in **Section 6.0**.

### 5.2.2 Road Network Assessment

This sub-section documents the existing road conditions as reported by the Norfolk County Model, the tool used to conduct the forecasting analysis. The existing conditions are based on the year 2011 because this represents the 2011 census data obtained. The model was constructed using Emme 4 travel demand forecasting software. The model illustrates travel patterns for auto mode during the p.m. peak hour. This assumption was made in order to ensure that "average" conditions were represented in the model.

There are limited seasonal transit services provided in the County, which do not have an impact on peak period travel. As a result, transit was not considered as part of this assessment. In addition, there are seasonal peaks in parts of the County during the summer months. However, from a capacity standpoint, evaluating the need for improvements depends on the needs of the road network for the entire year, and a p.m. model would better represent typical day to day conditions throughout the year.

The 2011 population and employment, as obtained from the 2011 National Household Survey for Norfolk County, are as follows:

- Population: 63,175
- Employment: 31,765

**Figure 5-5** below shows key system metrics for the 2011 model. The metrics Vehicle Kilometers Traveled (VKT) and Vehicle Hours Traveled (VHT) measure the total amount of distance traveled in kilometers and the total amount of travel time, multiplied by the number of trips in the entire road network, respectively. In addition, certain sections of roadway where the volume-to-capacity (v/c ratio) is at or greater than 0.7, using the predicted volumes from the model and an assumed capacity of the roadway, is used to identify the metrics of these roadways separately from the overall road network aggregate results. A threshold of 0.7 was chosen since this approximately represents the point at which users on these roadways experience significant delays.

**Figure 5-5 – 2011 Model System Metrics**

| System Metrics | Year: 2011 |
|---|---|
| **Daily VKT*** | 3,576,334 |
| **Daily VHT*** | 53,621 |
| **Total Lane Kms** | 4,339 |
| **VKT on v/c>0.7** | 45,311 |
| **VHT on v/c>0.7** | 603 |
| **% VKT on v/c>0.7** | 1.2% |
| **% VHT on v/c>0.7** | 1.1% |
| **Congested Lane Kms (v/c>0.7)** | 60 |

* Peak hour to daily conversion done using a multiplier of 10

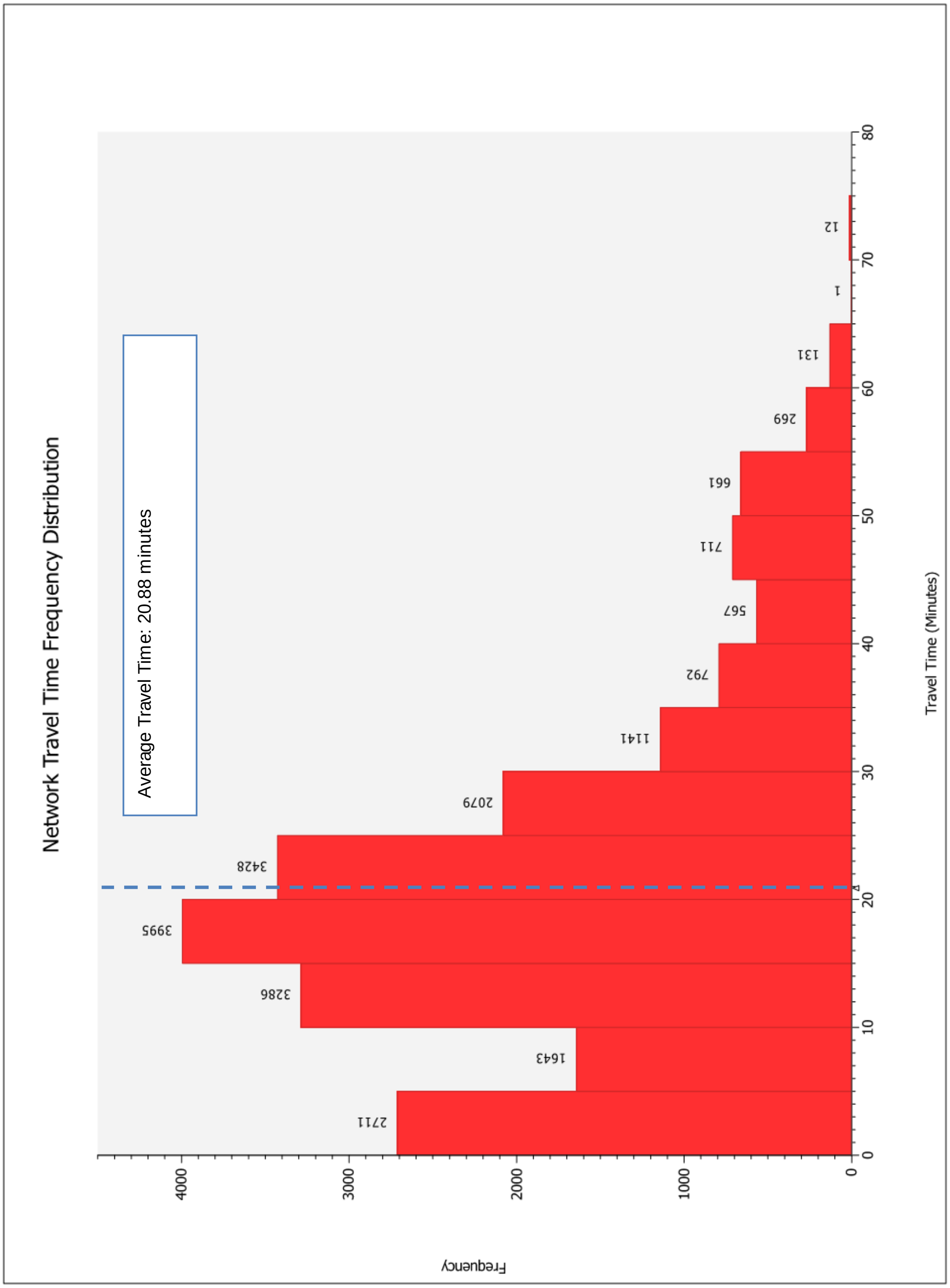
A v/c ratio of 0.7 was used as the threshold for congestion, since this represents approximately the point at which the roadways operates at level of service (LOS) 'D' based on the Highway Capacity Manual.

**Figure 5-5** indicates that 1.2% of the total vehicle kilometres travelled and 1.1% of vehicle hours travelled are spent in congestion, indicating that there is very little congestion in the network. The VKT and VHT on roadways with a v/c ratio of greater than 0.7 represent a small fraction of the daily totals. This is an expected outcome for the County's road network, which does not operate at high levels of congestion under existing conditions.

The model also revealed that the average travel time in the network is approximately 20.88 minutes, in the peak hour per trip. This is comparable to the median commute time of 18.8 minutes, as obtained from 2011 census data. The minor difference between the two values suggests that the model is reasonably accurate at representing the observed travel patterns.

**Figure 5-6** shows the frequency distribution of travel times in the network. The plot illustrates that the majority of trips made in the network are within 25 minutes.

Figure 5-6 – 2011 Norfolk County Travel Time Frequency Distribution



### 5.2.3 Opportunities and Challenges

***Establishing a Problem / Opportunity Statement***

A problem / opportunity statement is established at the beginning of a master plan if it is being undertaken consistent within the Municipal Class EA process. The problem / opportunity statement below was prepared for the ISMP and was developed to clearly identify what is intended to be addressed as a result of the completion of the study. The Transportation Strategy is intended to address the transportation components of the problem / opportunity statement.

> ***This study will propose a collection of active transportation, transportation and water / wastewater municipal infrastructure improvements that will function as a tool for Norfolk County to prioritize projects and implement them in an integrated fashion, based on a planning horizon of 2041.***
>
> ***The study will identify individual infrastructure needs for the above noted elements and will develop solutions that address these needs as well as their inter relationships and financial sustainability, on a short, medium and long term basis."***

***Challenges***

Norfolk County is poised to grow in importance as a tourist destination for travelers to Ontario's South Coast. The opportunities that arise from the additional exposure provide the County with the impetus to improve its existing road network in a sustainable manner, but also challenge the County's maintenance and capital resources.

In order to effectively manage these growth pressures while maintaining the standard to which County residents and visitors have become accustomed to, this Transportation Strategy outlines the key areas of opportunity for the County and the challenges associated with taking full advantage them.

Tourism Growth

Norfolk County is already known in southern Ontario as an attractive destination during the summer, for the agro-tourism associated with various agricultural destinations within the County, as well as for the eco-tourism, festivals and concerts occurring along the South Coast.

This peak seasonal traffic results in unique challenges to the road network, from both an operational and maintenance standpoint. For example, operationally, the effective volume that a road segment can accommodate may be 700 vehicles per hour per lane. Road segments around high traffic tourist destinations may exceed this value during the busiest times of the week, but this road may be underutilized for the rest of the year. As an example, in Port Dover, Highway 6 carries an AADT of 9,650 vehicles, but has a SADT (Summer Average Daily Volume) of 15,400, an almost 60% increase in vehicles. It can be expected that County Roads in the vicinity of these tourist locations experience similar increases in volumes.

At the same time, planning to construct new infrastructure or widen roadways in order to accommodate these seasonal flows is not a sustainable approach, because this new infrastructure would require additional maintenance dollars that are not needed during the off-peak months. As a result, the challenge is to ensure that these peak volumes can be accommodated with as little new infrastructure as possible. This does not preclude the possibility of providing improvements at specific intersections, but it does limit improvements to specific locations rather than corridors or long segments of roads.

Aging Infrastructure

Asset Management Plans for roads, bridges and large culverts were prepared in 2013 by the County, and identified 4,086.79 lane-km of roads, 130 bridges and 112 large culverts that are currently the responsibility of the County to maintain and rehabilitate.

The Plans indicate that approximately 27% of the roads require reconstruction today, with an additional 33% that will require reconstruction within the next 10 years. Furthermore, approximately 38% of the bridges and 27% of the large culverts have only 25% or less of their 70 year service life remaining, and thus will need to be rehabilitated or reconstructed within the next 15 years.

As a result, identifying the priorities for reconstruction or rehabilitation will be required in order to judiciously utilize the County’s resources on the roads and bridges which provide the greatest utility for the transportation network.

Transportation Standard Operating Procedures

Currently, the County has defined design standards for their roadways which specify roadway geometric features. There is a lack of documentation which describes the guidelines for prioritizing infrastructure, preparing traffic operations studies, and responding to other transportation requests from the public. In order to address each of these items, a number of standard operating procedures need to be developed in order to help guide staff to respond appropriately to these situations, drawing from the best practices in use in Ontario.

## 5.3 Planning for the Future

According to the latest population and employment growth projections, by 2041 Norfolk County is expected to increase its population by 6,400 residents, and the number of jobs in the County is expected to increase by 4,090. The total population will reach nearly 70,000 residents from the 2011 census value of 63,180, and the total number of jobs will increase from 22,870 today to over 25,000.

The changes in traffic patterns and operations on the roadway network as a result of this growth must be accounted for in future planning of the road network. In particular, the identification of the roadways which may need to be investigated for road improvements, either through a more detailed study or Environmental Assessment, is important for capital planning.

Furthermore, a strategy for managing the numerous bridges and culverts in the County must be prepared. Rationalizing the rehabilitation, reconstruction or decommissioning of these structures will play a vital role in sustainably proportioning available capital and maintenance budgets.

All of the proposed infrastructure must be supported by policy which is supportive of improving the day-to-day traffic operations within the County and utilizing the County's existing infrastructure as efficiently as possible, again to ensure resources are being spent effectively, and to provide staff with the necessary guidance to meet today's transportation standards. Each of these components has been incorporated into this Transportation Strategy in order to allow Norfolk County to effectively plan for the future.

### 5.3.1 Infrastructure

***Future Travel Demand Forecast***

The growth in population and employment will result in an increase in the number of vehicles travelling on the road network. However, similar to the fact that the growth will not be evenly spread out across the County, the increase of traffic on roadways will vary depending on the location and intensity of growth.

In order to estimate the effects of this uneven growth on the road network, a calibrated and validated travel demand forecasting model was applied to future conditions. Growth population and employment numbers from Hemson Consulting Ltd.'s Population Projection Study for the 2021, 2031 and 2041 horizon years were inputs into the model, which provided estimated trip generation and assignment onto the road network.

The projected trips on each road link were used to assess the performance of the roadway network and identify locations where improvements may be required in the future. Preparation of 2021, 2031 and 2041 model scenarios allowed for the identification of improvements for the short term (0-5 years), medium term (6-15 years) and long term (16-25 years) time periods. Furthermore, the preparation of travel demand model scenarios allows for the evaluation, as outlined in the following section, of network improvements in order to determine the best improvement for each identified issue.

Following the forecasting analysis for existing conditions, the model was used to run three future scenarios with horizon years of 2021, 2031 and 2041. These horizon years were selected to correspond with the "Population Projection Study" completed by Hemson Consulting Ltd (May 2014). The population and employment data available from this report was used in the future conditions forecasting analysis.

As a baseline across all three future scenarios, two infrastructure improvements were included in the analysis. These improvements were identified in the "Norfolk County Final 2015 Capital Plan". The improvements include the extension of Argyle Avenue from Huggins Avenue to Fertilizer Road in Delhi and the extension of Main Street from First Avenue to Crosier Street in Delhi. The two road extensions are projected to be completed by 2021 and 2018, respectively, as per the Capital Plan.

2021 Horizon Year Analysis

Similar to existing conditions, the network is expected to be largely uncongested in the 2021 horizon. While the County has experienced growth and the VKT and VHT values have increased, the proportion of congested roadways to overall roadways remains small. The metrics are summarized in **Figure 5-7**.

**Figure 5-7 – 2021 Model System Metrics**

| System Metrics | Year: 2021 |
|---|---|
| **Daily VKT*** | 4,566,884 |
| **Daily VHT*** | 74,331 |
| **Total Lane Kms** | 4,341 |
| **VKT on v/c>0.7** | 81,241 |
| **VHT on v/c>0.7** | 1,201 |
| **% VKT on v/c>0.7** | 1.8% |
| **% VHT on v/c>0.7** | 1.6% |
| **Congested Lane Kms (v/c>0.7)** | 94 |

2031 Horizon Year Analysis

The network is forecast to continue to remain largely uncongested in the 2031 horizon. The growth in population and employment has increased the overall VKT and VHT as well as those on congested roadways. However, the congested roadways still represent a small portion of the overall network, as seen in **Figure 5-8**.

**Figure 5-8 – 2031 Model System Metrics**

| System Metrics | Year: 2031 |
|---|---|
| **Daily VKT*** | 4,625,440 |
| **Daily VHT*** | 75,924 |
| **Total Lane Kms** | 4,341 |
| **VKT on v/c>0.7** | 84,500 |
| **VHT on v/c>0.7** | 1,172 |
| **% VKT on v/c>0.7** | 1.8% |
| **% VHT on v/c>0.7** | 1.5% |
| **Congested Lane Kms (v/c>0.7)** | 98 |

2041 Horizon Year Analysis

The 2041 horizon represents the highest population and employment numbers based on the projected growth. The model continues to demonstrate an overall uncongested network in the year 2041. It should be noted that the % VHT on roads with a v/c greater than 0.7 has increased slightly, indicating the impact of additional vehicles on an unimproved road network. However, even with more trips being taken and more time spent on roadways, the proportion of congested roadways to overall roadways remains largely unaffected.

**Figure 5-9 – 2041 Model System Metrics**

| System Metrics | Year: 2041 |
|---|---|
| **Daily VKT*** | 4,783,013 |
| **Daily VHT*** | 80,406 |
| **Total Lane Kms** | 4,341 |
| **VKT on v/c>0.7** | 86,224 |
| **VHT on v/c>0.7** | 1,333 |
| **% VKT on v/c>0.7** | 1.8% |
| **% VHT on v/c>0.7** | 1.7% |
| **Congested Lane Kms (v/c>0.7)** | 99 |

***Current Capital Plan Improvements***

The current improvements listed below have been programmed as of the 2015 Capital Plan, and have been included in the "Status Quo" alternative detailed in the following sub-section.

- Main Street of Delhi Extension – First Street to Crosier Street: Programmed for 2018
- Argyle Avenue Extension – Huggins Avenue to Fertilizer Road: Programmed for 2021

The cost of the Argyle Avenue Extension is listed as $1,390,000, while the Main Street of Delhi Extension cost is estimated at $415,000.

### *Improvement Screening*

Subsequent to running the model for the future horizon years, the network was assessed to determine which areas of the County would require transportation improvements as a result of population and employment growth. While overall, the level of congestion in the network was forecast to be very low, even in the 2041 horizon year, there are key areas that do need to be monitored as a result of increasing congestion. These locations were found based on those links that had v/c ratios higher than 0.5 and 0.7. A v/c ratio of 0.5 represents moderately congested conditions, defined roughly as the point at which roads operate at a LOS 'C' as defined by the Highway Capacity Manual, 2010. The v/c threshold of 0.7 represents a roadway LOS 'D' condition. These areas were identified using the process shown in **Figure 5-10**.

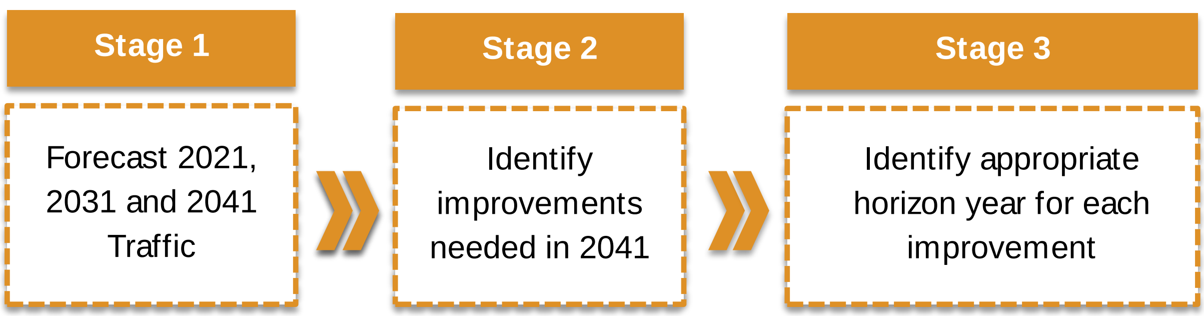



**Figure 5-10 – Improvement Screening Process**

The identified locations which require improvements are:

- Queensway West within the urban area of Simcoe. There appears to be a constraint in capacity along this roadway, particularly west of Hunt Street;
- In Delhi, the volume of traffic travelling east and west through the urban area suggests that there is a need for additional capacity along King Street and Church Street. The model indicates that the extension of Argyle Avenue will be a popular route for traffic travelling in those directions; and
- There is a need for additional north-south capacity in the rural areas east of Simcoe and north of Port Dover. Cockshutt Road was chosen as the corridor to which to make improvements. The justification for this is that the improvement will be aligned with planned active transportation improvements along Cockshutt Road.

In order to provide a meaningful evaluation, proposed improvements at each of the locations have been assumed, based on what would be the most reasonable to implement given the level of congestion on the roadway. These improvements were then evaluated as described in the following section. The improvement locations, subsequent recommendations for timing, and a proposed improvement to be evaluated are summarized in **Figure 5-11**.

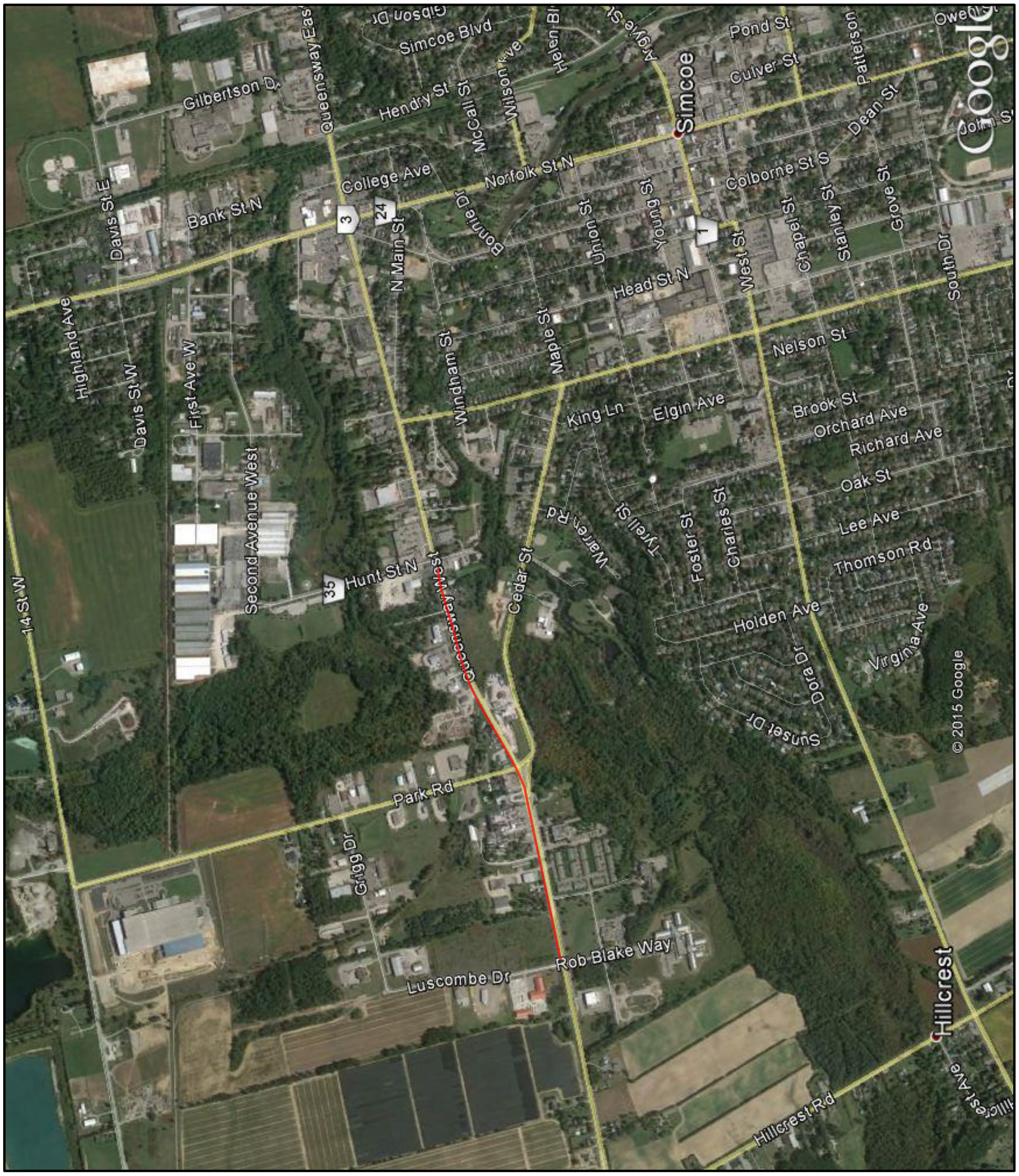
A detailed assessment of the improvement options would need to be undertaken during a formal Environmental Assessment, should these improvements be recommended as being carried forward by the Transportation Strategy. The locations are shown on **Figures 5-12** to **5-14**.

**Figure 5-11 – Summary of Improvements to be Evaluated and Recommended Timelines**

| Improvement | Horizon | Description |
|---|---|---|
| Simcoe – East-West Movement Through Urban Area | Short Term (0-5 Years) | • Queensway West widening between Hunt St & Rob Blake Way |
| Delhi – East-West Movement Through Urban Area | Medium-Long Term (6-15 Years) | • King St intersection turn lanes and signalization between Mill St & James St<br>• Church St intersection turn lanes and signalization between James St and Fertilizer Rd |
| North-South Traffic east of Simcoe and north of Port Dover | Long Term (16-25 Years) | • Cockshutt Rd intersection turn lanes and signalization between Concession 12 Townsend and Dover Mills Rd |

TRANSPORTATION STRATEGY

Figure 5-12 – Location of Proposed Queensway West Improvement



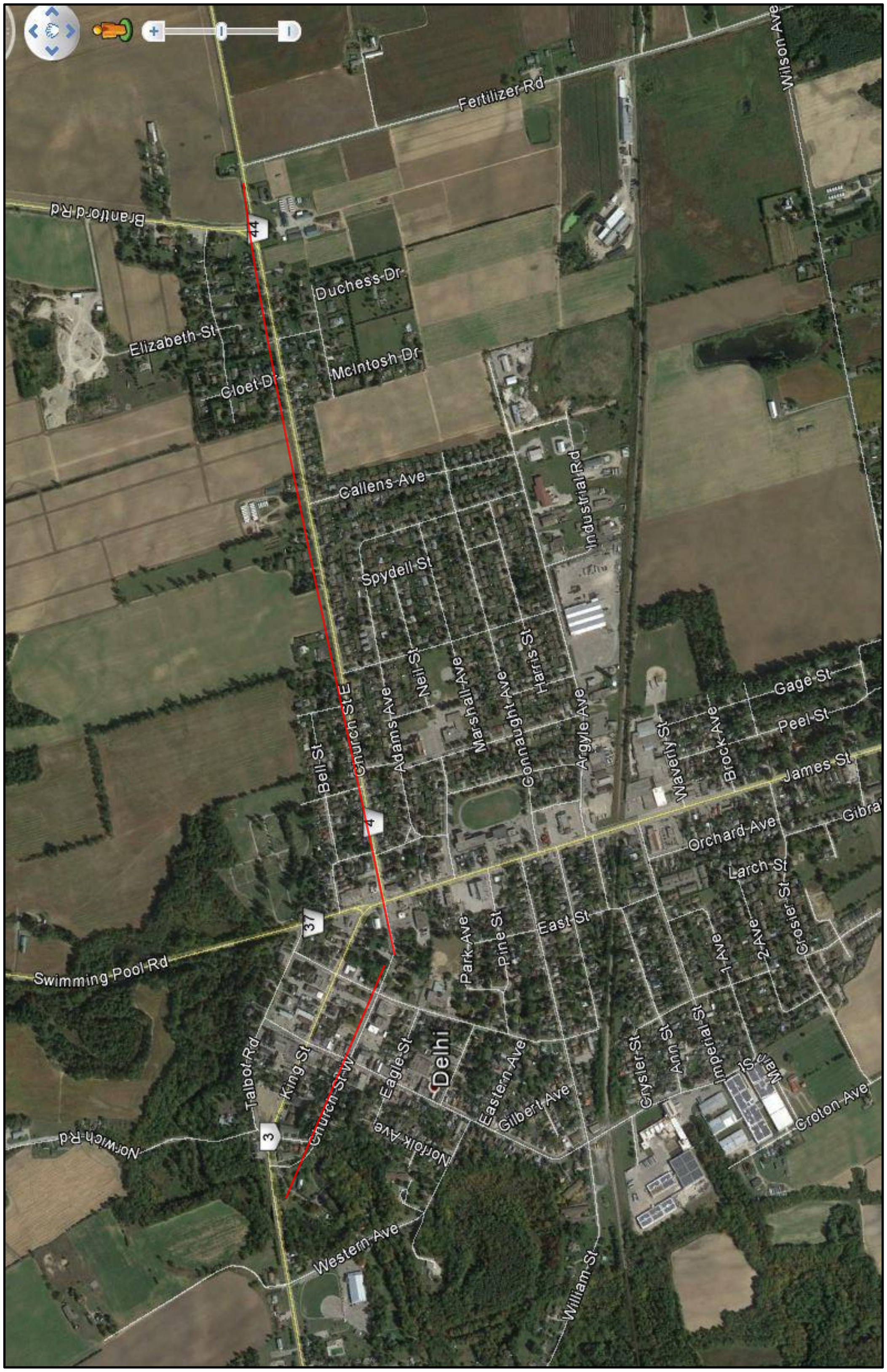
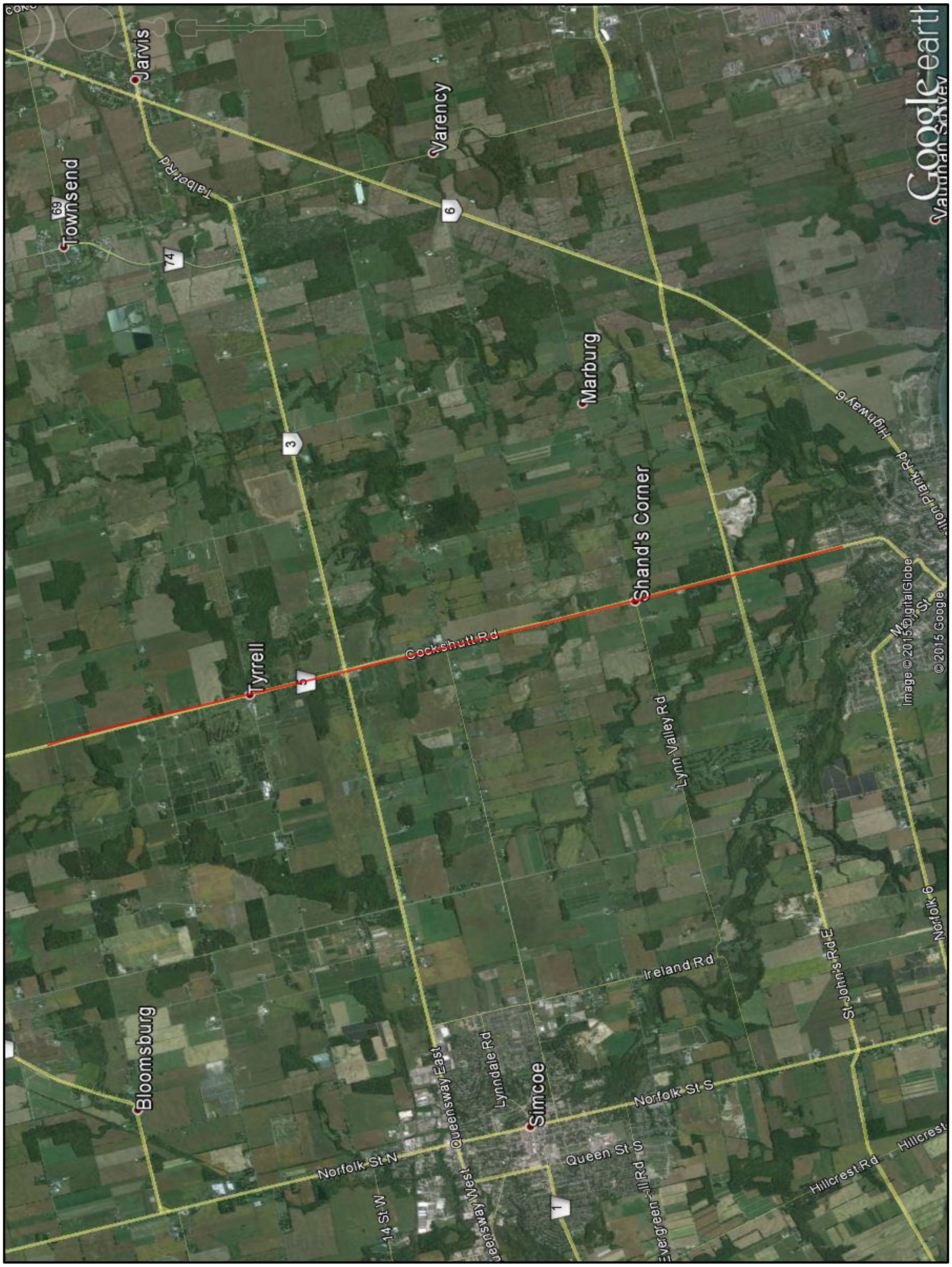



Figure 5-13 – Location of Proposed King St/Church St Improvement.

Figure 5-14 – Location of Proposed Cockshutt Rd Improvement



### *Proposed Alternative Options*

In order to assess the improvements in a manner which would take into account cumulative effects from other improvements, they were grouped into alternative options prior to evaluation. This allowed for a holistic approach to the implementation of improvements, rather than viewing each improvement in isolation from each other.

Alternative options were created by determining the threshold at which each improvement was required. Some of the improvements were required to improve v/c>0.7 or "LOS 'D'" conditions, while others were required to improve v/c>0.5 or "LOS 'C'" conditions.

The alternative options used in the evaluation are described in **Figure 5-15**.

**Figure 5-15 – Proposed Alternative Options**

| Alternative Option | Improvements |
|---|---|
| Status Quo | • Argyle Avenue Extension<br>• Main Street of Delhi Extension<br>• Conduct Operational Reviews of each improvement location |
| Improve LOS 'D' Roadways | • All Status Quo Improvements<br>• Queensway West Widening from approximately 250m west of Hunt Street to Rob Blake Way |
| Improve LOS 'C' and 'D' Roadways | • All LOS 'D' Improvements<br>• King Street Intersection Turn Lanes and Signalization between James Street and Mill Street<br>• Church St intersection turn lanes and signalization between James St and Fertilizer Rd<br>• Cockshutt Road Intersection Turn Lanes and Signalization between Concession 12 Townsend and Dover Mills Road |

The alternatives were evaluated using the 2041 scenario in order to provide an equivalent comparison between each set of improvements, since this horizon is the year that all of the improvements will be required.

### *Future Transportation Network Assessment*

In order to provide input to the Multiple Account Evaluation to choose the preferred alternative option, the following sub-section provides the results of the transportation analysis for the 2041 horizon year. As stated previously, 2041 was chosen in order to provide an equivalent comparison between the three alternative options.

In order to visually illustrate the capacity improvements for the "Improve LOS 'D' Roadways" alternative option, a visual comparison of the congestion levels along Queensway West before ("Status Quo") and after ("Improve LOS 'D' Roadways") the implementation of improvements can be seen in **Figures 5-16 and 5-17**.

The widening of Queensway West from two to four lanes between Rob Blake Way and Hunt Street provides additional capacity and helps relieve congestion. It should be noted that the roadway was only widened along this section due to the fact that it is under the jurisdiction of the MTO west of Rob Blake Way. The widening of Highway 3 beyond Rob Blake Way is not currently programmed.

Similar to the previous two figures, a comparison of the before improvements and after improvements, representing some of the improvements proposed in the "Improve LOS 'C' and 'D'" Alternative option, is provided in **Figures 5-18 and 5-19**.

The improvements along Church Street and James Street indicate that there is now more traffic volume along those two roadways. While it suggests that the level of congestion has increased along Church Street, it is important to note that the congestion level along Argyle Avenue has been reduced due to a lower volume. The improvements have resulted in vehicles preferring to use the major arterials rather than the collector roads.

Finally, **Figures 5-20 and 5-21** show a comparison of the Cockshutt Road improvements compared to the 2041 "Status Quo", representing the remaining improvements proposed as part of the "Improve LOS 'C' and 'D'" alternative option.

The improvements along Cockshutt Road have improved conditions in the overall area along parallel roadways. There are no longer roadways with north-south directionality with critical levels of congestion.


Figure 5-16 – Queensway West, 2041 PM Base


Figure 5-17 – Queensway West, 2041 PM Scenario 1

Figure 5-18 – Delhi, 2041 PM Base

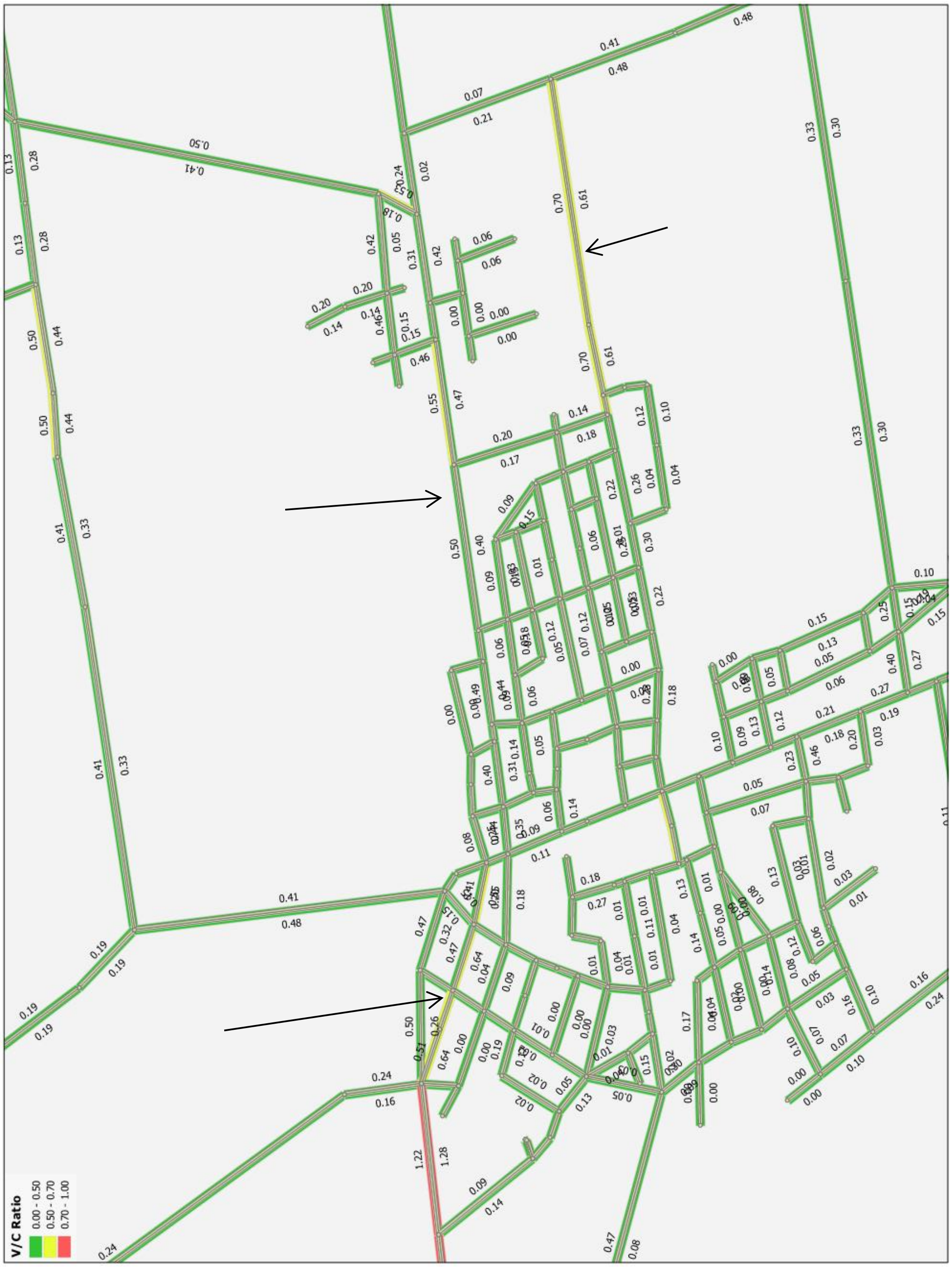


Figure 5-19 – Delhi, 2041 PM Scenario 2

Figure 5-20 – Rural Areas, 2041 PM Base

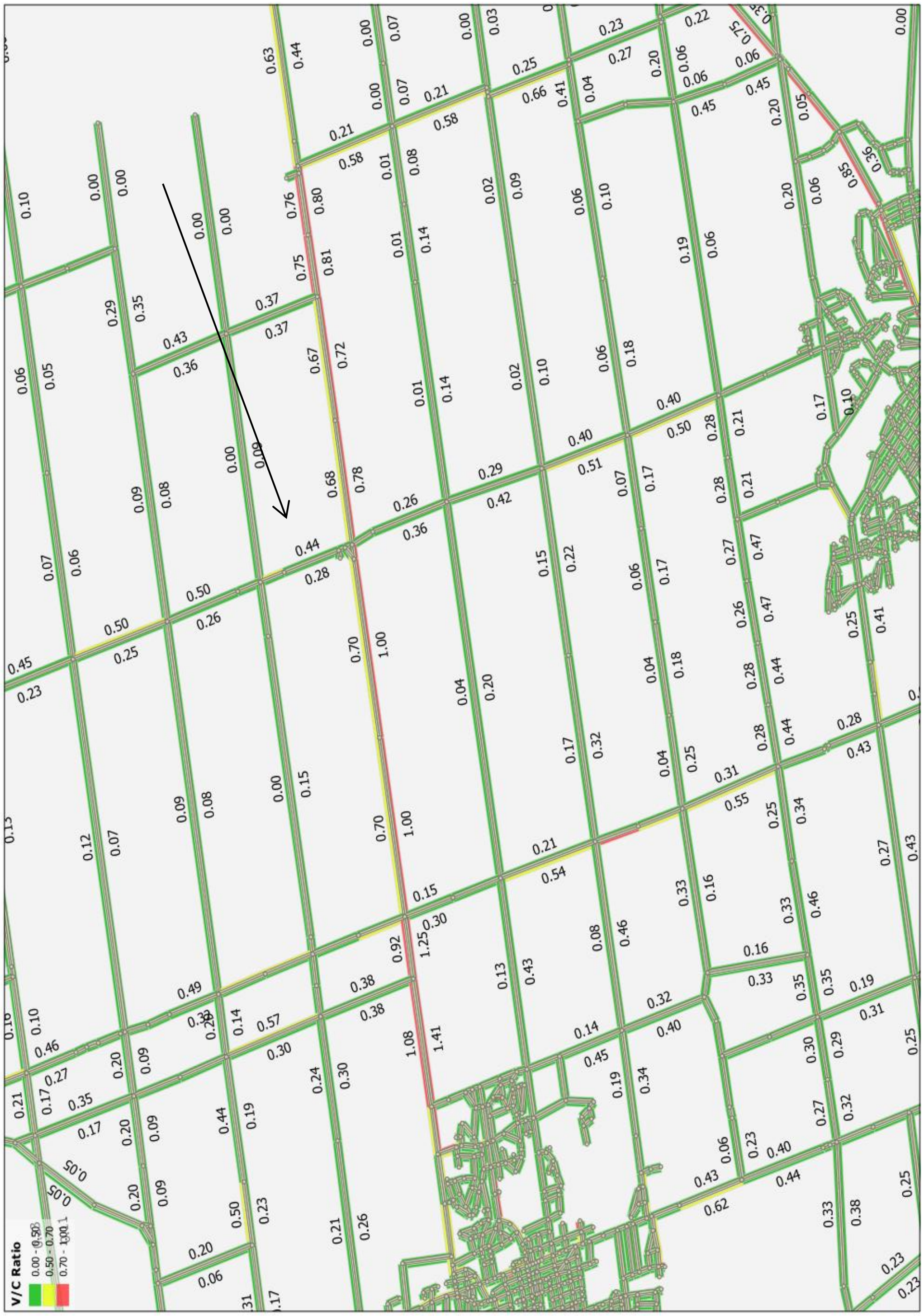
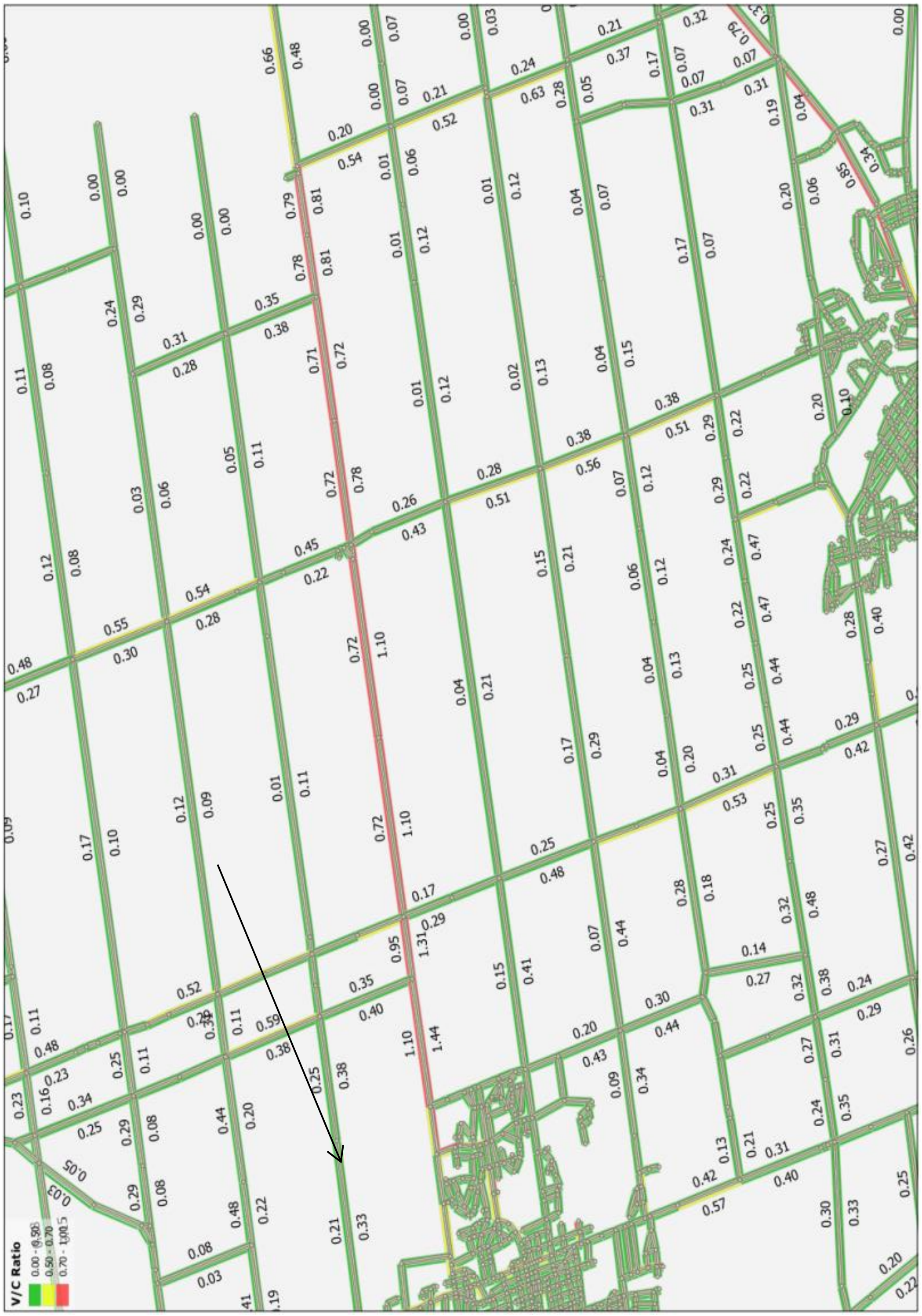


Figure 5-21 – Rural Areas, 2041 PM Scenario 2



The system metrics comparison for the two scenarios analyzed in 2041 is shown in **Figures 5-22 and 5-23**.

**Figure 5-22 – 2041 PM "Improve LOS 'D' Roadways" Scenario**

| System Metrics | Year: 2041 "LOS 'D'" |
|---|---|
| **Daily VKT*** | 4,776,184 |
| **Daily VHT*** | 80,250 |
| **Total Lane Kms** | 4,341 |
| **VKT on v/c>0.7** | 84,558 |
| **VHT on v/c>0.7** | 1,312 |
| **% VKT on v/c>0.7** | 1.8% |
| **% VHT on v/c>0.7** | 1.6% |
| **Congested Lane Kms (v/c>0.7)** | 96 |

**Figure 5-23 – 2041 PM "Improve LOS 'C' and 'D' Roadways" Scenario**

| System Metrics | Year: 2041 Scenario 2 |
|---|---|
| **Daily VKT*** | 4,795,977 |
| **Daily VHT*** | 80,355 |
| **Total Lane Kms** | 4,341 |
| **VKT on v/c>0.7** | 89,875 |
| **VHT on v/c>0.7** | 1,350 |
| **% VKT on v/c>0.7** | 1.9% |
| **% VHT on v/c>0.7** | 1.5% |
| **Congested Lane Kms (v/c>0.7)** | 102 |

The tables show that the VKT values for arterial class roadways have increased while the VKT values for collector and local roadways have decreased in Scenarios 1 and 2 from the Base Case scenario. While the percentages remain mostly unchanged, these changes in VKT values suggest that the improvements have shifted over traffic from collector and local roads to arterial roads, which ensures that arterials continue to provide their transportation function. This may result in some increased congestion on these arterial roads as we increase the number of improvements between Scenarios 1 and 2. This is indicated in the results by the slight increases in % VKT and VHT, as well as in congested lane kms between Scenarios 1 and 2. Overall, however, the network improvements have encouraged more travel in Scenario 2, which is what expected when we introduce more improvements to the network.

Furthermore, the fact that the %VKT on roads with a v/c greater than 0.7 has increased, while the %VHT on these same roads has decreased, indicates that more vehicles are travelling on the road and spending less time, indicating the impact of improvements on these busier roadways.

*Multiple Account Evaluation Framework*

Using the results of the alternative options, an evaluation framework was developed to guide the decision making process for assessing the improvements proposed for the capacity constrained locations, that reflect environmental, social, economic and transportation factors or "accounts". The framework consists of three key stages, as described previously:

1. **Improvement Screening:** the first stage was an initial screening process which identifies capacity constrained locations within the network, with v/c ratios of either 0.5 or 0.7. This was described in detail previously. An improvement that is most relevant to each of the capacity constrained locations was identified. This is because the selection process for each improvement, if selected, is intended to occur during the environmental assessment phase for each improvement. As a result, the "most appropriate" improvement was chosen at this time for each capacity constrained location.
2. **Proposed Alternative Options:** In order to group the improvements into "packages" to effectively determine a strategy for approaching currently identified improvements, as well as improvements identified in future Master Plans, the v/c thresholds identified above were grouped together. A "0.7 v/c threshold", representing an LOS 'D' condition where roads should be improved, and a "0.5 v/c threshold", representing and LOS 'C' condition where the roads could be considered for improvements, were compared with a "Status Quo" alternative which only included the already planned capital improvements noted in Section 3.1.2., and operational reviews of each improvement location in order to provide localized, intersection specific improvements if required. Each of these groups results in a set of improvements that will be evaluated as the alternative options for the development of the future road network.
3. **Evaluation:** The alternative options were evaluated using a Multiple Account Evaluation (MAE) approach where the various accounts provide input in the overall evaluation of the proposed improvement, enabling a balanced assessment of the proposed improvement. The following accounts were used in this evaluation:

- **Environmental:** measured as how much (in terms of length of frontage) would the alternative option infringe or impact any significant natural environment features such as a wetland, lake or forest.
- **Social:** whether the proposed improvement has a significant impact (in terms of area impacted) on adjacent buildings or property, in terms of access or visibility.
- **Economic:** the projected cost for the set of improvements.
- **Transportation:** represented by ratio of vehicle-hours travelled to vehicle-kilometres travelled, representing whether the delay per kilometer on the road network has changed after the improvements.

For the Environmental and Social accounts, each alternative was given a score of three if they had little to no impact, a score of two if they had some impacts, and a score of 1 if the improvement had major impacts.

For the Economic account, the scores were factored to take into account the magnitude of difference between each alternative. For example, the best economic score (lowest cost) was given a score of three. The score of the two other economic scores was determined using the following equation:

$$\frac{Lowest\ Cost}{Cost} \times 3$$

For the Transportation account, the score was calculated by comparing the vehicle-kilometres travelled (VKT) in the model for each option. In order to isolate the result of the improvements, only VKT on roads with a v/c ratio greater than 0.7 was evaluated. A higher vehicle-kilometres travelled indicates that there is more incentive to travel in the road network, and by corollary, less congestion. The highest VKT was related to the lowest VKT and scaled to the three point scale using the following equation:

$$\frac{VKT > 0.7}{Max\ VKT > 0.7} \times 3$$

The highest total score after evaluating each of the accounts is deemed to be the preferred alternative option.

### *Multiple Account Evaluation*

Based on the transportation analysis provided in the previous sub-sections, as well as information available in the transportation GIS database, the multiple account evaluation framework was applied to the proposed alternative options in **Figure 5-24**.

**Figure 5-24 – Multiple Account Evaluation**

| Multiple Account Evaluation of the Three Transportation Alternatives | | | | | | |
|---|---|---|---|---|---|---|
| **Scenario** | **Alternative** | **Environmental** | **Social** | **Economic** | **Transportation** | **Total Score** |
| 1 | Status Quo | 3 | 3 | 3 | 2.9 | 11.9 |
| 2 | Improve LOS 'D' roadways | 3 | 3 | 1.3 | 2.8 | 10.1 |
| 3 | Improve LOS 'C' and 'D' roadways | 2 | 1 | 0.7 | 3 | 6.7 |

A description for the basis of each score of each alternative is provided below:

"Status Quo Alternative"

*Environmental:* Few impacts expected on environmental areas, improvements are located within the urban area of Delhi.

*Social:* Minor impacts expected to property owners adjacent to unopened road allowances.

*Economic:* Lowest cost for improvements among the three alternatives, estimated at $1,805,000.

*Transportation:* As identified in Table 3.3, the VKT > 0.7 was modelled as 86,224. This is compared to the max VKT > 0.7 of 89,875.

"Improve LOS 'D' Roadways"

*Environmental:* Few impacts expected on environmental areas, improvements located within the Simcoe urban area.

*Social:* Right-of-way width on Queensway West is approximately 30m, sufficient for a 4 lane cross-section.

*Economic:* Cost for improvements estimated at $4,040,000.

*Transportation:* As identified in Table 3.4, the VKT > 0.7 was modelled as 84,558 compared to the max VKT > 0.7 of 89,875

"Improve LOS 'C' and 'D' Roadways"

*Environmental:* Some creeks and woodlots next to intersection locations, such as at St. John's Road East and Concession 14 Townsend, may be impacted.

*Social:* Right-of-way width on King Street (approximately 20m) may require additional property takings, or may impact parking. Other rights-of-way on Church and Cockshutt are sufficient for the turn lanes required.

*Economic:* Highest cost for improvements, total cost estimated at $8,055,000 Transportation: Table 3.5 shows that this alternative option had the maximum VKT > 0.7 of 89,875.

As a result, the preferred alternative option is the "Status Quo" Option. The amount of redundancy in the road network, in concert with the limited impact of the proposed changes and the high cost to implement the improvements, results in a preference to allocate capital funds towards already planned maintenance activities, rather than roadway expansion. However, this is not to say that no improvements should take place. Included as part of the "Status Quo" option, studies that analyze the operations of roadways on a localized level are encouraged. These can include observing specific intersections to determine the modifications required to achieve a better operation. An example of such a modification could be the signalization of a previously unsignalized intersection. The cost of implementation is relatively low when comparing to the capital costs of roadway expansions throughout the County, and this would address any prevailing issues that are localized. Furthermore, the evaluation indicates that the benefits of County-wide roadway expansion does not outweigh the large capital costs incurred, especially from the perspective of the network as a whole.

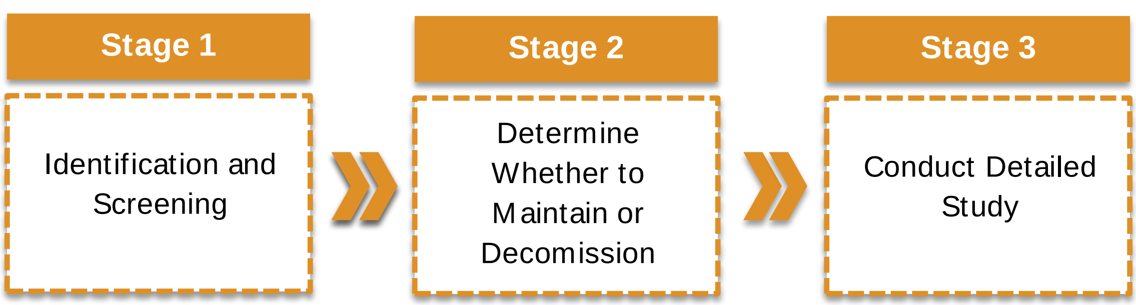
One of the major maintenance activities is the rehabilitation of Bridges and Large Culverts in the County, which is discussed in further detail in the following sub-section.

### 5.3.2 Bridge and Large Culvert Rationalization

Norfolk County is current responsible for 241 bridges or large culverts (culverts defined as longer than 3 m), over a quarter of which are nearing end of life. The Transportation Strategy has defined an approach which identifies the most critical bridges that should be reviewed as soon as possible, and also provides some guidance in determining the need for rehabilitation or decommissioning. It should be noted that this process is intended to work directly with the Ontario Structure Inspection Manual (OSIM) Inspections that are conducted every two years, the last of which was completed in 2014 by G. Douglas Vallee Limited. The intention is that the stages outlined below provide the rationale for whether a bridge/large culvert is important in a transportation context, whereas the OSIM inspection provides the County with information on whether the bridge is structurally safe. Structures that require rehabilitation but do not serve a transportation function are those that may be reviewed for decommissioning.

The bridge and large culvert rationalization is described in stages in **Figure 5-25.**

**Figure 5-25 – Bridge and Large Culvert Rationalization Process**




<u>Stage 1 - Identification and Screening</u>

This stage identifies bridges/large culverts currently at end of life which need to be reviewed from a maintenance perspective, which is also the logical point to review the structure in terms of transportation purpose. For Norfolk County, the end of life date was found by comparing the most recent date of construction in the Linear Asset database. **Figures 5-26 and 5-28** below show the bridges and large culverts currently at end of life, as well as the programed year for rehabilitation, in cases where these structures have already been identified for improvements by the 2014 OSIM.

For the future, the end of life list should be cross-referenced with the list of most urgent proposed rehabilitation or reconstructions from the latest OSIM report, which would provide information on the structural need for improvements to each structure. Structures that appear on both lists should be taken to Stages 2 and 3 of the process.

**Figure 5-26 – Bridges at or Beyond Design Lifespan**

| Structure ID | Age | Name | Location | AADT | Rehab Year |
|---|---|---|---|---|---|
| 000014 | 93 | Queensway Bridge | Queensway E. (Hwy #3) - 0.20km E of Hwy #24* | 16999 | -- |
| D00010 | 85 | Pen Central Underpass Con 8-9 | Windham W1/4 Line Road - 0.08km N of Windham Road 8 | 475 | -- |
| 010047 | 85 | Rockford Bridge | Con 11 Road Townsend - 2.17km W of County Road 70 | 350 | -- |
| 010092 | 85 | Concession 8 Villa Nova Road | Villa Nova Road - 0.5km S of County Road 9 | 262 | 2016 |
| D00022 | 85 | East St Underpass | East. St. Delhi - 0.03km N of Anne St. Delhi | 200 | -- |
| D00006 | 85 | Lot 11 Concession 3 Road | Concession 3 Road Windham | 180 | -- |
| 010043 | 81 | Lot 19 Concession 14 Road Townsend | Con14 Rd Townsend - 2.98km W of County Road 70 | 180 | -- |
| 010038 | 97 | Porters Bridge | Marburg Road - 0.48km N of County Road 3 | 150 | -- |
| 000110 | 95 | Big Creek Bridge | Con A Road, S. Wals. - 2.6km W of County Hwy#59 | 150 | -- |
| 010048 | 85 | Hall Bridge | Con10 Road Townsend - 1.85km W of County Road 70 | 120 | -- |
| 010105 | 75 | Cemetery Road Bridge | Cemetery Rd Con3 Townsend - 1.1km S of County Road 20* | 70 | 2016 |

| Structure ID | Age | Name | Location | AADT | Rehab Year |
|---|---|---|---|---|---|
| D00016 | 85 | Norwich Road Bridge | Norwich Road, Delhi - 1.0km N of King St. Delhi | 50 | -- |
| 000303 | 85 | Big Creek Bridge | 8th Con Road N Wals. - 1.7km W of E1/4 Line Road | 50 | -- |
| D00013 | 85 | Side Road Lot 22 Bridge | Windham Road 19 - 1.1km S of Windham Road 9 | 30 | 2015 |
| 000103 | 95 | Venison Creek Bridge | Troyer Rd. – 0.65km N of County Rd 60 | 10 | -- |
| 000105 | 95 | Big Creek Bridge | Hazen Rd. - 0.55km N of County Rd 60 | 10 | -- |
| 002122 | 17 | Dedrick Creek 4th Concession Bridge | 4th Concession Road South Walsingham | - | - |

*Note: Review of street view imagery indicates that this bridge may have been rehabilitated recently. If so, the Linear Asset Database should be updated accordingly.

Figure 5-27 – Bridges at or Beyond Design Lifespan

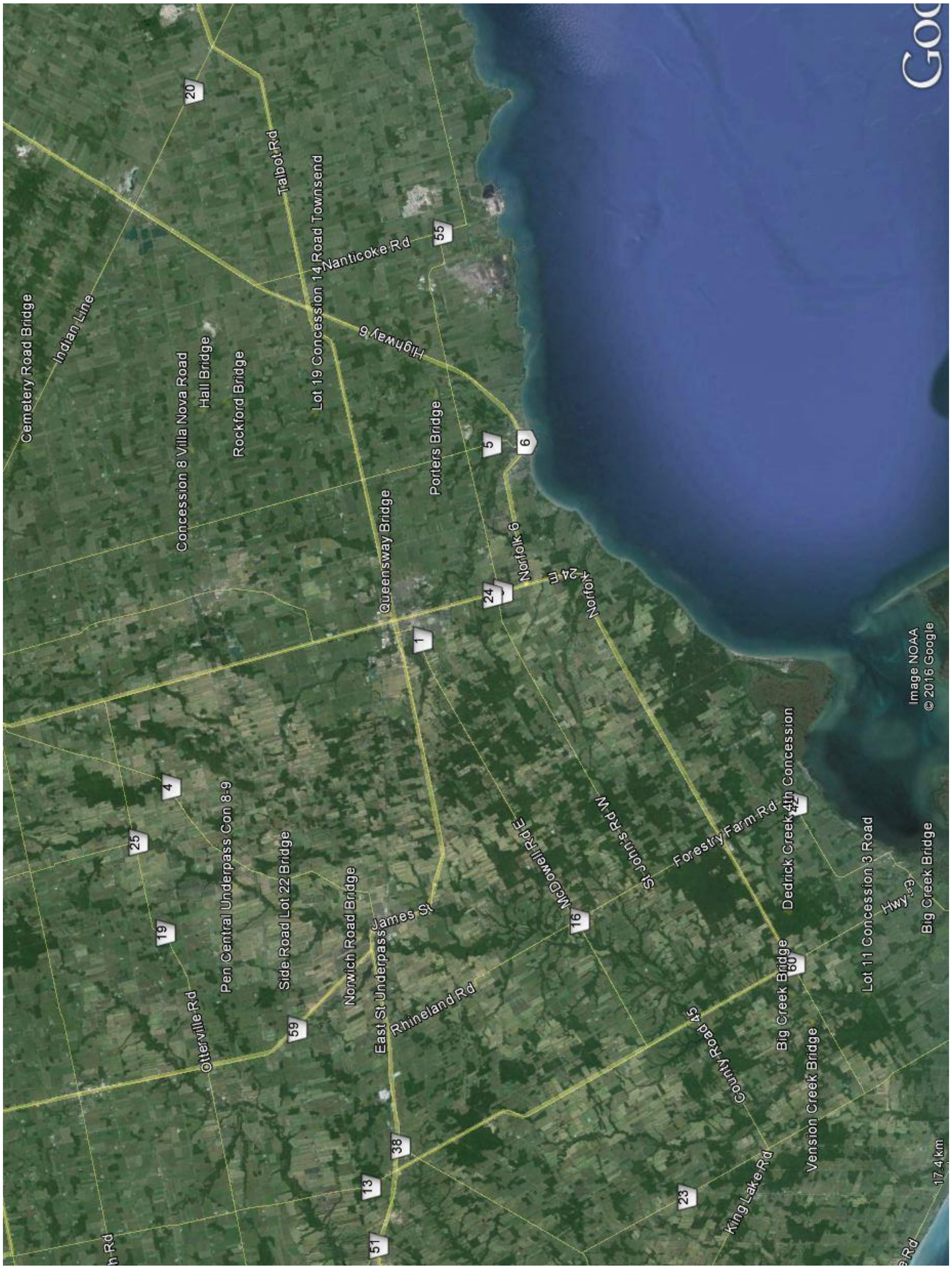


**Figure 5-28 – Large Culverts at or Beyond Design Lifespan**

| Structure ID | Age | Name | Location | AADT | Rehab Year |
|---|---|---|---|---|---|
| 974601 | 86 | Pinegrove Lake Culvert | County Road 46 Vilbersville | 2498 | -- |
| 10065 | 95 | Lot 14 Concession 2 | Concession 2 Woodhouse | 180 | -- |
| 2114 | 96 | Lot 9 Concession A-B Overflow | Con A Road, S. Wals. - 2.85km W of County Hwy #59 | 150 | -- |
| 2113 | 96 | Lot 8 concession A-B Overflow | Con A Road, S. Wals. - 2.8km W on County Hwy #59 | 150 | -- |

It should be noted that those bridges recommended for replacement or rehabilitation in the 2014 OSIM have already been programmed for improvements. However, if possible prior to replacement or rehabilitation, these structures should be reviewed to determine whether they continue to serve an important transportation function through the remaining stages as detailed below. This may preclude the need for improvements.

Our understanding is that Side Road Lot 22 Bridge (Asset D00013) is currently undergoing an environmental assessment (EA), and should be reviewed immediately. Big Creek Bridge (Asset 000110) is also undergoing an EA but does not have a programmed year for improvements.

Stage 2 - Determine whether to maintain or decommission

Generally speaking, structures that provide a proven transportation purpose should continue to be maintained. A transportation purpose would include:

- Whether the bridge or culvert provides the only connection to and from a property;
- If the bridge or culvert transports at least 200 vehicles per day, representing the threshold that the MTO Structural Manual uses as the safe point at which a one-lane bridge would provide adequate capacity for both directions of travel, therefore indicating whether a bridge/large culvert is well travelled or not; and

- If alternate routes are available within a 1km radius. A 1km radius roughly accounts for the spacing of the County's grid road network. Assuming that if an alternate route is available within for use in the grid network, it should be used for an otherwise underutilized structure. This would also ensure that emergency services are not adversely affected by removing the bridge or large culvert link.

As stated previously, given that the Concession 8 Villa Nova Road Bridge, the Cemetery Road Bridge, the Side Road Lot 22 Bridge and the Big Creek Bridge are proposed for improvements or are currently undergoing studies in the immediate term, these should be reviewed immediately to determine if they still serve a transportation function that would necessitate their programmed rehabilitation or replacement.

Stage 3 – Conduct Detailed Study

A detailed study must be undertaken for any rehabilitation work simply due to the nature of the design work that will be required. Furthermore, if a structure is noted as not serving a transportation function and is proposed for decommissioning, a detailed study should also be undertaken to ensure that there are no issues identified which would require the bridge or large culvert be maintained, such as unforeseen property access concerns or impacts to emergency service response time. Furthermore, this study would also determine whether the structure can be maintained for Active Transportation or other uses with minimal maintenance and upgrades. Any repair or reconstruction design work for bridges and culverts should be completed in accordance with the OSIM, the Canadian Highway Bridge Design Code, and the MTO Structural Manual.

It is recommended that the structures identified for improvements in the table above proceed with Stages 2 and 3 of the process. The remaining structures should be reviewed upon requiring improvements to maintain their structural integrity, with a priority being place on those structures with the highest and lowest AADTs. These high and low AADT structures are likely the ones that either must be repaired or replaced immediately, or could immediately be decommissioned or repurposed for other uses.

Following the Bridge and Culvert Rationalization process, the Dedrick Creek 4th Concession Bridge (ID 02122), which was closed previously, was analyzed using this new framework. It was found that the reopening of the bridge is not warranted as there are alternate routes available within a 1km radius in the form of Norfolk County Highway 24 and 3rd Concession Road. Furthermore, the bridge is not the only connection to and from a property.

### 5.3.3 Proposed Policy Additions

The Transportation Strategy is intended to provide guidance for future transportation in Norfolk County. The previous sub-sections outlined the infrastructure requirements, and this sub-section is intended to outline the policies and guidelines which should be adopted in order to provide the necessary support for future transportation infrastructure needs.

***Traffic Control Policies and Guidelines***

The review of existing policies and guidelines did not indicate any standards or information relating to the implementation of traffic control measures such as four-way stops, school crossings, traffic signals, signage and other measures. Implementation has generally relied on industry standards where possible. The intention of the Transportation Strategy is to formalize this process, utilize Ontario standards, and ensure that a consistent approach is taken for all future requests for this infrastructure.

Ontario Traffic Manual

The Ontario Traffic Manuals are intended to provide guidance for municipalities within Ontario on the design, application and operation of traffic control devices and systems. There are currently 11 books available which provide guidance on the following topics outlined in **Figure 5-29**.

**Figure 5-29 – Ontario Traffic Manuals**

| Book Number | Topic |
|---|---|
| 1 | Introduction |
| 2 | Sign Design, Fabrication and Patterns |
| 5 | Regulatory Signs |
| 6 | Warning Signs |
| 7 | Temporary Conditions |
| 10 | Dynamic Message Signs |
| 11 | Pavement, Hazard and Delineation Markings |
| 12 | Traffic Signals |
| 15 | Pedestrian Crossing Facilities |
| 18 | Cycling Facilities |
| 19 | Advanced Traffic Management Systems |

Of the manuals described above, all of them with the exception of 10 and 19 have applicability within Norfolk County and should be used as the guidelines for implementation of regulatory and warning signage (Books 2, 5 and 6), temporary construction conditions (Book 7), pavement markings (Book 11), and traffic signal installation (Book 12). Some of the roadway improvements described in the OTM are also included in the proposed Transportation Impact Study Guidelines, described in Section **5.3.4**. The Active Transportation Strategy also identifies Book 15 and 18 be adopted for the design of AT facilities, in conjunction with the design guidelines notes in the AT Strategy.

***Traffic Calming***

Currently, traffic calming requests are responded to on an ad-hoc basis. In order to ensure that traffic calming requests in the County meet current standards, it is recommended that the County adopt the Canadian Guide to Neighbourhood Traffic Calming as the guiding document for the design and installation of traffic calming measures.

In addition to adopting this guiding document, traffic calming guidelines are recommended to be created within the next five years which will be context-appropriate for Norfolk County, and will provide a process for the evaluation and prioritization of requests. Similar policies which have been prepared in the past include current guidelines for the City of Toronto (2010), the City of Kingston (2007) and the Town of Ajax (2007), which may form the basis for this proposed guideline.

***Special Events Protocol***

Norfolk County is unique among other counties in the province in that there are regular, large scale events that occur that have significant impacts on the roads. One of the largest is the Friday the 13th Motorcycle Rally in Port Dover (also known as PD13) that draws a significant number of people from across Ontario, typically over 100,000 motorcyclists during the summer time.

While it is not practical to plan infrastructure to accommodate one-day events such as PD13, one of the benefits of having a grid network of roads such as the one in Norfolk County is that there is significant redundancy in the network, both from a routing as well as a capacity standpoint. There may be some options, such as the temporary conversion of some two-way roadways to one-way roadways, which may provide benefits for entering and exiting the Port Dover area during these busy times. Temporary traffic control plans could also be extended to other event planning within the County, again leveraging the dense grid network of roads.

Interaction with local OPP who would be responsible for enforcing these detours would be essential, as would ensuring that any new plans for traffic control during events do not conflict with existing plans administered by OPP.

It is recommended that Norfolk County staff, in consultation with the OPP, investigate the feasibility of preparing a special events protocol which would outline roads that could have different designations and functions, such as temporary conversion of two-way roads to one-way, before, during and after regularly scheduled events in the County.

### 5.3.4 Norfolk County Design Criteria Additions

As part of the policy review, the County's current design criteria were reviewed to determine whether additional information should be added which relates specifically to transportation studies and infrastructure. In our review, it was determined that the following information should be included as described below.

#### *Transportation Impact Study Guidelines*

*Norfolk County Design Criteria, Section 3*, identifies the engineering review requirements for functional servicing reports in support for plans of subdivision. Within the section there is a requirement for completion of a traffic impact study. However, based on our review there is currently no standard for the preparation and submission of this traffic impact study, which may result in varied submission scope and quality.

As a result, it is recommended that Norfolk County adopt the proposed Transportation Impact Study Guidelines provided in **Appendix J** of the report and incorporate them as a new subheading within the Design Criteria. The proposed Guidelines are based on the Ministry of Transportation of Ontario's (MTO) *General Guidelines for the Preparation of Traffic Impact Studies*, The intention of the guidelines is to provide an industry-standard approach to the completion of these studies, while including components that are of most importance for development within the County.

### *Operations Studies*

In some cases, conducting transportation impact studies may not always be warranted, especially for small scale and more localized issues. In cases when there are traffic operations issues and a TIS is not warranted, small scale operations studies are more appropriate. These operations studies should continue to follow, as much as is appropriate, the roadway improvement guidelines outlined in the proposed Transportation Impact Study guidelines described above. This includes, but is not limited to, installing all-way stop controls or roundabouts, signalizing intersections, modifying intersection configurations or widening roadways.

### *Sidewalks*

Currently in the Norfolk County Design Criteria, the requirement for having sidewalks on both sides of roadways only applies to major roadways. The definition a major roadway is provided in the design criteria. As part of this transportation strategy, it is recommended that sidewalks be provided on both sides of major and minor roadways, requiring revision to Section 6.6.00 of the Design Criteria. Sidewalks should continue to be designed based on the Ontario Provincial Standards.

### *Roundabouts*

There are currently nation-wide guidelines for the selection and design of roundabouts. However, roundabouts are in operation in Ontario as well as other provinces across Canada. The most relevant example of this would be the Region of Waterloo Roundabout Guidelines due to its presence in Ontario. The Region of Waterloo has incorporated a feasibility assessment of roundabouts in its Transportation Impact Study Guidelines. The assessment highlights a detailed process to follow that determines whether the use of a roundabout is best suited to the situation. This includes factors such as vehicle volume and collision data, amongst other factors. The guidelines from Waterloo also reference *"An Informational Guide to Roundabouts"* by the US Federal Highway Administration (FHWA), along with the State of Wisconsin Department of Transportation Manual.

An approach similar to that used by Waterloo can be adopted for Norfolk County. While there are no warrants for roundabouts like there are for stop controls and traffic signals, a more qualitative process is required to determine the cost to benefit analysis of implementing a roundabout. For further Canadian inspiration, the province of British Columbia has design guides for roundabouts available from their Ministry of Transportation. A detailed methodology for better understanding the implications of roundabouts can be established from these resources.

It is recommended that the County adopt the cost to benefit analysis currently in use in Waterloo to determine whether a roundabout is an appropriate form of intersection control. This will require approval from Waterloo Region to seek their approval for use of their guidelines, and also to obtain the necessary forms identified. Should Waterloo Region approve, our recommendation is to include the language and standards shown in **Appendix K**, and incorporate the text and drawing into Section 6 of the Design Criteria.

## 5.4 Recommendations

The preferred alternative for infrastructure improvements is the "Status Quo" option, which recommends the implementation of the 2015 capital program. No additional road improvements are recommended.

The County's Road Rationalization and Goods Movement networks help to prioritize the roads in the County and assign a level of importance to each roadway relative to others. Thus, these networks can be used in the future to prioritize maintenance and improvement plans.

Several additional guidelines and policies are recommended to be adopted in order to provide better guidance to staff within the County. These proposed guidelines and policies bring the County in line with current Ontario standards, and help to effectively administer the County's resources to the roadways, bridges and culverts. Finally, they provide the necessary tools to measure the impacts of growth within the County and determine any local operational improvements that may be required.

### 5.4.1 Summary of Recommendations and Phasing

A map showing the goods movement network, locations of transportation improvements that were reviewed but ultimately not recommended, and active transportation strategy can be found on **Figure 5-30, Appendix L**. A table summarizing the recommendations of the Transportation Strategy is provided in **Figure 5-31**. In addition, the proposed horizon for each improvement is provided. The table should be reviewed at each Transportation Strategy update to ensure that the findings are still relevant, particularly the medium and long term recommendations.

**Figure 5-31 – Summary of Transportation Strategy Recommendations**

| | Name | Improvement Type | Location | Description |
|---|---|---|---|---|
| Short Term (0 5 Years) | Programmed Bridge Rehabilitation Review | Infrastructure | Concession 8 Villa Nova Road, Cemetery Road, Side Road Lot 22, Big Creek Bridge | Review the need to rehabilitate these bridges immediately in order to ensure that they are still needed for transportation access, emergency, road network and other purposes, as outlined in **Section 5.3.2**. |
| | Bridge and Large Culvert Review | Infrastructure | Various County-Wide | The remaining 17 bridges and large culverts identified in **Figures 5-26 and 5-28** should be reviewed immediately following the steps outlined in **Section 5.3.2**. |
| | Traffic Control Guidelines | Policy | County-Wide | Adoption of OTM Books for traffic control device and system standards within the County. |
| | Traffic Calming | Policy | County-Wide | Develop County-specific Traffic Calming Policy based on the Canadian Guide to Neighbourhood Traffic Calming, and other municipality specific guidelines. |
| | Special Events Protocol | Policy | County-Wide | Develop Special Events protocol to accommodate regularly scheduled tourist events, in consultation with tourism agencies and OPP. |
| | TIS Guidelines | Design Criteria | County-Wide | Adopt TIS Guidelines as shown in **Appendix J** as part of a new subsection of the Norfolk County Design Guidelines. |
| | Sidewalks | Design Criteria | County-Wide | Include a requirement for sidewalks on both sides of major and minor roads. Change Section 6.6.00 of the Design Criteria to reflect this recommendation. |

| | Name | Improvement Type | Location | Description |
|---|---|---|---|---|
| | Roundabouts | Design Criteria | County-Wide | Adopt the text and figure provided in Appendix K as part of Section 6 of the Design Criteria, to reflect the standards to be used in the County for roundabout selection and construction. |
| | Designate Goods Movement Network | Policy | County-Wide | Designate Goods Movement network as proposed in **Section 5.2.1.** |
| | Designate Road Rationalization Network | Policy | County-Wide | Designate Primary, Secondary and Tertiary Road networks as proposed in **Section 5.2.1**, indicating the relative importance of roads within the County to be used for future prioritization of maintenance and improvement plans. |
| **Medium Term (6 15 years)** | Transportation Strategy Update | Policy | County-Wide | The conclusions of this Transportation Strategy should be reviewed on a 5-year basis to ensure that the assumptions are still valid. |
| **Long Term (16 25 years)** | Reconstruct Goods Movement Network | Infrastructure | Various County-Wide (See **Figure 5-4**) | At the appropriate time for rehabilitation and reconstruction, the roads identified as goods movement corridors should be reviewed to determine whether they need to be reconstructed to a standard which would preclude the need for a half-load restriction. The need would be based on industry requirements in the adjacent industrial lands. |

# 6.0 ACTIVE TRANSPORTATION STRATEGY

## 6.1 Introduction

As part of the Integrated Sustainable Master Plan (ISMP) – specifically the transportation master plan - the consultant team developed a long-term active transportation strategy. The strategy is a comprehensive blueprint for future planning, design, implementation and maintenance of active transportation (walking and cycling) facilities and programs.

The AT Strategy was developed as a stand-alone plan; however, it has been integrated into the phasing and costing for other County infrastructure recommendations / improvements to facilitate efficient and effective implementation. The full strategy is contained in a separately bound appendix. Highlights from the strategy are included in the following sections.

### *What is Active Transportation?*

Active Transportation refers to "any human powered transportation – walking, cycling, using a wheel-chair, in-line skating or skateboarding" (Public Health Agency of Canada). This definition provides the context and basis for Norfolk County's AT strategy by defining the potential users that the active transportation network will be developed for. Within Norfolk County, the focus of route and network planning will be on two primary AT user groups – pedestrians and cyclists.

### *What are the benefits?*

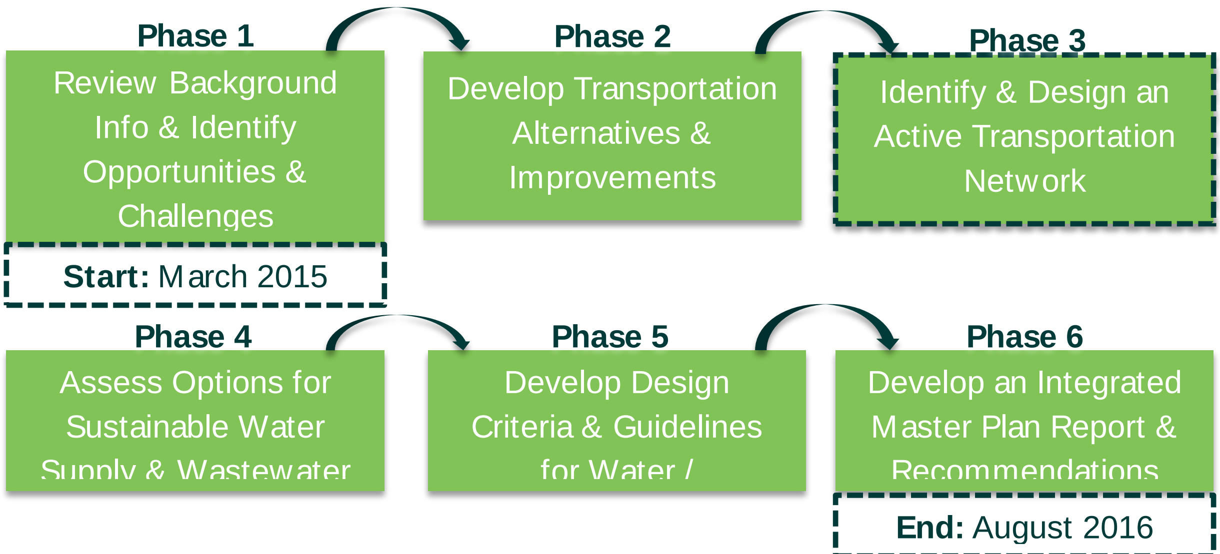
Cycling has been growing within Norfolk County as a tourism opportunity as well as a means of getting to school and work within local communities. The potential for growth within these two areas is significant. Investing in AT should be a priority for the County. Providing opportunities for AT can lead to a number of benefits including reduced heart disease, improve mental well-being, a reduction in the number of motorized vehicles on the road, improved safety for pedestrians and cyclists, a greater sense of comfort and security, increased local tourism and economic investment and a reduction in road congestion.

More detailed information on the potential benefits to increased investment in AT are provided in separately bound **Technical Appendix A-2** of the Active Transportation Strategy Report.

### *Process Overview*

As noted in earlier sections, the AT Strategy was completed as part of the County's Integrated Sustainable Master Plan. The strategy was one component of a six phase study process which was completed between March 2015 and August 2016. The process used to develop the ISMP is illustrated in **Figure 6-1**. The AT Strategy was developed as part of Phase 3 of the process.

**Figure 6-1 – Overview of the ISMP Study Process**




### *Consistency with the Municipal Class Environmental Assessment*

When planning and designing for municipal infrastructure projects, the Municipal Class Environmental Assessment (MCEA) process is typically applied. The MCEA is made up of five phases. Environmental Assessment Act includes requirements and guidelines for the development of master plans. There are five approaches that can be used to develop master plans.

The application of the MCEA process is determined by the approach that is determined. For the Norfolk County AT Strategy, the team applied approach #1 which meant that Phases 1 and 2 of the MCEA process were fulfilled. Highlights of the results are documented in the section below. Additional information on the MCEA phases and steps undertaken are provided in **section 2.1.2** of the AT strategy.

### *Understanding the Background*

There are a number of supportive policies and plans that have been established which guide the content and direction of Norfolk's Active Transportation strategy. Policies and plans are available at all levels of government i.e. the province's #CycleON Strategy which provides directions on cycling priorities throughout the province, Trails Actions Plan which provides trail specific actions for the province's consideration; the County's Trails Master Plan which includes a comprehensive strategy and action plan for the design and implementation of off-road trails; and plans and strategies from surrounding municipalities.

This support gives the County a strong basis from which to identify active transportation policy and infrastructure improvements at the local level. More detailed information on the policies that were reviewed and considered as part of the development of the AT Strategy are provided in **Technical Appendix A-1** of the AT Strategy Report.

### *What did we hear?*

Consistent with the requirements of the MCEA process the project team consulted at two points in the study process. Consultation occurred with internal staff, members of the public and political / agency stakeholders to guide the development of the AT vision and objectives and to highlight AT route opportunities, barriers and priorities. The consultation and engagement activities included an online questionnaire and study webpage, three meetings with Pathways for People which were held in a workshop format, two Public Information Centres and four Technical Review Committee meetings.

A number of the comments provided at these consultation events focused on active transportation improvements throughout the County. Some highlights include:

- Prioritize connecting sidewalks gaps within the built-up areas.
- Developing a continuous and connected sidewalk network would provide access to schools for youth and parents.
- Providing accessible connections for people of various ages and abilities.
- Developing a connected system of on and off-road cycling and pedestrian facilities that provides access to key destinations throughout the County (e.g. bakeries, wineries, conservation areas, restaurants, etc.) for residents and tourists.

Developing connections to surrounding municipalities.

## 6.2 Developing the Active Transportation Strategy

Using the background information reviewed and the input received through public and stakeholder consultation the consultant team prepared a Made in Norfolk County Active Transportation Strategy. Additional details on how the Strategy was shaped and developed are provided in the sections below.

### 6.2.1 Shaping the Strategy

#### *Problem / Opportunity Statement*

One of the first steps in the MCEA process is the development of a problem / opportunity statement. A statement was prepared for the ISMP and was developed to clearly identify what is intended to be addressed as a result of the completion of the study. The following is the statement that was prepared for Norfolk County.

> ***This study will propose a collection of active transportation, transportation and water / wastewater municipal infrastructure improvements that will function as a tool for Norfolk County to prioritize projects and implement them in an integrated fashion, based on a planning horizon of 2041.***
>
> ***The study will identify individual infrastructure needs for the above noted elements and will develop solutions that address these needs as well as their inter relationships and financial sustainability, on a short, medium and long term basis."***

#### *AT Vision and Objectives*

A long-term vision statement was prepared for Norfolk County that builds upon the 2009 Trails Master Plan and input received from key stakeholders, interest groups, and County staff. The following is Norfolk's vision for AT.

> ***Norfolk County's Active Transportation system complements and connects existing and future off road trails with a network of on road cycling facilities that link people with places. The system provides residents and visitors with a continuous and connected system of facilities that are designed with safety in mind and are comfortable for active transportation users and integrated with local transit.***

A vision statement is typically supported by specific objectives that are meant to be achieved through the implementation of proposed strategies, actions and recommendations outlined in the master plan. The following objectives were developed to support for AT in Norfolk County.

1. **Build on Successes** – Reinforce policies, plans and recommendations from the 2009 Trails Master Plan.
2. **Provide Policy Support** – Establish supportive planning and design policies and guidelines for AT.
3. **Create a Connected System** – Identify missing links and connections to create a continuous system of facilities.
4. **Design for Safety and Comfort** – Design facilities with safety and comfort in mind as well as various user groups.
5. **Identify Priorities** – Identify short, medium and long-term priorities for implementation.
6. **Increase Awareness** – Develop strategies and actions that increase awareness and educate people on AT options.

### 6.2.2 Developing the Network

The active transportation network is the cornerstone of the strategy. Identifying a long-term active transportation network made up of various routes and facility types is one of the primary objectives of the master plan.

The process used was founded on best practices and lessons learned from Southern Ontario Municipalities as well as current best practices and guidelines such as Ontario Traffic Manual (OTM) Book 18: Cycling Facilities and the Ministry of Transportation's Bikeways Design Guidelines. The following sections outline how Norfolk County's AT network was developed.

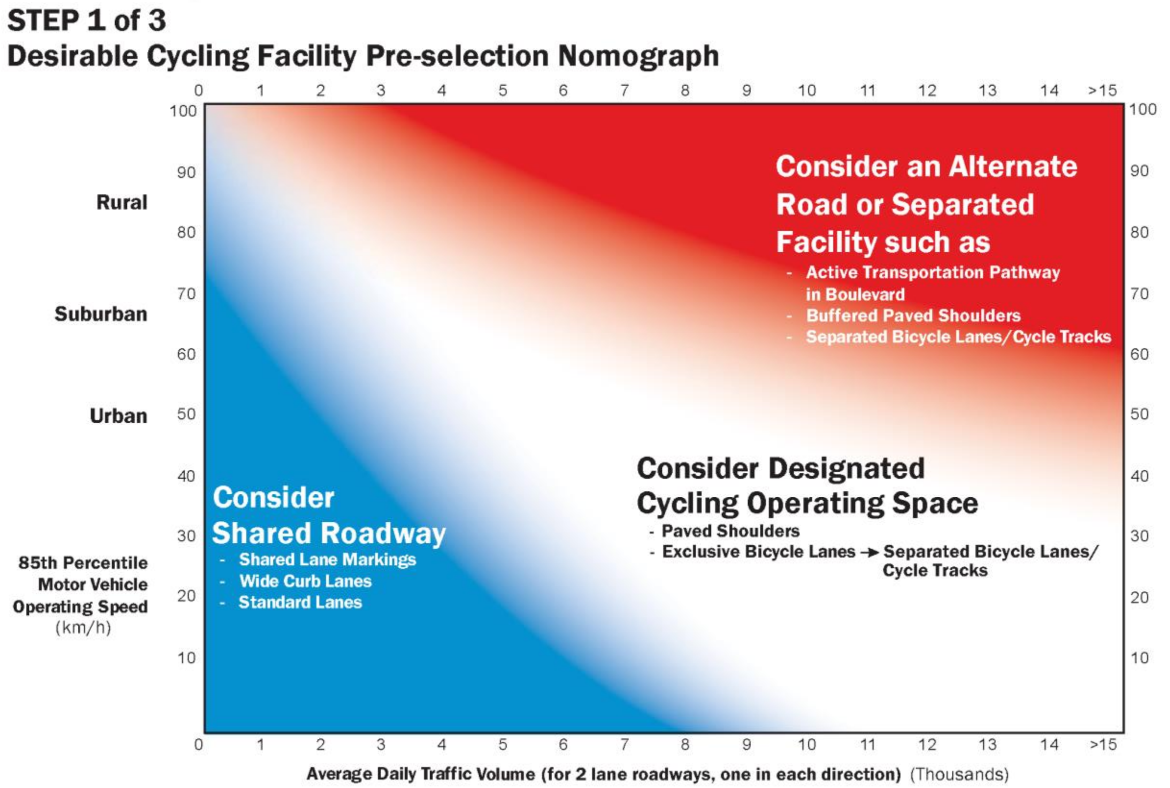
#### *The Process*

The AT network was developed using an eight step iterative development process. The steps are not intended to be completed in sequence but rather guide the project team to confirm the preferred AT network, facility types and implementation strategy. The steps of the process are illustrated in **Figure 6-2**.

When developing the network, the consultant team focused on steps one through six. Step six included an additional process to select preferred facility types. The process used was consistent with the selection tool identified in OTM Book 18: Cycling Facilities in **section 3.0**. The tool is made up of a three step process which uses Average Annual Daily Traffic (AADT) volumes and operating speed to identify an initial recommendation of a level of separation for potential facilities (see **Figure 6-2**) followed by more detailed investigation of context specific characteristics to determine the preferred facility type. Additional details are provided in **Section 3.0** of the AT Strategy.

**Figure 6-2 – Network Development Process for Norfolk AT Strategy**

**Figure 6-3 – OTM Book 18 Facility Selection Tool, Step 1: Nomograph**




The process specifically looks at the design of cycling facilities with some consideration for multi-use facilities that accommodate both pedestrians and cyclists. As this strategy addresses both pedestrians and cyclists another approach / process was used to consider and design pedestrian improvements. In addition to the existing off-road pathway system which accommodates pedestrians, the other primary facility type that pedestrians use are sidewalks. As part of the network development process the team mapped existing sidewalks and the "walkable area" around schools (~1.6km or less). Using this information, gaps in the system and priorities for improvements were identified. The priorities include roads where an AT route has been proposed where a sidewalk connection is missing on either one or both sides of the roadway. The implementation of sidewalk connections is intended to be determined on an annual basis by County staff based on available budgets.

### *Outcome: Norfolk's AT Strategy*

The outcome of the network development process, the application of OTM Book 18's facility selection tool and sidewalk gap prioritization assessment is a proposed AT network for Norfolk County. The AT network is made up of on and off-road linkages that span the County, connect to surround municipalities, link major communities and local destinations, provide access to areas of natural and cultural significance and provide a range of options for various pedestrians and cyclists. The proposed AT network is identified in **Maps 1a** to **1c** and illustrates the proposed facility types. **Maps 2a** and **2b** highlight the sidewalk priorities / missing links. A summary of the proposed facility types (including missing sidewalk linkages) that make-up the County's AT network are presented in **Figure 6-4** below.

**Figure 6-4 – Overview of the Proposed AT Network for Norfolk County**

| Facility Type | Existing | Proposed | Total |
|---|---|---|---|
| **Active Transportation Improvements** | | | |
| Off-road Trail | 368 | 23.2 | 391.2 |
| In-boulevard multi-use trail | 0 | 4.4 | 4.4 |
| Buffered Paved Shoulder | 0 | 33 | 33 |
| Paved Shoulder | 8.6 | 242.6 | 251.2 |
| Bike Lane | 0 | 12.7 | 12.7 |
| Signed Bike Route | 0 | 411.3 | 411.3 |
| Signed Bike Route with Edgeline | 0 | 3.2 | 3.2 |
| Signed Bike Route with Sharrow | 0 | 7.3 | 7.3 |
| **Total** | 377 | 738 | 1114 |
| Sidewalk Improvements | | | |
| Sidewalks | 153.4 | 290.8 | 444.2 |
| **Total AT Improvements** | 530.2 | 1028.5 | 1558.5 |

Details on the design of proposed facility types are included in separately bound **Technical Appendix A-3** of the AT Strategy report which is meant to be used as a design toolbox for those involved in the design and construction of AT infrastructure. These guidelines build on accepted provincial documents (as noted above) and are meant to be used as a reference as the AT network is implemented.

### 6.2.3 Strategic Actions

In order to move forward through to implementation it is important to set-out strategic actions that support the objectives of the Strategy. The AT Strategy identifies four strategic directions – Planning & Design; Process & Coordination; Implementation & Operation; and Promotion & Outreach. The table below includes a summary of the intents and purposes of the strategic directions and the recommended actions which, if implemented, are intended to help achieve the County's goals and objectives for AT. Further details are provided in Section 4.0 of the separately bound AT Strategy.

| Planning & Design | Process & Coordination | Implementation & Operation | Promotion & Outreach |
|---|---|---|---|
| Strategies that help guide the design and implementation of AT facilities and infrastructure improvements. | Strategies that will help to guide the coordination of the strategy's implementation and improvements to local policies to improve the planning process. | Strategies that are intended to guide implementation, operation, management, maintenance and monitoring of the active transportation network. | Strategies that are intended to help improve / increase active transportation through promotion, outreach, programming and education. |
| • Establish & Apply Consistent Design Guidelines<br>• Designing Complete Streets<br>• Implementing Interim Facilities<br>• Designing for Various Users Groups<br>• Design with Accessibility in Mind<br>• Prioritizing Sidewalk Improvements | • Connecting Community Areas<br>• Integrating with the Development Community<br>• Defining Roles and Responsibilities<br>• Planning for Future AT Systems<br>• Establishing Supportive Policies<br>• Integration with the Land-use Planning Policies | • Integrating the on and off-road network<br>• Implementing Network Amenities<br>• Integrating with other Infrastructure Planning Initiatives<br>• Seasonal Considerations<br>• Risk Management & Liability<br>• Monitoring & Evaluating Successes | • Enhancing Cycling Tourism<br>• Designing for Safe Routes to School<br>• Coordinating with Existing Committees<br>• Moving Towards a Bicycle Friendly Community<br>• Establish & Promote Key AT Messages<br>• Exploring New Partnerships |

## 6.3 Implementing the Active Transportation Strategy

The master plan is meant to be a long-term guide for the County and has been developed as a blueprint for future planning, design and development of AT infrastructure. The strategy is not meant to be a prescriptive road-map but a flexible tool to help the County with future coordination and decision-making.

### 6.3.1 Phasing Overview

The implementation of the AT Strategy has been organized into three phases that are consistent with those identified for the transportation master plan and water / wastewater master plan for efficiency purposes. The phasing strategy focuses on the short and medium-term (the next 15 years) which is the anticipated timeline until the next update to the County's AT strategy. Within each phase the previously budgeted / confirmed capital works (as determined by Council) and projects identified in the County's roads database as potential projects for future reconstruction and / or rehabilitation are identified. It has been assumed that funding has been made available for the capital works projects while future funding may be made available for the previously planned projects.

The AT system that is achieved solely with the implementation of capital works projects, project funded by development charges and road improvements is relatively comprehensive. The routes are illustrated on **Maps 3a – 3c** in **Appendix M**. Though there are a number of routes that have already been planned for, there are still some missing links that could provide County-wide connectivity and continuity for cyclists and pedestrians. In order to achieve some of the overall strategy objectives, select linkages were identified for the County's consideration within the short and medium-term in addition to those projects illustrated on **Maps 3a – 3c**. These routes are considered "additional strategic linkages" for consideration by the County should additional funds be made available. **Map 4a – 3c** in **Appendix M** illustrate the "additional strategic linkages". A summary of the short and medium-term projects is included in **Figure 6-5**.

ACTIVE TRANSPORTATION STRATEGY

**Figure 6-5 – Overview of the AT Network Phasing**

| Phase | Capital Projects (km) | Future Planned (km) | Strategic Linkages (km) | Total (km) |
|---|---|---|---|---|
| Short-term | 7 | 160 | 133 | 299 |
| Medium-term | 0.6 | 79 | 38 | 117.6 |
| **Total** | **7.6** | **239** | **171** | **417** |

Phasing (and costing) was not identified for the missing sidewalk linkages identified in **Figure 6-4**. It will be the responsibility of the County to determine when and how select linkages will be implemented based on available annual budgets and County priorities.

### 6.3.2 Strategic Priorities

As the County moves forward with implementation, it will need to prioritize certain linkages within the short and medium-term timeline. To help inform this decision making process, six implementation priorities have been identified. The following infrastructure improvements should be considered as “top priority” when determining which linkages to implement (see section 5.1.2 of the separately bound AT Strategy for further details):

- **Signed Routes** identified within the majority community areas;
- **Bike Lanes** that only require repainting of lines as opposed to reconstruction of the roadway;
- **Waterfront Trail** and **Trans Canada Trail** gaps where more than a signed route (i.e. a paved shoulder) is required;
- **Paved Shoulders** identified in rural areas that provide connections to major communities or destinations;
- **Sidewalk Gaps** on roadways that are identified as part of the AT network where sidewalks are not provided on either side of the roadway; and
- **Erie Boulevard & Longpoint Causeway** including active transportation improvements such as Share the Road signage and a paved shoulder (where space is available).

### 6.3.3 How much will it cost?

Understanding that there are limited funds available for municipal infrastructure, the project team identified options and alternatives for the County to consider as they move forward with implementation. Using the same approach as was used to determine the phasing strategy, the proposed AT linkages were costed. Costs were determined based on construction projects for comparable municipalities in southern Ontario. The unit costs used to project AT costs for Norfolk County are provided in separately bound **Technical Appendix B**. The unit costs are not prescriptive and should be updated if costs change. Using the total proposed kilometres identified in **Figure 6-5**, the costs to implement the proposed AT infrastructure is presented in **Figure 6-6**.

**Figure 6-6 – Summary of AT Network Costing**

| Phase | Capital Projects ($) | Future Planned ($) | Strategic Linkages ($) | Total ($) |
|---|---|---|---|---|
| Short-term | 16,311 | 5,261,102 | 4,129,737 | 9,407,150 |
| Medium-term | 4,183 | 6,864,754 | 3,325,582 | 10,194,519 |
| **Total** | **20,025** | **12,125,856** | **7,455,319** | **19,601,669** |

Costing does not reflect costs associated with encouragement, education and evaluation programs and initiatives. In addition to funding allocated to infrastructure improvements, the County should also identify an annual budget to educate and encourage residents to use active transportation **section 4.4** of the Strategy.

### 6.3.4 Conclusions

The recommendations, actions and initiatives included in the AT Strategy reflect are intended to provide the County with the tools needed to move the strategy through to implementation. The County and its partners are encouraged to use the AT Strategy and the resources found within in to guide the planning and design, process and coordination, implementation and operation and promotion and outreach.

# 7.0 SUMMARY OF ISMP RECOMMENDATIONS

This section summarizes the individual water / wastewater, transportation, and active transportation infrastructure and policy recommendations provided in **Sections 4.0, 5.0 and 6.0** of the ISMP. Where possible, these recommendations have been integrated in order to minimize impacts and costs during implementation.

Recommendations in **Figures 7-1** and **7-2** have been colour-coded to clearly distinguish which subject area the recommendation applies to, for example:

- Water / Wastewater recommendations are highlighted **blue**;
- Transportation recommendations are highlighted **orange**; and
- Active Transportation recommendations are highlighted **green**.

**Figure 7-2** provides a summary of location-specific infrastructure improvements. This figure includes an AT Segment identification number (if applicable), the segment location, type of recommended improvement, jurisdiction, length, estimated cost, and MCEA Schedule information (if applicable). It also provides suggested phasing for implementation, as follows:

- Short Term: 0–5 years
- Medium Term: 6-15 years
- Long Term: 16-25 years

If any recommended improvements geographically overlap each other and there is an opportunity for integration, they are linked together in **Figure 7-2** via the AT segment number (e.g. 7a and 7b).

**Figure 7-3** provides general infrastructure and policy recommendations, which are not restricted to a particular site. This figure provides the area where the recommendation is proposed (or County-Wide if appropriate), a brief description of the recommendation, suggested phasing for implementation, estimated cost, and recommendation type (i.e., infrastructure or policy). This figure also provides a reference to the page in the ISMP where the recommendation is discussed in detail.

Estimated costs to implement the recommendations outlined in the ISMP recommendations have been organized according to the applicable phasing for implementation, and are as follows:

**Figure 7-1 – Summary of Estimated Costs for ISMP Recommendations**

| Subject Area | Short term (5 year horizon) | Medium term (15 year horizon) | Long Term (25 year horizon) |
|---|---|---|---|
| **Water** | | | |
| Multiple Upgraded Option | $28,000,000 | $20,000,000 | $6,000,000 |
| **Wastewater** | | | |
| Wastewater Treatment | $14,200,000 | $1,000,000 | $1,000,000 |
| Wastewater Collection | $8,555,000 | $2,672,000 | $507,000 |
| **Stormwater** | $13,220,000 | $14,620,000 | $11,750,000 |
| **Active Transportation** | $9,408,000 | $10,195,000 | Not determined as part of the current analysis |
| **Transportation** | None | None | $7,800,000 |
| **TOTAL** | **$70,383,000** | **$48,487,000** | **$27,057,000** |

The Summary of estimated costs for the ISMP recommendations identified in **Figure 7-1** over the three planning horizons represents a very significant capital expenditure. The purpose of the three timeframes identified is to set high-level priorities for projects. It is fully recognized that the total magnitude of capital costs would unreasonably burden Norfolk County when considered in the context of all other County financial obligations. The assessment was completed from a technical perspective which evaluated alternatives and identified preferred alternatives for each of the three time horizons. Discussions with the County finance managers, confirmed that even though the timing for the implementation of the individual projects will have to be adjusted to reflect responsible financial planning for all County obligations, the priority of projects should not change. The plan provides flexibility to accommodate evolving needs and priorities of the County and any new federal or provincial infrastructure funding programs that may become available in the future.

**Figure 7-2 – Summary of ISMP Recommendations, Location-Specific**

| AT Segment ID | Segment / Street Name | To | From | Improvement / Ultimate AT Facility Type | Phasing | Jurisdiction | Length (km) | Estimated Cost | MCEA Schedule |
|---|---|---|---|---|---|---|---|---|---|
| 234 | 13th Street East / Concession 13 Townsend | Windham East Quarter Line Road | Culver Road | Signed Route | Short Term | County | 6.85 | $6,850 | N/A |
| 148 | 1st Concession Road | Lake Shore Road | Community Limit | Signed Route | Long Term | County | 0.87 | N/A | N/A |
| 241 | 1st Concession Road | Gore Road | Highway 59 | Signed Route | Long Term | County | 8.05 | N/A | N/A |
| 282 | 1st Concession Road | Dedrick Road | Community Limit | Signed Route | Long Term | County | 0.78 | N/A | N/A |
| 46 | 1st Concession Road North | Bylerlay Sideroad | Hawtrey Road | Paved Shoulder | Long Term | County | 9.00 | N/A | A+ |
| 252 | 1st Concession Sideroad / Schaffer Side Road | Lehman Dam Side Road | Byerlay Sideroad | Signed Route | Short Term | County | 7.85 | $7,850 | N/A |
| 253 | 3rd Concession Road | Highway 59 | Norfolk County Road 23 | Signed Route | Short Term | County | 7.32 | $7,300 | N/A |
| 254 | 3rd Concession Road | Highway 59 | Charlotteville West Quarter Line Road | Signed Route | Short Term | County | 11.03 | $11,050 | N/A |
| 269 | 8th Concession Road | East Quarter Line Road | 1.4km west of East Quarter Line Road | Signed Route | Long Term | County | 1.35 | N/A | N/A |
| 270 | 8th Concession Road | Highway 59 | 600m east of Highway 59 | Signed Route | Long Term | County | 0.60 | N/A | N/A |
| N/A | Aberdeen Avenue | Adams Avenue | Lansdowne Avenue | Replace existing 200 mm diameter sanitary sewer with new 250 mm diameter sanitary sewer | Medium Term | County | 0.084 | $54,450 | A+ |
| 130 | Alice Street | St. James Street South | Main Street South | Signed Route with Sharrow | Long Term | County | 0.27 | N/A | N/A |
| 225 | Argyle Street | Existing Off-Road Multi-Use Trail | Lynndale Road | Signed Route | Long Term | County | 0.34 | N/A | N/A |
| 226 | Argyle Street | Argyle Street | Lynndale Road | Signed Route | Long Term | County | 0.05 | N/A | N/A |
| 132 | Argyle Street | Norfolk Street North | Pond Street | Signed Route with Sharrow | Long Term | County | 0.33 | N/A | N/A |
| 222 | Barkley Crescent | Sheridan Boulevard | Donly Drive South | Signed Route | Short Term | County | 1.26 | $1,900 | N/A |
| 106a | Bay Street | Chestnut Street | Church Street | Signed Route | Long Term | County | 0.24 | N/A | N/A |
| 195a | Bay Street | 1st Concession Road | Chestnut Street | Signed Route | Long Term | County | 0.78 | N/A | N/A |
| 195b / 106b | Bay Street | Aspen Lane | Church Street | Replace existing 200 mm diameter sanitary sewer with new 250 mm diameter sanitary sewer | Long Term | County | 0.806 | $522,300 | A+ |
| 116 | Bay Street | Chestnut Street | Price Street | Signed Route | Long Term | County | 0.24 | N/A | N/A |
| 124a | Bay Street | Church Street | Wolven Street | Signed Route with Sharrow | Long Term | County | 0.11 | N/A | N/A |

| AT Segment ID | Segment / Street Name | To | From | Improvement / Ultimate AT Facility Type | Phasing | Jurisdiction | Length (km) | Estimated Cost | MCEA Schedule |
|---|---|---|---|---|---|---|---|---|---|
| 124b | Bay Street | Church Street | Front Road | Replace existing 200 mm and 250 mm diameter sanitary sewer with new 300 mm diameter sanitary sewer | Medium Term | County | 0.196 | $89,550 | A+ |
| 158 | Bayham Boundary Road / Gore Side Road | County Boundary | Orange Hall Road | Signed Route | Long Term | County | 2.08 | N/A | N/A |
| 250 | Bayham Norfolk Boundary Road | Gore Side Road | Colonel Tablot Road | Signed Route | Long Term | County | 2.03 | N/A | N/A |
| N/A | Big Creek Bridge | Con A Road, S. Wals. - 2.6km W of County Hwy#59 | N/A (single site) | Programmed Bridge Rehabilitation Review | Short Term | County | N/A | Completed in 2014 | N/A |
| N/A | Big Creek Drive | At existing off-road trail | N/A (single site) | Proposed Trailhead | Short Term | County | N/A | $7,000 | N/A |
| 162 | Blue Line Road | Concession 10 Townsend | Concession 13 Townsend | Paved Shoulder | Short Term | County | 4.13 | $453,855 | N/A |
| 278 | Blue Line Road | Thompson Road West | Concession 10 Townsend | Signed Route | Long Term | County | 1.46 | N/A | N/A |
| 65 | Brantford Road | Church Street East | Windham Centre Road | Paved Shoulder | Short Term | County | 6.26 | $688,100 | A+ |
| 66 | Brantford Road | Brantford Road | Windham Road 12 | Paved Shoulder | Long Term | County | 0.08 | N/A | A+ |
| 146 | Brown Street / Montclair Crescent | Washington Street | Duncombe Street | Signed Route | Short Term | County | 1.17 | $1,750 | N/A |
| 193 | Byerlay Side Road | Community Limit | Middleton North Walsingham Townline Road | Signed Route | Short Term | County | 6.47 | $6,450 | N/A |
| 194 | Byerlay Side Road | 1st Concession Road | Talbot Street | Signed Route | Long Term | County | 2.03 | N/A | N/A |
| 281 | Byerlay Side Road | Talbot Street | Community Limit | Signed Route | Short Term | County | 0.65 | $950 | N/A |
| 265 | Cedar Drive | Turkey Point Road | Front Road | Signed Route | Medium Term | County | 1.47 | $1,450 | N/A |
| 6 | Cedar Street | Windham Street | Queen Street North | Bike Lane | Long Term | County | 1.21 | N/A | A |
| 110 | Cedar Street | Windham Street | 412m east of Windham Street | Signed Route | Long Term | County | 0.41 | N/A | N/A |
| N/A | Cemetery Road | 1.1 km south of County Road 20 | N/A (single site) | Programmed Bridge Rehabilitation Review | Short Term | County | N/A | Completed in 2014 | N/A |
| 135a | Chapman Street West | St. George Street | St. Annie Street North | Signed Route with Sharrow | Short Term | County | 0.92 | $3,700 | N/A |
| 135b | Chapman Street West | Lynn Street | N/A (single site) | Proposed Share the Road signage | Short Term | County | N/A | $250 | N/A |
| 211 | Charles St / Beckett Blvd / Royal Rd / Holden Ave | Dora Drive | Bellevue Avenue | Signed Route | Long Term | County | 0.56 | N/A | N/A |

| AT Segment ID | Segment / Street Name | To | From | Improvement / Ultimate AT Facility Type | Phasing | Jurisdiction | Length (km) | Estimated Cost | MCEA Schedule |
|---|---|---|---|---|---|---|---|---|---|
| 157 | Charlotteville Road 1 | Charlotteville West Quarter Line Road | Turkey Point Road | Signed Route | Short Term | County | 3.71 | $3,700 | N/A |
| 95 | Charlotteville Road 7 | Turkey Point Road | Hillcrest Road | Paved Shoulder | Medium Term | County | 7.36 | $809,150 | A+ |
| 259 | Charlotteville Road 7 | Charlotteville West Quarter Line Road | Turkey Point Road | Signed Route | Medium Term | County | 3.66 | $3,650 | N/A |
| 54 | Charlotteville West Quarter Line Road | Lynedoch Road | Charlotteville Road 10 | Paved Shoulder | Medium Term | County | 2.55 | $280,050 | A+ |
| 172 | Charlotteville West Quarter Line Road | Vittoria Road | Charlotteville Road 1 | Signed Route | Long Term | County | 4.20 | N/A | N/A |
| 175 | Charlotteville West Quarter Line Road | Charlotteville Road | Front Road | Signed Route | Long Term | County | 1.96 | N/A | N/A |
| 176 | Charlotteville West Quarter Line Road | Charlotteville Road 7 | Vittoria Road | Signed Route | Long Term | County | 4.18 | N/A | N/A |
| 251 | Charlotteville West Quarter Line Road | Charlotteville Road 10 | Charlotteville Road 7 | Signed Route | Medium Term | County | 4.21 | $4,200 | N/A |
| 8 | Church Street East | James Street | Delcrest Avenue | Bike Lane | Medium Term | County | 0.56 | $4,200 | A |
| 122 | Church Street East | Delcrest Avenue | Brantford Road | Signed Route with Sharrow | Short Term | County | 1.09 | $4,400 | N/A |
| 9 | Church Street West | Queen Street | James Street | Bike Lane | Short Term | County | 0.24 | $1,800 | A |
| 223 | Clinton Street | St. George Street | St. Patrick Street | Signed Route | Long Term | County | 0.36 | N/A | N/A |
| 21 | Cockshutt Road | County Road 19 | Thompson Road East | Buffered Paved Shoulder | Long Term | County | 6.51 | N/A | A+ |
| 23 | Cockshutt Road | Jenkins Road | 495m north of County Road 19 | Buffered Paved Shoulder | Long Term | County | 3.60 | N/A | A+ |
| 48 | Cockshutt Road | Thompson Road East | Concession 2 Woodhouse | Paved Shoulder | Short Term | County | 9.64 | $1,060,400 | A+ |
| 102 | Cockshutt Road | Thompson Road East | Concession 13 Townsend | Paved Shoulder | Long Term | County | 5.59 | N/A | A+ |
| 236 | Cockshutt Road | 45m south of County Road 19 | 310m south of County Road 19 | Signed Route | Long Term | County | 0.26 | N/A | N/A |
| 237 | Cockshutt Road | County Road 19 | 45m south of County Road 19 | Signed Route | Long Term | County | 0.56 | N/A | N/A |
| N/A | Colborne Street North | Main Street North | Windham Drive | Replace existing 200 mm diameter sanitary sewer with new 250 mm diameter sanitary sewer | Medium Term | County | 0.159 | $103,050 | A+ |
| 131 | Colborne Street South | Maple Street | Bonnie Drive | Signed Route with Sharrow | Short Term | County | 0.08 | $350 | N/A |

| AT Segment ID | Segment / Street Name | To | From | Improvement / Ultimate AT Facility Type | Phasing | Jurisdiction | Length (km) | Estimated Cost | MCEA Schedule |
|---|---|---|---|---|---|---|---|---|---|
| 53 | Colonel Talbot Road | Elgin County Road | North Road | Paved Shoulder | Long Term | County | 1.29 | N/A | A+ |
| 77 | Colonel Talbot Road | Highway 59 | Orange Hall Road | Paved Shoulder | Short Term | County | 9.49 | $1,043,500 | A+ |
| 87 | Colonel Talbot Road | North Road | County Road 23 | Paved Shoulder | Long Term | County | 0.70 | N/A | A+ |
| 81 | Concession 12 Townsend | Old Highway 24 | Cockshutt Road | Paved Shoulder | Long Term | County | 5.48 | N/A | A+ |
| 142 | Concession 12 Townsend | Cockshutt Road | County Line | Signed Route | Long Term | County | 7.21 | N/A | N/A |
| 143 | Concession 13 Townsend | Culver Road | Cockshutt Road | Signed Route | Short Term | County | 4.23 | $4,250 | N/A |
| 233 | Concession 13 Townsend | Cockshutt Road | County Boundary | Signed Route | Long Term | County | 5.55 | N/A | N/A |
| 268 | Concession 2 Townsend | Cockshutt Road | Indian Line | Signed Route | Long Term | County | 4.93 | N/A | N/A |
| 159 | Concession 2 Woodhouse | Cockshutt Road | Community Limit | Signed Route | Long Term | County | 1.93 | N/A | N/A |
| 279 | Concession 2 Woodhouse | Community Limit | East Quarter Line | Signed Route | Long Term | County | 1.87 | N/A | N/A |
| 171 | Concession 6 Townsend / Angling Road | Existing Off-Road Multi-Use Trail | Cockshutt Road | Signed Route | Long Term | County | 6.74 | N/A | N/A |
| 56 | Concession 6 Woodhouse | Ireland Road | Cockshutt Road | Paved Shoulder | Long Term | County | 5.51 | N/A | A+ |
| 96a | Concession 8 Townsend | Existing Off-Road Multi-use Trail | 1.4km west of existing trail | Paved Shoulder | Long Term | County | 1.40 | N/A | A+ |
| 96b | Concession 8 Townsend | At existing off-road trail | N/A (single site) | Proposed Trailhead | Long Term | County | N/A | N/A | N/A |
| 97 | Concession 8 Townsend | Highway 24 | 1.4km west of existing trail | Paved Shoulder | Long Term | County | 1.10 | N/A | A+ |
| 161 | Concession 8 Townsend / Mechanic Street West | Trans Canada Trail | Main Street North | Signed Route | Long Term | County | 1.38 | N/A | N/A |
| 121 | Connaught Avenue | James Street | Northern Avenue | Signed Route with Sharrow | Short Term | County | 0.29 | $1,150 | N/A |
| 187 | Connaught Avenue/ Callens Avenue | Northern Avenue | Church Street East | Signed Route | Short Term | County | 1.02 | $1,550 | N/A |
| 155 | County Line | Thompson Road East | Concession 12 Townsend | Signed Route | Long Term | County | 4.17 | N/A | N/A |
| 238 | County Road 19 | Bookton Lane | Windham Road 4 | Signed Route | Short Term | County | 1.21 | $1,200 | N/A |
| 154 | County Road 19 West | Windham Road 19 | Bookton Lane | Signed Route | Short Term | County | 1.85 | $1,850 | N/A |
| 164 | County Road 23 | Colonel Talbot Road | Barth Side Road | Signed Route | Short Term | County | 8.28 | $8,300 | N/A |
| 165 | County Road 23 | Norrfolk Coutny Road 45 | North Walsingham Townline Road | Signed Route | Long Term | County | 2.81 | | N/A |
| 244 | County Road 23 | 1st Concession Road | 3rd Concession Road | Signed Route | Long Term | County | 2.74 | N/A | N/A |
| 247 | County Road 23 | Norfolk County Road 45 | 10th Concession Road | Signed Route | Medium Term | County | 2.42 | $2,400 | N/A |
| 283 | County Road 23 | 3rd Concession Road | North Walsingham South Walsingham Townline Road | Signed Route | Long Term | County | 3.4 | N/A | N/A |

| AT Segment ID | Segment / Street Name | To | From | Improvement / Ultimate AT Facility Type | Phasing | Jurisdiction | Length (km) | Estimated Cost | MCEA Schedule |
|---|---|---|---|---|---|---|---|---|---|
| 284 | County Road 23 | 1st Concession Road | North Walsingham South Walsingham Townline Road | Signed Route | Short Term | County | 2.1 | $2,150 | N/A |
| 286 | County Road 24 | Turkey Point Road | Simcoe Town Limit (Decou Road) | Paved Shoulder | Short Term | County | 14.78 | $1,625,822 | A+ |
| 59 | County Road 45 | Elgin County Road 55 | Charlotteville West Quarter Line Road | Paved Shoulder | Medium Term | County | 26.76 | $2,943,650 | A+ |
| 266 | Croton Avenue / Main Street | Dalton Road | Imperial Street | Signed Route | Short Term | County | 0.94 | $950 | N/A |
| 260 | Cultus Road / 6th Concession Road | County Road 23 | Fairground Road | Signed Route | Short Term | County | 2.16 | $2,150 | N/A |
| 151 | Dalton Road / Tisdale Sideroad | Norwood Road | Croton Avenue | Signed Route | Long Term | County | 2.59 | N/A | N/A |
| 224a | Davis Street West / North Court | Existing Off-Road Multi-Use Trail | Existing Off-Road Multi-Use Trail | Signed Route | Short Term | County | 0.46 | $700 | N/A |
| 224b | Davis Street West / North Court | Norfolk Street South | N/A (single site) | Proposed Wayfinding Signage | Short Term | County | N/A | $500 | N/A |
| 111 | Decou Road | Norfolk Street South | Ireland Road | Signed Route | Long Term | County | 1.00 | N/A | N/A |
| 115a | Decou Road | Existing Off-Road Trail | Ireland Road | Signed Route | Long Term | County | 0.81 | N/A | N/A |
| 115b | Decou Road | Existing Off-Road Trail | N/A (single site) | Proposed Crossing Enhancement | Long Term | County | N/A | N/A | N/A |
| 113 | Deer Park Road / Concession 8 Townsend | Cockshutt Road | Community Limit | Signed Route | Long Term | County | 2.44 | N/A | N/A |
| 118 | Deer Park Road / Concession 8 Townsend | Community Limit | Old Highway 24 | Signed Route | Long Term | County | 0.93 | N/A | N/A |
| 188 | Delcrest Avenue | Church Street East | Connaught Avenue | Signed Route | Long Term | County | 0.39 | N/A | N/A |
| 16 | Donly Drive North | Queensway East | Lynndale Road | Bike Lane | Short Term | County | 0.72 | $5,400 | A |
| 5 | Donly Drive South | Victoria Street | Woodway Trail | Bike Lane | Medium Term | County | 0.91 | $6,850 | A |
| 17 | Donly Drive South | Lynndale Road | Victoria Street | Bike Lane | Medium Term | County | 0.71 | $5,300 | A |
| 205 | Duncombe Road | East Church Street | Thompson Road East | Signed Route | Medium Term | County | 0.74 | $1,100 | N/A |
| N/A | Easement (located between Mallard Walk and Bay Street and along Bay Street) from easement to Aspen Lane | Mallard Walk | Aspen Lane | Replace existing 200 mm diameter sanitary sewer with new 250 mm diameter sanitary sewer | Medium Term | County | 0.328 | $212,550 | A+ |
| 240 | East Quarter Line | Lynn Valley Road | New Lakeshore Road | Signed Route | Long Term | County | 5.24 | N/A | N/A |

| AT Segment ID | Segment / Street Name | To | From | Improvement / Ultimate AT Facility Type | Phasing | Jurisdiction | Length (km) | Estimated Cost | MCEA Schedule |
|---|---|---|---|---|---|---|---|---|---|
| 139 | East Quarter Line Road | Middleton North Walsingham Towline Road | County Road 21 | Signed Route | Short Term | County | 1.89 | $1,900 | N/A |
| 140 | East Quarter Line Road | County Road 21 | Walsingham Townline Road | Signed Route | Short Term | County | 9.86 | $9,850 | N/A |
| 245 | East Quarter Line Road | Front Road | North Walsingham South Walsingham Townline Road | Signed Route | Short Term | County | 8.74 | $8,750 | N/A |
| 183a | East Street | William Street | Imperial Street | Signed Route | Short Term | County | 0.33 | $500 | N/A |
| 183b | East Street | Ann Street | Imperial Street | Replace existing 200 mm diameter sanitary sewer with new 250 mm diameter sanitary sewer | Medium Term | County | 0.096 | $62,200 | A+ |
| 183c | East Street | Crossing at railway | N/A (single site) | Proposed Enhanced Railway crossing | Short Term | County | N/A | $120,000 | N/A |
| 213 | Elgin Avenue | Union Street | Robinson Street | Signed Route | Short Term | County | 0.32 | $500 | N/A |
| 89 | Elgin County Road 55 | County Road 45 | Colonel Talbot Road | Paved Shoulder | Long Term | County | 6.66 | N/A | A+ |
| 249 | Elgin County Road 55 | Old Dump Road | Lakeshore Road | Signed Route | Short Term | County | 4.03 | $4,050 | N/A |
| 271 | Elgin County Road 55 | County Road 45 | Old Dump Road | Signed Route | Long Term | County | 3.95 | N/A | N/A |
| N/A | Ellis Street | Front Road | Port Rowan Pumping Station | Replace existing 200 mm diameter sanitary sewer with new 250 mm diameter sanitary sewer | Medium Term | County | 0.027 | $20,800 | A+ |
| 100 | Erie Boulevard | Highway 59 | Road Terminus | Paved Shoulder | Long Term | County | 3.95 | N/A | A+ |
| 112 | Evergreen Hill Road | Hillcrest Road | Oak Street | Signed Route | Short Term | County | 1.34 | $1,350 | N/A |
| 221a | Evergreen Hill Road | Oak Street | Elm Street | Signed Route | Long Term | County | 0.69 | N/A | N/A |
| 221b | Evergreen Hill Road | Oak Street | N/A (single site) | Proposed Pedestrian Crossing | Short Term | County | N/A | $80,000 | N/A |
| 134 | Evergreen Hill Road | Norfolk Street South | Elm Street | Signed Route with Sharrow | Long Term | County | 0.47 | N/A | N/A |
| 178 | Fairground Rod | North Road | 6th Concession Road | Signed Route | Short Term | County | 8.26 | $8,250 | N/A |
| 57 | Fertilizer Road | Windham Road 12 | Rail Corridor (north of Windham Road 13) | Paved Shoulder | Long Term | County | 1.03 | N/A | A+ |
| 69 | Fertilizer Road | Existing Off-Road Multi-Use Trail | Windham Road 13 | Paved Shoulder | Long Term | County | 0.38 | N/A | A+ |
| 258 | Fertilizer Road / Lynedoch Road | Yuell Road | Windham Road 13 | Signed Route | Medium Term | County | 3.45 | $3,450 | N/A |
| 210 | Foster / Beckett / Sunset / Dora | Charles Street | Holden Avenue | Signed Route | Short Term | County | 1.74 | $2,600 | N/A |
| 61 | Front Road | East Quarter Line Road | Townline Street | Paved Shoulder | Short Term | County | 4.49 | $494,150 | A+ |
| 98 | Front Road | Dancey Side Road | Turkey Point Road | Paved Shoulder | Short Term | County | 8.91 | $979,850 | A+ |

| AT Segment ID | Segment / Street Name | To | From | Improvement / Ultimate AT Facility Type | Phasing | Jurisdiction | Length (km) | Estimated Cost | MCEA Schedule |
|---|---|---|---|---|---|---|---|---|---|
| 196a | Front Road | Dedrick Road | Wolven Street | Signed Route | Short Term | County | 1.40 | $2,100 | N/A |
| 196b | Front Road | South of Wolven Street | N/A (single site) | Proposed Share the Road signage | Short Term | County | N/A | $250 | N/A |
| 196c | Front Road | South of Dock Street | N/A (single site) | Proposed Share the Road signage | Short Term | County | N/A | $250 | N/A |
| 198 | Front Road | Dedrick Road | Highway 59 | Signed Route | Long Term | County | 0.37 | N/A | N/A |
| 246 | Front Road | Old Dump Road | Fairground Road | Signed Route | Short Term | County | 0.76 | $750 | N/A |
| 262 | Front Road | Townline Street | Dancey Side Road | Signed Route | Short Term | County | 1.12 | $1,100 | N/A |
| 263 | Front Road | Fisher's Glen Road | Mole Side Road | Signed Route | Short Term | County | 3.69 | $3,700 | N/A |
| 264 | Front Road | Fisher's Glen Road | Chillan Road | Signed Route | Short Term | County | 3.49 | $3,500 | N/A |
| 3 | Future Planned Road in Port Dover | Concession 2 Woodhouse | New Lakeshore Road | Bike Lane | Long Term | County | 1.85 | N/A | A |
| 272 | Gore Road | Lakeshore Road | 1st Concession Road | Signed Route | Long Term | County | 1.78 | N/A | N/A |
| 199 | Greenock Street West | St. George Street | Mergl Drive | Signed Route | Long Term | County | 0.68 | N/A | N/A |
| 35 | Hamilton Plank Road | John Street | Somerset Drive | In-Boulevard Multi-use Trail | Long Term | MTO | 0.63 | N/A | A |
| 36 | Hamilton Plank Road | Somerset Drive | Ocean Way | In-Boulevard Multi-use Trail | Long Term | MTO | 0.58 | N/A | A |
| 203 | Hare Street / Kingsland Drive | Main Street North | Main Street North | Signed Route | Long Term | County | 0.67 | N/A | N/A |
| 181 | Hawtrey Road / Norwich Townline Road | County Boundary | Windham Road 20 | Signed Route | Medium Term | County | 2.12 | $2,100 | N/A |
| 182 | Hawtrey Road / Norwich Townline Road | Windham Road 20 | Highway 59 | Signed Route | Long Term | County | 0.72 | N/A | N/A |
| 280 | Hawtrey Road / Norwich Townline Road | County Boundary | Highway 59 | Signed Route | Medium Term | County | 1.21 | $1,800 | N/A |
| 232 | Highway 24 | Windham Road 12 | 200m north of Windham Road 12 | Signed Route | Long Term | MTO | 0.20 | N/A | N/A |
| 20 | Highway 59 | 3rd Concession Road | Norfolk County Road 60 | Buffered Paved Shoulder | Medium Term | County | 3.40 | $510,500 | A+ |
| 25 | Highway 59 | 6th Concession Road | Middleton North Walsingham Townline Road | Buffered Paved Shoulder | Medium Term | County | 12.56 | $1,883,700 | A+ |
| 34 | Highway 59 | Arnold Sayeau Drive | Talbot Road | In-Boulevard Multi-use Trail | Long Term | County | 0.15 | N/A | A |
| 51 | Highway 59 | Front Road | Erie Boulevard | Paved Shoulder | Long Term | County | 4.36 | N/A | A+ |
| 47 | Hillcrest Road | Charlotteville Road 7 | Vittoria Road | Paved Shoulder | Long Term | County | 4.26 | N/A | A+ |
| 75 | Hillcrest Road | Queensway West | Evergreen Hill Road | Paved Shoulder | Long Term | County | 2.31 | N/A | A+ |
| 76 | Hillcrest Road | Evergreen Hill Road | Eighth Street West | Paved Shoulder | Long Term | County | 0.30 | N/A | A+ |
| 101 | Hillcrest Road | Charlotteville Road 8 | Charlotteville Road 7 | Paved Shoulder | Long Term | County | 1.40 | N/A | A+ |

| AT Segment ID | Segment / Street Name | To | From | Improvement / Ultimate AT Facility Type | Phasing | Jurisdiction | Length (km) | Estimated Cost | MCEA Schedule |
|---|---|---|---|---|---|---|---|---|---|
| 197 | Hunter Drive North | Front Road | 510m north of Front Road | Signed Route | Long Term | County | 0.51 | N/A | N/A |
| 147 | Imperial Street | Main Street | East Street | Signed Route | Long Term | County | 0.48 | N/A | N/A |
| 50 | Ireland Road | Victoria Street | Concession 5 Woodhouse | Paved Shoulder | Short Term | County | 1.40 | $153,500 | A+ |
| 73 | Ireland Road | Lynn Valley Road | Decou Road | Paved Shoulder | Long Term | County | 1.21 | N/A | A+ |
| 217 | Ireland Road | Lynndale Road | Concession 6 Woodhouse | Signed Route | Short Term | County | 0.68 | $1,050 | N/A |
| 191 | James Court | West Lane | King Crescent | Signed Route | Long Term | County | 0.34 | N/A | N/A |
| 137a | James Street | William Street | Connaught Street | Signed Route with Sharrow | Long Term | County | 0.05 | N/A | N/A |
| 137b | James Street | William Street | N/A (single site) | Proposed Pedestrian Crossing | Long Term | County | N/A | N/A | N/A |
| 189 | King Crescent | Queen Street | Talbot Street | Signed Route | Medium Term | County | 0.38 | $600 | N/A |
| 267 | La Salette Road | Swimming Pool Road | Windham West Quarter Line | Signed Route | Long Term | County | 3.77 | N/A | N/A |
| 58 | Lakeshore Road | Backus Mill Road | 1st Concession Road | Paved Shoulder | Long Term | County | 1.12 | N/A | A+ |
| 60 | Lakeshore Road | Highway 59 | West Quarter Line Road | Signed Route | Short Term | County | 4.88 | $536,450 | N/A |
| 62 | Lakeshore Road | Gore Road | West Quarter Line Road | Signed Route | Short Term | County | 3.78 | $416,350 | N/A |
| 78 | Lakeshore Road | Backus Mill Road | East Quarter Line Road | Paved Shoulder | Long Term | County | 1.32 | N/A | A+ |
| 85 | Lakeshore Road | 7th Concession Road | Gore Road | Paved Shoulder | Medium Term | County | 3.98 | $437,550 | A+ |
| 86 | Lakeshore Road | County Road 28 | 7th Concession Road | Paved Shoulder | Medium Term | County | 5.65 | $621,400 | A+ |
| 261 | Lakeshore Road | Elgin County Road 55 | Norfolk County Road 28 | Signed Route | Short Term | County | 5.42 | $5,400 | N/A |
| N/A | Lansdowne Avenue | Aberdeen Avenue | Churchill Avenue | Replace existing 200 mm diameter sanitary sewer with new 250 mm diameter sanitary sewer | Medium Term | County | 0.098 | $63,500 | A+ |
| 105 | Lehman Dam Side Road / Old Mill Road | William Street | Schaeffer Road | Signed Route | Long Term | County | 2.12 | N/A | N/A |
| 239 | Little Lake Road | Windham Road 4 | Windham West Quarter Line Road | Signed Route | Short Term | County | 1.09 | $1,100 | N/A |
| 55 | Lynedoch Road | Charlotteville West Quarter Line Road | Yuell Road | Paved Shoulder | Medium Term | County | 1.91 | $210,100 | A+ |

| AT Segment ID | Segment / Street Name | To | From | Improvement / Ultimate AT Facility Type | Phasing | Jurisdiction | Length (km) | Estimated Cost | MCEA Schedule |
|---|---|---|---|---|---|---|---|---|---|
| 218 | Lynn Valley Road | Ireland Road | Highway 3 | Signed Route | Long Term | County | 11.11 | N/A | N/A |
| 219 | Lynn Valley Road | Abandoned Rail Corridor | Ryers Road | Signed Route | Long Term | County | 0.85 | N/A | N/A |
| 220 | Lynn Valley Road | Ryers Road | Ireland Road | Signed Route | Long Term | County | 0.69 | N/A | N/A |
| 30 | Lynndale Road | Donly Drive North | Ireland Road | Signed Route with Edgeline | Long Term | County | 0.55 | N/A | N/A |
| 109 | Main Street | Prospect Street | Lynn Park Avenue | Signed Route | Long Term | County | 0.32 | N/A | N/A |
| 37 | Main Street North | Russell Street | Deer Park Road | In-Boulevard Multi-use Trail | Long Term | County | 0.46 | N/A | A |
| 128 | Main Street North | Mechanic Street West / Deer Park Road | Nichol Street | Signed Route with Sharrow | Long Term | County | 0.40 | N/A | N/A |
| 7a | Main Street of Delhi | Western Avenue | William Street | Bike Lane | Long Term | County | 0.33 | N/A | A |
| 7b | Main Street of Delhi | Eastern Avenue | Gilbert Avenue | County to confirm existing sanitary sewer diameter. If the existing diameter is confirmed as 375 mm, replace with new 450 mm diameter sanitary sewer | Long Term | County | 0.032 | $20,750 | A+ |
| 184a | Main Street of Delhi | William Street | Imperial Street | Signed Route | Short Term | County | 0.38 | $550 | N/A |
| 184b | Main Street of Delhi | Crossing at railway | N/A (single site) | Proposed Enhanced Railway crossing | Long Term | County | N/A | N/A | N/A |
| 127a | Main Street South | Nichol Street | East Church Street | Signed Route with Sharrow | Short Term | County | 0.23 | $950 | N/A |
| 127b | Main Street South | East Church Street | N/A (single site) | Proposed Pedestrian Crossing | Long Term | County | N/A | N/A | N/A |
| 129 | Main Street South | Green Street | Thompson Road East / West | Signed Route with Sharrow | Long Term | County | 0.48 | N/A | N/A |
| 136 | Main Street South | West Church Street | Green Street | Signed Route with Sharrow | Long Term | County | 0.24 | N/A | N/A |
| 26 | Main Street Walsingham | 480m north of Concession Street | 710m south of Concession Street | Buffered Paved Shoulder | Medium Term | County | 1.19 | $178,350 | A+ |
| 150 | Mall Road / Schaeffer Road | County Boundary | Lehman Dam Side Road | Signed Route | Short Term | County | 5.48 | $5,500 | N/A |
| 52 | Middleton North Walsingham Townline Road | Rhineland Road | East Quarter Line Road | Paved Shoulder | Medium Term | County | 3.34 | $367,800 | A+ |
| 99 | Middleton North Walsingham Townline Road | Highway 59 | Byerlay Side Road | Paved Shoulder | Medium Term | County | 2.90 | $319,050 | A+ |

| AT Segment ID | Segment / Street Name | To | From | Improvement / Ultimate AT Facility Type | Phasing | Jurisdiction | Length (km) | Estimated Cost | MCEA Schedule |
|---|---|---|---|---|---|---|---|---|---|
| 243 | Middleton-North Walsingham Townline Road | Highway 59 | County Road 23 | Signed Route | Long Term | County | 7.32 | N/A | N/A |
| 125 | Nelson Street West | St. George Street | Regent Avenue | Signed Route with Sharrow | Long Term | County | 0.24 | N/A | N/A |
| N/A | Nelson Street West | Nelson Pumping Station | 25m upstream of Nelson Pumping Station | Replace existing 450 mm diameter sanitary sewer with 600 mm diameter sanitary sewer | Medium Term | County | 0.025 | $644,750 | A+ |
| 108 | New Lakeshore Road | John Street | County Boundary | Signed Route | Short Term | County | 4.10 | $4,100 | N/A |
| 119 | New Lakeshore Road | John Street | County Boundary | Signed Route | Short Term | County | 1.85 | $2,750 | N/A |
| 145 | Nichol Street | Washington Street | Road Terminus at west | Signed Route | Short Term | County | 0.65 | $950 | N/A |
| 204 | Nichol Street | St. James Street South | Main Street South | Signed Route | Short Term | County | 0.28 | $400 | N/A |
| 208 | Nichol Street | Washington Street | St. James Street South | Signed Route | Short Term | County | 0.22 | $300 | N/A |
| 15 | Norfolk Street South | Evergreen Hill Road | Decou Road | Bike Lane | Long Term | County | 0.43 | N/A | A |
| 177 | North Road | County Road 45 | Fairground Road | Signed Route | Long Term | County | 10.25 | N/A | N/A |
| 88 | North Walsingham South Walsingham Townline Road | Byerlay Side Road | East Quarter Line Road | Paved Shoulder | Short Term | County | 0.78 | $85,300 | A+ |
| 168 | Norwich Road | Windham Road 20 | Talbot Road | Signed Route | Long Term | County | 2.13 | N/A | N/A |
| 185 | Norwood Road | Pine Grove Road | Tisdale Side Road | Signed Route | Long Term | County | 0.74 | N/A | N/A |
| 156 | Oak Street | South Drive | Evergreen Hill Road | Signed Route | Short Term | County | 0.60 | $900 | N/A |
| 44 | Off-Road Multi-Use Trail | Mechanic Street West | St. James Street | Off Road Multi-use Trail | Long Term | County | 0.25 | N/A | To be determine d |
| 41 | Off-Road Trail along Abandoned Rail Corridor | Bayham-Norfolk Boundary Road | Tillsonburg | Off Road Multi-use Trail | Long Term | County | 3.63 | N/A | To be determine d |
| 42 | Off-Road Trail along Abandoned Rail Corridor | Trans Canada Trail in Waterford | Windham West Quarter Line Road | Off Road Multi-use Trail | Long Term | County | 14.35 | N/A | To be determine d |
| 43 | Off-Road Trail along Abandoned Rail Corridor | Main Street South | Thompson Road East | Off Road Multi-use Trail | Long Term | County | 3.03 | N/A | To be determine d |
| 45 | Off-Road Trail along Abandoned Rail Corridor | Existing Off-Road Multi-Use Trail | Lynn Valley Road | Off Road Multi-use Trail | Long Term | County | 1.95 | N/A | To be determine d |

| AT Segment ID | Segment / Street Name | To | From | Improvement / Ultimate AT Facility Type | Phasing | Jurisdiction | Length (km) | Estimated Cost | MCEA Schedule |
|---|---|---|---|---|---|---|---|---|---|
| 93 | Old Brook Street | Water Street | Mill Pond Road | Paved Shoulder | Long Term | County | 0.82 | N/A | A+ |
| 255 | Old Brook Street | Fisher's Glen Road | Charlotteville East Quarter Line Road | Signed Route | Long Term | County | 0.63 | N/A | N/A |
| 256 | Old Brook Street | Fisher's Glen Road | Water Street | Signed Route | Long Term | County | 0.56 | N/A | N/A |
| 248 | Old Dump Road | Elgin County Road 55 | North Road | Signed Route | Short Term | County | 1.34 | $1,350 | N/A |
| 22 | Old Highway 24 | Highway 24 | Concession 12 Townsend | Buffered Paved Shoulder | Medium Term | County | 1.73 | $258,850 | A+ |
| 74 | Old Highway 24 | Concession 6 Townsend | Russell Street | Paved Shoulder | Long Term | County | 2.30 | N/A | A+ |
| N/A | Old Mill Road | West of William Street (north side of road) | N/A (single site) | Proposed Share the Road signage | Long Term | County | N/A | N/A | N/A |
| N/A | Old Mill Road | West of William Street (south side of road) | N/A (single site) | Proposed Share the Road signage | Long Term | County | N/A | N/A | N/A |
| 103 | Old Mill Road / Hillside Avenue / Big Creek Drive | William Street | Existing Off Road Trail | Signed Route | Short Term | County | 0.35 | $550 | N/A |
| 117a | Old Mill Road / Hillside Avenue / Big Creek Drive | William Street | Highway 59 | Signed Route | Long Term | County | 0.22 | N/A | N/A |
| 117b | Old Mill Road | North of William Street (south side of road) | N/A (single site) | Proposed Share the Road signage | Short Term | County | N/A | $250 | N/A |
| 117c | Old Mill Road | North of William Street (north side of road) | N/A (single site) | Proposed Share the Road signage | Short Term | County | N/A | $250 | N/A |
| 242 | Orange Hall Road | Colonel Talbot Road | Plowman's Line | Signed Route | Long Term | County | 2.02 | N/A | N/A |
| 209 | Park Road | Existing Off-Road Multi-Use Trail | Windham Street | Paved Shoulder | Short Term | County | 0.96 | $105,291 | N/A |
| 71 | Pine Grove Road | Scott's Street | Lynedoch Road | Paved Shoulder | Long Term | County | 1.50 | N/A | A+ |
| 174 | Port Ryers Road / Front Road | Chillan Road | Radical Road | Signed Route | Short Term | County | 3.75 | $3,750 | N/A |
| 152 | Port Ryerse Road | Lynn Valley Road | Radical Road | Signed Route | Long Term | County | 4.21 | N/A | N/A |
| 149 | Price Street / College Avenue | Bay Street | Front Road | Signed Route | Long Term | County | 0.85 | N/A | N/A |
| 202 | Prospect Street | Main Street | Silver Lake Road | Signed Route | Medium Term | County | 2.02 | $3,050 | N/A |
| 18 | Queen Street | South Drive | Evergreen Hill Road | Bike Lane | Long Term | County | 0.60 | N/A | A |
| 29 | Queen Street | King Street | William Street | Signed Route with Edgeline | Short Term | County | 0.55 | $2,200 | N/A |
| 32 | Queen Street | King Street | William Street | Signed Route with Edgeline | Short Term | County | 0.07 | $250 | N/A |
| 179 | Queen Street | King Street | Talbot Road | Signed Route | Long Term | County | 0.12 | N/A | N/A |
| 190 | Queen Street | West Lane | King Crescent | Signed Route | Medium Term | County | 0.36 | $550 | N/A |
| 1 | Queen Street North / | Maple Street | South Drive | Bike Lane | Medium | County | 1.20 | $9,000 | A |

| AT Segment ID | Segment / Street Name | To | From | Improvement / Ultimate AT Facility Type | Phasing | Jurisdiction | Length (km) | Estimated Cost | MCEA Schedule |
|---|---|---|---|---|---|---|---|---|---|
| | South | | | | Term | | | | |
| 40 | Queensway East | Existing Off-Road Multi-Use Trail | Donly Drive North | In-Boulevard Multi-use Trail | Long Term | MTO | 1.13 | N/A | A |
| 83 | Queensway West | Hillcrest Road | Windham East Quarter Line Road | Paved Shoulder | Long Term | County | 0.60 | N/A | A+ |
| 72 | Radical Road | Port Ryers Road | Regent Street | Paved Shoulder | Short Term | County | 4.79 | $526,900 | A+ |
| 91 | Rhineland Road | 1st Concession Sideroad | Middleton North Walsingham Townline Road | Paved Shoulder | Medium Term | County | 2.99 | $329,200 | A+ |
| 14 | Robinson Street | Talbot Street North | Norfolk Street North | Bike Lane | Long Term | County | 0.29 | N/A | A |
| 144 | Robinson Street | Elgin Avenue | Talbot Street North | Signed Route | Short Term | County | 0.49 | $750 | N/A |
| 138 | Silver Lake Drive / Cockshutt Road | Dover Mills Road | Prospect Street | Signed Route with Sharrow | Short Term | County | 0.92 | $3,650 | N/A |
| 201 | Somerset Dr / Newport Ln / Ocean Wy / Lakeview Ave | Hamilton Plank Road | New Lakeshore Road | Signed Route | Long Term | County | 1.42 | N/A | N/A |
| 27 | South Drive | Queen Street South | Talbot Street South | Signed Route with Edgeline | Short Term | County | 0.33 | $1,300 | N/A |
| 31 | South Drive | Oak Street | Queen Street South | Signed Route with Edgeline | Short Term | County | 0.52 | $2,050 | N/A |
| 2 | St. George Street | Nelson Street West | Clinton Street | Bike Lane | Long Term | County | 0.55 | N/A | A |
| 11 | St. George Street | Greenock Street West | Nelson Street West | Bike Lane | Long Term | County | 0.36 | N/A | A |
| 19 | St. George Street / Harbour Street | Clinton Street | Harbour Street | Bike Lane | Long Term | County | 0.31 | N/A | A |
| 206 | St. James Street | Green Street | Brown Street West | Signed Route | Long Term | County | 0.18 | N/A | N/A |
| 33 | St. James Street South | Alice Street | Green Street | In-Boulevard Multi-use Trail | Long Term | County | 0.62 | N/A | A |
| 200 | St. Patrick Street / Bridge Alley | Existing Off-Road Multi-Use Trail | Clinton Street | Signed Route | Short Term | County | 0.78 | $1,150 | N/A |
| N/A | St. Patrick Street to Walker Street | Metal stairs with hand railing and gutter to roll bicycle | N/A | Proposed Pedestrian Access | Long Term | County | N/A | N/A | N/A |
| 214 | Stanley Street | Queen Street South | Talbot Street South | Signed Route | Long Term | County | 0.33 | N/A | N/A |
| 133 | Stanley Street | Norfolk Street South | Talbot Street South | Signed Route with Sharrow | Long Term | County | 0.30 | N/A | N/A |
| 227 | Steiner Road | Windham Road 3 | Windham Road 5 | Signed Route | Short Term | County | 2.93 | $2,950 | N/A |
| 79 | Swimming Pool Road | La Salette Road | 265m north of Windham Road 11 | Paved Shoulder | Long Term | County | 3.91 | N/A | A+ |
| 104 | Swimming Pool Road | Talbot Road | Windham Road 11 | Signed Route | Long Term | County | 1.13 | N/A | N/A |
| 120 | Swimming Pool Road | Windham Road 11 | 265m north of Windham Road 11 | Signed Route with Sharrow | Long Term | County | 0.27 | N/A | N/A |

| AT Segment ID | Segment / Street Name | To | From | Improvement / Ultimate AT Facility Type | Phasing | Jurisdiction | Length (km) | Estimated Cost | MCEA Schedule |
|---|---|---|---|---|---|---|---|---|---|
| 169 | Talbot Road | Norwich Road | James Street | Signed Route | Long Term | County | 0.56 | N/A | N/A |
| 170 | Talbot Road | Talbot Road | Swimming Pool Road | Signed Route | Long Term | County | 0.04 | N/A | N/A |
| 28 | Talbot Street | Maple Street | South Drive | Signed Route with Edgeline | Short Term | County | 1.22 | $4,900 | N/A |
| 192 | Talbot Street | Highway 59 | Byerlay Side Road | Signed Route | Long Term | County | 2.29 | N/A | N/A |
| 228a | Teeterville Road | Windham Road 5 | Windham Road 6 | Signed Route | Short Term | County | 1.74 | $1,750 | N/A |
| 228b | Teeterville Road | North of Ellington Lane (east side of road) | N/A (single site) | Proposed Share the Road signage | Short Term | County | N/A | $250 | N/A |
| 228c | Teeterville Road | North of Ellington Lane (west side of road) | N/A (single site) | Proposed Share the Road signage | Short Term | County | N/A | $250 | N/A |
| 229 | Teeterville Road | Windham Road 6 | Windham Centre Road | Signed Route | Short Term | County | 2.95 | $2,950 | N/A |
| 160 | Thompson Drive / Mergl Drive | Highway 6 | Greenock Street West | Signed Route | Long Term | County | 1.18 | N/A | N/A |
| 277 | Thompson Drive / Mergl Drive | Greenock Street West | Nelson Street West | Signed Route | Short Term | County | 0.24 | $350 | N/A |
| 38 | Thompson Road East | Main Street | Duncombe Road | In-Boulevard Multi-use Trail | Medium Term | County | 0.51 | $127,250 | A |
| 49 | Thompson Road East | Duncombe Road | Cockshutt Road | Paved Shoulder | Medium Term | County | 2.86 | $314,750 | A+ |
| 82 | Thompson Road East | Cockshutt Road | County Line | Paved Shoulder | Long Term | County | 7.23 | N/A | A+ |
| 90a | Thompson Road West | Existing Off-Road Multi-Use Trail | Main Street South | Paved Shoulder | Medium Term | County | 0.97 | $106,300 | A+ |
| 90b | Thompson Road West / East | At existing off-road trail | N/A (single site) | Proposed Trailhead | Long Term | County | N/A | N/A | N/A |
| 90c | Thompson Road West | Main Street South | Leamon Street | Construct new 250 mm diameter sanitary sewer | Medium Term | County | 0.104 | $67,400 | A+ |
| 90d | Thompson Road West | Blueline Road | Leamon Street | Replace 200 mm diameter sanitary sewer with new 250 mm diameter sanitary sewer. | Medium Term | County | 0.155 | $100,450 | A+ |
| 24 | Turkey Point Road | Vittoria Road | Charlotteville Road 1 | Buffered Paved Shoulder | Long Term | County | 4.00 | N/A | A+ |
| 94 | Turkey Point Road | Charlotteville Road 1 | Cedar Drive | Paved Shoulder | Medium Term | County | 2.88 | $317,200 | A+ |
| 212 | Union Street | Elgin Avenue | Norfolk Street South | Signed Route | Short Term | County | 0.79 | $1,200 | N/A |
| N/A | Union Street | Norfolk Street North | N/A (single site) | Proposed Crossing Enhancement | Short Term | County | N/A | $80,000 | N/A |
| 4a | Victoria Street | Norfolk Street South | Ireland Road | Bike Lane | Medium | County | 1.80 | $13,500 | A |

| AT Segment ID | Segment / Street Name | To | From | Improvement / Ultimate AT Facility Type | Phasing | Jurisdiction | Length (km) | Estimated Cost | MCEA Schedule |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Term | | | | |
| 4b | Victoria Street | Donly Drive South | east of Potts Road | Replace existing 300 mm diameter sanitary sewer with new 375 mm diameter sanitary sewer | Medium Term | County | 0.3259 | $276,050 | A+ |
| N/A | Villa Nova Road | 0.5 km south of County Road 9 | N/A (single site) | Programmed Bridge Rehabilitation Review | Short Term | County | N/A | Completed in 2014 | N/A |
| 92 | Vittoria Road | Mill Pond Road | Hillcrest Road South | Paved Shoulder | Long Term | County | 1.60 | N/A | A+ |
| 257 | Vittoria Road | Turkey Point Road | Charlotteville East Quarter Line Road | Signed Route | Long Term | County | 3.68 | N/A | N/A |
| 84 | Vittoria Road / Radical Road | Hillcrest Road South | Port Ryere Road | Paved Shoulder | Long Term | County | 2.50 | $275,458 | A+ |
| 10 | Walker Street | St. George Street | Main Street | Bike Lane | Long Term | County | 0.12 | N/A | A |
| 12 | Walker Street | Main Street | St. Patrick Street | Bike Lane | Long Term | County | 0.24 | N/A | A |
| 126 | Walker Street / Hamilton Plan Road | John Street | St. Patrick Street | Signed Route with Sharrow | Short Term | MTO | 0.36 | $1,450 | N/A |
| 13 | Washington Street | Brown Street West | Thompson Road West | Bike Lane | Short Term | County | 0.31 | $2,350 | A |
| N/A | Grace Street | Drayton Street | Water Street | Replace existing 200 mm diameter sanitary sewer with new 300 mm diameter sanitary sewer | Medium Term | County | 0.031 | $23,850 | A+ |
| 207 | West Church / East Church Street | Main Street South | Duncombe Road | Signed Route | Short Term | County | 0.45 | $650 | N/A |
| 180 | Western Avenue | Main Street in Delhi | Existing Off-Road Multi-Use Trail | Signed Route | Long Term | County | 0.40 | N/A | N/A |
| 114a | William Street | Old Mill Road | Main Street of Delhi | Signed Route | Short Term | County | 0.85 | $1,300 | N/A |
| 114b | William Street | South of Old Mill Road (north side of road) | N/A (single site) | Proposed Share the Road signage | Short Term | County | N/A | $250 | N/A |
| 114c | William Street | South of Old Mill Road (south side of road) | N/A (single site) | Proposed Share the Road signage | Short Term | County | N/A | $250 | N/A |
| 114d | William Street | West of Main Street (north side of road) | N/A (single site) | Proposed Share the Road signage | Short Term | County | N/A | $250 | N/A |
| 114e | William Street | West of Main Street (south side of road) | N/A (single site) | Proposed Share the Road signage | Short Term | County | N/A | $250 | N/A |
| 186 | William Street | Main Street of Delhi | James Street | Signed Route | Short Term | County | N/A | $250 | N/A |
| 276 | Willowdale Cres/ Ivey Rose W/ Cardinal Ln | Willowdale Crescent | Main Street | Signed Route | Medium Term | County | N/A | $250 | N/A |
| 273 | Wilson Avenue | Viola Court | Fertilizer Road | Signed Route | Long Term | County | 1.53 | N/A | N/A |
| 123 | Wilson Avenue | James Street | Gage Street | Signed Route with Sharrow | Long Term | County | 0.27 | N/A | N/A |

| AT Segment ID | Segment / Street Name | To | From | Improvement / Ultimate AT Facility Type | Phasing | Jurisdiction | Length (km) | Estimated Cost | MCEA Schedule |
|---|---|---|---|---|---|---|---|---|---|
| 39 | Wilson Drive | Norfolk Street South | Hendry Street | In-Boulevard Multi-use Trail | Long Term | County | 0.33 | N/A | A |
| 215 | Wilson Drive / Lynndale Road | Argyle Street | Donly Drive North | Signed Route | Short Term | County | 0.76 | $1,150 | N/A |
| 216 | Wilson Drive / Lynndale Road | Hendry Street | Argyle Street | Signed Route | Short Term | County | 0.28 | $450 | N/A |
| 80 | Windham Centre Road | Windham West Quarter Line | Highway 24 | Paved Shoulder | Long Term | County | 10.96 | N/A | A+ |
| 141 | Windham East Quarter Line Road | Windham Road 13 | Highway 3 | Signed Route | Long Term | County | 2.75 | N/A | N/A |
| 163 | Windham East Quarter Line Road | Windham Road 3 | Windham Road 6 | Signed Route | Long Term | County | 4.16 | | N/A |
| 235 | Windham East Quarter Line Road | Abandoned Rail Corridor | Windham Road 13 | Signed Route | Short Term | County | 6.60 | $6,600 | N/A |
| 274 | Windham East Quarter Line Road | Windham Road 6 | Abandoned Rail Corridor | Signed Route | Long Term | County | 3.02 | N/A | N/A |
| 64 | Windham Road 11 | Swimming Pool Road | Brantford Road | Paved Shoulder | Long Term | County | 2.03 | N/A | A+ |
| 67 | Windham Road 12 | Windham West Quarter Line Road | Fertilizer Road | Paved Shoulder | Long Term | County | 1.80 | N/A | A+ |
| 68 | Windham Road 12 | Brantford Road | Fertilizer Road | Paved Shoulder | Long Term | County | 0.16 | N/A | A+ |
| 230 | Windham Road 12 | Windham West Quarter Line | Nixon Road | Signed Route | Long Term | County | 3.65 | N/A | N/A |
| 231 | Windham Road 12 | Windham East Quarter Line Road | Highway 24 | Signed Route | Medium Term | County | 3.68 | $3,700 | N/A |
| 275 | Windham Road 12 | Nixon Road | Highway 24 | Signed Route | Long Term | County | 3.62 | N/A | N/A |
| 166 | Windham Road 13 | Fertilizer Road | Windham West Quarter Line Road | Signed Route | Medium Term | County | 1.80 | $1,800 | N/A |
| 167a | Windham Road 13 | Windham West Quarter Line Road | Windham East Quarter Line Road | Signed Route | Short Term | County | 7.28 | $7,300 | N/A |
| 167b | Windham Road 13 | East of Windham West Quarter Line Road | N/A (single site) | Proposed Share the Road signage | Short Term | County | N/A | $250 | N/A |
| N/A | Windham Road 19 | 1.1 km south of Windham Road 9 | N/A (single site) | Programmed Bridge Rehabilitation Review | Short Term | County | N/A | Completed in 2014 | N/A |
| 63 | Windham Road 20 | Norwich Road | Swimming Pool Road | Paved Shoulder | Medium Term | County | 1.00 | $110,550 | A+ |
| 70 | Windham Road 20 | Hawtrey Road | Norwich Road | Paved Shoulder | Short Term | County | 0.96 | $105,600 | A+ |
| 173 | Windham Road 3 / Concession 3 Townsend | Windham West Quarter Line Road | Cockshutt Road | Signed Route | Short Term | County | 18.93 | $18,950 | N/A |
| 107a | Wolven Street | Bay Street | East Quarter Line Road | Signed Route | Short Term | County | 1.44 | $2,150 | N/A |
| 107b | Wolven Street | East of Grave Street (north side of road) | N/A (single site) | Proposed Share the Road signage | Short Term | County | N/A | $250 | N/A |

| AT Segment ID | Segment / Street Name | To | From | Improvement / Ultimate AT Facility Type | Phasing | Jurisdiction | Length (km) | Estimated Cost | MCEA Schedule |
|---|---|---|---|---|---|---|---|---|---|
| 107c | Wolven Street | East of Grave Street (south side of road) | N/A (single site) | Proposed Share the Road signage | Short Term | County | N/A | $250 | N/A |
| 153 | Woodway Trail | Decou Road | Decou Road | Signed Route | Long Term | County | 2.74 | N/A | N/A |

**Figure 7-3 – Summary of ISMP Recommendations, General Infrastructure and Policy**

| Area | Recommendation | Phasing | Estimated Cost | Improvement Type | MCEA Schedule | ISMP page reference |
|---|---|---|---|---|---|---|
| County-Wide | Risk assessments should be performed for the water treatment plants, periodically. (Note that these risk assessments are in addition to risks assessments required as part of the Clean Water Act and 2015 Long Point Region Source Protection Plan for the area.) | Short Term | No additional costs | Policy | N/A | 20 |
| County-Wide | For surface water treatment plants, all pumping systems should have a firm capacity equal to the total of all pumps with the largest pump out of service. | Short Term | Included in Individual Plant Recommendations | Policy | N/A | 20 |
| County-Wide | For surface water treatment plants, all pumps to be considered in the plant capacity must be operable without compromising the treatment of drinking water. | Short Term | Included in Individual Plant Recommendations | Policy | N/A | 20 |
| County-Wide | For surface water treatment plants, the filtration capacity should be considered as the capacity of the filters with the one filter out of service. | Medium Term | Included in Individual Plant Recommendations | Policy | N/A | 20 |
| County-Wide | For surface water treatment plants, at least two pre-treatment trains must exist. | Medium Term | Included in Individual Plant Recommendations | Policy | N/A | 20 |
| County-Wide | Groundwater-based system should have duty and standby wells, such that the firm capacity of the system equals the total capacity of the wells, with the largest well out of service. | Short Term | No additional costs | Policy | N/A | 20 |
| County-Wide | Groundwater-based system should be supplied from a minimum of two aquifers. | Medium Term | Included in Individual Water System Recommendations | Policy | N/A | 20 |
| County-Wide | Groundwater risk assessments and vulnerability reviews should be reviewed and updated on a regular basis. | Medium Term | Included in Individual Water System Recommendations | Policy | N/A | 21 |
| County-Wide | Apart from completing permitting requirements for current groundwater Permit to Take Water applications, future County water supplies should be based on Lake Erie-based solutions. | Medium Term | Included in Individual Water System Recommendations | Policy | N/A | 21 |
| County-Wide | Norfolk should continue to follow the recommendations of the FUS for determining design fire flows. The current fire flow of 83 L/s for typical single family residences should continue to be used for new single family developments. For all other developments, it is recommended that individual FUS calculations be performed to select the specific fire flow to be used for that development. | Short Term | No additional costs | Policy | N/A | 22 |

| Area | Recommendation | Phasing | Estimated Cost | Improvement Type | MCEA Schedule | ISMP page reference |
|---|---|---|---|---|---|---|
| County-Wide | Fire flow modelling should be undertaken with the water level (or hydraulic grade line) at a level that would occur at the end of fire on the maximum day. | Short Term | No additional costs | Policy | N/A | 22 |
| County-Wide | Water mains in some existing localized areas of the distribution systems are smaller than the recommended minimum diameter of 150 mm. In cases of undersized mains, the County should consider the installation of larger diameter mains as part of infrastructure renewal projects in the future. These needs have been identified in this report. | Short Term | No additional costs | Policy | TBD | 22 |
| County-Wide | Distribution systems should be designed to achieve the following system pressures:<br>• Peak Hour Demand – Target: 350 – 550 kPa (50-80 psi)<br>• Peak Hour Demand – Min. and Max.: 275 – 700 kPa (40-100 psi)<br>• Maximum Day + Fire: ≥140 kPa (20 psi)<br><br>If ground elevations result in pressures outside of the indicated ranges, either booster pumping stations or pressure reducing stations should be added. | Short Term | No additional immediate costs | Policy | TBD | 23-24 |
| County-Wide | All water system facilities and water mains should be located on municipally owned property or public right-of-ways. Easements should be avoided unless they are readily accessible during an emergency.<br>The County should:<br>• obtain easements for all existing water mains on private property<br>• construct access lanes above all existing water main easements to allow access<br>• construct replacement water mains where the previous two points are not possible. | Short Term | No additional immediate costs | Policy | TBD | 24 |
| County-Wide | To address potential future issues at the Courtland Reservoir, the draft Schedule B Class Environmental Assessment prepared by G. Douglas Vallee Limited should be revisited and a third alternative (Alternative 2, with the addition of hydro-pneumatic vessels, a revised control system, and additional standby power facilities) be considered. | Short Term | $25,000 | Policy | TBD | 55 |
| County-Wide | For any new developments adjacent to areas of marginal service, conduct detailed network modelling of the proposal, and establish if any network upgrades using replacement mains of a larger diameter will be required. | Short Term | No additional immediate costs | Policy | N/A | 60 |
| County-Wide | At the time any streets are to be reconstructed or water mains replaced, consider whether upsizing of the water main could be used to supplement supplies to marginal areas, along with any local sub-standard areas. (See **Appendix D** for detailed listing). | Short Term | No additional immediate costs | Policy | N/A | 60 |

| Area | Recommendation | Phasing | Estimated Cost | Improvement Type | MCEA Schedule | ISMP page reference |
|---|---|---|---|---|---|---|
| County-Wide | The County should complete draw down testing to confirm pumping station capacity, particularly for those pumping stations where approval documents cannot be located. | Short Term | $10,000 | Policy | N/A | 108, 113, 114 |
| County-Wide | Collect information for sewage pumping stations for which documentation, including CofA or ECA documents could not be located. These stations include PS1 and PS2 in Simcoe, Hillside Pumping Station, Western Pumping Station and Industrial Pumping Station in Delhi and Ducks Landing Pumping Station in Port Rowan. | Short Term | No additional costs | Policy | N/A | 119 |
| County-Wide | The County's growth projections identified employment lands growth of 735 ha within the urban areas of Simcoe, Port Dover, Delhi and Waterford. Future needs associated with servicing new employment lands should be identified once the location of employment growth areas has been identified. | Medium Term | No additional costs | Policy | N/A | 119 |
| County-Wide | The County's database of information for sanitary sewers should be expanded to include information on invert and manhole rim elevations. | Short Term | No additional costs | Policy | N/A | 119 |
| County-Wide | Consider measures to reduce inflow and infiltration in future including providing storm connections to existing properties when undertaking sewer upgrade works | Long Term | Not Included in capital budget | Infrastructure | N/A | 93 |
| County-Wide | Enhance Water Conservation | Short Term | $0.2 Million/Year | Infrastructure | A | 66-67, 71-72, 74, 75, 79, 81, 83 |
| County-Wide | Traffic Control Guidelines - Adopt OTM Books for traffic control device and system standards | Short Term | N/A | Policy | N/A | 258-260, 263 |
| County-Wide | Develop County-specific Traffic Calming Policy based on the Canadian Guide to Neighbourhood Traffic Calming | Short Term | N/A | Policy | N/A | 259, 263 |
| County-Wide | Develop Special Events protocol | Short Term | N/A | Policy | N/A | 259-260, 263 |
| County-Wide | Adopt Transportation Impact Study (TIS) Guidelines as a new subsection of the Norfolk County Design Guidelines | Short Term | N/A | Policy | N/A | 260, 263 |
| County-Wide | Include a requirement for sidewalks on both sides of major and minor roads. Change Section 6.6.00 of the Design Criteria to reflect this recommendation. | Short Term | N/A | Policy | N/A | 261, 263 |
| County-Wide | Roundabouts - Adopt text and figure in **Appendix J** as part of Section 6 of the Design Criteria to reflect the standards to be used for roundabout selection and construction | Short Term | N/A | Policy | N/A | 261-262, 263 |
| County-Wide | Designate Goods Movement network | Short Term | N/A | Policy | N/A | 224, 264 |
| County-Wide | Designate Primary, Secondary and Tertiary road networks | Short Term | N/A | Policy | N/A | 224, 264 |

| Area | Recommendation | Phasing | Estimated Cost | Improvement Type | MCEA Schedule | ISMP page reference |
|---|---|---|---|---|---|---|
| County-Wide | Review conclusions of the Transportation Strategy Update on a five-year basis | Medium Term | N/A | Policy | N/A | 262, 264 |
| County-Wide (Various) | Bridge and Large Culvert Review | Short Term | Already programmed on 2-year cycle | Infrastructure | A+ (if no major changes to function) | 229, 252-256, 264 |
| County-Wide (Various) | Reconstruct Goods Movement Network | Long Term | $ 7,800,000 | Infrastructure | A+ (no changes recommended to function or width of roadway) | 262, 264 |
| County-Wide | The AT network is made up of primary "spine" routes and secondary "local" connections. The network is made up of both on and off-road linkages. | Short Term – Long Term | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | County staff should use the definitions for the primary and secondary network and should assign a hierarchy to additional routes that are identified and ultimately incorporated into the AT network when implementing the strategy. | Short Term - Long Term | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | Use the OTM Book 18 Facility Selection process should additional route opportunities arise as the County proceeds with the implementation of the AT Strategy and network. | Short Term - Long Term | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | Adopt the design guidelines (Technical Appendix A-4 of the standalone AT Strategy) in addition to other industry standards and guidelines as the basis for the design of AT facilities County-wide. Designers and builders should be provided with the relevant resources for future decision-making. | Short Term | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | Review the suggested updates to the existing 2009 Norfolk County Design Criteria and consider updating the document to reflect these changes. | Short Term | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | The AT network presented in **Appendix L, Maps 4a-c** should be adopted as a blueprint for the development of future AT facilities in combination with the 2009 Trails Master Plan Network (until next updated). | Short Term | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | Over time the AT network will change, to reflect new opportunities. The database and mapping should be updated to reflect these changes and the changes should be communicated to the appropriate staff members. | Short Term - Long Term | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | Adopt and use the OTM Books 18 and 15 as the primary reference for the design of AT facilities in conjunction with the design guidelines prepared for the AT Strategy. | Short Term | N/A | Policy | N/A | Standalone AT Strategy |

| Area | Recommendation | Phasing | Estimated Cost | Improvement Type | MCEA Schedule | ISMP page reference |
|---|---|---|---|---|---|---|
| County-Wide | As the main streets within the County's community areas come up for redesign, staff should consider the design and implementation of a complete street to accommodate various users along the key connections. | Medium Term - Long Term | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | Proceed with the implementation of the proposed interim facilities as identified in Table 4 of the stand-alone AT Strategy with the goal of implementing the ultimate solution in the proposed timeline. | Short Term | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | When implementing the AT network, facilities should be designed with people of all ages and abilities in mind with specific reference to the design guidelines identified in Technical Appendix A-4 of the standalone AT Strategy. | Short Term | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | When designing and implementing AT facilities and multi-use trails, the County must refer to the Built Environment Standards (under the Integrated Accessibility Standards Regulation) as well as the AODA section 80.8 and 80.10 to satisfy the requirements to the greatest extent possible given the context of each trail's location, the surrounding environment and the type of trail experience that is desired.. | Short-term | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | Prioritize the implementation of sidewalks on routes that make up part of the County-wide AT network specifically within the " walkable areas" of the County's communities. Reference should be made to the maps presented in **Appendix L, Maps 5a and b** and the information in Table 6 of the stand-alone AT Strategy for the location of these priorities. | Consistent with phasing of proposed AT routes - see location specific improvements | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | Identify monies, on an annual basis, allocated to implement select sidewalk priorities with consideration for those identified in Table 6 of the stand-alone AT Strategy. | Short Term to Long Term | TBD by County staff | Policy | N/A | Standalone AT Strategy |
| County-Wide | Revise all existing sidewalk policies to reflect current design guidelines and standards for pedestrians. The policies should be included in the County's Official Plan and all other applicable guiding policy documents. | Short Term to Long Term | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | Continue to consider and design for service and emergency vehicles at trail access and exit points including the use of swing gates and bollards (where it is deemed appropriate). | Short Term to Long Term | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | Prioritize the implementation of short-term routes that provide direct connections between the community areas to achieve connectivity in the near future. | Short Term | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | Changes to the development process should be made and communicated to the development community. Clear directions on the approach to review site plans and development applications should be clearly documented. | Medium Term | N/A | Policy | N/A | Standalone AT Strategy |

| Area | Recommendation | Phasing | Estimated Cost | Improvement Type | MCEA Schedule | ISMP page reference |
|---|---|---|---|---|---|---|
| County-Wide | The roles and responsibilities identified in Figure 18 of the stand-alone AT Strategy should be reviewed, confirmed and adopted as the preferred method for decision-making when implementing the AT Strategy. The process should be incorporated into existing County processes and communicated to external partners. | Short Term | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | Review the desired AT network connections and identify the ownership of said connections to determine the appropriate course of action for implementation. | Medium Term | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | When the Official Plan is next updated, the recommendations and network contained within the AT Strategy should be reviewed and incorporated where appropriate. | Short Term | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | When the Official Plan is next updated, the proposed AT network should be included as a schedule and reinforced through updated policy. | Short Term | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | Explore the development and implementation of land-use planning policies that support active transportation including mixed-use, higher density community areas and user friendly streetscapes. | Short Term | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | Make reference to the network enhancements identified as part of the phasing maps and implement the proposed design treatments at the suggested locations as the routes are implemented. | Consistent with phasing of proposed network enhancements - see location specific improvements | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | County staff should make reference to the design treatments outlined in Section 4.2.1.4 in OTM Book 18 to confirm the preferred design treatment for the locations identified as part of the AT network. | Consistent with phasing of proposed network enhancements - see location specific improvements | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | The County and its partners should explore the implementation of network amenities to complement the various on and off-road linkages implemented County-wide. | Short Term | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | The County and its partners should work with local businesses and interest groups to identify opportunities to improve local AT amenities such as bicycle parking, wayfinding or signage. | Short Term | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | The County should integrate the Transportation Master Plan and AT Strategy recommendations and phasing should identify priorities for implementation based on the available annual budget as well as associated maintenance. | Short Term | N/A | Policy | N/A | Standalone AT Strategy |

| Area | Recommendation | Phasing | Estimated Cost | Improvement Type | MCEA Schedule | ISMP page reference |
|---|---|---|---|---|---|---|
| County-Wide | County staff should prepare and submit a summary report to Council on an annual basis that proposes updates and improvements to maintenance practices in order to accommodate new AT infrastructure that has been implemented. | Short Term | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | Define the preferred level of service standards for winter and seasonal maintenance and integrate the maintenance for AT facilities including a guide for snow clearing and removal. | Short Term - Medium Term | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | When selecting and designing active transportation facilities within Norfolk County, staff should use the highest prevailing standards, OTM Book 18, to guide decision-making. | Short Term | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | Use the facility selection and documentation process outlined in OTM Book 18 to determine the preferred facility type and document it in a similar fashion as has been done in the AT Strategy and incorporated into the AT database. | Short Term | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | The proposed performance measures identified for the Norfolk AT Strategy should be reviewed and revised (as necessary) before being adopted by the County to guide data gathering and evaluation. | Medium Term | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | Establish a process where data is collected every two years to measure the performance of infrastructure, policies and programs. The data collection should occur at the same time / season each year for consistency. An annual report should be submitted to Council documenting the status of implementation. | Medium Term | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | The County and its partners should use the tourism assessment to help prioritize future improvements related to AT tourism and promotion and should make specific reference to the recommendations outlined in the assessment. | Short Term | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | The Health Unit should update and implement the previously developed Active and Safe Routes to School program in partnership with the local school boards and should work with local schools to implement future initiatives. | Short Term | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | When implementing the AT network, prioritize the implementation of connections within the community areas that provide direct connections to local schools. | Short Term - see priority projects in the AT Strategy Database | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | The Haldimand-Norfolk Health Unit should work with the community services department, local committees and interest groups to establish education and awareness programs to promote active transportation and recreation County-wide. | Short Term - Medium Term | N/A | Policy | N/A | Standalone AT Strategy |

| Area | Recommendation | Phasing | Estimated Cost | Improvement Type | MCEA Schedule | ISMP page reference |
|---|---|---|---|---|---|---|
| County-Wide | The County and its partners should explore the opportunity to become a Bicycle Friendly Community once some of the initial short-term AT infrastructure priorities have been implemented. | Medium Term | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | When developing communication and outreach tools and promotional materials to support the AT Strategy, the County should review and confirm the key messages and incorporate them as appropriate. | Short Term | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | The County should work with local partners to move the AT Strategy forward to the implementation phase and should make reference to the partners outlined in Table 10 and their specific roles and responsibilities when determining who to engage and when. | Short Term | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | The network phasing identified in **Appendix M, Map 6a-c and Map 7a-c** should be used by the County to guide the development of the AT network and should be used as a reference by external partners when future connections are being explored. | Short Term | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | The AT priorities illustrated on **Appendix M, Map 7a-c** should be used as a primary reference for the County and its partners within 2 years of implementation. | Short Term | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | As additional opportunities arise, the County should work to identify them as short-term AT infrastructure priorities and should incorporate them into the network database. | Short Term | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | The implementation tools identified in the AT Strategy should be adopted in principle by County Council, staff and its partners and used to guide network design and development. | Short Term | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | The database prepared for the AT Strategy should be integrated into the County's existing database and regularly updated to track, manage and budget for AT improvements. | Short Term | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | The database prepared for the AT Strategy should be used as a communication tool in various formats including an electronic display of the network as well as promotional mapping prepared by County partners. | Short Term | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | The County should use the unit cost spreadsheet as a tool to inform future budgeting and cost allocation. As needed, the spreadsheet should be updated to reflect changes to costing to ensure the information is accurate. | Short Term | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | As the plan is implemented, the cost associated with phases 2 and 3 should be revisited and revised to reflect up-to-date unit costing and confirmed facility types. | Medium Term – Long Term | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | The capital costing identified in the spreadsheet for the AT Strategy should be integrated with the costing identified for the TMP. | Short Term | N/A | Policy | N/A | Standalone AT Strategy |

| Area | Recommendation | Phasing | Estimated Cost | Improvement Type | MCEA Schedule | ISMP page reference |
|---|---|---|---|---|---|---|
| County-Wide | County staff should work together to ensure that the budgeting for proposed linkages as identified in the TMP is coordinated with those identified in the AT Strategy using the costing / implementation tool. | Short Term | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | The County should review potential funding opportunities and explore those that are applicable to fund the future implementation of the AT Strategy. | Short Term - Long Term | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | The Health Unit should be responsible for reviewing potential funding sources on an annual basis to highlight additional opportunities and should communicate these opportunities in advance of the capital budgeting process. | Short Term - Long Term | N/A | Policy | N/A | Standalone AT Strategy |
| County-Wide | Update stormwater management database | Short Term | $200,000 | Policy | N/A | 184 |
| County-Wide | Refine and update current policies and by-laws | Short Term | $30,000 | Policy | N/A | 184 |
| County-Wide | Develop a SWM operation and maintenance program | Short Term | $60,000 | Policy | N/A | 184 |
| County-Wide | Update the county-wide hydrology/hydraulics model | Short Term | $75,000 | Policy | N/A | 184 |
| County-Wide | Implement pilot scale Low Impact Development measures | Medium Term | $100,000 | Infrastructure | Conveyance Controls: Resurfacing – A or A+ | 187 |
| County-Wide | Assess climate change concerns and adaptation measures | Medium Term | $50,000 | Policy | N/A | 187 |
| County-Wide | Develop a county-wide stream erosion master plan | Medium Term | $120,000 | Policy | N/A | 187 |
| County-Wide | Update the stormwater management master plan | Long Term | $100,000 | Policy | N/A | 189 |
| County-Wide | Implement large scale Low Impact Development measures | Long Term | $500,000 | Infrastructure | Conveyance Controls: Resurfacing – A or A+ | 189 |
| County-Wide | Maintain all SWM Facilities (annual operation and maintenance) | Annual | 9,200/Wet Pond<br>2,600/Dry Pond | Infrastructure | N/A | 204 |
| Courtland | Develop enhanced response time to water main break between Delhi and Courtland | Short Term | $0.1 Million | Policy | N/A | 84, 86 |
| Courtland | Modifications to existing Courtland Pumping Station | Short Term | $0.45 Million | Infrastructure | TBD | 85, 86 |
| Courtland | Complete Distribution Loops. | Long Term | $0.4 Million | Policy | A | 85, 86 |
| Delhi | Develop new well in the vicinity of Windham West Quarter Line Road and Windham Road 14 | Short Term | $4.0 Million | Infrastructure | A | 73, 75 |
| Delhi | Decommission existing water treatment plant | Short Term | $0.5 Million | Infrastructure | A+ | 74, 75 |
| Delhi | Install one duty and one standby pump at the Delhi Standpipe | Short Term | $1.4 Million | Infrastructure | A | 74, 75 |

| Area | Recommendation | Phasing | Estimated Cost | Improvement Type | MCEA Schedule | ISMP page reference |
|---|---|---|---|---|---|---|
| Delhi | Pipeline interconnection with Simcoe | Medium Term | (considered in Simcoe) | Infrastructure | B | 74, 75 |
| Delhi | Replace Undersized Mains | Long Term | $0.9 Million | Infrastructure | A | 74, 76 |
| Delhi | Increase the firm capacity of the Main Street Pumping Station to 62 L/s. | Medium Term | $102,000 | Infrastructure | B | 112, 117, 119 |
| Delhi | Collect additional information on the Hillside, Industrial and Western Avenue Pumping Stations. Consider draw down testing to establish station firm and total capacities | Medium Term | $10,000 | Policy | N/A | 112, 117, 121 |
| Delhi | WWTF equipment, including pumps, blowers or aeration diffusers, may require replacement as they reach their useful lives. | Long Term | $300,000 | Infrastructure | A | 112, 117, 121 |
| Delhi | The applicable regulatory requirements are recommended to be assessed once every 10 years. | Medium Term | $15,000 | Policy | N/A | 132 |
| Delhi | Upgrading of storm sewers with significant flooding concerns | Short Term | $450,000 | Infrastructure | B | 185 |
| Delhi | Maintain SWM Facilities with current issues | Short Term | $5,000 | Infrastructure | A+ | 185 |
| Delhi | Construct one (1) new SWM facility | Short Term | $1,300,000 | Infrastructure | B | 185 |
| Delhi | Retrofit one (1) dry pond | Short Term | $650,000 | Infrastructure | A+ or B | 185 |
| Delhi | Upgrading of storm sewers with flooding concerns | Medium Term | $1,050,000 | Infrastructure | B | 187 |
| Delhi | Construct one (1) new SWM facility | Medium Term | $1,300,000 | Infrastructure | B | 188 |
| Delhi | Retrofit one (1) dry pond | Medium Term | $650,000 | Infrastructure | A+ or B | 188 |
| Delhi | Upgrading of storm sewers with flooding concerns | Long Term | $300,000 | Infrastructure | B | 189 |
| Delhi | Construct one (1) new SWM facility | Long Term | $1,300,000 | Infrastructure | B | 189 |
| Delhi | Retrofit one (1) dry pond | Long Term | $650,000 | Infrastructure | A+ or B | 189 |
| Port Dover | Water Treatment Plant upgrades | Short Term | $3.8 Million | Infrastructure | A+ | 133 |
| Port Dover | New Booster Pumping Station in northwest corner of system | Short Term | $3.0 Million | Infrastructure | A | 71, 72 |
| Port Dover | Interconnection with Simcoe (500 mm dia.) | Short Term | $6.0 Million | Infrastructure | B | 71, 72 |
| Port Dover | Replace Undersized Mains | Long Term | $2.4 Million | Infrastructure | A | 71, 72 |
| Port Dover | The currently planned WWTP upgrade to 5,800 $m^3$/d should be carried out for a rated capacity of 6,062 $m^3$/d. | Short Term | $8.5 Million | Infrastructure | Schedule C Class EA completed in 2011 | 71, 72 |
| Port Dover | Increase firm capacity of the Don Jon Pumping Station to a firm capacity of 31 L/s. | Medium Term | $55,000 | Infrastructure | B | 130 |
| Port Dover | The digester should be inspected for code compliance within 2016. | Short Term | $15,000 | Policy | N/A | 109, 116, 119 |
| Port Dover | The applicable regulatory requirements are recommended to be assessed once every 10 years. | Medium Term | $15,000 | Policy | N/A | 131 |

| Area | Recommendation | Phasing | Estimated Cost | Improvement Type | MCEA Schedule | ISMP page reference |
|---|---|---|---|---|---|---|
| Port Dover | Consider upsizing the existing 250mm diameter sanitary sewer on Main Street downstream of Greenock Street West to match the upstream 450mm diameter sanitary sewer when replacement is required | Long Term | Not included as part of Capital program. | Infrastructure | TBD | 131 |
| Port Dover | Upgrading of storm sewers with significant flooding concerns | Short Term | $900,000 | Port Dover | B | 185 |
| Port Dover | Maintain SWM Facilities with current issues | Short Term | $20,000 | Port Dover | A+ | 185 |
| Port Dover | Construct one (1) new SWM facility | Short Term | $1,300,000 | Port Dover | B | 185 |
| Port Dover | Retrofit one (1) dry pond | Short Term | $650,000 | Port Dover | A+ or B | 185 |
| Port Dover | Upgrading of storm sewers with flooding concerns | Medium Term | $300,000 | Port Dover | B | 187 |
| Port Dover | Construct one (1) new SWM facility | Medium Term | $1,300,000 | Port Dover | B | 187 |
| Port Dover | Retrofit one (1) dry pond | Medium Term | $1,300,000 | Port Dover | A+ or B | 187 |
| Port Dover | Upgrading of storm sewers with flooding concerns | Long Term | $300,000 | Port Dover | B | 189 |
| Port Dover | Construct one (1) new SWM facility | Long Term | $1,300,000 | Port Dover | B | 189 |
| Port Dover | Retrofit one (1) dry pond | Long Term | $650,000 | Port Dover | A+ or B | 189 |
| Port Rowan | Water Treatment Plant upgrades | Short Term | $3.8 Million | Infrastructure | A+ | 110, 117, 122 |
| Port Rowan | Deepen the existing surface water intake | Short Term | $0.5 Million | Infrastructure | A | 77, 79 |
| Port Rowan | Add loops to service the north portion of the system | Medium Term | $0.2 Million | Infrastructure | A | 77, 79 |
| Port Rowan | Replace Undersized Mains | Long Term | $0.05 Million | Infrastructure | A | 77, 79 |
| Port Rowan | Partial or full replacement of the WWTF membranes can be expected between 2023 to 2027. | Medium Term | $500,000 | Infrastructure | A | 78, 80 |
| Port Rowan | Replace 2 WWTF biofilters in the next 20 years. | Medium Term | $250,000 | Infrastructure | A | 134 |
| Port Rowan | Replace the current WWTF membrane diffusers with PTFE-coated membranes at the first replacement, and subsequently as required in the future. | Medium Term | $200,000 | Infrastructure | A | 134 |
| Port Rowan | The applicable regulatory requirements are recommended to be assessed once every 10 years. | Medium Term | $5000 | Policy | N/A | 134 |
| Port Rowan | Improve Mallard Walk Pumping Station to increase the station and total capacity to 24 L/s. | Medium Term | $38,000 | Infrastructure | B | 135 |
| Port Rowan | Upgrading of storm sewers with significant flooding concerns | Short Term | $450,000 | Infrastructure | B | 186 |
| Port Rowan | Maintain SWM Facilities with current issues | Short Term | $5,000 | Infrastructure | A+ | 186 |
| Port Rowan | Construct one (1) new SWM facility | Short Term | $1,300,000 | Infrastructure | B | 186 |
| Port Rowan | Retrofit one (1) dry pond | Short Term | $650,000 | Infrastructure | A+ or B | 186 |
| Port Rowan | Upgrading of storm sewers with flooding concerns: | Medium Term | $450,000 | Infrastructure | B | 188 |

| Area | Recommendation | Phasing | Estimated Cost | Improvement Type | MCEA Schedule | ISMP page reference |
|---|---|---|---|---|---|---|
| Port Rowan | Construct one (1) new SWM facility | Medium Term | $1,300,000 | Infrastructure | B | 188 |
| Port Rowan | Retrofit one (1) dry pond | Medium Term | $650,000 | Infrastructure | A+ or B | 188 |
| Port Rowan | Upgrading of storm sewers with flooding concerns | Long Term | $150,000 | Infrastructure | B | 190 |
| Port Rowan | Construct one (1) new SWM facility | Long Term | $1,300,000 | Infrastructure | B | 190 |
| Port Rowan | Retrofit one (1) dry pond | Long Term | $650,000 | Infrastructure | A+ or B | 190 |
| St. Williams | Develop Enhanced Response Time to Water Main Break | Short Term | $10,000 | Infrastructure | A | 114, 118, 121 |
| St. Williams | Install a Generator at the St. Williams Booster PS | Short Term | $0.1 Million | Infrastructure | A | 89 |
| St. Williams | Install pressure loggers to monitor suction and discharge pressures at the St. Williams PS to determine if there any concerns at this location. | Short Term | $5000 | Infrastructure | A | 89 |
| Simcoe | Maintain proactive Well Maintenance Program | Short Term | No additional costs | Policy | N/A | 69 |
| Simcoe | Pipeline Interconnection to Port Dover | Short Term | Included Under Port Dover | Infrastructure | B | 68, 69 |
| Simcoe | Increase firm capacity of Cedar St. High Lift Pumps and Northwest Reservoir Pumps | Short Term | $4.4 Million | Infrastructure | A | 67, 69 |
| Simcoe | Pipeline interconnection with Waterford (400 mm dia. main and Booster PS) | Medium Term | $5.6 Million | Infrastructure | B | 68, 69 |
| Simcoe | Pipeline interconnection with Delhi (400 mm dia. main and Booster PS) | Medium Term | $4.0 Million | Infrastructure | B | 63 |
| Simcoe | New Well to north-east of Simcoe | Medium Term | $6.9 Million | Infrastructure | A | 63 |
| Simcoe | Replace Undersized Mains | Long Term | $0.6 Million | Infrastructure | A | 67, 70 |
| Simcoe | Maintain the Simcoe Elevated tank within a narrow band between the top water level (TWL) and 1-2 m below the TWL if possible. | Short Term | No additional immediate costs | Policy | N/A | 68, 70 |
| Simcoe | The County should collect pumping station capacity information at PS1 and PS2. | Short Term | Additional study required | Policy | N/A | 108, 116, 119 |
| Simcoe | Replace WWTF equipment, once the useful life of the components is reached. | Short Term | $2.3 Million | Infrastructure | N/A | 125 |
| Simcoe | Construct new WWTF filter building. | Short Term | $2.0 Million | Infrastructure | A | 128 |
| Simcoe | Assess the WWTF applicable regulatory requirements, once every 10 years. | Short Term | No additional immediate costs | Policy | N/A | 128 |
| Simcoe | Implement short-term flow monitoring program in the sanitary sewer system downstream of the Industrial Park | Medium Term | $15,000 | Policy | N/A | 108 |
| Simcoe | Upgrading of storm sewers with significant flooding concerns | Short Term | $1,050,000 | Infrastructure | B | 184 |
| Simcoe | Maintain SWM Facilities with current issues | Short Term | $20,000 | Infrastructure | A+ | 184 |
| Simcoe | Construct one (1) new SWM facility | Short Term | $1,300,000 | Infrastructure | B | 184 |
| Simcoe | Retrofit one (1) dry pond | Short Term | $650,000 | Infrastructure | A+ or B | 184 |

| Area | Recommendation | Phasing | Estimated Cost | Improvement Type | MCEA Schedule | ISMP page reference |
|---|---|---|---|---|---|---|
| Simcoe | Upgrading of storm sewers with flooding concerns | Medium Term | $1,200,000 | Infrastructure | B | 187 |
| Simcoe | Construct one (1) new SWM facility | Medium Term | $1,300,000 | Infrastructure | B | 187 |
| Simcoe | Retrofit one (1) dry pond | Medium Term | $1,300,000 | Infrastructure | A+ or B | 187 |
| Simcoe | Upgrading of storm sewers with flooding concerns | Long Term | $500,000 | Infrastructure | B | 189 |
| Simcoe | Construct one (1) new SWM facility | Long Term | $1,300,000 | Infrastructure | B | 189 |
| Simcoe | Retrofit one (1) dry pond | Long Term | $650,000 | Infrastructure | A+ or B | 189 |
| Waterford | Pipeline interconnection with Simcoe | Medium Term | (considered in Simcoe) | Infrastructure | B | 81, 83 |
| Waterford | New Booster Pumping Station at base of Standpipe | Medium Term | $3.0 Million | Infrastructure | A | 81, 83 |
| Waterford | Consider looping Main Street N. from College Street W. to minimize head loss from the standpipe to any new development areas. | Medium Term | $150,000 | Infrastructure | A | 62 |
| Waterford | Upgrade mains to the north end and loop from Main Street to Woodley Road to eliminate dead end to upgrade local areas with inadequate fire protection | Medium Term | $0.1 Million | Infrastructure | A | 82, 83 |
| Waterford | Replace Undersized Mains | Long Term | $1.1 Million | Infrastructure | A | 62 |
| Waterford | WWTF equipment, including pumps, blowers or aeration diffusers, may require replacement as they reach their useful lives. | Medium Term | $200,000 | Infrastructure | A | 136 |
| Waterford | Improve the Blueline Road Pumping Station to increase the station and total capacity to a firm capacity of 48 L/s. | Medium Term | $85,000 | Infrastructure | B | 115, 118, 121 |
| Waterford | Improve the Mechanic Pumping Station to provide sufficient firm capacity to pump 2041 peak design flows. | Medium Term | $133,000 | Infrastructure | B | 115, 118, 121 |
| Waterford | Media in the Submerged Attached Growth Reactor (SAGR™) may have to be replaced at least once within the projected growth period. | Medium Term | $200,000 | Infrastructure | A | 137 |
| Waterford | The applicable regulatory requirements are recommended to be assessed once every 10 years. | Medium Term | $15,000 | Policy | A | 137 |
| Waterford | Upgrading of storm sewers with significant flooding concerns | Short Term | $150,000 | Infrastructure | B | 186 |
| Waterford | Maintain SWM Facilities with current issues | Short Term | $10,000 | Infrastructure | A+ | 186 |
| Waterford | Construct one (1) new SWM facility | Short Term | $1,300,000 | Infrastructure | B | 186 |
| Waterford | Retrofit one (1) dry pond | Short Term | $650,000 | Infrastructure | A+ or B | 186 |
| Waterford | Upgrading of storm sewers with flooding concerns | Medium Term | $300,000 | Infrastructure | B | 188 |
| Waterford | Construct one (1) new SWM facility | Medium Term | $1,300,000 | Infrastructure | B | 188 |
| Waterford | Retrofit one (1) dry pond | Medium Term | $650,000 | Infrastructure | A+ or B | 188 |
| Waterford | Upgrading of storm sewers with flooding concerns | Long Term | $150,000 | Infrastructure | B | 189 |
| Waterford | Construct one (1) new SWM facility | Long Term | $1,300,000 | Infrastructure | B | 189 |

| Area | Recommendation | Phasing | Estimated Cost | Improvement Type | MCEA Schedule | ISMP page reference |
|---|---|---|---|---|---|---|
| Waterford | Retrofit one (1) dry pond | Long Term | $650,000 | Infrastructure | A+ or B | 189 |

(*) Stormwater Management - Schedule A+ does not allow for the expansion of the existing facility, therefore the alteration/upgrade or retrofit must be confined to the existing facility footprint or stormwater management block limits.

# 8.0 FINANCING THE ISMP

This section provides a qualitative summary of potential financing options to support the infrastructure growth for the ISMP. Funding tools for improving municipal infrastructure include a range of traditional and non-traditional apparatuses. As part of the Norfolk County ISMP study, the following potential funding sources were evaluated: development charges; front-ending and cost-sharing arrangements; local improvement charges and tax-increment financing; debt financing, user fees, property taxes, federal and provincial funding, and public private partnerships. Opportunities have been identified that make use of Norfolk's internal financial resources (debt and reserves) and external capital.

The Summary of estimated costs for the ISMP recommendations identified in **Figure 7-1** over the three planning horizons represents a very significant capital expenditure. The purpose of the three timeframes identified is to set high-level priorities for projects. It is fully recognized that the total magnitude of capital costs would unreasonably burden Norfolk County when considered in the context of all other County financial obligations. The assessment was completed from a technical perspective which evaluated alternatives and identified preferred alternatives for each of the three time horizons. Discussions with the County finance managers, confirmed that even though the timing for the implementation of the individual projects will have to be adjusted to reflect responsible financial planning for all County obligations, the priority of projects should not change. The plan provides flexibility to accommodate evolving needs and priorities of the County and any new federal or provincial infrastructure funding programs that may become available in the future.

Note, the annual Norfolk County Capital Plan outlines the year's infrastructure priorities for the County. **Figures 7-2** and **7-3**, which outline the summary of ISMP recommendations, considered the 2016 Capital Plan when prioritizing short-term projects.

### Development Charges

In August 2014, Norfolk County passed By-Laws 2014-104 and 2014-015 under Section 2(1) of the Development Charges Act, 1997. Development Charges (DC) allow municipalities to fund new capital investments for designated municipal services. Within Norfolk County, DCs can be levied for fire protection service, recreation, parking, marinas, roads and related service, water/wastewater, library service and government administration service. DCs are levied against land for new capital costs required as a result of the need for infrastructure and servicing. There are many benefits to the use of DCs, the primary benefit being that new development / growth is self-funding and does not impose a major burden on existing taxpayers. There are, of course, disadvantages to development charges, including the risk of developers moving to other nearby municipalities which offer lower DCs and the revenue received only covers the capital cost of building the infrastructure, not the operating and maintenance costs. According to the County's 2015 Capital Plan, growth and asset expansion that results from new development should be funded through DC's. Where expansion of services is not related to new development, asset expansion can come from a variety of sources, including, community donations, government grants, water/wastewater rates, tax levies, and special funding programs.

**Figure 8-1** summarizes development charges for residential and non-residential development as per By-Law No. 2014-104. These DC schedules can be revaluated and adjusted so as to maximize cost recovery from implementing the ISMP capital program. It should be noted that in many jurisdictions major increases are often implemented using a phased-in approach that would gradually see DC's increase over a period of time.

Figure 8-1 – Summary of Development Charge Fees, Norfolk County (By-Law 2014-104)

| ***Service*** | ***Residential ($/dwelling)*** | | | | ***Non-Residential*** |
|---|---|---|---|---|---|
| | *Single and Semi-Detached Dwelling* | *Apartments – 2 Bedrooms +* | *Apartments – Bachelor and 1 Bedroom* | *Other Multiples* | *(charge per square meter)* |
| **Sub Total General Service** | $2,118 | $901 | $780 | $1,324 | $1.62 |
| **Urban Services**<br>Roads and Related<br>Water Service<br>Wastewater | $1,013<br>$1,120<br>$5,203 | $430<br>$476<br>$2,209 | $374<br>$414<br>$1,921 | $632<br>$699<br>$3,245 | $1.98<br>$2.75<br>$12.80 |
| Subtotal Engineered Services | $7,336 | $3,115 | $2,709 | $4,576 | $17.53 |
| Total Urban Area Charge/Unit<br>Total Rural Area Charge/Unit | $9,454<br>$3,131 | $5,900<br>$1,956 | $4,016<br>$1,331 | $3,489<br>$1,154 | $19.15<br>$3.60 |

### Front Ending, Cost Sharing Agreements and Conditions of Approval

Another viable option for the County to consider is to engage in a cost-sharing agreement with potential developers (as stipulated under Sections 41 and 51 of the Planning Act) to open up new growth areas for development. These agreements permit developers to build municipal services and to be reimbursed for costs beyond their share by subsequent developers in the area who benefit from the front-ended municipal services.

### Local Improvement Charges and Tax-Increment Financing

Local Improvement Charges are another mechanism available to Norfolk County to collect revenue in support of infrastructure improvements. According to the Ministry of Municipal Affairs and Housing, '[m]unicipalities can use the local improvement process to undertake a capital project and recover all, or part, of the cost of the project by imposing local improvement charges on properties that benefit from the work.' Projects that can be included as local improvements are the following: installation of water and wastewater infrastructure; roadway reconstructions, such as repaving; construction of a sidewalk, curb, and installation of street lighting; and construction of traffic calming features, such as speed bumps. Some of the primary benefits of Local Improvement Charges are that the costs of improvements are borne by those receiving the benefits (as opposed to general property taxes) and the costs of improvements can be spread out over the lifecycle of the asset (forming part of the property tax bill).

Tax increment-based financing (TIFs) is a tool commonly used in the U.S. to stimulate development, including the financing of capital projects. This tool leverages the increase in property tax that results from investment to fund (by grant or loan) improvements. In other words, the tool is structured such that the base property tax is frozen and the expected increase from the uplift ('the increment') resulting from the development of land or a building is utilized to finance the development. Generally, TIFs are financed through a municipal bond which is repaid over time and are thus considered to be 'self-financing', if all assumptions on expected tax increases are correctly made.

Ontario, however, does not currently have the legislative framework that allows for the establishment of designated TIF areas or to direct funds to a designated TIF authority. TIFs in Ontario currently falls under the Planning Act's Community Improvement provisions (Section 28), and is utilized as a financial incentive to encourage developers to return underutilized or inappropriate uses of land and buildings back into productive use. Municipalities can thus define Community Improvement Project Areas and implement a Community Improvement Plan (CIP), with grants/loans that are calculated on the basis of a tax increment.

**Debt Financing**

Although debt financing has decreased in popularity over time, a number of debt financing mechanisms are available to governments to fund infrastructure. These include the issue of bonds (tax-exempt, revenue and general obligation), local improvement debentures, and asset-backed borrowing. Debt financing is a means to secure upfront the large amount of capital required to finance infrastructure servicing improvements. During the term of the debt issue, payments of principal and interest are made to the holder of the debt instrument.

Advantages of debt financing:

- Maintain ownership: Debentures are a way for the County to raise capital without having to use their assets or give up ownership. The County's obligation to the lender is limited to repaying the loan with interest, enabling the County to maintain control and run the operation as it sees fit.

Disadvantages of debt financing:

- Interest rate risk: Interest rates vary with macroeconomic conditions, the history of the County with lenders and the credit rating of the County.
- Credit rating: Taking on debt will affect the credit rating of the County and borrowing rates will increase as outstanding loan values increase. Any reduction in credit rating will increase borrowing rates on potential future capital infrastructure expansion projects.
- Cash flow: The County will need to generate significant operating cash flows and revenues to cover debt repayment.

In Ontario, municipalities have the ability to incur long-term debt for municipal infrastructure. However, the Municipal Act (Section 3 of Ontario Regulation 403/02) limits the amount of annual debt financing so that annual debt repayments do not exceed 25% of net revenues.

At the end of 2013, Norfolk County's tax-supported debt totalled only $44 million and debt servicing was considered to be well below the provincial annual repayment limit of 25%. As such, there is significant room available to increase the debt burden to fund the largest components of the infrastructure improvements identified in the ISMP. Moreover, in addition to the traditional use of capital markets to issue debt, the County can make use of alternative financing through Infrastructure Ontario. Given the historic low interest rate environment this would be a very favourable time to take on long term debt to fund growth. However, debt levels should never be increased to a level that jeopardizes the County's financial flexibility and sustainability to respond to future unanticipated financing needs.

At the end of 2014, Norfolk County maintained its strong liquidity position with approximately $31.1 million in cash and liquid assets. A portion of this can be reserved to pay for many of the improvements identified in the ISMP. Or alternatively, given the low interest rate environment, can be used as leverage to obtain more debt financing.

**User Fees**

Where the primary beneficiaries of infrastructure are easily identifiable, as in the case of water and sewer services, user fees tend to be the favoured revenue generating tool, and generally cover the majority of the cost of service provision. Capital costs for such improvements, on the other hand, are typically funded through development charges. It is noteworthy that under Ontario Regulation 585/06, user fees cannot be levied on capital costs where development charges and/or front-ending agreements have paid for the costs. User fees have the primary benefit of charging those who benefit directly from a service. They can also be adapted to charge fees at varying time-of-use rates (e.g. electricity), but can also divert users to shift to other alternatives (e.g. automobiles from toll routes to non-toll routes).

As has been done in other jurisdictions the County can set an internal policy where a certain portion of debt can be financed based on the expected water and wastewater revenues that will be generated. This can help to fund a portion of the water related infrastructure improvements identified in the ISMP.

**Property Taxes**

Property taxes are the single most important source of revenue generation for municipalities in Canada and indeed Ontario. Property taxes are collected to fund municipal expenditure on service provisions. However, there are a number of difficulties that arise with generating new revenues from property taxation. For example, they tend to be unpopular, are inelastic (they do not respond to annual changes in economic activity in the way income taxes do); their base can be eroded (i.e. tax exemptions, limits, incentives); and they can be poorly administered. Notwithstanding, they are the major revenue source for Norfolk County and will likely contribute the largest source of revenues to fund the ISMP infrastructure improvements. **Figure 8-2** summarizes relevant 2015 property tax rates within Norfolk County.

**Figure 8-2 – 2015 Property Tax Rates, Norfolk County**

| *Property Class* | *General Tax Rate* | *Educational Tax Rate* | *Total Tax Rate* |
|---|---|---|---|
| Residential | 0.0101390 | 0.0019500 | 0.0120890 |
| Multi-Residential | 0.0171640 | 0.0019500 | 0.091140 |
| Commercial Occupied | 0.0171640 | 0.0143000 | 0.0314640 |
| Commercial Excess Land | 0.0115000 | 0.0095810 | 0.0210810 |
| Commercial Vacant Land | 0.0115000 | 0.0095810 | 0.0210810 |
| Industrial Occupied | 0.0171640 | 0.01530000 | 0.0324640 |
| Industrial Excess Land | 0.0115000 | 0.0102510 | 0.0217510 |
| Industrial Vacant Land | 0.0115000 | 0.0102510 | 0.0217510 |
| Pipeline | 0.0151000 | 0.0149266 | 0.0300266 |
| Farmlands | 0.0025350 | 0.0004875 | 0.0030225 |
| Managed Forests | 0.0025350 | 0.0004875 | 0.0030225 |

**Federal and Provincial Funding, including Public-Private-Partnerships**

A number of federal funds have been established to support municipalities in funding key infrastructure projects. Infrastructure Canada, for instance, has established the New Building Canada Fund, which has two components – projects of national significance (National Infrastructure Component), and projects of national, regional and local significance (Provincial-Territorial Infrastructure Component). This includes the Small Communities Fund that has set aside $1 billion for projects in municipalities with fewer than 100,000 residents. Traditionally-procured projects demonstrating eligibility can receive up to one third of funds from federal sources (with up to 50 percent for transit, highways and major roads). This funding could be used towards many of the infrastructure improvements outlined in the ISMP.

As part of the New Building Canada Plan, the Gas Tax Fund gives municipalities funding for infrastructure development; it also provides them with the flexibility to fund projects based on municipalities' own priorities. Funding is generally allocated on a per capita basis, to each province and territory, the City of Toronto and municipal associations, and is distributed semi-annually. Another tool is the Provincial Gas Tax Program, which levies two cents per liter of gas and channels the funds to the municipal level. This fund, however, is dedicated towards reducing congestion, improving the environment and supporting economic growth through investment in transit.

In 2008, the former federal government created PPP Canada to improve the delivery of public infrastructure by achieving greater accountability, schedule and cost reliability through the use of Public-Private-Partnerships (P3). As part of its responsibilities PPP Canada manages the $1.25 billion P3 Canada Fund. The fund is a merit-based program designed to generate and increase the use of P3s on large scale infrastructure projects. If a project is accepted by PPP Canada, the P3 Canada fund provides up to a 25% capital contribution of the projects capital costs. Given the size and scale of the infrastructure improvements outlined in the ISMP, it would be difficult to meet the eligibility requirements for P3 Canada funding.

# 9.0 PROCESS TO AMEND THE MASTER PLAN

Once approved, the lifespan of a Municipal Class EA Master Plan is 10 years from its completion date. However, a Master Plan should be reviewed every five years to determine the need for a detailed formal review and/or update. Potential changes which may trigger the need for a detailed review include:

- Major changes to the original assumptions;
- Major changes to components of the Master Plan;
- Major changes in the proposed timing of projects within the Master Plan; and
- Significant new environmental effects.

In addition, the ISMP project implementation schedule will be reviewed annually both to confirm project priorities and to verify EA Schedules for projects approaching implementation.