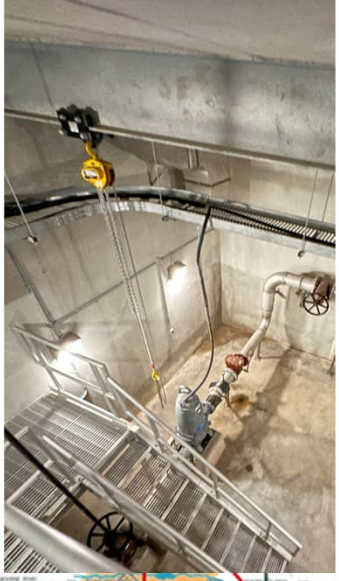

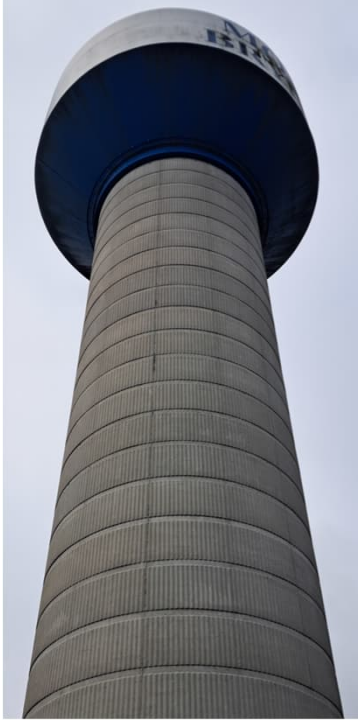

MUNCIPALITY OF STRATHROY - CARADOC

Water, Wastewater and Stormwater Master Plan

Master Plan Report

October 31, 2024

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RVA 236786.01

October 31, 2024

Municipality of Strathroy-Caradoc
52 Frank Street
Strathroy, ON N7G 2R4

Attention: Paul Zuberbuhler B.Sc, B.Comm, C.E.T, Manager of Environmental Services
Dear Sir:
Re: Municipality of Strathroy-Caradoc 2025 Water, Wastewater and Stormwater Master Plan

Please find attached the final version of the 2025 Water, Wastewater and Stormwater Master Plan (WWSMP) for the Municipality of Strathroy-Caradoc (Municipality). The Municipality is responsible for the provision of water and wastewater services to its serviced communities and has undertaken this study to develop, evaluate and select preferred long-term water, wastewater and stormwater servicing strategies to support existing servicing needs and accommodate future projected population and employment growth to the year 2046. This report covers the following:

- The legislative and planning background to WWSMP including the Municipal Class Environmental Assessment Process and assumptions on population growth;
- The consultation and engagement that has been undertaken;
- The evaluation criteria used in the WWSMP;
- The Water Master Plan covering service requirements to meet expected water demand solutions to provide servicing to 2046
- The Wastewater Master Plan covering service requirements to meet expected water demand solutions to provide servicing to 2046;
- The Stormwater Master Plan to address gaps in standards and policies to allow for an appropriate level of service to 2046;
- Project Recommendations; and
- A proposed Capital Implementation Plan.

…/2

On review by Council, this report can be issued with the Notice of Completion and any additional public or agency comments that are received so that the Municipality can place the document on the Public Register.

Yours very truly,

R.V. ANDERSON ASSOCIATES LIMITED

John Tyrrell, M.Sc.(Eng.), P.Eng.
Senior Project Manager/Regional Manager
Cell: 519-878-7903
jtyrrell@rvanderson.com

Encls.: Municipality of Strathroy-Caradoc Water, Wastewater and Stormwater Master Plan

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1.0 INTRODUCTION

1.1 Background

The Municipality of Strathroy-Caradoc (Municipality) is the largest municipality in Middlesex County and is located 40 km west of London in Southwestern Ontario. The Municipality was formed in 2001 from an amalgamation of the Town of Strathroy and the Township of Caradoc and covers an area of approximately 27,000 ha. It is an urban-rural municipality with large agricultural areas and a few urban settlements. The 2021 census by Statistics Canada recorded a population of 23,871 people residing in a total of 9,695 private dwellings. The Municipality comprises of two main urban settlement areas – Strathroy and Mount Brydges – and smaller settlements comprising of Melbourne, Campbellvale, and Delaware West. The Master Plan focuses on the municipal services in the two urban settlement areas.

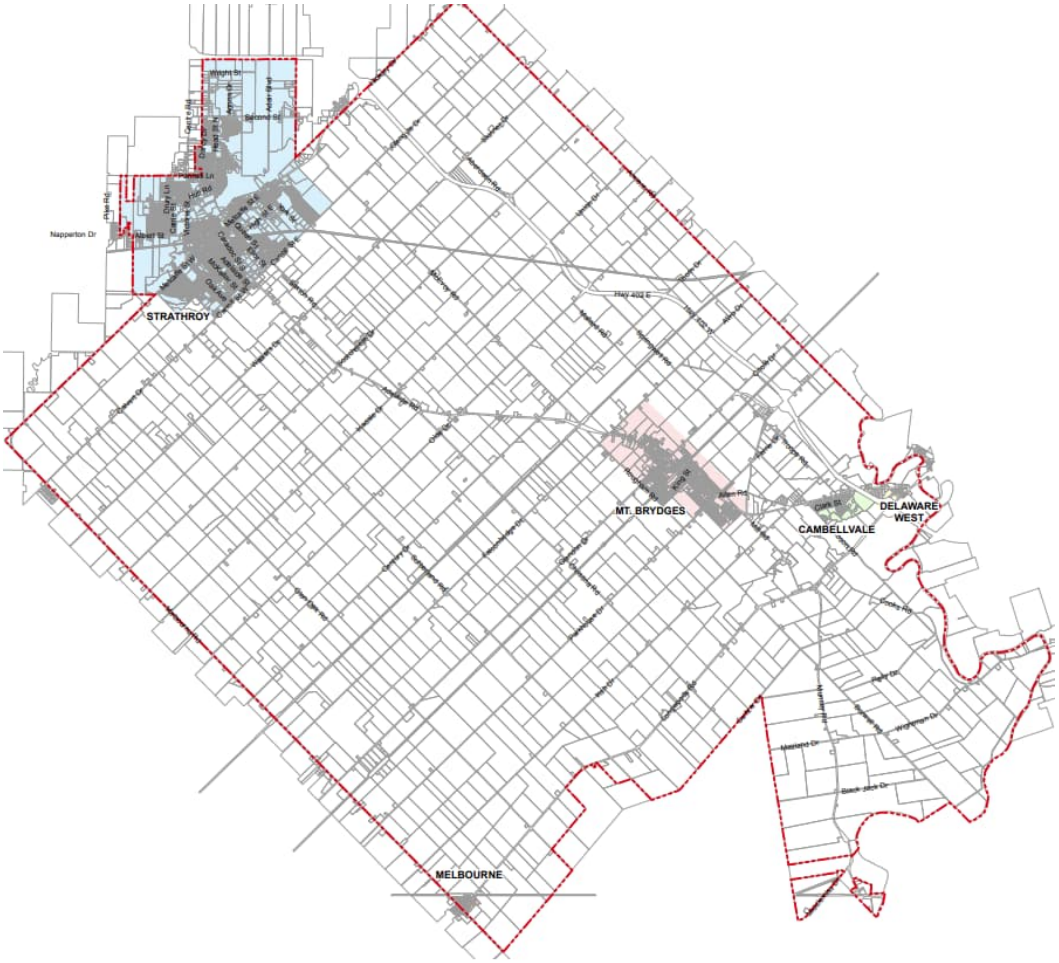

Figure 1-1: Municipality of Strathroy - Caradoc Study Area

The Municipality is responsible for the provision of water and wastewater services to its serviced communities. As such, the Municipality has undertaken the 2025 Water, Wastewater and Stormwater Master Plan (WWSMP) and Pollution Prevention and Control Plan (PPCP) to comprehensively develop, evaluate and select preferred long-term water, wastewater and stormwater servicing strategies to support existing servicing needs and accommodate future projected population and employment growth to the year 2046. R.V. Anderson Associated Limited (RVA) has been retained to undertake this project.

1.2 Master Plan Goals

The WWSMP was developed based on the following key goals:

- Determine water, wastewater and stormwater infrastructure requirements to service growth to 2046 using models of the existing and proposed water, wastewater and stormwater systems;
- Ensure the proposed requirements are consistent with and conform to the provincial policies and legislations, and the Municipality's policies identified in this TM; and
- Identify options for optimizing the effectiveness of the existing water, wastewater and stormwater infrastructure.

1.3 Natural Environment

1.3.1 Strathroy Settlement Area

Per the current Strathroy–Caradoc Official Plan (Official Plan), land use within the Strathroy settlement area is generally:

- Urban (residential, commercial, industrial);
- Wetland and woodland features within the valley lands of the Sydenham River and its tributaries; and
- Agricultural lands to the south.

The Strathroy settlement area is in the St. Clair Region Conservation Authority watershed. Figure 1-2 details the Natural Heritage Features in Strathroy as identified in the Official Plan.

1.3.2 Mount Brydges Settlement Area

Per the current Official Plan, land use within the Mount Brydges settlement area is generally Urban (residential, commercial, industrial). The Mount Brydges settlement area is is within the following watersheds:

- St. Clair Regional Conservation Authority;
- Upper Thames River Conservation Authority; and
- Lower Thames Valley Conservation Authority.

Figure 1-3 details the Natural Heritage Features in Mount Brydges as identified in the Official Plan.

1.4 Existing Infrastructure

1.4.1 Strathroy

1.4.1.1 Water System

The Strathroy water distribution system (WDS) is supplied water from the Lake Huron Primary Water Supply System (LHPWSS). The feed is from a single, dedicated 600 mm transmission main from the main 1200 mm transmission main northeast of Strathroy. Strathroy is connected at the LHPWSS Monitoring Station #2 located at the Second Street Reservoir. The LHPWSS has a maximum current capacity to deliver treated water of 340 mega-litres (ML) per day and the 2023 maximum day flow was 198.5 ML/d. The current water supply agreement with LHPWSS does not specify a maximum day limit on water supply to Strathroy. With the Strathroy MDD expected to increase by 3.0 MLD in 2046 to approximately 11.0 ML/d and given the available LHPWSS capacity, water supply is not expected to be an issue. The Municipality should convey its future demand requirements so that the LHPWSS can undertake its own future supply planning.

The Strathroy WDS consists of the Second Street Pumping Station/Reservoir with re-chlorination and Reservoir (capacity 11,250 m³), the Head Street Water Tower (capacity 1,900 m³). The system consists of 106.6 km of watermain consisting of cast iron pipe (16%), ductile iron pipe (35%) and polyvinyl chloride (PVC) pipe (49%). The entire settlement area is serviced by this water system.

1.4.1.2 Wastewater System

The wastewater system currently services the entire population of. The wastewater collection system has approximately 90 km of gravity sewers, 6 km of forcemains, 1,236 manholes. The Strathroy wastewater collection system consists of nine (9) sewage pumping stations (SPS). The Strathroy WWTF comprises of a mechanical treatment plant with a design rated capacity of 10,000 m^3/day on the western side of the settlement area. The WWTF's liquid train comprises of mechanical screens, one aeration basin, chemical phosphorus removal, two secondary clarifiers, and UV disinfection. Sludge storage is provided by an onsite lagoon.

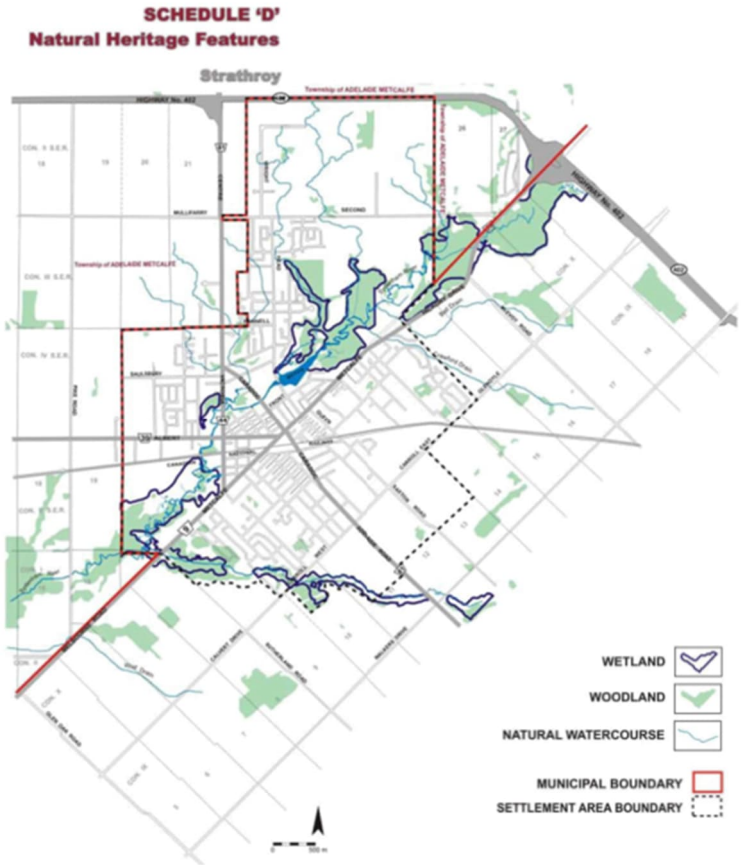

Figure 1-2: Strathroy Natural Heritage Features

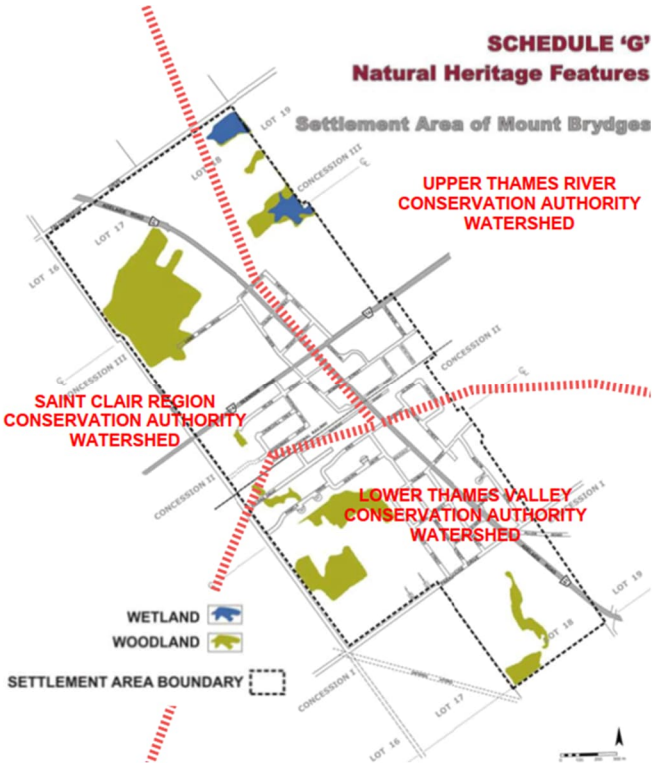

Figure 1-3: Mount Brydges Natural Heritage Features

1.4.1.3 Stormwater Management Facilities

There are eight SWM facilities located in Strathroy:

- SWMP-01- Pinetree Ln/Riverview Dr;
- SWMP-02 - Parkview Dr/Parkview Cres (north);
- SWMP-03 - Parkview Dr/Parkview Cres (south);
- SWMP-04 - Second Str. & Adair Blvd;
- SWMP-05 - Head St N/ Thorne Dr ;
- SWMP-06 - Molnar Industrial Park;
- SWMP-010 - Agnes Drive Extension SWM Pond; and
- SWMP-011 Agnes Drive Roadway South SWM Pond.

1.4.2 Mount Brydges

1.4.2.1 Water System

The Mount Brydges water distribution system (WDS) is supplied water from the LHPWSS. The water supply is from the Komoka-Mount Brydges Transmission System which is fed from a dedicated pumping station at the Arva Reservoir (Pumping Station # 4) and transmitted via a dedicated Komoka-Mount Brydges transmission main to the Mount Brydges WDS. The current water supply agreement with LHPWSS does not specify a maximum day limit on water supply to Mount Brydges. Mount Brydges MDD expected to increase by 2.5 MLD in 2046 to approximately 5.2 ML/d total Mount Brydges population. The Municipality should convey its future demand requirements so that the LHPWSS can undertake its own future supply planning.

The Mount Brydges WDS consists of:

- The Glendon Drive High Lift PS (HLPS) that has an underground 2-celled storage reservoir with total capacity of 1,630 m^3. The HLPS has back-up power;
- Oriole Drive Monitoring and Re-chlorination Facility (Monitoring Station #3) that also has backup-power; and
- The Railroad Street Water Tower with a total volume of 720 m^3.

The system consists of 45 km of watermains, and the entire settlement area is serviced by this water system.

1.4.2.2 Wastewater System

The wastewater system currently services a population of 1,549 which is approximately 40% of the current population. The wastewater collection system comprises of approximately 11 km of gravity sewers, 2 km of forcemains, 145 manholes and two (2) sanitary pump stations. The Mount Brydges WWTF is located approximately 2 km southeast of Mount Brydges, at 22416 Mill Road. The Mount Brydges WWTF was constructed in 2011 and has a design capacity of 825 m^3/day. Since 2019, the Municipality has had operational issues resulting in exceedances of water discharge quality with the WWTF and have been actively engaged with MECP District Office and Approvals Branch to mitigate these issues. Section 7 details the current condition of the WWTF and the strategy to restore capacity to 825 m^3/day.

1.4.2.3 Stormwater Management Facilities

There are three Stormwater Management (SWM) facilities located in Mount Brydges:

- SWMP-07 - Bennett Cres, Mount Brydges;
- SWMP-08 - Lucas St/Pondhaven Ln (south side); and
- SWMP- 09 - Lucas St/Pondhaven Ln (north side).

2.0 LEGISLATIVE AND PLANNING BACKGROUND TO MASTER PLAN

2.1 Municipal Class Environmental Assessment Process

2.1.1 Introduction

This WWSMP and PPCP is being undertaken in accordance with the requirements of the Municipal Class Environmental Assessment (MCEA) March 2023. The MCEA process sets out the process that a proponent must follow to meet the requirements of the *Ontario Environmental Assessment Act* for a class or category of infrastructure projects. Projects are divided into schedules based on the type of projects and activities. Schedules are categorized as Exempt, B and C with reference to the magnitude of their anticipated environmental impact. These are described briefly in the following paragraphs.

Exempt projects include various municipal maintenance, operational activities, rehabilitation works, minor reconstruction or replacement of existing facilities, and new facilities that are limited in scale and have minimal adverse effects on the environment. These projects are exempt from the requirements of the Environmental Assessment Act. Most Exempt projects were formerly classified as Schedule A and A+ projects.

Schedule B projects are those which have a potential for adverse environmental effects. A screening process must be undertaken which includes consultation with directly affected public and relevant review agencies. Projects generally include improvements and minor expansions to existing facilities. The project process must be filed, and all documentation prepared for public and agency review.

Schedule C projects have the potential for significant environmental effects and must follow the full planning and documentation procedures specified in the Class EA document. An Environmental Study Report (ESR) must be prepared and filed for review by public and review agencies. Projects generally include the construction of new facilities and major expansions to existing facilities.

There are five key elements in the Class EA planning process. These include:

1. Phase 1 – Identification of problem (deficiency) or opportunity;
2. Phase 2 – Identification of alternative solutions to address the problem or opportunity. Public and review agency contact is mandatory during this phase and input received along with information on the existing environment is used to establish the preferred solution. It is at this point that the appropriate Schedule (B or C) is chosen for the undertaking. If Schedule

B is chosen, the process and decisions are then documented in a Project File. Schedule C projects proceed through the following Phases;

3. Phase 3 – Examination of alternative methods of implementing the preferred solution established in Phase 2. This decision is based on the existing environment, public and review agency input, anticipated environmental effects and methods of minimizing negative effects and maximizing positive effects;
4. Phase 4 – Preparation of an Environmental Study Report summarizing the rationale, planning, design, and consultation process of the project through Phases 1-3. The ESR is then to be made available to agencies and the public for review; and
5. Phase 5 – Completion of contract drawings and documents. Construction and operation to proceed. Construction to be monitored for adherence to environmental provisions and commitments. Monitoring during operation may be necessary if there are special conditions.

2.1.2 Master Plan Process

The Master Plan Process provides the basis for a developing a long-range plan which integrates infrastructure requirements for existing and future land use. The WWSMP and PPCP has been developed following Approach #1 of the Municipal Class Environmental Assessment (Municipal Engineers Associated [MEA], which involves a broad scope and a low level of assessment of the projects identified in the Master Plan. The process follows, at minimum, the same steps of the first two phases of the MCEA process, allowing integration of infrastructure requirements for existing and future land use with the MCEA process, including public and agency consultation. Figure 2-1 shows the MCEA Master Plan process being followed by this project.

2.2 Problem and/or Opportunity Statement

As the first step in Phase 1 of the Class EA process, the proponent (the Municipality) must identify and describe the problem or opportunity that the project is intended to address. In essence, the Problem Statement outlines the need and justification for the overall project and establishes the general parameters, or scope, of the study. The Municipality has chosen the following as its statement of the problem/opportunity to be addressed by the Master Plan:

> *"To identify preferred water and wastewater serving strategies to meet the Municipality of Strathroy-Caradoc's growth needs to 2046 as well as provide effective on-going continuity to existing serviced community areas across the Municipality of Strathroy-Caradoc as appropriate."*

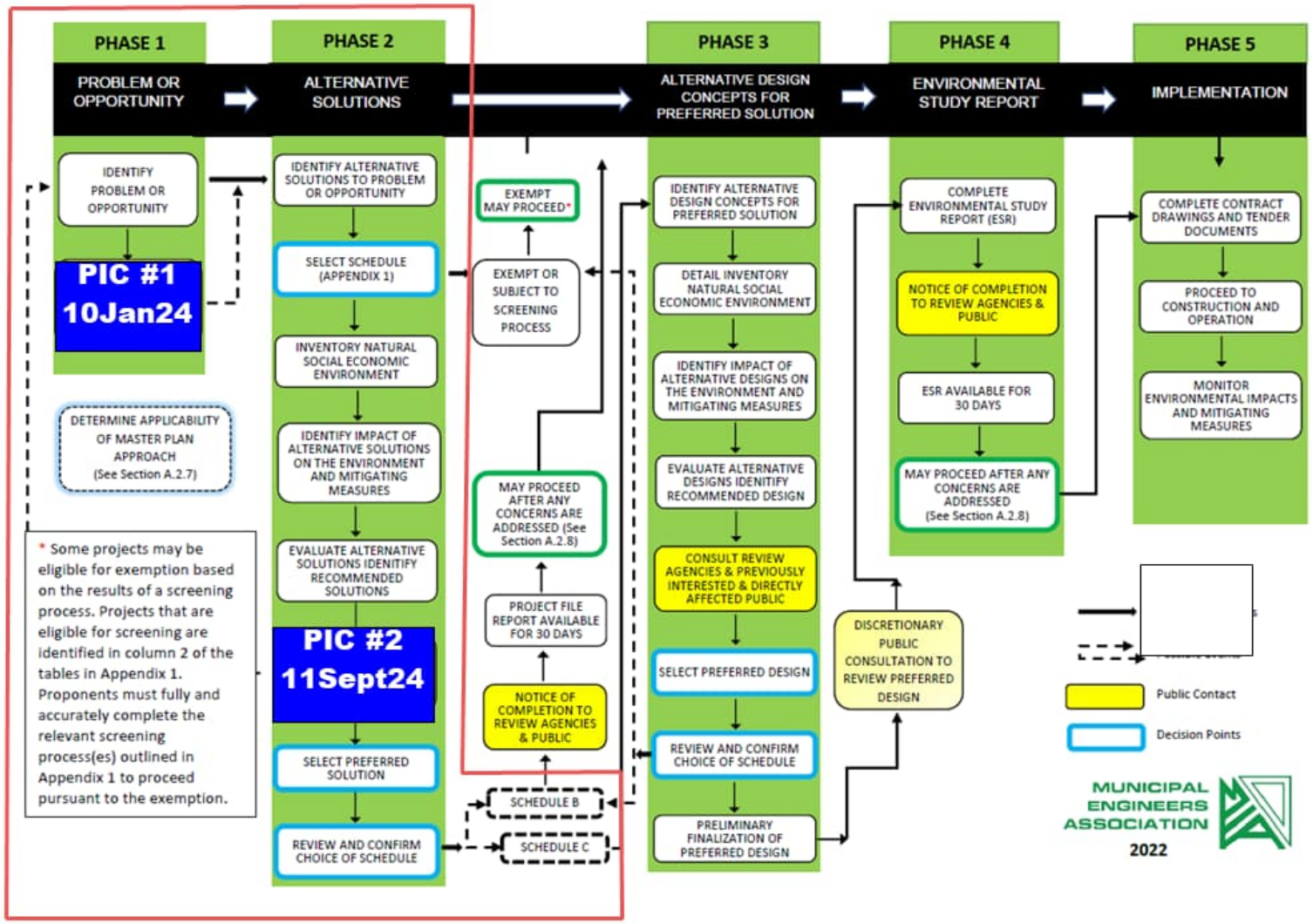

Figure 2-1: MCEA Master Plan Process
(outlined in red)

2.3 Provincial Acts and Policies

The WWSMP will reference applicable Provincial regulations for the analysis of the Municipality's drinking water and wastewater systems, which are summarized in the following subsections.

2.3.1 Environmental Assessment Act (EAA)

The EAA is the legislation which allows the MCEA process to be followed by municipalities so that they can plan, design, construct, maintain, rehabilitate, and/or retire municipal road, water, wastewater, and transit projects. This allows these projects to proceed without having to obtain project-specific approval under the EAA provided that the MEA Class EA process is followed.

2.3.2 Environmental Protection Act (EPA)

The intent of the EPA is to protect the Ontario environment from an "adverse effect" which is defined as the following:

- Impairment of quality of the natural environment for any use that can be made of it;
- Injury or damage to property or to plant or animal life;
- Harm or material discomfort to any person;
- An adverse effect on the health of any person;
- Impairment of the safety of any person;
- Rendering any property or plant or animal life unfit for human use;
- Loss of enjoyment of normal use of property; and
- Interference with the normal conduct of business.

2.3.3 Environmental Protection Act (EPA)

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- Impairment of the safety of any person;
- Rendering any property or plant or animal life unfit for human use;

- Loss of enjoyment of normal use of property; and
- Interference with the normal conduct of business.

Regulations from the Act which may impact or have bearing on the operation or construction of water and wastewater systems are shown below in Table 2-1.

Table 2-1: EPA Regulations Impacting Water, Wastewater and Stormwater Systems

Regulation	Title
O. Reg. 53/24	General and Transitional Matters
O. Reg. 406/19	On-Site and Excess Soil Management
O. Reg. 208/19	Environmental Compliance Approval in Respect of Sewage Works
O. Reg. 1/17	Registrations Under Part ii.2 of the Act - Activities Requiring Assessment of Air Emissions
O. Reg. 351/12	Registrations Under Part ii.2 of the Act - Waste Management Systems
O. Reg. 255/11	Applications for Environmental Compliance Approvals
O. Reg. 224/07	Spill Prevention and Contingency Plans
O. Reg. 222/07	Environmental Penalties
O. Reg. 153/04	Records of Site Condition - Part xv.1 of the Act
O. Reg. 675/98	Classification And Exemption of Spills and Reporting of Discharges
O. Reg. 524/98	Environmental Compliance Approvals - Exemptions from Section 9 of the Act
O. Reg. 232/98	Landfilling Sites
O. Reg. 206/97	Waste Disposal Sites, Waste Management Systems and Sewage Works Subject to Approval Under or Exempt from the Environmental Assessment
O. Reg. 101/94	Recycling and Composting of Municipal Waste

Regulation	Title
R.R.O. 1990, Reg. 360	Spills

2.3.4 Ontario Water Resources Act (OWRA)

The purpose of this Act is to provide for the conservation, protection, and management of Ontario's waters and for their efficient and sustainable use, to promote Ontario's long-term environmental, social, and economic well-being.

2.3.5 Water Opportunities and Water Conservation Act (WCA)

The 2010 WCA under the Water Taking and Transfer (OWRA) Regulation (O. Reg 387/04) is one of the various provincial land use planning statutes, policies, and plans that set out direction relating to water conservation and efficiency best management practices. The Act aims to conserve and sustain water resources for present and future generations by:

a) Foster innovative water, wastewater and stormwater technologies, services and practices in the private and public sectors; and
b) Create opportunities for economic development and clean-technology jobs in Ontario.

One measure managed by the regulation comprises of the *Province of Ontario – 2021 Water Conservation and Efficiency Program* which assesses water conservation measures in accordance with best water management standards and practices. Ontario has a range of programs to manage water supply and demand, such as establishing water efficiency standards, and requires local planning authorities to protect water quality and promote green infrastructure. Water takers are required to monitor and report data annually.

2.3.6 Nutrient Management Act (NMA)

The General Regulation Ontario Regulation (O. Reg.) 267/03 made under the Nutrient Management Act governs the requirements for land application of biosolids, e.g., seasonal storage requirement. For wastewater treatment plants (WWTF) which were not phased in under the *Nutrient Management Act*, requirements are set out in the Environmental Compliance Approval (ECA), based on the MECP and the Ministry of Agriculture, Food and Rural Affairs (OMAFRA) Guidelines for the Utilization of Biosolids and Other Wastes on Agricultural Land, 1996. Part II of the NMA requires the Municipality to ensure that their biosolids land application program meets the requirements of the Act and complies with the requirements for land application for non-agricultural source materials (NASM).

2.3.7 Safe Drinking Water Act (SDWA)

The *Safe Drinking Water Act* was implemented following the Walkerton Water Crisis (2000), at which time there was no formal regulation of drinking water treatment, operation, record taking, and remedial actions for unsafe drinking water in Ontario. Ontario Regulation 170 (O. Reg 170) under the SDWA provides the requirement for municipal water supply systems which includes reference to the Ten State Standards and the MECP document titled *Procedure for Disinfection of Drinking Water*. The MECP *Design Guidelines for Drinking-Water Systems* (Water Guidelines) is used for the analysis of the Municipality's supply and distribution systems; but it is understood that the guidelines do allow some individual municipal discretion on items such as municipal fire protection. The guidelines will be the foundational basis for risk assessments, supply and distribution planning, fire flow determination, design system pressures and calculation of future water supply.

Schedule 22 and Section 11 of O. Reg 170/03 under the Act requires that an annual status summary report on the performance of the Municipality's Drinking Water System (DWS) be provided to the Council and be reviewed per the guidelines established by the MECP.

The sampling, testing, monitoring, and pumping of the water supplied by the wells must follow the requirements set by Permits to Take Water (PTTW), the Municipal Drinking Water License, and Drinking Water Works Permit for the subject systems. The Sustainable Water and Sewage Systems Act (SWSS) (2002) indicates that regulated entities are required to submit a report detailing the provision of water services and wastewater services including an inventory of and management plan for the associated infrastructure.

2.3.8 Clean Water Act (CWA)

The CWA is a law enacted by the Legislative Assembly of Ontario, Canada to protect existing and future sources of drinking water. The CWA (2006) is a major part of the Ontario government's commitment to ensuring that every Ontarian has access to safe drinking water. Key regulations enabling the work and authority for Source Water Protection are:

- O. Reg. 284/07 Source Protection Areas and Regions delineates source water protection areas within the province;
- O. Reg. 287/07 General mandates the terms of reference and requirements for source water protection plans; and
- O. Reg. 288/07 Source Protection Committees under the CWA constitutes and mandates Source Protection Committees.

When municipal raw water demonstrates an exceedance of an Ontario Drinking Water Quality standard or increasing trend of a contaminant of concern, the CWA allows local Source Protection Authorities (SPAs) to designate municipal wellhead protection areas as Issues Contributing Areas (ICA). An ICA delineates an area where certain current or past land use have or are likely inferred to contribute to the elevated contaminant concentration in raw water supplies.

2.3.9 Sustainable Water and Sewage Systems Act

The *Sustainable Water and Sewage Systems Act* (SWSSA) mandates that all municipalities (regulated entity) operate their water and wastewater systems on a full cost recovery basis where the system cost is borne by the system users. Every municipality that provides water services to the public has to prepare and approve a plan describing how the entity intends to pay the full cost of providing those services. This Act has no enabling regulations and was implemented following the Walkerton Water Crisis which occurred in 2000.

2.3.10 Provincial Policy Statement 2020

The Provincial Policy Statement (PPS), 2020 (Ministry of Municipal Affairs and Housing [MMAH], 2020) sets out the Provincial policy direction for land use planning in Ontario, including managing growth, using and managing natural resources, protecting the environment, and ensuring public health and safety.

The vision of the policy recognizes that Ontario's long-term prosperity, environmental health and social well-being depend on promoting efficient land use and development patterns. Efficient development patterns also optimize the use of land, resources and public investment in infrastructure and public service facilities and support sustainability by promoting strong, liveable, healthy and resilient communities, protecting the environment and public health and safety, and facilitating economic growth.

The policies indicate that settlement areas shall be the focus of growth and development, and that municipalities plan for a full range of and mix of land uses and housing options to meet current and future needs over a 25-year planning horizon. Land use patterns within settlement areas shall be based on densities and a mix of land uses which:

- Efficiently use land and resources;
- Are appropriate for, and efficiently use, the infrastructure and public service facilities which are planned or available; and
- Avoid the need for their unjustified and/or uneconomical expansion.

In addition, the importance of intensification and redevelopment is noted as follows:

a) *"Maintain at all times the ability to accommodate residential growth for a minimum of 15 years through residential intensification and redevelopment and, if necessary, lands which are designated and available for residential development; and*

b) *Maintain at all times where new development is to occur, land with servicing capacity sufficient to provide at least a three-year supply of residential units available through lands suitably zoned to facilitate residential intensification and redevelopment, and land in draft approved and registered plans."*

The PPS policies require that planning for sewage and water services shall:

c) Accommodate forecasted growth in a manner that promotes the efficient use and optimization of:
    i. Existing municipal sewage services and municipal water services,
    ii. Existing private communal sewage services and private communal water services, where municipal sewage services and municipal water services are not available or feasible;

d) Ensure these systems are provided in a manner that:
    i. Can be sustained by the water resources upon which such services rely,
    ii. Prepares for the impacts of a changing climate,
    iii. Is feasible, affordable and financially viable over their lifecycle,
    iv. Protects human health and safety, and the natural environment;

e) Promote water conservation and water use efficiency;

f) Integrate servicing and land use considerations at all stages of the planning process; and

g) Be in accordance with the servicing hierarchy in the policies

All planning decisions and Official Plan policies (including those related to infrastructure) are required to be 'consistent with' the policies of the PPS (2020). As such, the Strathroy-Caradoc WWSMP will be developed on the premises of the above-described PPS policies.

2.4 Federal Acts

2.4.1 Federal Fisheries Act

The *Fisheries Act* (Government of Canada 1985) is administered by Fisheries and Oceans Canada (DFO) provides a framework for the proper management and control of fisheries as well as the

conservation and protection of fish and fish habitat, including the prevention of pollution. In June of 2019, Canada modernized the *Fisheries Act;* the new provisions and stronger protections aim to better support the sustainability of Canada's fish and fish habitat for future generations. In particular, Section 34.4 prohibits any work, undertaking or activity (other than fishing) that results in the death of fish; Section 35.1 prohibits the harmful alteration, disruption, or destruction of fish habitat (HADD); and Section 36 prohibits the deposit of deleterious substances.

The Fisheries Act requires that projects avoid causing death of fish or HADD of fish habitat unless authorized by DFO or a designated representative. Proponents are responsible for planning and implementing works, undertakings or activities in a manner that avoids harmful impacts to fish and fish habitat. Should proponents believe that their work, undertaking or activity will result in harmful impacts to fish and fish habitat, a Request for Review (RFR) must be submitted, and the DFO will work with them to assess the risk and provide advice and guidance on how to comply with the *Fisheries Act*.

2.4.2 Species at Risk Act

At a federal level, Species at Risk (SAR) designations for species occurring in Canada are initiated by the completion of a comprehensive Status Report by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). If approved by the federal Minister of the Environment, species are added to the federal List of Wildlife Species at Risk (Government of Canada 2002).

Species that are included on Schedule 1 as Endangered or Threatened are afforded both individual and critical habitat protection on federal lands under the Species at Risk Act (SARA). On private or provincially owned lands, only aquatic species listed as Endangered, Threatened or Extirpated are protected under SARA, unless ordered by the Governor in Council.

2.4.3 Endangered Species Act

At the provincial level, SAR and their habitats are protected under the *Endangered Species Act* (ESA, Government of Ontario 2007) which is administered by the Ministry of Environment, Conservation and Parks (MECP). SAR designations for species in Ontario are initiated by the completion of a comprehensive Status Report by the Committee on the Status of Species at Risk in Ontario (COSSARO), and if approved by the provincial Minister of the Environment, Conservation and Parks, species are added to the Species at Risk in Ontario (SARO) List (O. Reg. 230/08) under the ESA. Section 9(1) of the ESA, 2007 prohibits the killing, harming, harassment, capture, taking, possession, transport, collection, buying, selling, leasing, trading, or offering to buy, sell, lease or trade species listed as Extirpated, Endangered, or Threatened on the SARO List. Section 10(1) prohibits damaging or destroying habitat of Endangered or Threatened species on the SARO List

and may apply to Extirpated species through special regulations. General habitat protection applies to all Endangered and Threatened species, with some species having 'categorized habitat', which protects areas within specific distances from known records. Some SAR are afforded a more precise habitat protection through a habitat regulation (regulated habitat), as identified in Ontario Regulation 242/08. Species designated as Special Concern are not protected under the Act.

The ESA, 2007 does include provisions for permits under Section 17(2)(c) that would otherwise contravene the Act. Projects which propose impacts to SAR or their habitat would require a permit or other process (e.g., registration) to proceed without contravening the Act.

2.5 Municipality of Strathroy-Caradoc Policies

2.5.1 Middlesex County Official Plan

Strathroy – Caradoc is within the Middlesex County and its planning policies need to adhere to those within the Middlesex County Official Plan. The County Official Plan identifies Strathroy and Mount Brydges as urban settlement areas with growth hierarchy. It also provides the population and housing growth projected to the year 2046 for both communities. Official maps for the communities include:

- Land Use Types;
- Transportation (comprising of highway, arterial and collector roads);
- Conservation Authority Regulation Limits; and
- Aggregate Resources.

The Master Plan development will use the County Official Plan as a foundational basis.

2.5.2 Strathroy – Caradoc Official Plan

2.5.2.1 Introduction

The Strathroy–Caradoc Official Plan (Official Plan) was first adopted by the Municipality in 2006 and has since seen several amendments prior to undergoing updates in 2023. The Notice of Adoption of the updated Official Plan was issued in November 2022 and is currently pending council approval. This Official Plan uses the Growth Management hierarchy set out in Section 2.3.2 of the Middlesex County Official Plan described in section above. The Official Plan dictates the Municipality's growth management strategy on the basis of sustaining the existing land use types, designating growth centres based on availability of municipal services and enhancing community improvements, and ensuring economic development with a sustainable approach towards the land's natural resources.

2.5.2.2 Growth Management Strategy

Under the Official Plan, Strathroy, Mount Brydges and Melbourne are the only areas in the Municipality of Strathroy-Caradoc designated as settlement areas.

The Towns of Strathroy and Mount Brydges are serviced by municipal water and wastewater infrastructure and are designated as growth centres. Melbourne is serviced by the municipal water system only (supplied by the Southwest Middlesex Water system and not by the Municipality), thereby, designated as a partially serviced community. The Official Plan intends to direct the majority of residential developments to the two growth centres, contingent on the provisional capability of adequate municipal infrastructure comprising of water supply, wastewater, stormwater, roads, and active transportation infrastructure. Since Melbourne is not serviced by a municipal sanitary sewage system and relies on individual on-site sewage disposal instead, it can only accommodate small-scale development primarily limited to infilling and minor extensions of existing development.

The Official Plan recognizes the Municipality's industries as a key employment sector and attracting new industries while expanding existing ones is to be used to strengthen the Municipality's economic base. Additionally, agriculture remains the dominant use of land in the Municipality's rural area owing to its significance to the Municipality's economic base. Non-agriculturally related industrial and commercial development will be directed primarily to Strathroy.

2.5.2.3 Stormwater Management

The Official Plan recognizes that stormwater, constituting of runoff from rainwater and snowmelt, is a valuable natural resources and proper stormwater management is important for protection of life and property, surface and ground water quality and quantity, the ecological health of natural areas and habitats, and the integrity of municipal infrastructure. As such, the Official Plan requires that planning and development applications consider stormwater management as an integral part and that appropriate stormwater management facilities, as approved by the Municipality and conservation authority, and where applicable, the province, be provided. Specifically, stormwater management shall include:

- Provisions to mitigate the impact of proposed development on the environment including erosion, sedimentation and pollution control;
- Provisions to protect and enhance water quality, groundwater recharge/discharge areas, and baseflow receiving watercourses; and
- Account for severity of weather due to climate change in all plans to effectively prevent loss of life and reduce property damage.

2023 updates to the Strathroy-Caradoc Official Plan states that planning and development of stormwater management facilities are to consider minimizing stormwater flows and reliance on stormwater ponds as well as stormwater management facilities by incorporating low impact development (LID) and green infrastructure including public park and open spaces.

2.5.3 Strathroy-Caradoc Strategic Plan

In 2020, Strathroy-Caradoc prepared a strategic plan that outlined a clear vision for the Municipality's future over the next 10 years. The plan aims to achieve a well-rounded community and their wellbeing through six goals that include local infrastructure, economic development, and growth management.

2.5.4 Strathroy-Caradoc Service-Related Policies

2.5.4.1 Municipality By-Law: Regulation of Water Supply

The Municipality regulates water supply under By-Law No. 14-20 with regards to water production, treatment, storage and distribution. The By-Law mandates the connection of housing units including buildings to a main or water service stubs, if available. Once connected to the water supply, alternative water supply cannot be used for domestic purposes and if used, cannot enter the municipal sanitary sewer system. However, all properties fronting or adjacent to a watermain are required to be connected and water consumption to be metered. Municipal water may not be used without being metered, and water loss is to be prevented or compensated for by the user. In case of a malfunctioning meter, the meter reading for the previous six (6) months is taken. However, water used for firefighting purposes is not metered in most cases the exception being when a fire connection is downstream of a water meter pit at property line.

The By-Law also enables water conservation by limiting the external (non-domestic) use of municipal water based on municipal addresses from May 1st to September 1st to specific calendar dates.

The water servicing analysis for this Master Plan will make assumptions for future development based on these regulations.

2.5.4.2 Municipality By-Law: Regulation for Discharge of Waste

The Municipality controls the discharge of waste into public sewer systems under By-Law 64-14. The By-Law mandates the connection of housing units including buildings to sanitary sewer mains, if available. Exemption for buildings is contingent to monthly sewer charges. In addition, connection of buildings to sewer is contingent to the Operating Authority confirming the availability of treatment capacity of the Sewage Works.

Sewage entering the sanitary sewer may only contain water originating from the Municipal water supply, except for residential homes connected prior to the enactment of this By-Law, and for commercial/industrial/multi-unit properties that have entered a Sanitary Sewer Discharge Agreement. In both cases, surcharge charges based on agreed upon amounts are added to the monthly Wastewater Rates. No connections of rainwater or storm water leader, and/or groundwater drainage system (sump pump) is permitted under the By-Law.

The By-Law also prohibits discharging of waste into the sewer system that will risk or adversely impact the sewer collection and treatment system in any way.

2.5.4.3 Drinking Water Quality Management System

The Municipality maintains a Drinking Water Quality Management System (DWQMS) as required under the SDWA, where the consistent supply of safe drinking water to residents and businesses is committed to by the Municipality.

2.6 Strathroy-Caradoc Servicing Standards (SCSS)

The SCSS design requirements for sanitary sewers, water mains, and stormwater management. These will be referenced for developing the screening and evaluation criteria, which will ensure the standards are reflected in the final recommendations in the Master Plan. Overall, the SCSS requires that wastewater treatment plants and collection system and water supply system use the design principles dictated in the Ministry of Environment, Conservation and Parks Guidelines (MECP) for Drinking Water Systems (Water Guidelines) and Sewage Works (Wastewater Guidelines). The MECP principles used for the development of the SC Master Plan are explained in the following sections.

2.7 Related Strathroy-Caradoc Plans

2.7.1 Downtown Master Plan

The 2020 Strathroy Downtown Master Plan prepared by Republic Urbanism provides the design vision and development expectations of key stakeholders and members of the Downtown Strathroy community. Strategies to meet the vision of an interconnected and sustainable community include a downtown connected to the waterfront, renewing key landmark properties, creating moderate density near highly livable spaces, and creating opportunities for improving non-vehicular connectivity.

2.7.2 2021 Asset Management Plan

The 2021 Asset Management Plan (AMP) for the Municipality prepared by PSD Research Consulting establishes the approach for the management of the Municipality's assets. The

recommendations and capital project lists in the Water, Wastewater and Stormwater Management components will be considered based on the following AMP strategies:

- Lifecycle management strategies including identifying project type under categories of preventative and/or general maintenance, rehabilitation and/or renewal, replacement, and upgrades; and
- Risk management strategies which states that precedence of asset prioritization is (1) condition of the asset; (2) its importance to service delivery; and (3) impact of its failure or disrepair.

The 2021 AMP provides the *estimated useful life* (EUL) and *service life remaining* (SLR) of the Municipality's existing infrastructure assets which will be used to develop the project recommendations.

2.7.3 Cross Connection and Backflow Prevention Program

The Municipality has undertaken a plan to prevent contamination of potable water in the drinking water supply systems via the Backflow Prevention Program in accordance with the Water Supply Control By-Law. Backflow prevention devices are connected in areas stated in the by-law and in the Ontario Building Code.

3.0 CONSULTATION AND ENGAGEMENT

Public consultation is documented in **Appendix 1** of this report.

3.1 Introduction

The consultation process is an integral component of the MCEA process. As the Municipality 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 WWSMP. Effective communication with Indigenous communities, agencies, stakeholders, and the public can reduce or avoid controversy that can ultimately lead to project delays and general discontent of project stakeholders. RVA, in consultation with Municipality staff, identified stakeholders, agencies and Indigenous communities that may have an interest in the study, the methods of contact, and the timing of contact for this project. This section details the consultation process followed by this MCEA.

3.2 Notices

The Notice of Study Commencement was published on the Municipality's News & Public Notices Website (https://www.strathroy-caradoc.ca/Modules/News/en?_mid_=28747) and the project page for the Master Plan is at the following address:

> https://www.strathroy-caradoc.ca/en/city-hall/water-wastewater-and-stormwater-master-plan-and-pollution-prevention-control-plan.aspx

The Notice of Completion was sent out to agencies and interested parties by email. Copies of the notices are included in **Appendix 1.1**.

3.3 Stakeholder Consultation

The MCEA process requires stakeholder consultation to incorporate input from interested or impacted groups. Potential stakeholders included but were not limited to:

- Public – This includes individual members of the public including property owners who may be affected by the project, individual citizens who may have a general interest in the project, special interest groups, community representatives, and developers; and
- Review agencies – This includes government agencies who represent the policy positions of their respective departments, ministries, authorities, or agencies.

Public and Agency contact lists and notices are in presentation are in **Appendix 1-1**. Responses were received and reviewed, and these are documented in **Appendix 1-4**.

All Notices, PICs and other information on the Master Plan has been published on the Municipality's News & Public Notices Website:

https://www.strathroy-caradoc.ca/Modules/News/en?_mid_=28747.

and the project page for the Master Plan is at the following address:

https://www.strathroy-caradoc.ca/en/city-hall/water-wastewater-and-stormwater-master-plan-and-pollution-prevention-control-plan.aspx.

3.4 Indigenous Consultation

Based on discussions and recommendations provided by the MECP regional office, RVA on behalf of the Municipality confirmed Indigenous communities and in addition contacted Aboriginal Affairs and Northern Development Canada (AANDC) and the Ministry of Aboriginal Affairs (MAA) separately from the general notifications sent to review agencies. The purpose of the contact was to request which, if any, Indigenous communities may be affected by the project alternatives. The Information provided ensures the appropriate communities have been included in the contact lists for the duration of the MCEA project. Contact was made with the following Indigenous groups:

- Metis Nation of Ontario;
- Aamjiwnaang First Nation;
- Caldwell First Nation;
- Chippewas of Kettle and Stony Point First Nation;
- Chippewa of the Thames First Nation;
- Delaware Nation (Moravian of the Thames)- EELÜNAAPÉEWI LAHKÉEWIIT;
- Munsee-Delaware Nation;
- Oneida of the Thames First Nation; and
- Bkejwanong Territory (Walpole Island).

This is documented in **Appendix 1.2**.

3.5 Public Information Centres

A Public Information Centre (PIC) is a method to communicate with the public, interested parties and review agencies. For this project, two (2) PICs were held to present the Problem and Opportunity Statement, background information collected, a review of the servicing strategies being

evaluated, present the evaluation criteria, the preliminary preferred solution, and the project timeline.

PIC#1 was held on January 10, 2024, for the Municipality of Strathroy – Caradoc's Water, Wastewater and Stormwater Master Plan and Pollution Prevention Control Plan at the Caradoc Community Centre in Mount Brydges. The posted hours were from 6:00 PM to 8:00 PM.

PIC#2 was held on September 11, 2024, for the Municipality of Strathroy – Caradoc's Water, Wastewater and Stormwater Master Plan and Pollution Prevention Control Plan at the Gemini Sportsplex in Strathroy. The posted hours were from 6:00 PM to 8:00 PM.

Details of the PICs are included in Appendix 1.3 which contains a summary of the meetings, a copy of the presentations, attendance lists, comments received. Any responses were received and reviewed, and these are documented in Appendix 1.4.

3.6 Incorporating Consultation Input

The input and information gathered from the various parties who participated in the consultation were reviewed by the Project Team and used to develop the WWSMP.

4.0 POPULATION PROJECTIONS USED IN MASTER PLAN

Note: RVA projections of servicing are based on the projected settlement populations calculated in the 2022 Residential Lands Needs Assessment (RLNA) was prepared by Watson & Associates Economists Ltd. as part of the review and update of the Municipality's Official Plan. study. Our analysis of committed and/or anticipated development is intended to provide a picture of the anticipated progress of growth as of mid-2024 and use this as a tool to consider the expected rate and extent of growth in our analysis. The reader should consult current Municipality and County Planning reports and Council minutes to confirm the status of development.

To determine growth projections over the Master Plan Study period (to 2046), the following Municipality documents were reviewed.

4.1 Strathroy-Caradoc Residential Lands Needs Assessment

4.1.1 Report Review: Existing Conditions

The 2022 Residential Lands Needs Assessment (RLNA) was prepared by Watson & Associates Economists Ltd. as part of the review and update of the Municipality's Official Plan. The study projected future residential land needs to accommodate the anticipated population and housing growth over a 25-year period and provided recommendations for the allocation of the growth based on the several factors such as land supply and municipal services availability. The recommendations were built upon two previous related studies: 2019 Middlesex Population and Housing Projections prepared for the Middlesex County Official Plan and the 2020 Growth Management and Housing Report.

Table 4-1 provides the Municipality's population and housing breakdown for 2021.

Table 4-1: 2021 Housing by Settlement Area[1]

Type / Settlement	Population	Housing
Strathroy	16,600	6,560
Mount Brydges	3,300	1,190
Total Urban Settlement Areas	**19,900**	**7,750**
Remaining Rural Areas	4,800	1,710
Strathroy-Caradoc	**24,700**	**9,460**

1: Source: Watson & Associates Economists Ltd. 2022 Residential land Needs Assessment

The study noted that:

- The Municipality has witnessed an average growth rate of 235 units per year from 2016 to 2021 and an average persons per dwelling unit (P.P.U) of 2.61;
- The Municipality's 2016 population was approximately 21,600, which grew to 24,700 by 2021;
- Approximately 60% of the Municipality's housing growth from 2016 to 2021 has been accommodated in Strathroy (Section 2.3, RLNA) with an average of 155 units per year from 2016 – 2020 (Section 3.3.4, RLNA);
- Mount Brydges accommodated 36% of the housing growth, with an average of 72 units per year from 2016 to 2020);
- Melbourne has remained relatively unchanged since 2016 and has not added any new housing units; and
- The remaining 4% of the housing growth in the Municipality has occurred in the rural areas not currently serviced by municipal water and wastewater facilities.

4.1.2 Report Review: Projections

Table 4-2 provides the Municipality's population forecast to the year 2046 for the high growth scenario that was developed for the Middlesex County Official Plan and adopted by the Municipality in 2019.

Table 4-2: Strathroy-Caradoc Population Forecast to 2046[1]

Year / Population	2021	2026	2031	2036	2041	2046
Strathroy-Caradoc	24,700	27,030	30,190	32,400	33,960	35,360

1: Source: Watson & Associates Economists Ltd. 2022 Residential Land Needs Assessment

In alignment with the Municipality's Official Plan, the RLNA identified Strathroy and Mount Brydges as urban settlement areas and expected to accommodate the majority of the population and housing growth, with limited infill growth expected in the partially serviced community of Melbourne. The rural areas of Delaware West, Campbellvale and Paulin Crescent Estates were not planned for growth. Specifically:

- The community of Strathroy will have a total population of 23,900 by 2046, with an average annual growth rate of 1.5%; and

- It will also see 3,920 additional houses at an annual growth rate of approximately 157 houses, bringing the total to 10,480 by 2046. Of this, 805 units are assumed to be accommodated through intensification.

Similarly, Mount Brydges:

- Will have a total population of 7,500 by 2046, with an average annual growth rate of 3.3%; and
- It will also see 1,750 additional houses at an annual growth rate of approximately 70 houses, bringing the total to 2,940 by 2046. Of this, 30 units are assumed to be accommodated through intensification.

The study also reviewed the housing inventory and determined that as of September 2022, Strathroy can accommodate up to 3,074 units in its vacant lands, while Mount Brydges can accommodate 1,260 housing units. These do not include intensification opportunities. The land supply assessment that was also undertaken for a 5-, 15- and 25-year period found that both Strathroy and Mount Brydges can expect shortfalls for the required land supply beyond the next 15 years.

4.2 Employment Lands Study

4.2.1 Report Review: Existing Conditions

Watson and Associates were retained by the Municipality to complete the 2021 Employment Lands Study (ELS) to determine future employment growth potential in the Municipality and the employment lands capability of accommodating this growth. The study provided recommendations to assist development of land use policies pertaining to employment growth within designated employment areas that are located primarily in the communities of Strathroy and Mount Brydges.

The review recognized that the Municipality's employment base is made of a community-based sector, which refers to employment of the local population, and an export-based sector. The Municipality recorded an employment population of 10,400 people in 2021, of which 7,910 (76%) jobs are defined as usual place of work employment, while 840 (8%) are work at home and 1,650 (16%) are identified as off-site or *No Fixed Place of Work* (NFPOW).

The assessment directs that estimates for NFPOW be excluded from the employment land needs analysis as these employees do not require land in designated Employment Areas. Specifically, the following are key employment areas in Strathroy and Mount Brydges:

1. Molnar Industrial Park is located in the northern part of Strathroy and covers approximately 40 ha. The industrial park is home to Ricco Food Distributors, Catalent Pharma Solutions,

Lafarge, Anderson Corporation, Vari-form, Metamag Inc., Gray Ridge Egg Farms, Parmerit Inc., and Norbec, among some smaller storage and industrial service businesses;

2. Albert Street Industrial Park is also located in the Strathroy settlement area, and accommodates a range of industrial and commercial uses; and
3. High Street Industrial Park is one of the largest Employment areas in all of Middlesex County, and home to Langs Bus Lines, Nortera North America, Meridian Magnesium Products, Autotube Limited, and Vari-form (in three facilities). Other key businesses in the area include Purina, Pentacast Inc., and Sansin Corporation.

Mount Brydges has only one small industrial area that contains one large facility. The study anticipated that the majority of industrial employment growth will be accommodated within the two Strathroy-Caradoc designated urban settlement area.

Strathroy-Caradoc's existing employment land base totals approximately 154 net ha. As of 2021, the gross vacant employment land supply for the Municipality is 107 ha located entirely in the community of Strathroy. Of this, the developable portion that excludes any areas subject to constraints is 91 ha.

4.2.2 Report Review: Projections

The key driver for the employment growth rate is the growth of the residential population. This results in a forecast of an additional 4,600 jobs for a total of 15,000 jobs forecasted for 2046, reflecting a growth of 1.5% over the 25-year forecast per the 2021 Employment Lands Study (Watson & Associates Economist Ltd.). The Municipality's employment lands, which are situated in the town of Strathroy, are anticipated to accommodate 37% of total employment growth or 1,700 jobs from 2021-2046, broken down as follows:

- 1,270 jobs in industrial sector;
- 325 jobs in commercial sector; and
- 100 jobs in institutional sector.

The forecasted Urban Employment Area land demand is anticipated to total 124 net ha (306 net acres) over the 2021 to 2046 period or 5 net ha (12 net acres) annually to accommodate 1,690 jobs. As such, the Municipality needs a minimum of 33 net ha of designated urban employment lands to meet long-term needs to 2046. If future land vacancy and other non-developable features are considered, the minimum increases to 58 gross ha. Since Mount Brydges does not have additional employment designated land, Strathroy is expected to accommodate any future employment related growth.

4.3 Development Charges Background Study (DC)

4.3.1 2018 DC Background Study for the Mount Brydges Service Area

The Municipality retained Hemson Consulting in 2018 to complete an Area-Specific DC Background Study for the Mount Brydges Service Area in response to the large development anticipated for the community. The study identified the preliminary infrastructure required to facilitate development forecasted over the period of 2018 to 2037, as well as:

- Reviewed the operating costs of capital projects that are currently in progress and that are planned for future; and
- Facilitated the preparation of the municipality's asset management plan for assets that are attributed to development charges, which include engineered services for roads, sanitary sewers, storm sewers and municipal drains, and water infrastructure within the study area.

The findings of the study are reviewed for the purposes of this Master Plan.

4.3.2 2019 and 2022 DC Background Study

A DC Background Study was also completed by Hemson in 2019 as part of the process for approval of new DC by-law in compliance with the Development Charges Act, 1997. The study provides anticipated residential and non-residential growth over the 2020-2029 and 2020-2036 period, and the corresponding development charge to accommodate this growth.

A subsequent study was completed in 2022 by Hemson. The study analyzed growth to 2031 and calculated the development charges for soft services to help develop an updated By-law to support the anticipated growth.

For the purpose of the Master Plan, growth numbers will only be taken from the RLNA report and not from the estimations made by Hemson for the DC study.

4.4 Existing Population

The historical population of the two growth centres is used to obtain an average water demand and wastewater flow projection per person/capita. As noted in Section 2.5, the RLNA only provides historical populations for the overall Municipality and not for its individual towns. The 2019-2021 populations for the Town of Strathroy is interpolated based on the historical housing trend provided in the report using the following methodology:

- The 2021 population and housing units provided in Table 4-1 in Strathroy give a PPU of 2.53;

- The average annual housing growth from 2016 to 2022 is 155 units. This is back calculated from 2021 to obtain the housing units in Strathroy for 2019 and 2020. The units are then multiplied by the PPU to obtain the population estimates for those years; and
- Since the housing growth from 2021 and 2022 is not provided in the RLNA study, the 2022 population is simply interpolated between the 2021 and 2026 populations, both of which are provided in the RLNA report. Although the report did provide an annual growth rate from 2021 to 2046 for both Towns that could have been used instead, the interpolated population was higher and therefore taken as the 2022 population (in alignment with the High Growth scenario adopted by the Municipality).

The historical population for Mount Brydges is calculated likewise. Table 4-3 provides the results for both the Towns.

Table 4-3: Historical Population

Year / Settlement	2019	2020	2021	2022
Strathroy	15,816	16,208	16,600	16,997
Mount Brydges	2,912	3,106	3,300	3,480

4.5 Projected Population

4.5.1 Population Forecast

Population projections from the RLNA for the settlements of Strathroy and Mount Brydges are provided in Table 4-4. The employment populations are not provided separately for either of the Towns; however, reasonable assumptions can be made based on the information provided in the ELS. It is difficult to predict if the additional jobs forecasted for Strathroy will be filled by the current or future residents of the Town or by the population residing outside the Town. Hence, for the purpose of the Master Plan and to prevent double counting population growth, only the residential growth will be taken into consideration.

Table 4-4: Population Forecasts to 2046 for Strathroy-Caradoc's Urban Settlement Areas

Year / Settlement	2021	2026	2031	2036	2041	2046
Strathroy	16,600	18,200	20,300	21,800	22,900	23,900
Mount Brydges	3,300	4,200	5,500	6,300	6,900	7,500

4.5.2 Addressing Expanded Boundaries

In our analysis of future servicing our technical staff have taken measures to include demands that may arise from outside of existing boundaries. This has been done on a case-by-case basis to facilitate developing the required data. The impacts of this type of growth are generally minor in terms of its impact to the overall 20-year infrastructure plan.

4.6 Committed Development

4.6.1 Current Draft Approved/Registered Development

A list of planned residential, commercial and industrial development currently undergoing different stages of the approval process was provided by the Municipality. The SCSS provides Population Per Unit (P.P.U) factors for different density zones as follows:

- Low Density comprising of 30 units/hectare with P.P.U of 2.4 people/unit. This is generally single/detached homes;
- Medium Density comprising of 75 units/hectare with P.P.U of 2.4 people/unit. This is generally semi-detached/townhomes; and
- High Density comprising of 150 – 300 units/hectare with P.P.U. of 1.6 people/unit. This is generally apartment units.

The corresponding population expected from the planned development is then obtained by multiplying the P.P.U corresponding to the development type by the number of units. Development applications that have reached site plan approval stage is considered as committed development and used for committed capacity calculations.

4.6.2 Committed Development in Strathroy

Table 4-5 provides our understanding of committed development for the Strathroy as of mid-2024.

Table 4-5: Strathroy Planned Development that has Received Site Plan Approval

Development	Development Type	# of Units	Population
100 Second Street	Townhomes	35	84
Darcy Drive	Townhomes	72	173
Strathroy Crossing	Townhomes	36	86
50 Carrol Street	Townhomes	40	96
392 Second Street	Apartments	48	115
430 Head Street	Singles/Semis	21	34
Cuddy Farms – Saulsbury Development	Singles/Semis	323	517

Development	Development Type	# of Units	Population
	Townhomes	151	362
Fieldcrest	Singles/Semis	119	286
	Townhomes	186	298
Southgrove Meadows	Singles/Semis	24	38
Total		**1,056**	**2,142**

A large industrial building is also expected to be built at 990 Wright Street, covering approximately 157,000 ft^2 (1.5 ha). Phase 2 of the industrial development is an additional 112,000 ft^2 (1 ha). The SCSS requires that population density shall be not less than 11 persons per net hectare for industrial built. This roughly results to a population of 28 people.

4.6.3 Committed Development in Mount Brydges

Table 4-6 provides our understanding of committed development for the Mount Brydges as of mid-2024.

Table 4-6: Mount Brydges Planned Development that has Received Site Plan Approval

Development	Development Type	# of Units	Population
Falconbridge (west side of Adelaide Rd. along Falconbridge Dr.)	Townhomes	106	254
	Singles/Semis	111	178
Falconbridge (east side of Adelaide Rd. along Falconbridge Dr.)	Townhomes	204	490
	Singles/Semis	107	171
Edgewood Phase 1	Singles/Semis	83	154
Forest View	Townhomes	64	166
	Singles/Semis	104	133
Total		**779**	**1,546**

4.6.4 North Meadows Secondary Plan

The North Meadows Secondary Plan prepared by Monteith Browns Planning Consultants in February 2021 provides comprehensive policies for the development of approximately 108 ha of undeveloped lands in Strathroy that are currently labelled as 'Schedule C' in the Official Plan.

5.0 EVALUATION CRITERIA USED IN THE MASTER PLAN

5.1 Servicing Evaluation Strategy

The MCEA process requires that a reasonable range of alternative management techniques be developed for the water servicing constraints identified through the master planning process. The first strategy is the *Do-Nothing* scenario which is a compulsory check per the MCEA process. The remaining strategies are taken from the 2021 AMP which identifies *preventative maintenance, rehabilitation and/or replacement* as the best practice strategies for municipal infrastructure. Therefore, the problems or opportunities identified in the hydraulic model will be categorized into these 4 strategies to ensure they meet the Municipality's asset management goals.

5.2 MCEA Evaluation Criteria Description

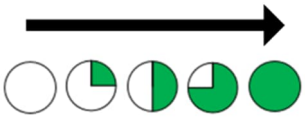
An evaluation criterion to evaluate the alternative solutions is developed based on the MCEA requirements. It comprises of four categories with specific criteria that should be reviewed as listed in Table 5-1.

Table 5-1: MCEA Evaluation Criteria

Category	General Criteria to Assess Impact
Technical	• Constructability • Improvements to operation • Infrastructure Required • Approval Requirements
Social and Cultural	• Public Requirements • Impact to built heritage resources and cultural heritage landscapes
Environmental	• Impact to aquatic and terrestrial species and habitat • Impact to surface water quantity and quality • Climate Change resiliency
Economic	• Capital Costs • Operational and Maintenance Costs • User Value

The evaluation criteria is applied to each alternative solution to rate their ability of meeting the Master Plan's Problem and Opportunity Statement and narrow down to the preferred solution. Table 5-2 illustrates the rating scale used.

Table 5-2: Evaluation Criteria Measurement

Evaluation Rating Scale		
Highest Impact (Most Negative Solution)		Lowest Impact (Most Positive Solution)

5.3 General Solutions to Review

For municipal infrastructure, the following are the standard solutions to review when issues are identified regarding servicing, operational or capacity issues:

Do Nothing: This alternative solution is required baseline condition that considers the anticipated impacts if no remedial or mitigation measures are taken to address the identified issues. Under this scenario, no improvements or changes would be undertaken to address the current and future water supply and storage requirements.

Operational Changes: This alternative solution will address the identified issues by proposing operational strategies that will reduce risks address the servicing issue.

Rehabilitation/Optimization: This alternative solution will target optimization of the water conveyance infrastructure to improve performance or increase capacity.

Replacement/Expansion: This alternative solution is implemented when the other alternatives prove incapable of meeting growing system demands.

The detailed Technical Memos for the Water System, the Wastewater System and the Stormwater Management (**Appendices 2**, **3** and **4**) provide specific details on how issues that are noted in each type of system are recommended to be addressed.

6.0 WATER MASTER PLAN

Appendix 2 is the Water Master Plan Technical Report that provides detailed descriptions of the review of the water systems, modeling undertaken and recommendations for capital works.

6.1 Water Servicing Standards

The Strathroy-Caradoc Servicing Standards (SCSS) detail the Municipality's design requirements for sanitary sewers, water mains, and stormwater management. These will be referenced for developing the screening and evaluation criteria, which will ensure the standards are reflected in the final recommendations in the Master Plan. Overall, the SCSS requires that the water supply system use the design principles dictated in the Ministry of Environment, Conservation and Parks Guidelines (MECP) for Drinking Water Systems (Water Guidelines).

6.2 Water Design Parameters

The glossary in Appendix 2 the Water Master Plan Technical Report provides details of the typical water design parameters used to evaluate the water system capacity.

6.3 Capital Forecast

The Municipality has provided the planned 10-year capital forecast from 2024 to 2033 for water projects. This list is provided in Appendix A for reference. The Total Capital Budget is estimated at $25.4 million of this:

- $6.5 million is identified for renewal and upgrades to existing facilities;
- $5.5 million is identified for extensions of the water distribution system for new growth; and
- $13.4 million is identified for renewal projects.

Appendix 2 the Water Master Plan Technical Report provides additional details on the related water projects in the current 10-year capital plan. The recommended projects from this Master Plan should be reviewed and considered within the context of the current 10-year capital plan should they be needed within this timeframe.

6.4 Hydraulic Modeling

To evaluate the demands for the capital plan timelines hydraulic models for Strathroy and Mount Brydges were developed. The timelines for each system are as follows:

- 2023 (existing), 2030, 2041 and 2046 for Strathroy-Caradoc; and
- 2023 (existing), 2036 and 2046 for Mount Brydges.

Autodesk InfoWater Pro software was used to model water distribution systems through a geographic information system (GIS) interface. GIS data that was provided by the Municipality. Set points for the reservoirs and pumps were incorporated into the model.

The following criteria, obtained from the Strathroy-Caradoc Servicing Standards (October 2021) were utilized to evaluate the performance of each WDS:

- The normal operating pressure in the distribution system should be approximately 350 to 480 kPa (50 to 70 psi) and not less than 275 kPa (40 psi);
- The system should be designed to maintain a minimum pressure of 140 kPa (20 psi) at ground level at all points in the distribution system under maximum day demand plus fire flow conditions;
- The maximum pressures in the distribution system should not exceed 700 kPa (100 psi) to avoid damage to household plumbing and unnecessary water and energy consumption; and
- The requirement for fire flow requirements is to be completed using the "Water Supply for Public Fire Protection – A guide to Recommended Practice" prepared by Fire Underwriters Survey for a particular development. There is no minimum overall requirement for fire protection stipulated by the Municipality. It was assumed that a minimum fire protection of 67 L/s is required in the Municipality's water system.

For modelling scenarios representing future conditions, flow demands allocated to future developments were distributed to the nearest junction already connected to an existing watermain. The modelling results for current and future demand conditions are summarized in the subsequent sections for Strathroy and Mount Brydges distribution systems. System improvement recommendations are proposed for those results which do not meet the above listed criteria.

Additional information on the model appears in Appendix 2 the Water Master Plan Technical Report.

6.5 Strathroy Water Distribution System

6.5.1 System Components

6.5.1.1 Water Supply

The Strathroy water distribution system (WDS) is supplied water from the LHPWSS. The feed is from a dedicated 600 mm transmission main from the main 1200 mm transmission main northeast of Strathroy. Strathroy is connected at the LHPWSS Monitoring Station #2 located at the Second Street Reservoir between Second St and Highway 402 on the north side of the settlement area. The

LHPWSS has a maximum current capacity to deliver treated water of 340 mega-litres (ML) per day and the 2023 maximum day flow was 198.5 ML/d. The current water supply agreement with LHPWSS does not specify a maximum day limit on water supply to Strathroy. With the Strathroy MDD expected to increase by 3.0 MLD in 2046 to approximately 11.0 ML/d and given the available LHPWSS capacity, water supply is not expected to be an issue. The Municipality should convey its future demand requirements to the LHPWSS so that the LHPWSS can undertake its own future supply planning.

6.5.1.2 Pumping and Storage

The Strathroy WDS operates in two pressure Zones, Zone 1 to the south in in the lower elevations of the settlement area and Zone 2 in the north. The system consists of the Second Street Pumping Station/Reservoir with re-chlorination and Reservoir (capacity 11,250 m³), the Head Street Water Tower (capacity 1,900 m³). Table 6-1 summaries the Strathroy storage.

Table 6-1: Strathroy Water Storage

Storage	Volume (m³)
Second St Reservoir Cell # 1	3,750
Second St Reservoir Cell # 2	3,750
Second St Reservoir Cell # 3	3,750
Elevated Water Tower	1,900
Total	**13,150**

Chlorine residual is monitored at the Second Street PS and at the water tower. Both zones are supplied by the Second St. reservoir, with each zone being interconnected to supply back up flow in adverse events. Per Strathroy-Caradoc's *Water System Operations Manual*, Pumps No. 1 and No. 2 are operated to maintain the water pressures in Zone 1, and Pumps No. 4 and No. 5 are alternated as duty pumps periodically by the operators to maintain acceptable pressures in Zone 2. Pump No. 3 is available for the fire duty or to service the higher demand scenarios for Zone 2. The PS has 2 pump wells and five vertical turbine pumps. Figure 6-1 shows the pressure zones and Table 6-2 summarizes the pump information.

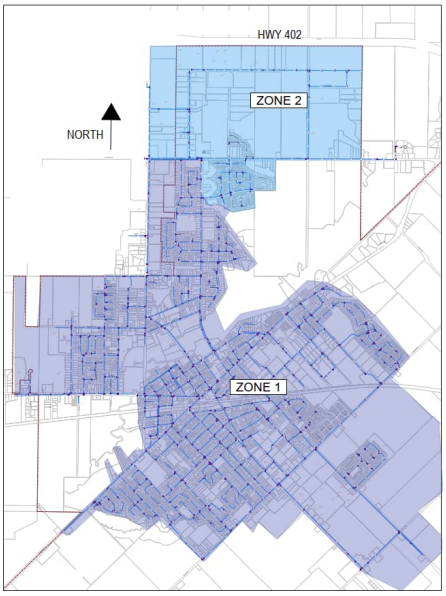


Figure 6-1: Strathroy WDS Pressure Zones

Table 6-2: Strathroy DS Pump Information

Pump No.	Pump Type	HP	Design Capacity (L/s)	Design Capacity (m^3/day)	TDH (m)
1	Constant Speed	75	66	5,702	42
2	VFD	125	139	12,010	54
3	Constant Speed	300	212	18,317	49
4	VFD	40	39	3,370	51
5	VFD	40	39	3,370	51

The water distribution system (WDS) also provides a connection point to the neighbouring Township of Adelaide-Metcalfe's water distribution system along the Centre Road (County Road 81) corridor.

6.5.1.3 Watermain Inventory

Based on watermain inventory (GIS shapefile) data, Strathroy has approximately 106.6 km of watermain consisting of cast iron pipe (16%), ductile iron pipe (35%) and polyvinyl chloride (PVC) pipe (49%).

6.5.2 Current Water Demand

The historical water consumption obtained from the 2019-2023 reports are shown in Table 6-3.

Table 6-3: Strathroy Historical Average Water Consumption Data

Parameter	Units	2019	2020	2021	2022	2023	Average
Average Day Demand (ADD)	m^3/day	4,363	4,551	4,591	4,725	4,499	**4,546**
ADD	L/cap/d	282	281	284	285	255	**271**
Maximum Day Demand (MDD)	m^3/day	8,031	8,187	7,541	6,782	7,516	**7,611**
MDD	L/cap/d	508	505	454	399	434	**460**
Maximum Day Factor (MDF)	-	1.8	1.8	1.6	1.4	1.7	**1.7**

Based on water data from 2019 to 2023, the average per capita Maximum Day Demand (MDD) for Strathroy is 460 L/cap/day. The required storage capacity calculated per MECP guidelines for the 2023 population is 6,916 m^3.

6.5.3 Projected Water Demand

Table 6-4 shows the forecasted water demand to the study horizon of year 2046. Additionally, the corresponding water storage required capacity, and the remaining available capacity is also shown. The total current available storage volume from Reservoir Cells 1 to 3, from the Water Tower and from the Emergency Storage is 20,650 m^3. The forecasted storage capacity for the year 2046 is 11,870 m^3. Therefore, Strathroy's current WDS has ample storage capacity to the service growth beyond the 25-year study period. Water demand projections are also shown in Figure 6-4.

Table 6-4: Strathroy WDS Projected Water Demand

Parameter	Units	2023	2026	2031	2036	2041	2046
MDD	m^3/day	7,516	8,374	9,341	10,031	10,537	10,997

1: Available Capacity = 20,650 m^3

6.5.4 Future Storage Requirements

Table 6-5 shows the forecasted water demand to the study horizon of year 2046. The Strathroy water model reviews the performance of the WDS under 2046 MDD and fire flow simulations.

Additionally, the corresponding water storage required capacity, and the remaining available capacity is also shown. The total current available storage volume from Reservoir Cells 1 to 3 and from the Water Tower is 13,150 m^3. The forecasted storage capacity for the year 2046 is 10,977 m^3. Therefore, Strathroy's current WDS has ample storage capacity to the service growth beyond the 25-year study period. Water storage projections are also shown in Figure 6-3.

Table 6-5: Strathroy WDS Projected Water Storage Requirement

Parameter	Units	2023	2026	2031	2036	2041	2046
MDD	m^3/day	7,516	8,374	9,341	10,031	10,537	10,997
MDD	l/s	87.0	96.9	108.1	116.1	122.0	127.3
Required Storage Capacity	m^3	6,916	7,264	7,823	8,222	8,515	8,781
Remaining Available Storage Capacity[1]	m^3	6,234	5,886	5,327	4,928	4,635	4,369

1: Available Capacity = 13,150 m^3

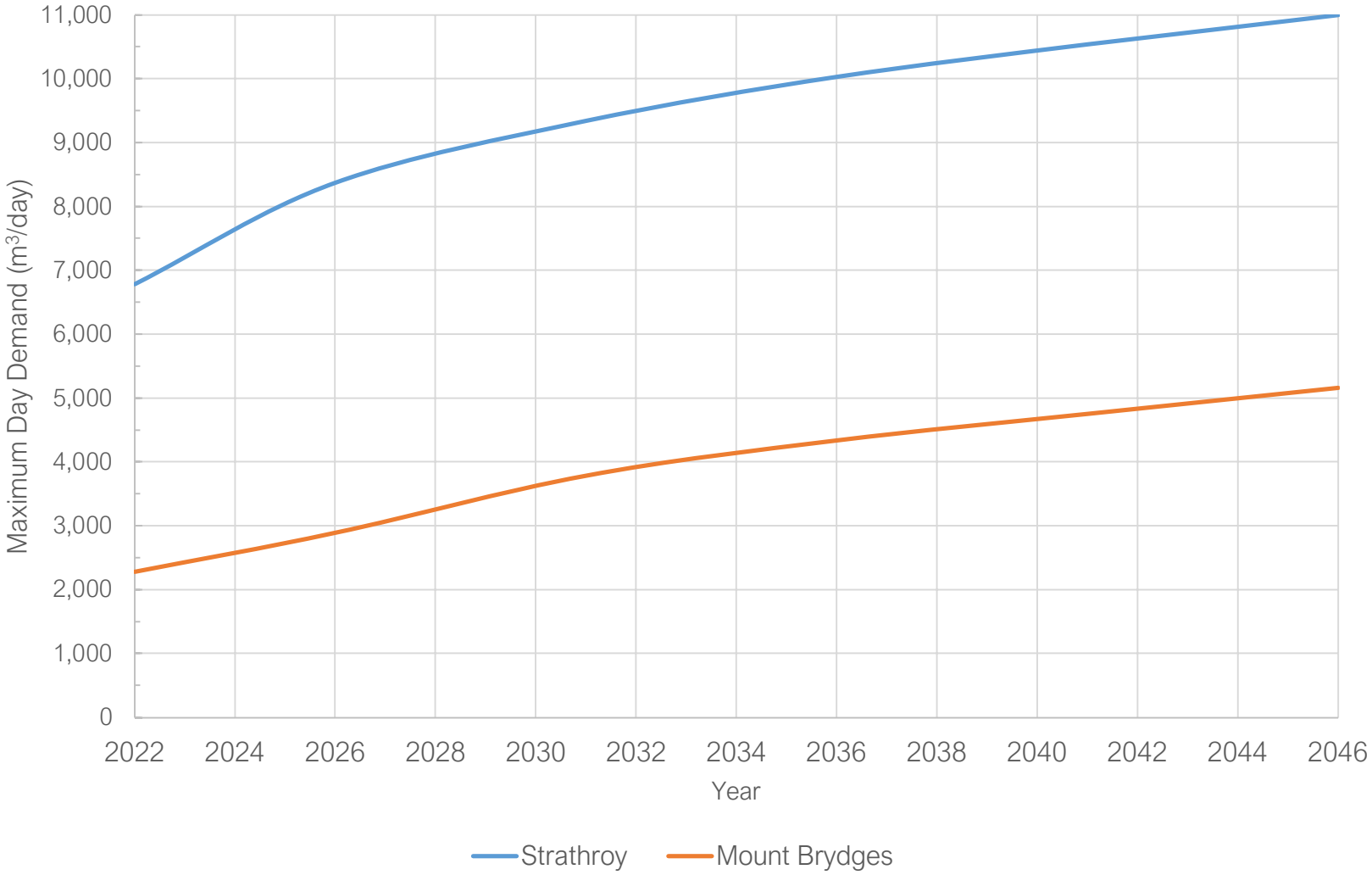


Figure 6-2: Strathroy and Mount Brydges Water Demand Projections

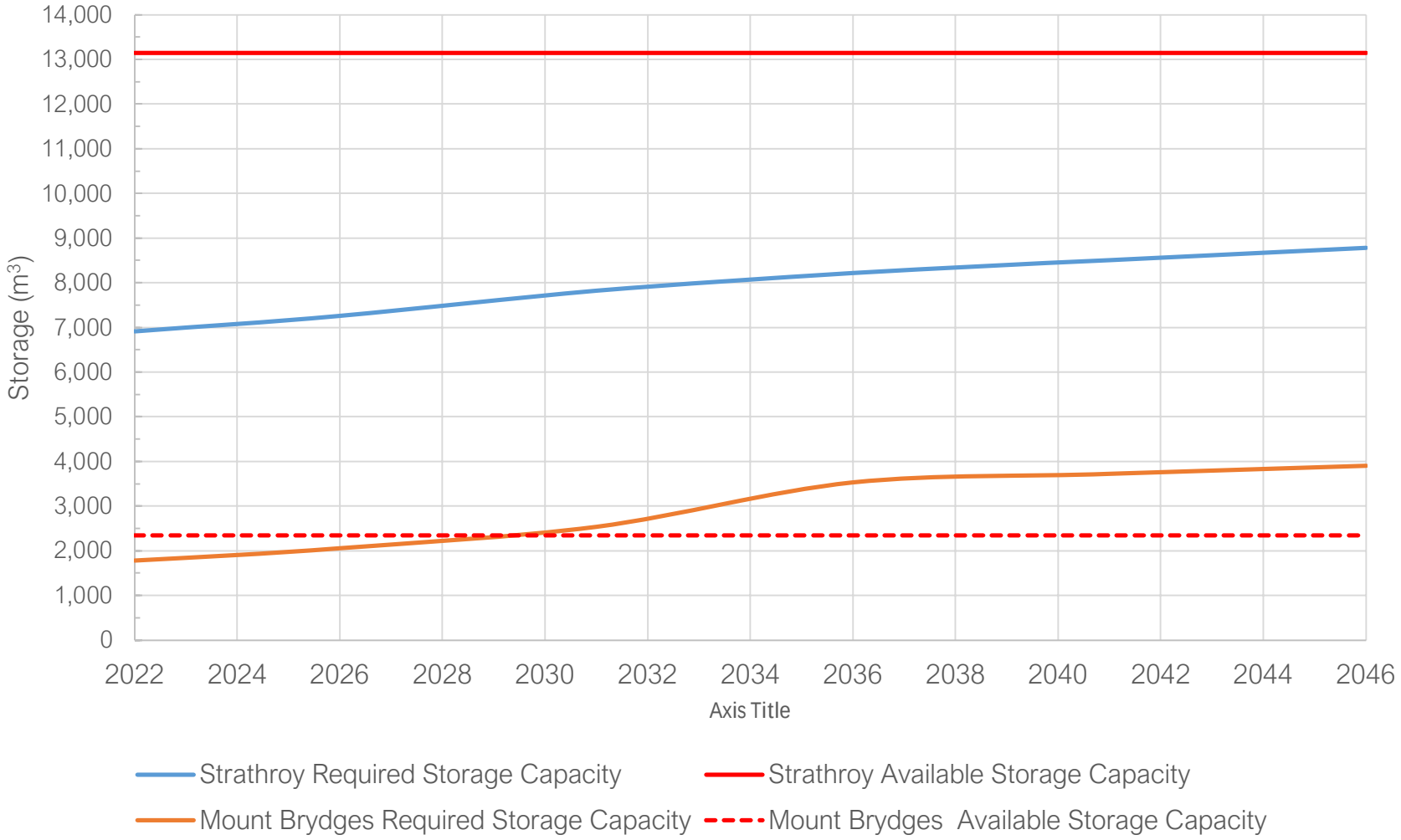


Figure 6-3: Strathroy and Mount Brydges Water Storage Projections

6.5.5 Hydraulic Modeling

In the scenarios modelled, service pressures in the Strathroy WDS ranged from 313 kPa to 521 kPa under existing and all future study periods, which fall which fall within the acceptable range. Fire flow simulation showed that most areas within the system can achieve the minimum fire flow requirement of 67 L/s, except in areas with small diameter and/or dead-end watermains. This is a normal impact/result of low diameter watermains or lack of properly looped watermain connections. Table 6-6 provides a list of locations with watermains that cannot meet fire flow demand conditions. These watermains are generally older and smaller in diameter and in the case of the cast iron pipes are reaching the end of their life expectancy.

Table 6-6: Strathroy WDS Hydraulic Analysis Recommendations

Location	Location Type/ Watermain Type	Hydrant Flow (L/s)	Hydrant Pressure at Flow (kPa)	Pipe Material and Diameter	Solution	Proposed Pipe Material and Diameter	Pipe Length (m)
Center St. NW of Metcalfe	Residential Area, Dead End Main	26	138	Cast Iron 100 mm	Upgrade water main on Center St. to a 150 mm PVC pipe	PVC 150 mm	141
Concord St.	Residential Area, Dead End Main	28	138	Cast Iron 100 mm	Upgrade water main on Concord St. to a 150 mm PVC pipe	PVC 150 mm	127
Riverview Drive, N of Joel Court	Residential Area, Dead End Main	42	138	Ductile Iron 150 mm	Extend watermain from Riverview Dr. using a 150 mm PVC watermain to connect to the 300 mm watermain on Head St. N	PVC 150 mm	127
Oak Ave., NW of Laughton Cres.-	Residential Area, Dead End Main	45	138	Cast Iron 150 mm	Upgrade watermain on Oak Ave. to 150 mm PVC pipe	PVC 150 mm	308
North St., W of Victoria Rd. to Emily St.	Residential Area, Looped watermain	53	138	Cast Iron 100 mm	Upgrade watermain on North St. W. up until Emily St. to a 150 mm PVC pipe	PVC 150 mm	299
Locke Heights, N of Hull Rd.	Residential Area, Dead End Main	57	138	Ductile Iron 150 mm	Upgrade watermain on Locke Heights to	PVC 200 mm	241

Location	Location Type/ Watermain Type	Hydrant Flow (L/s)	Hydrant Pressure at Flow (kPa)	Pipe Material and Diameter	Solution	Proposed Pipe Material and Diameter	Pipe Length (m)
					a 200 mm PVC pipe		
Lamore Cres., W of Riverview Dr.	Residential Area, Dead End Main	58	138	Ductile Iron 150 mm	Upgrade watermain on Lamore Cres. to a 200 mm PVC pipe	PVC 200 mm	203
Mill Pond Cres, N of Front St. E	Residential Area, Dead End Main	60	138	Ductile Iron 150 mm	Upgrade watermain on Mill Pond to a 200 mm PVC pipe	PVC 200 mm	241
Head St., Looped main to Canaan St.	Residential Area, Looped watermain	64	138	Cast Iron 100 mm	Extend the looped main using a 150 mm PVC watermain to connect with the 350 mm PVC running parallel on Canaan St.	PVC 150 mm	342

6.6 Mount Brydges Water Distribution System

6.6.1 System Components

6.6.1.1 Water Supply

The Mount Brydges water distribution system (WDS) is supplied water from the Lake Huron Primary Water Supply System (LHPWSS). The water supply is from the Komoka-Mount Brydges Transmission System which is fed from a dedicated pumping station at the Arva Reservoir (Pumping Station # 4) and transmitted via a dedicated 400 mm/350 Komoka-Mount Brydges transmission main to the Mount Brydges WDS. The current water supply agreement with LHPWSS does not specify a maximum day limit on water supply to Mount Brydges. With the Mount Brydges MDD expected to increase by 2.9 MLD in 2046 to approximately 5.2 ML/d and given the available LHPWSS capacity, water supply is not expected to be an issue. The Municipality should convey its future demand requirements to the LHPWSS so that the LHPWSS can undertake its own future supply planning.

6.6.1.2 Pumping and Storage

The Mount Brydges WDS consists of:

- The Glendon Drive High Lift PS (HLPS) that has an underground 2-celled storage reservoir with total capacity of 1,630 m^3. The HLPS has back-up power;
- Oriole Drive Monitoring and Re-chlorination Facility (Monitoring Station #3) that also has backup-power; and
- The Railroad Street Water Tower with a total volume of 720 m^3.

The system consists of 45 km of watermains, a reservoir connected to a booster pumping station, an elevated tank and 179 fire hydrants.

The pumps in the Glendon Drive HLPS are summarized in Table 6-7.

Table 6-7: Mount Brydges Glendon PS Pump Information

Pump No.	Pump Type	HP	Design Capacity (L/s)	Design Capacity (m^3/day)	TDH (m)
1	Constant Speed	40	42.9	3,707	54
2	Constant Speed	60	60.6	5,236	53
3	Constant Speed	60	59.3	5,124	64
4	Constant Speed	60	59.3	5,124	64

The water distribution system (WDS) also supplies water to Campbellvale and Deware West to the Southwest of Mount Brydges along County Road 81 corridor and provides a water supply to the Longwoods Road Conservation Area to the south.

6.6.1.3 Watermain Inventory

Based on watermain inventory (GIS shapefile) data, Mount Brydges has approximately 44.8 km of watermain consisting predominantly of PVC pipe.

6.6.2 Current Water Demand

The historical water consumption obtained from the 2019-2023 reports are shown in Table 6-8.

Table 6-8: Mount Brydges Historical Average Water Consumption Data

Parameter	Units	2019	2020	2021	2022	2023	Average
ADD	m^3/day	795	892	949	934	910	**896**
ADD	L/cap/d	272	290	286	273	247	**284**
MDD	m^3/day	1,658	2,248	2,547	2,285	2,601	**2,268**

Parameter	Units	2019	2020	2021	2022	2023	Average
MDD	L/cap/d	572	725	772	654	716	**717** [1]
MDF	-	2.1	2.5	2.7	2.4	2.9	**2.6** [1]

Note 1: 2019 per capital flow excluded from average due to variance compared to other years.

Based on water data from 2019 to 2023, the average per capita Maximum Day Demand (MDD) for Mount Brydges is 717 L/cap/day. The per capita MDD demand in Mount Brydges is significantly higher than what would be expected for a community and therefore the Municipality should consider reviewing this issue. The required storage capacity calculated per MECP guidelines for the 2023 population is 1,784 m^3.

6.6.3 Projected Water Demand

The water demand and required storage capacity projections to the year 2046 for Mount Brydges WDS is provided in Table 6-9. The Mount Brydges Glendon PS pumps can supply the MDD to 2046 and the water model details the performance of the WDS under 2046 MDD and fire flow simulations. Remaining available storage capacity is calculated based on a storage volume of 2,350 m^3 provided by the Glendon Pumping Station Reservoir and the Railroad Water Tower. As shown, the required storage capacity will be in deficit post year 2026. Water demand is shown in Figure 6-2 and storage projections in Figure 6-3.

Table 6-9: Mount Brydges WDS Projected Water and Storage Demand

Parameter	Units	2023	2026	2031	2036	2041	2046
MDD	m^3/day	2,601	2,893	3,788	4,339	4,753	5,166
MDD	l/s	30.1	33.5	43.8	50.2	55.0	59.8
Required Storage Capacity	m^3	1,784	2,063	2,547	3,533	3,723	3,913
Remaining Available Storage Capacity[1]	m^3	566	287	-197	-1,183	-1,373	-1,563

1: Available Capacity = 2,350 m^3

6.6.4 Hydraulic Modeling

Service pressures in the Mount Brydges WDS range from 360 kPa (53 psi) to 571 kPa (83 psi) under existing and all future study periods, which fall which fall within the acceptable range.

Fire flow simulation showed that areas east of Adelaide Road and Gibson Road, are consistently lower than the proposed minimum fire protection of 67 L/s. This can be attributed to various factors,

large distance from water source, going from lower elevation to a higher elevation area, small diameter pipes, and presence of dead end watermains. Areas with lower fire flow availability are remote areas and only look to service a few single-family homes.

Under the future MDD, the estimated fire flow is approximately 25 L/s below the minimum targeted fire flow of 67 L/s in the vicinity of Falconbridge Drive and Adelaide Road. If this area is subject to future development, then an analysis will need to be undertaken to ensure the water distribution system satisfies the minimum fire flow requirements of 67 L/s through looping existing watermains. Depending on the effectiveness of looping the watermain on Adelaide Road (between Woods Edge Road and Falconbridge Drive) may require upsizing. As the details cannot be confirmed at this time, this project is not included in the capital plan but should be noted by the Municipality for future action at the time of development in this area.

6.7 Water System Alternatives and Recommendations

6.7.1 Strathroy Water System

The proposed Strathroy WDS improvements include new and/or upsizing of existing watermains to improve fire flow. The recommendations specifically target dead-end main scenarios and achieve looped watermains. Each identified location listed in Table 6-6 is evaluated per the criterion establish in Section 5. The results of the evaluation are in Table 6-10.

6.7.2 Mount Brydges Water System

6.7.2.1 Water Storage

The required water storage capacity will be in deficit post 2026. To service growth and provide fire protection, the storage capacity is to be increased from its current volume of 2,350 m^3 to 3,950 m^3. New water storage infrastructure can be installed by the Glendon Drive High Lift Pumping Station (HLPS). This location is optimal as growth in the community and planned development falls within the vicinity of this HLPS, which minimizes piping and pumping capacity upgrades.

Figure 6-4 shows the existing water storage property and two options to incorporate the additional 1,600 m^3 of storage needed. The two identified options for water storage infrastructure are:

1. Aboveground Potable Water Storage Tanks: This solution would look at providing two storage tanks, each with a volume of 800m^3 for a total volume of 1,600 m^3. Providing two tanks allows for redundancy. Tank dimensions can be designed such that a future 800m^3 tank can be accommodated at the proposed location, allowing for future growth beyond the study horizon of 2046; or

2. Underground Water Reservoirs: This solution is an underground reservoir with a minimum volume of 1,600 m^3. This solution must meet the following MECP requirements:
    a. Pumps connected to ground storage reservoirs are to be sized to meet the maximum day plus fire flow demands or the peak domestic demand,
    b. Reservoir to be ideally above the groundwater table, which can impact structural costs,
    c. A minimum distance of 15m is required to between the reservoir and sewers and other potential sources of contamination; and
    d. The buried reservoir is to be design with at least two cells which can operate independently.

    The current reservoir structure can be mirrored to the east of the current building to provide this storage but there will be little available area for expansion and it will not allow access to the south of the reservoir from the east side of the property.

Appendix 2 provides additional information on the two water storage options and both alternative strategies are evaluated in Table 6-11.

6.7.2.2 Fire Flow Issues East of Adelaide Rd and Gibson Rd

The proposed improvements to the Mount Brydges WDS to address fire flow availability in areas East of the intersection of Adelaide Rd. and Gibson Rd are listed below. Results from the hydraulic analysis indicate that available fire flows in this area are consistently lower than the proposed minimum of 67 L/s (FUS requirement). The three alternative strategies can address this deficiency.

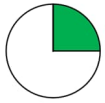
1. Booster Pump at the Sanitary Pumping Station on Mill Road: Install a booster pump servicing the potable water system at the existing SPS located at the intersection of Mill Road and Adelaide Road. The booster pump will address the insufficient fire flows available on Gibson Rd. and in those areas Southwest of Gibson Rd. Installing the booster pump at the existing SPS reduces the capital costs associated with the solution.
2. Tanker Truck for Fire Flow Requirements: As the areas which do not meet the fire flow requirements are considered isolated with limited anticipated development planning, tanker trucks can be used to provide the additional flow.
3. Upsize Watermains in Targeted Areas:
    - For Areas southwest of Gibson Road, the existing watermain on Gibson Road from Adelaide Road is 150mm for a stretch of 769 m before it becomes a 250mm main. This stretch should be replaced/upsized to a 250mm as it induces headloss during fire flows.

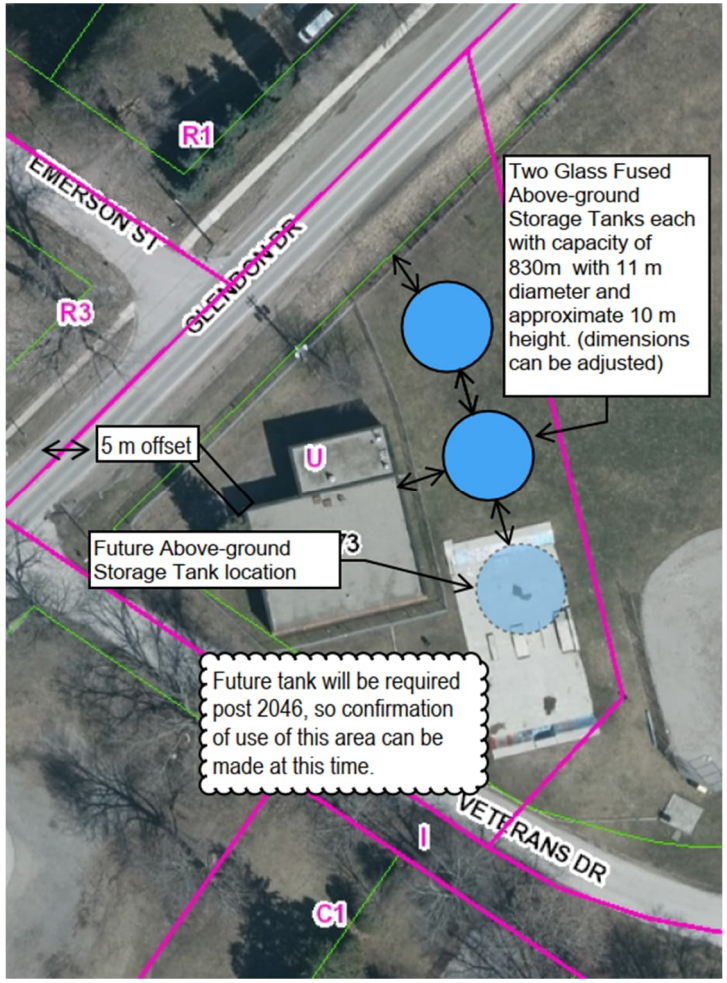
- For Areas east of the intersection of Adelaide Road and Gibson Road, installing a new booster pump at the Sanitary Pumping Station on Mill Road with a higher capacity will ensure fire flow supply to those areas.

These alternative strategies are evaluated in Table 6-12.

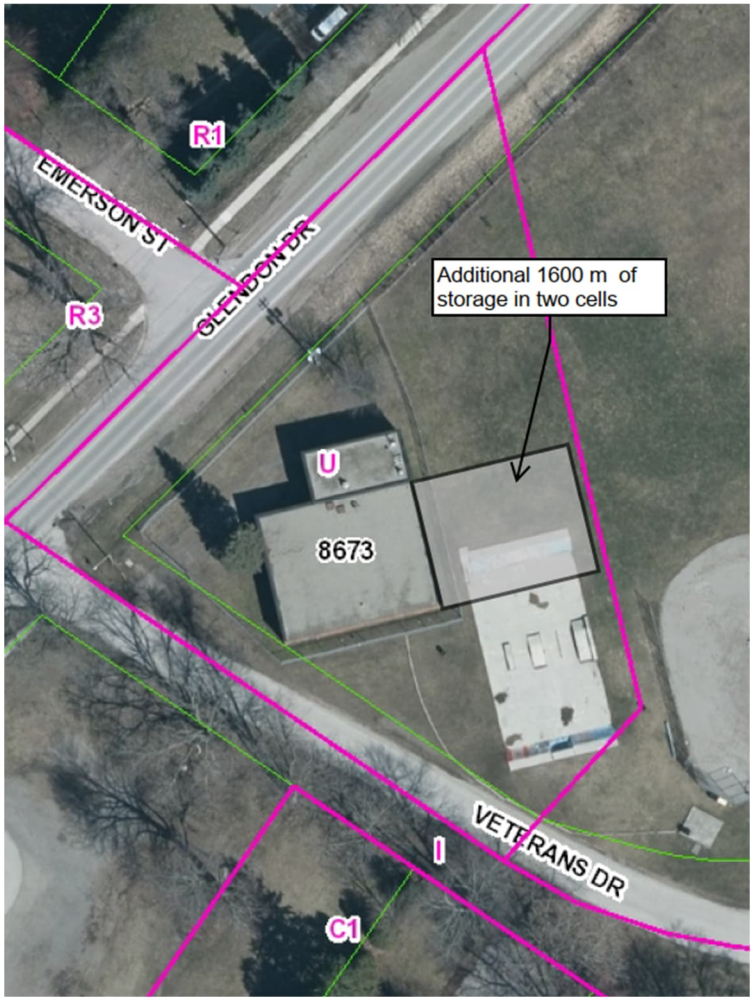
Table 6-10: Strathroy WDS Improvement of Fire Flow Alternative Solution Evaluation

Strathroy	Do Nothing	Preventative Maintenance	Rehabilitation	Replacement
Description	Implement no solution	Regular flushing / swabbing of manholes	Relining of watermains	Replace pipes
Technical	• In many cases these watermains are old cast iron pipe that is prone to failure and close to service life. • Dead-end mains impact water quality but even more when pipe sizes are small.	• Not a long-term solution as it involves significant operational changes. • Does not address fire flow supply issues.	• This could improve the C-factor; thereby lowering friction and headlosses. • Lining of pipes reduces internal diameter. This will offset the improvements in the C-factor	• Upgraded pipe material and pipe size will adhere to recommended standards. • All MCEA Schedule B projects with minimum to no permit requirements.
Social and Cultural	• Insufficient fire protection puts risk of losses on public. • Availability of water-trucks is always needed. • Older pipes.	• Availability of water-trucks is always needed. • Insufficient fire .protection puts risk of losses on public.	All water services connected to the watermain will have to be re-installed or replaced. This may have some impact on social and cultural aspects but can be mitigated through construction practices.	• Provision of efficient fire protection is generally supported by public opinion. • Watermain construction may have some impact on social and cultural aspects but can be mitigated through construction practices.
Environment	Can have adverse impact to environment depending on fire incident.	Can have adverse impact to environment depending on fire incident.	General construction impacts only.	• Projects are confined to existing public right- of-ways and/or Municipality properties where impacts to natural environment is minimal.

Strathroy	Do Nothing	Preventative Maintenance	Rehabilitation	Replacement
				• General construction impacts only.
Economic	• Water trucks will be needed in case of fire. • Older pipes pose high risks of leakage which will increase non-revenue water supply.	• Lower cost than *Rehabilitation* and *Replacement* alternatives • Marginal improvement only but increased operational costs • Increased flushing demand will increase non-revenue water supply	Lower cost than replacement but will not have same life expectancy gained from replacement of pipes.	• Capital investments required may not justify the project unless costs are shared. • Lower maintenance and operational costs • Infrastructure-related risks are mitigated with new pipes
Overall Strategy	For areas with minimal to no planned development, this is a viable option. However, for areas that are undergoing development planning, this strategy will risk supply of water and fire flow protection to serviced population.	This option does not address the risk of lack of fire flow supply. It also increases maintenance activities and, subsequently, associated costs. This is not a suitable long-term solution.	The current issues include small diameter (100mm) aging pipes. Since relining of these pipes will further reduce their diameters, this is not a viable solution.	This strategy will require some capital investment; however, it will ensure that all of Strathroy community meets its servicing goals as established for its public assets.
Score				



Option 1 – Above Ground Storage Tanks



Option 2 – Inground Storage Tanks

Figure 6-4: Mount Brydges Water Storage Options

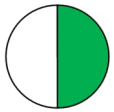
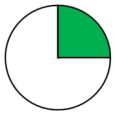
Table 6-11: Mount Brydges Water Storage Capacity Alternative Solutions Evaluation

Mount Brydges	Do Nothing	Rehabilitation - Strategy 1	Rehabilitation - Strategy 2
Description	Implement No Solution	Above Ground Storage Tank	Buried Storage Reservoir
Technical	• Low water storage capacity may strain the water system and risks negative pressures in the distribution network during peak demand scenarios • Water storage system will not meet recommended municipal guidelines	• Provision of two tanks will allow isolation of each for routine maintenance • Proposed location has space for an additional tank for complete redundancy or if needed for more storage beyond 2046 • Above ground infrastructure simplifies inspection and maintenance activities • Design, equipment, and warranty is provided by tank supplier	• Reservoir to be separated into two cells to allow isolation of each for routine maintenance • Inspection and maintenance for buried tanks will need *Confined Space Entry* licence
Social and Cultural	Lack of water storage will directly impact the service level of the municipality's water supply system to the serviced population	• Above ground infrastructure will need to be secured to prevent access to children • Proper water storage will ensure adequate water supply to serviced population.	Proper water storage will ensure adequate water supply to serviced population.
Environment	No impact to the environment	• Water tanks proposed location is not in a significant natural environment area.	General construction impacts only which can be mitigated with construction practices.

Mount Brydges	Do Nothing	Rehabilitation - Strategy 1	Rehabilitation - Strategy 2
		• General construction impacts only which can be mitigated with construction practices.	Area is not a significant natural environment area.
Economic	Risk of contamination of distribution network	Total cost is estimated at $2,300,000 (excluding HST) which includes the cost of the above ground tanks and associated equipment, construction costs, and engineering design.	Total cost is estimated at $4,400,000 (excluding HST) which includes construction cost and engineering design.
Overall Strategy	This strategy is not recommended as it will significantly impede proper distribution	This strategy will meet the requirements of the water system at a much lower cost than alternative 2. Additional planning may be required to protect the infrastructure from public access.	This strategy will meet the requirements of water system but will need more complicated maintenance procedures compared to Alternative 1
Score			

Table 6-12: Mount Brydges Water System Fire Flow Issues East of Adelaide Rd and Gibson Rd Alternative Solutions Evaluation

Mount Brydges	Do Nothing	Strategy 1	Strategy 2	Strategy 3
Description	Implement no solution.	Provision of Tanker Truck for Fire Protection.	Put in new Booster Pumping Station in area to meet fire flow demands.	Replacement of upstream 150 mm watermain with larger watermain.
Technical	Number of tanker trucks or other source of water needed for non-covered areas to be estimated yearly as demand will change with growth.	• Addresses insufficient fire flows but will cause high pressures in areas just downstream of booster station. • Project falls under 'Exempt' schedule per MCEA category; therefore, ECA not required.	• Addresses insufficient fire flows supply issue. • Existing standard practice for surrounding rural areas.	• Upsized watermains are exempt projects under the MCEA schedule. • Since the upsize is only for fire flow protection, they will be oversized for average daily demand.
Social and Cultural	• Insufficient fire protection puts risk of losses on public. • Availability of water-trucks is always needed.	Provision of efficient fire protection is generally supported by public opinion.	Provision of efficient fire protection is generally supported by public opinion.	• Provision of efficient fire protection is generally supported by public opinion. • Construction related social and cultural impacts can be addressed by construction practices.
Environment	Can have adverse impact to environment depending on fire incident.	General construction impacts only.	No adverse impact to the environment.	General construction impacts only.

Mount Brydges	Do Nothing	Strategy 1	Strategy 2	Strategy 3
Economic	No associated cost	Project capital cost is higher than Preventative Maintenance solution but much lower than Replacement solution.	Cost of water trucks will only arise during a fire incident in the specific area.	• Large initial capital cost. Cost may not be justified as solution is extensive as compared to the issue being addressed. • Increased watermain flushing means larger volume of non-revenue water.
Overall Strategy	This strategy does not ensure fire protection for the specified areas, and therefore does not address the identified issue.	This strategy will address the identified issue, however, high pressurized areas downstream of the booster pump may cause additional unforeseen issues.	This strategy addresses the identified issues efficiently as it is economically justifiable based on the long-term trends with respect to population growth anticipated development in the specified areas.	This strategy has high costs that may not be justified when compared to the operation changes solution which is more economically justifiable.
Score				

7.0 WASTEWATER MASTER PLAN

7.1 Wastewater Servicing Standards

The SCSS design requirements for sanitary sewers, water mains, and stormwater management. These will be referenced for developing the screening and evaluation criteria, which will ensure the standards are reflected in the final recommendations in the Master Plan. Overall, the SCSS requires that wastewater treatment plants and collection system use the design principles dictated in the Ministry of Environment, Conservation and Parks Guidelines (MECP) for Drinking Water Systems Sewage Works (Wastewater Guidelines).

7.2 Wastewater Design Parameters

The glossary in Appendix 3 Wastewater Master Plan Technical Memorandum provides details of the typical wastewater design parameters used to evaluate the wastewater system capacity.

7.3 Capital Forecast

The Municipality has provided the planned 10-year capital forecast from 2024 to 2033 for wastewater projects. This list is provided in Appendix A for reference. The Total Capital Budget from 2024 to 2033 is $49.9 million of this:

- $1.9 million is identified for sanitary pumping station renewal projects;
- $1.3 million is identified for renewal projects for the Strathroy WWTF; and
- $18.5 million is identified for extensions of the sanitary collection system for the Mount Brydges WWTF.

Appendix 3 Wastewater Master Plan Technical Memorandum provides additional details on the related wastewater projects in the current 10-year capital plan. The recommended projects from in this Master Plan should be reviewed and considered within the context of the current 10-year capital plan should they be needed within this timeframe.

7.4 Hydraulic Modeling

PCSWMM (version 7.6) software was used for the hydraulic modeling and analysis of Strathroy's and Mount Brydges wastewater collection system (WWCS). The calibrated hydraulic models were used to determine the wastewater collection system performance under the following conditions:

- 2024 (existing), 2029, 2041 and 2046 (ultimate) for Strathroy; and;
- 2024 (existing), 2032 and 2046 (ultimate) for Mount Brydges.

For each of the time horizons stated above, modeling scenarios were created to evaluate the performance of the WWCS and identify potential constraint areas that may have issues related to pipe capacity. The system analysis has considered sanitary system only and it was assumed that if any combined sewers exist within the system, the Municipality will consider sewer separation to direct all surface flows to the new storm sewer. The calibrated hydraulic models were then utilized to evaluate system's capacity under 2024 (existing), 2029, 2041 and 2046 (ultimate) for Strathroy and 2024 (existing), 2032 and 2046 (ultimate) for Mount Brydges.

A summary of the hydraulic analysis results are:

- The Strathroy's existing WWCS is capable of conveying future estimated wet weather flows under the 2046 conditions;
- The Mount Brydges WWCS has sufficient capacity to convey future estimated wet weather flows under the 2046 conditions; and
- All the SPS's in Strathroy and Mount Brydges have capacity to handle ultimate scenario flows for the year 2046 while maintaining the existing configuration.

The system analysis has considered the sanitary system only. It should be noted that there were no significant wet weather impacts noted as part of the hydraulic analysis.

The Hydraulic Analysis report is included in Appendix 3 Wastewater Master Plan Technical Memorandum.

7.5 Strathroy Wastewater System

7.5.1 System Components

7.5.1.1 Collection and Pumping

The Strathroy wastewater collection system (WWCS) comprises of approximately 90 km of gravity sewers, 6 km of forcemains, 1,236 manholes. The Strathroy wastewater collection system consists of nine (9) sewage pumping stations (SPS). Out of nine, two pumping stations service the majority of the sanitary drainage areas. Albert Street SPS and Metcalfe Street SPS convey all of the wastewater from the Strathroy collection system to the Strathroy Sewage Treatment Plant. The remaining seven (7) sewage pumping stations are secondary, discharging to the existing sanitary sewers.

7.5.1.2 Treatment

The Strathroy WWTF comprises of a mechanical treatment plant with a design rated capacity of 10,000 m^3/day. The WWTF's liquid train comprises of mechanical screens, one aeration basin,

chemical phosphorus removal, two secondary clarifiers, tertiary filtration, and UV disinfection. Sludge storage is provided by an onsite lagoon.

7.5.2 Historical Wastewater Flows

Strathroy's historical per capita flows used to project the future flows is 294 L/cap/day, based on 2019 – 2022 rolling wastewater flow data.

7.5.3 Projected Wastewater Flows

Table 7-1 provides the forecasted sanitary flow to the Strathroy WWTF for the associated population projected to the year 2046. The current WWTF rated capacity is 10,000 m^3/day and, therefore, the system has ample capacity to continue supporting growth to the study horizon of 2046.

Table 7-1: Strathroy WWTS Projected Wastewater Flows

Parameter	Units	2026	2031	2036	2041	2046
Population	-	18,200	20,300	21,800	22,900	23,900
ADF	m^3/day	5,357	5,975	6,416	6,740	7,034
Built Out Scenario Population	-	24,096				
Built Out Scenario ADF	m^3/day	7,092				

With the current rated capacity of 10,000 m^3/d, the Strathroy WWTF has capacity to support growth beyond 2046.

7.5.4 Hydraulic Modeling

A calibrated hydraulic model was used to determine the wastewater collection system performance under the following conditions:2024 (existing), 2029, 2041 and 2046 (ultimate). The Strathroy's existing WWCS is capable of conveying future estimated wet weather flows under the 2046 conditions.

All the SPS's in Strathroy have capacity to handle ultimate scenario flows for the year 2046 while maintaining their existing configuration.

7.6 Mount Brydges System

7.6.1 System Components

7.6.1.1 Collection and Pumping

The Mount Brydges Wastewater Collection System comprises of approximately 11 km of gravity sewers, 2 km of forcemains, 145 manholes and two (2) sanitary pump stations.

7.6.1.2 Treatment

Mount Brydges is currently services by the Mount Brydges WWTF which is located approximately 2 km southeast of Mount Brydges, at 22416 Mill Road. The WWTF was constructed in 2011 and has a design capacity of 825 m^3/day. Since 2019, the Municipality has had operational issues with the WWTF and have been actively engaged with MECP District Office and Approvals Branch to mitigate these issues. In 2019, the WWTF was operating at approximately 15-20% of its rated capacity and these low loadings led to the treatment system having trouble treating Total Ammonia Nitrogen (TAN) to its required limit. As flows to the WWTF continued to rise from 2020 to present, the WWTF has experienced equipment breakdown and treatment challenges in meeting the treatment requirements for other parameters including total suspended solids, organic matter and TAN. This has demonstrated that the capacity and reliability of the current WWTF technology cannot provide the level of treatment required to its capacity is 825 m^3/day. The Municipality has undertaken a phased approach to reduce the environmental impacts. These phases are detailed below.

Immediate Action - Modifications at the Main PS to replace existing discharge valve with a throttle valve to better control flows coming into the WWTF. This included piping and SCADA changes and was completed in early 2021.

Interim Action - Modifications to the existing spare tank to work as an equalization tank are being considered by the Municipality.

Permanent Approach (restoration of WWTF ECA Capacity to 825 m^3/day) - This involves construction of headworks and moving to an extended air process which has several advantages and is much better suited to future expansion of the WWTF. The ECA approval has been received from the MECP for the changes to the WWTF. Preparation and submission of an ECA – Air and Noise, and a Permit to Take Water (PTTW) both from MECP is underway. Once the Air and Noise ECA and PTTW are obtained and the project is approved by Council, the tender/construction of the Capacity Restoration project can be started in early 2025 with completion of works anticipated sometime in 2026.

Table 7-2 provides the current committed capacity and the remaining available capacity of the Mount Brydges WWTS as of mid-2024. Refer to note in Section 4.6 regarding use of development data.

Table 7-2: Mount Brydges WWTF Committed Capacity

Locations	Allocated Flow (m^3/day)
2023 ADF (existing connected lots)	419
Approved Proposed Developments	
22182 Adelaide Road	23
Falconbridge	154
Falconbridge West	202
Edgewood	100
Forest View	122
22226 Adelaide Road	20
22696 Adelaide Road	163
2585 Queen Street	60
8535 Glendon Drive	33
22268 Adelaide Road	22
Total Flow Generated from Developments	899
Total Flow to the WWTF	1,318
Plant Capacity	825
Remaining Capacity	-493

7.6.2 Historical Wastewater Flows

Mount Brydges' historical per capita flows varied from 201 to 331. The per capita ADF of 300 L/cap/day as provided in the SCSS. Late 2023 and early 2024 monthly averages appeared to be trending higher without a significant change in connected units. To address this variability, an assume per Capita flow of 313 L/cap/day is used for flow forecasting.

7.6.3 Projected Wastewater Flows

Based on direction from Strathroy-Caradoc Council, the future serviced population for municipal wastewater treatment in Mount Brydges is to be based on the additional growth from 2023 onwards as well as the existing unconnected population. It is assumed that there will be a phasing of connecting the existing unconnected population will be connected in a phased approach such that, by year 2046, the entire un-serviced population is fully connected.

Table 7-3 provides the forecasted sanitary flow to the Mount Brydges WWTF for the associated population projected to the year 2046.

Figure 7-1: Mount Brydges Wastewater Flow Projection

Table 7-3: Mount Brydges WWTS Projected Wastewater Flows

Parameter	Years				
	2026	2031	2036	2041	2046
Total Population	4,200	5,500	6,300	6,900	7,500
Future Development Population	0	1050	2100	3150	4200
Existing Unconnected Population	1,456	1092	728	364	0
Total Connected Population Growth	2,744	4,408	5,572	6,536	7,500
WWTF Capacity Requirement (m^3/day)	718	1,287	1,703	2,064	2,348

With the current rated capacity of 825 m^3/d, the Mount Brydges WWTF needs to undergo capacity expansion to continue supporting growth. In either of the scenarios, the ADF reaches 85% of the capacity by 2028. This is illustrated graphically in Figure 7-1.

7.6.4 Hydraulic Modeling

A calibrated hydraulic model was used to determine the wastewater collection system performance under the following conditions: 2024 (existing), 2032 and 2046 (ultimate). The Mount Brydges WWCS has sufficient capacity to convey future estimated wet weather flows under the 2046 conditions. The SPS's in Mount Brydges have capacity to handle ultimate scenario flows for the year 2046 while maintaining their existing configuration.

7.7 Wastewater System Alternatives and Recommendations

7.7.1 Strathroy Wastewater System

There no recommendations associated with the Strathroy wastewater system as a result of the Master Plan review.

7.7.2 Mount Brydges System

Mount Brydges' existing sewage collection system does not pose any servicing constraints as determined in the hydraulic model. Expansion of wastewater treatment capacity from 825 to 2,348 m^3/day is required to meet anticipated demand. At present, the MCEA Schedule C process will be required to confirm the required type of project to be undertaken for the provision of increased wastewater treatment capacity. The following are the Options for the expansion of wastewater capacity for Mount Brydges to provide a capacity of 2,348 m^3/day as anticipated to be required by 2046:

1. Upgrade Existing Mount Brydges WWTF;
2. Upgrade Mill Road Main Sewage Pumping Station and send flows to Strathroy WWTF

2.1. Send all flows and decommission the existing WWTF,

2.2. Split flows between current WWTF rated at 825 m^3/day and send additional flows Strathroy WWTF; and

3. Build a New WWTF and divert part or all of flows from Mill Road Main Sewage Pumping Station

3.1. Send all flows and decommission the existing WWTF,

3.2. Split flows between current WWTF rated at 825 m^3/day and send additional flows to a Strathroy.

These options are shown in Figure 7-2.

In addition to the expansion of the treatment capacity to accommodate growth and the connection of the existing population, the collection system will have to be expanded. The portion of the collection system that is to be expanded to accommodate growth will be paid by the proponents of this growth through Development Charges. The connection of the current unconnected population of 2,264 will have to be funded by the Municipality. There is approximately 11.6 km of new sanitary sewer that will be required to service the existing development areas in Mount Brydges. As part of the sanitary sewer placement to ensure conservative costing, it would be assumed that the Municipality will look to reconstruct the roadways as fully urbanized sections to the current local road standard which would include storm sewers and curbs.

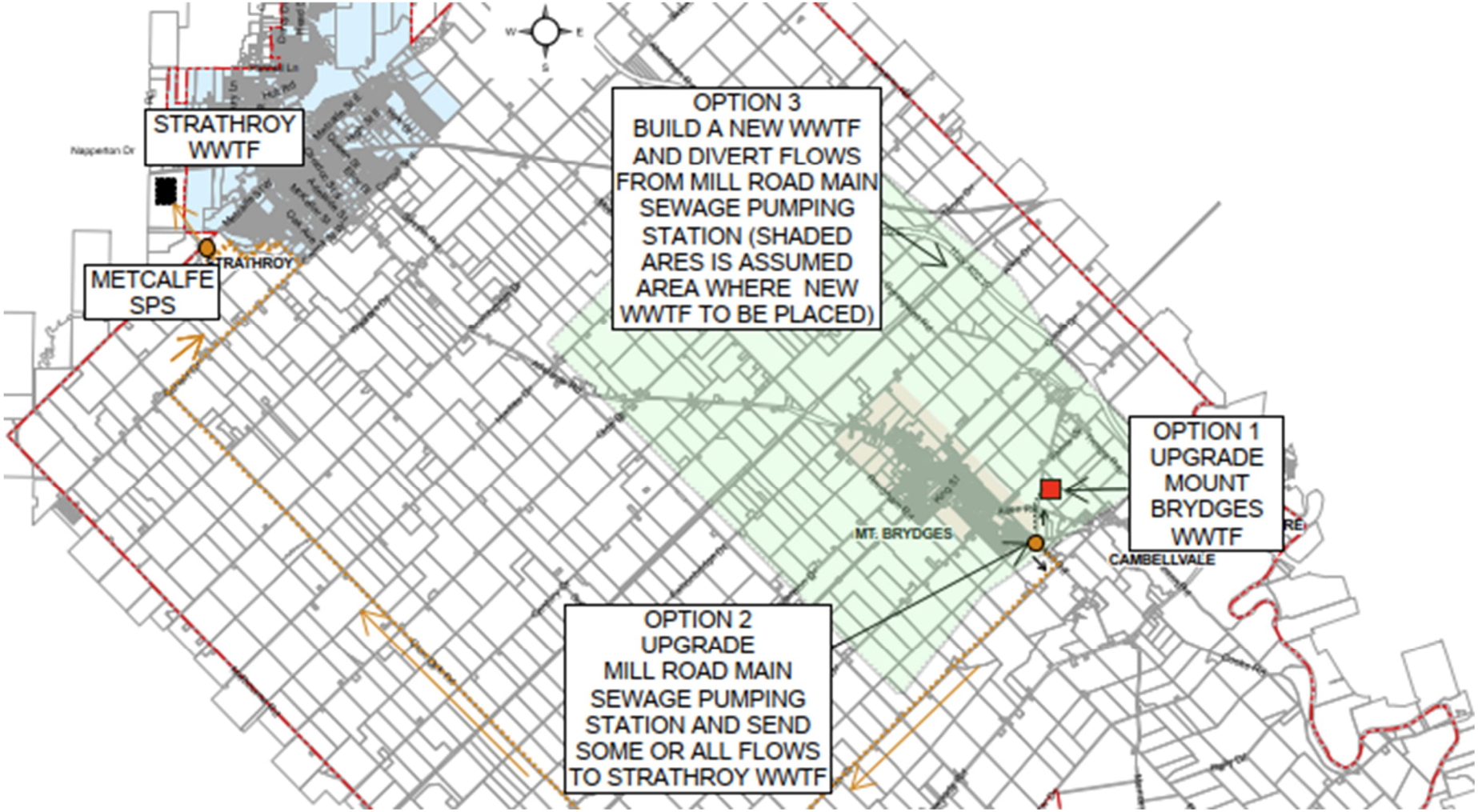


Figure 7-2: Mount Brydges Options to Increase Wastewater Capacity

8.0 STORMWATER MASTER PLAN

8.1 Scope of Master Plan

This portion of the Master Plan reviewed the conditions of existing Stormwater Management (SWM) facilities and review the current SWM standards, the approval requirements for new facilities, and the operations and maintenance of the current SWM Facilities. The intent is to provide the Municipality with recommendations to improve the current SWM approval and management process to balance meeting regulatory requirements, safety, environmental protection/enhancement, lifecycle cost, liability, and an equitable apportionment between new and existing development. Appendix 4 is the Technical Memorandum that provides detail on the Stormwater Planning and Implementation program that is recommended.

8.2 Background

8.2.1 Requirement for SWM

In Ontario, SWM is required when a rural area is urbanized and its intent is to mitigate impacts on the environment. Therefore, three aspects of SWM that need to be addressed in development and these are:

- Quantity Control, which is the name given to managing the amount of runoff generated by a drainage area and generally includes attempts to limit the maximum run off flow of the developed area to the rate of flow that occurred prior to development;
- Quality Control, which is the name given to managing the quality of the runoff generated from a drainage area and generally includes attempts to allow for an extended period of detention of storm water in order to encourage the settling out of pollutants within a facility for most frequent rainfall events; and
- Enhanced Protection, which is to provide for the protection of receiving streams from excessive erosion or to changes in stream morphology (structure of the channel).

8.2.2 SWM Facility Lifecycle

The lifecycle of a SWM facility consists of the following stages:

1. Planning and Approvals;
2. Construction;
3. Pre-Municipal Assumption Operation;
4. Municipal Assumption;
5. Operation;

6. Facility Renewal (often multiple times); and
7. Facility Replacement.

Figure 8-1 shows the relative time for each phase based on an assumed 50-year time period.

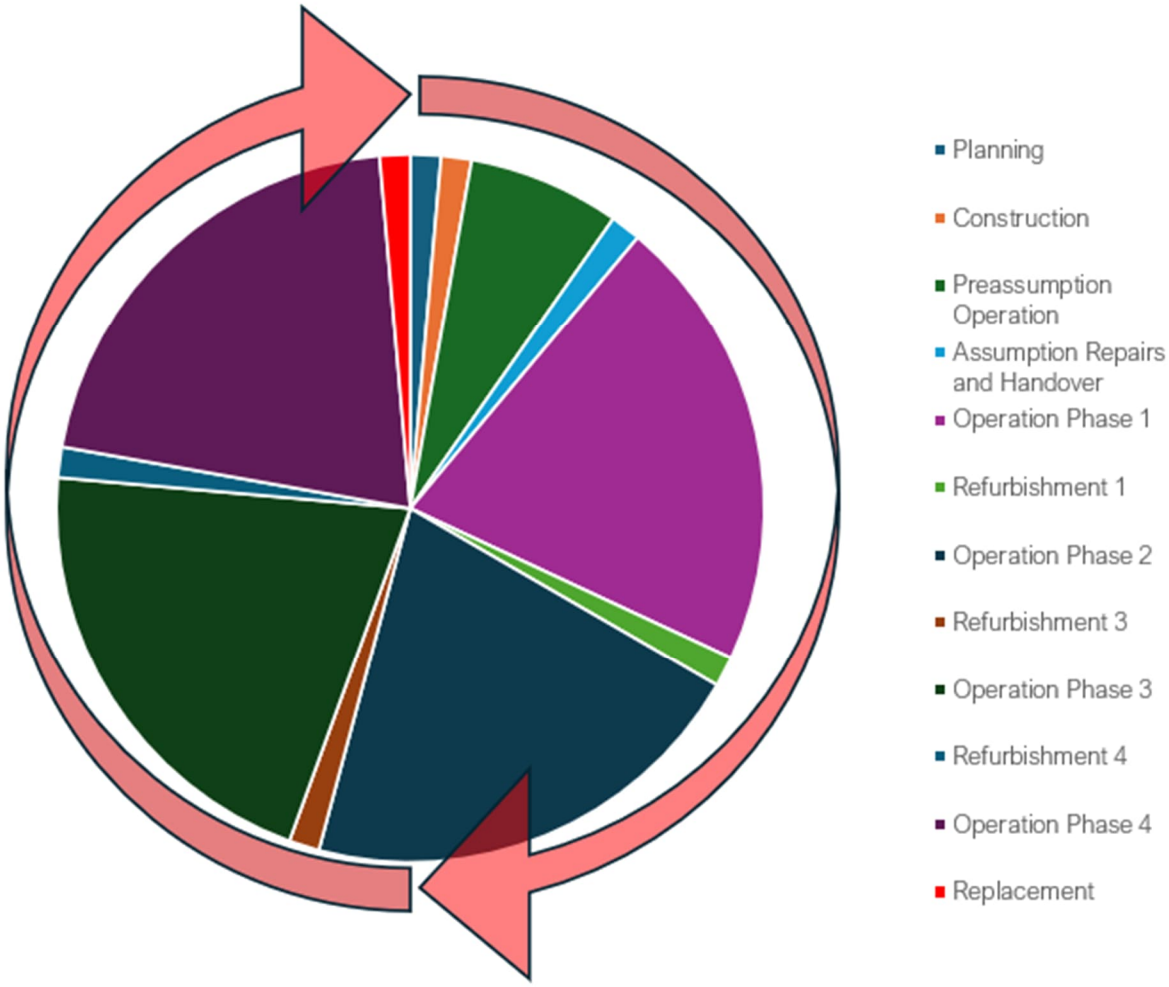


Figure 8-1: SWM Facility Lifecycle

8.2.3 Requirement for SWM Policy

SWM facilities are intended to be in operation permanently once installed prior to but this will require periodic maintenance activities and eventual substantial rebuilding or replacement. Likely, the Municipality will be operating the facility in excess of 90% of its lifespan. Therefore, the Municipality has an interest with regard to SWM to:

1. Ensure that a Proponent who wishes to urbanize an area provides an acceptable level of protection to the public regarding stormwater runoff based on current accepted practices and the requirements of agencies having jurisdiction;

2. Ensure that a Proponent who wishes to urbanize an area provides an acceptable level of protection to the environment regarding stormwater runoff based on current accepted practices and the requirements of agencies having jurisdiction;
3. Ensure that the risk to the Municipality in operating these facilities is reasonable;
4. Ensure that the cost to the Municipality to operate these facilities is reasonable and is borne by the Proponent and/or the benefiting users;
5. Ensure that these facilities are planned, constructed, and operated in a manner consistent with the Municipality's Master Servicing Plan Principles; and
6. Ensure that there is a policy in place so that all parties (municipal council, municipal staff, Proponents, regulators, members of the public, etc.) understand the roles and responsibilities that the Municipality has in this regard as well as that of the Proponent.

8.3 SWM Approval Process in Strathroy-Caradoc

8.3.1 Design Standards

The Strathroy-Caradoc Servicing Standards (SCSS), October 2021 are the basis for SWM design criteria and include references to provincial standard designs. The SCSS states the "engineering design package [submitted by a proponent] should adhere and comply with the current version of various Provincial and Federal Acts and other references.

8.3.2 Subdivision and Site Plan Agreements

8.3.2.1 Subdivision Agreements

Under the current *MUNICIPALITY OF STRATHROY-CARADOC SUBDIVISION AGREEMENT* template there is a section devoted to the requirements for SWM. This requires that the Subdivider provide the Municipality with a Stormwater Management Plan, a Sediment and Erosion Control Plan; and a Final Detailed Servicing and Grading Plan. These plans must be approved by the Municipality, its Engineer, the MECP and any other agencies having jurisdiction.

Additionally, the Subdivider has to provide the Municipality with a Functional Servicing Report satisfactory which shall include projected development population based on the Municipality's standards, and calculations determining the stormwater demand based on the Municipality's design guidelines.

Upon completion of the subdivision being 85% build out the Subdivider is to undertake steps to allow for the Municipality to assume the SWM facility and take over its ownership.

8.3.2.2 Site Plan Agreements

Under the current *MUNICIPALITY OF STRATHROY-CARADOC SITE PLAN AGREEMENT* template there is no specific section devoted to the requirements for SWM as each site plan is unique and may be both either a greenfield or an infill development. Under the *General Conditions* clause, subclause *Construction in Accordance with the Plans*, under the *Grading and Drainage* sub-subclause, there is the requirement that the proponent provide the Municipality with a *Stormwater Management Plan*.

8.4 Existing Facilities

The Municipality owns and manages an urban stormwater management system (SWM) with ten (10) stormwater ponds and a large collection system encompassing the Sydenham River, Thames River and watersheds. Based on a review of the MECP's Environmental Compliance Approval for a Municipal Stormwater Management System ECA Number: 058- S701, Issue Number: 1 dated February 8, 2023, Schedule B, these numbered SWMP 01 to 09 are described in Appendix A and summarized in Table 8-1. Included in the table is the Agnes Drive Roadway Extension SWM Pond in Strathroy which is a Future SWMP-10 currently under review and a SWM Pond which is given the designation SWMP-11 which was built but is not accounted for in the current SWM ECA.

Table 8-1 – Current and Planned SWM Facilities

Facility Name, Location and Description	
SWMP-01- Pinetree Ln/Riverview Dr, Strathroy Facility Type: Wet Pond Type of Controls: Quantity Drainage Area (ha): 26.5 In-Service Date: 1992	SWMP-02 - Parkview Dr/Parkview Cres (north), Strathroy Facility Type: Infiltration/Wet Pond? Type of Controls: Quantity Drainage Area (ha): 20.5 In-Service Date: 1992
SWMP-03 - Parkview Dr/Parkview Cres (south), Strathroy Facility Type: Dry Pond Type of Controls: Quantity Drainage Area (ha): 6.3 In-Service Date: 1994	SWMP-04 - Second Str. & Adair Blvd., Strathroy Facility Type: Extended Detention Pond Type of Controls: Quantity/Quality Drainage Area (ha): 70.1 In-Service Date: 2001
SWMP-05 - Head St N/ Thorne Dr, Strathroy Facility Type: Dry Pond Type of Controls: Quantity Drainage Area (ha): 25.6 In-Service Date: 1994	SWMP-06 - Molnar Industrial Park, Strathroy Facility Type: Wet Pond Type of Controls: Quantity Drainage Area (ha): 26.5 In-Service Date: 2010
SWMP-07 - Bennett Cres, Mount Brydges Facility Type: Wet Pond Type of Controls: Quantity/Quality Drainage Area (ha): 33.9	SWMP-08 and 09 - Lucas St/Pondhaven Ln, Mount Brydges Facility Type: Wetland Type of Controls: Quantity/Quality

Facility Name, Location and Description	
In-Service Date: 2013	Drainage Area (ha): 34.5 In-Service Date: 2014
SWMP-010 - Agnes Drive Extension SWM Pond, Strathroy Facility Type: Wet Pond Type of Controls: Quantity/Quality Drainage Area (ha): 12.5 In-Service Date: TBD	SWMP-011 - (not noted in CLI) Agnes Drive Roadway South SWM Pond, Strathroy Facility Type: Infiltration Pond Type of Controls: Quantity/Quality Drainage Area (ha): 4.8 In-Service Date: circa 2015-20

8.5 Asset Management, Level of Service, and Capital Plan

8.5.1 2021 Strathroy Caradoc Asset Management Plan

The 2021 Asset Management Plan (AMP) for the Municipality prepared by PSD Research Consulting establishes the approach for the management of the Municipality's assets. Section 4.7.2 *Asset Condition* states that the Municipality's "current approach:

- There are no formal condition assessment programs in place for the storm water system.
- The Municipality should consider establishing an industry best practice assessment cycle for the storm water system."

Section 4.7.3 *Estimated Useful Life & Average Age* states that SWM facilities have an average useful life of 50 years with an average age of age of approximately 16 years.

8.5.2 Levels of Service Requirements

The original ECAs for each of the SWM facility should provide detail as to the required level of quantity, quality, erosion control and thermal protection required. Additionally, the original design reports for the SWM facilities should provide the rationale for their sizing, design criteria and the treatment provided. Over time, within a SWM facility increased vegetation and sediment deposition will reduce storage volume available to provide quantity control for large run-off events. Sediment resuspension and poor water quality due to eutrophication may impact the ability of a SWM facility to provide quality control during warm weather months.

Operation of the SWM facility after the Municipality's assumption of ownership will be conducted by the Municipality and should include periodic review to determine:

- That the facility is functioning as intended with no short circuiting of flows, excessive standing water or dumping of materials by residents;
- When dredging of silt deposits from the sediment forebay is required;
- When access roads, fencing, berms, outlet structures, headwalls, etc. need to be repaired;

- When storage in the main bays need to be restored through the removal of vegetation and sediment; and
- The vegetation in the facility is thriving and free of invasive species.

Efforts by the Municipality to restore the required storage volumes would typically require the SWM facility to be drained and partially reconstructed following the removal of excess vegetation and sediment. The extent of this work may vary depending on the type and robustness of the design of the SWM facility and the previous maintenance work undertaken which can mitigate the extent of restoration work.

8.5.3 Capital Forecast

The municipality has provided the planned 10-year capital forecast to the year 2033. The list includes water, wastewater, stormwater and transportation projects which were separated to facilitate the development of an updated capital forecast plan. The separated list is provided in Appendix B for reference only. The Municipality has budgeted $100,000 per year for a total of $1,000,0000 over this 10-year period. Based on recently publicly tendered SWM Facility cleanout/restoration projects, costs to rehabilitate a facility typically are in the range of $200,000 to $500,000.

8.6 Gaps Identified

8.6.1 SWM Guidance Documents

Appendix 4 provides a detailed review of the applicable sections of Current Subdivision Agreement, Site Plan Agreement and the current Strathroy-Caradoc Servicing Standards and details noticeable gaps within each document and also gaps in coordination between them.

8.6.2 SWM Facility Maintenance Program

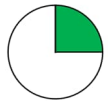
The cost associated with cleanout/restoration of SWM facilities is underfunded in the current 10-year capital plan and there is at present no known plan or rationale to review, prioritize and undertake any needed rehabilitation. This activity would include the preparation of standard Operations Manuals for each SWM Facility.

8.6.3 Review to Address SWM Guidance Document Gap

Applying the MCEA methodology, the following solutions in Table 8-2 are possible to address the SWM Gaps.

Table 8-2: Strathroy SWM Alternative Solution Evaluation

Strathroy	Do Nothing	Preventative Maintenance/ Operational Changes	Rehabilitation	Replacement
Description	Implement no solution	Develop comprehensive SWM Policy and Capital Plan	Rehabilitate SWM Facilities	Replace SWM Facilities
Technical	• Does not address capital address policy and capital gaps	• Allows Municipality to develop an overall plan to address policy and capital gaps	• Addresses requirement to remediate SWM Facilities so that they are properly functioning	• Addresses requirement to remediate SWM Facilities so that they are properly functioning • Difficult to undertake new facility construction unless in same location as current SWM facility
Social and Cultural	• Does not address policy gap	• Addresses policy gap • Provides defensible response to issues arising from SWM Facility performance	• Provides defensible response to issues arising from SWM Facility performance	• Provides defensible response to issues arising from SWM Facility performance
Environment	• Degradation of SWM Facility treatment will negatively impact the environment	• Provides basis for long term environmental projection,	• Addresses specific potential environmental issues downstream of SWM Facilities.	• Addresses specific potential environmental issues downstream of SWM Facilities.
Economic	• While no capital commitment made, the risk of unexpected major claim or requirement for capital works is a possibility • May not allow for best lifecycle cost for future SWM facilities.	• Some cost for consultation to implement the program and to assess SWM Facilities • Can minimize future costs to Municipalities through more rigorous SWM design standards and assumption requirements from proponents who build new SWM Facilities	• Rehabilitation cost per facility expected to be between $200,000 to $500,000	• Very expensive compared to rehabilitation option.

Strathroy	Do Nothing	Preventative Maintenance/ Operational Changes	Rehabilitation	Replacement
		• Allows for prioritization of spending over		
Overall Strategy	Not recommended	Recommended in conjuction with Rehabilitaiton	Recomended as part of Policy and Capital Plan	Not recommended
Score				

8.7 Recommendations

To improve the current SWM approval and management process to balance meeting regulatory requirements, safety, environmental protection/enhancement, lifecycle cost, liability, and an equitable apportionment between new and existing development.

- Stage 1: Develop Overall SWM Policy for Council Endorsement;
- Stage 2: Update Procedures Facility Assessment and Assumption; and
- Stage 3: Implement SWM Lifecycle Management Program to prioritize the rehabilitation of SWM Facilities.

This is illustrated in Figure 8-2.

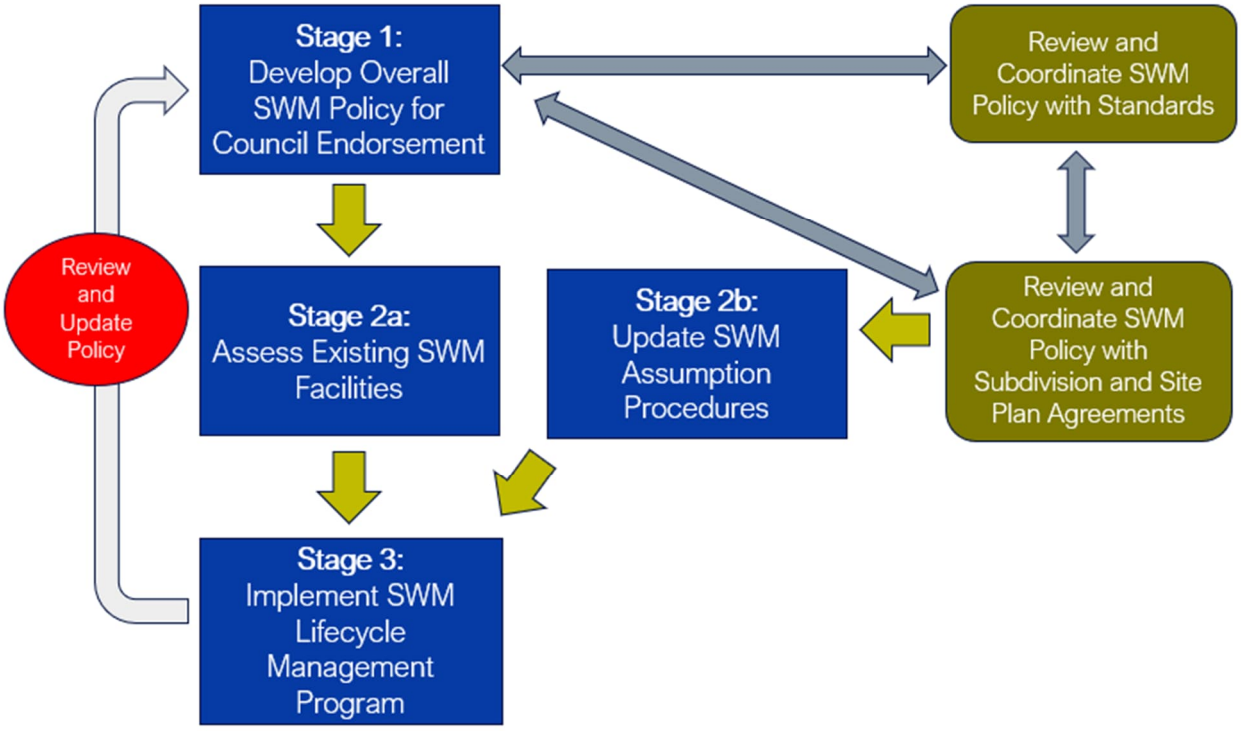


Figure 8-2: SWM Policy Implementation Flow Chart

9.0 MASTER PLAN RECOMMENDATIONS

9.1 Costing Presented in the Master Plan

ASTM E 2516 (Standard Classification for Cost Estimate Classification System) provides a five-level classification system based on several characteristics, with the primary characteristic being the level of project definition (i.e., percentage of design completion). The ASTM standard, shown in Table 9-1, illustrates the typical accuracy ranges that may be associated with the general building industries.

Table 9-1: ASTM E2516 Accuracy Range of Cost Opinions for General Building Industries

Cost Estimate Class	Expressed as % of Design Completion	Anticipated Accuracy Range as % of Actual Cost
5	0-2	-30 to +50
4	1-15	-20 to +30
3	10-40	-15 to +20
2	30-70	-10 to +15
1	50-100	-5 to +10

The cost estimates developed in this report would be best described as a **Class 5 Cost Estimate** which is typically used for high level study project. Cost opinions provided in this Master Plan do not include HST.

9.2 Linear Construction Costs

Based upon data from 2023 linear urban infrastructure renewal projects in Strathroy-Caradoc, Table 9-2 summarizes the costs for infrastructure reconstruction which assumes that a full reconstruction of the roadway will be undertaken and that the existing watermain, sanitary and storm sewer will also be replaced (or added) at the time of this work to ensure that the roadway is up to the current municipal standard. This is shown in Figure 9-1. The Municipality should determine the extent of construction on a case-by-case basis to determine the extent of work required for growth, lifecycle improvement and service level.

Table 9-2: Estimated 2024 Linear Construction Costs (per m)

Component	Construction	+15% Engineering	% of Total Costs
Total General Tax Base (Storm sewer, road, curb)	$3,108	$3,575	60.4%
Sanitary Sewers (funded through Sewer Rate)	$939	$1,080	18.3%
Watermain (funded through Water Rate)	$1,097	$1,262	21.3%
Total	**$5,145**	**$5,917**	**100.0%**

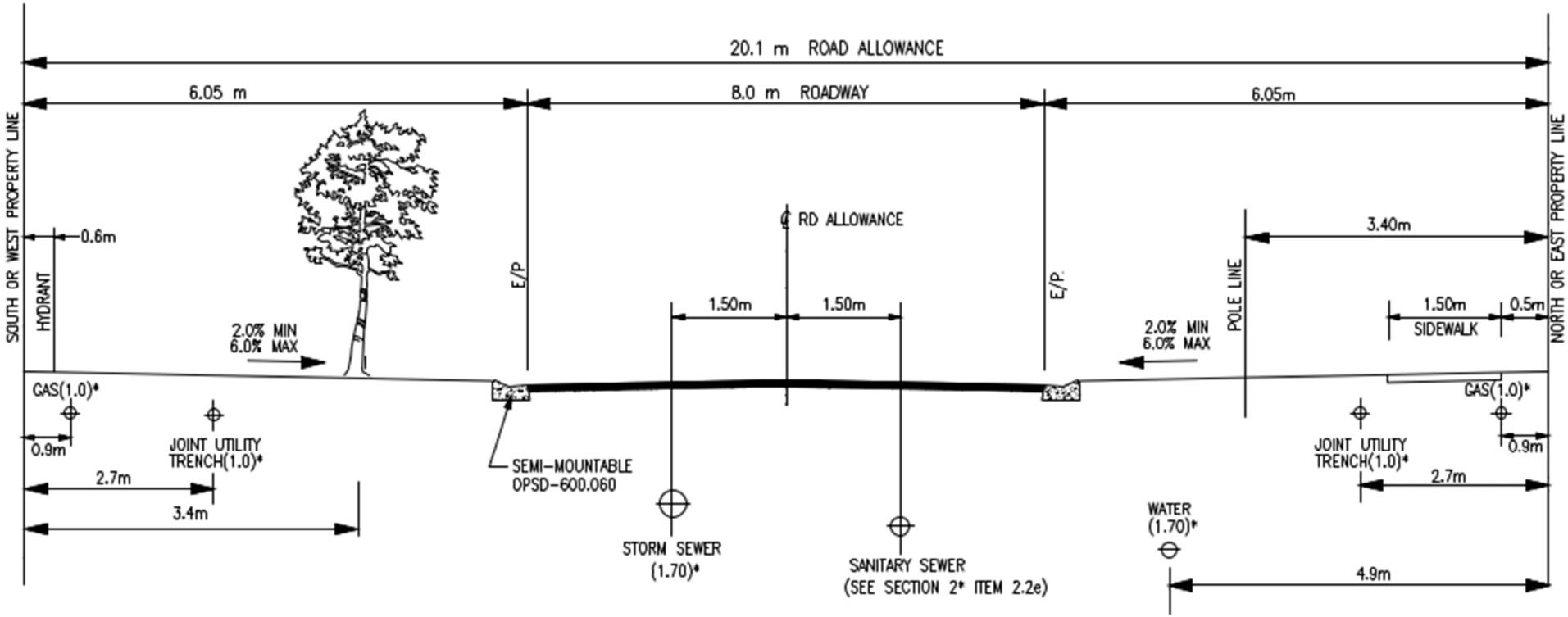


Figure 9-1- Current Strathroy-Caradoc Right of Way Standard

9.3 Water System

9.3.1 Strathroy Water System

This Master Plan has provided the Municipality with a list of water service-related projects that are required over the current planning horizon to address growth and to maintain the required level of service. Most of these projects involve replacement of existing watermains. The costs presented are those for the replacement of the watermains identified, water service connections and restoration of the impacted road allowance. As these replacements are within older areas of Strathroy, the Municipality may decide to undertake additional infrastructure renewal including storm and sanitary sewer replacements as well as new surface works. Currently, the Municipality's 10-year Capital Plan has not identified these watermain replacement projects or as part of any infrastructure renewal projects. Therefore, column titled Project Cost in Table 9-3 assumes the cost of replacement of the watermain as a stand-alone project. We would recommend that the Municipality review and evaluate the cost-benefit of undertaking these recommended projects either as watermain only projects or as part of a full infrastructure renewal projects or a combination of these. We would recommend that the Municipality undertake these projects within the next 10 to 15 years.

Table 9-3: Strathroy Water Servicing Fire Flow Improvement Recommendations

#	Project Description	Alternative	MCEA Schedule	Project Cost
1	Centre Street Watermain Upgrades	1	Exempt	$840,000
2	Concord Drive Watermain Upgrades	2	Exempt	$760,000
3	Riverview Drive Watermain Upgrades	1	Exempt	$760,000
4	Oak Avenue Watermain Upgrades	1	Exempt	$1,830,000
5	North Street Watermain Upgrades	1	Exempt	$1,770,000
6	Locke Heights Watermain Upgrades	1	Exempt	$1,430,000
7	Lamore Cresent Watermain Upgrades	1	Exempt	$1,210,000
8	Mill Pond Cresent Watermain Upgrades	1	Exempt	$1,430,000
9	Head Street Watermain Upgrades	1	Exempt	$2,030,000

9.3.2 Mount Brydges Water System

9.3.2.1 Additional Storage

The recommended strategy is the Above Ground Water Storage tanks per the evaluation results shown in Table 6-11. Cost of the two 800m^3 tanks, revisions to pump controls, valving, upgrades to the back up generator is estimated at $2,575,000 (excluding HST). This cost includes tank necessities including

sidewall manway and ladder, access hatches and walkway. The engineering design coordination and construction costs are also included.

As seen in Figure 6-2, required storage volume will reach 85% capacity (2,000 m^3) just before year 2026. Hence, this project is recommended to be implemented within the next 5 years. The 2019 *Strathroy Caradoc Water & Wastewater Condition Assessment* completed by RVA report noted required upgrades to the Process Electrical (Pump Station Back-up Generator and corroded meter), Building Architectural (frost damage, mold removal and fence upgrades) and Building Mechanical (building heaters) to be made to the Mount Brydges Pumping Station Reservoir.

9.3.2.2 Fire Flow Issues East of Adelaide Rd and Gibson Rd

The proposed solution to low flow during fire condition at the remote areas outside of the Mount Brydges community are based on treating these areas as rural areas for fire protection. Therefore, there is no capital cost associated with this solution.

9.3.3 Hydraulic Modeling

It would be recommended that the Municipality provide an allotment of $50,000 for the next five-year period ($250,000) to work on enhancement of the water hydraulic model. This project can also investigate the high per capita MDD demand in Mount Brydges. Additionally, we would recommend that approximately every 10-years the Municipality update the model (total $150,000).

9.4 Wastewater System

9.4.1 Strathroy Wastewater System

No capital projects were identified.

9.4.2 Mount Brydges Wastewater System

9.4.2.1 Wastewater Treatment Options

To address the requirement to increase the treatment capacity for Mount Brydges to 2,348 m^3/day as anticipated to be required by 2046, we have provided as the basis for the capital cost projection based on the three options detailed in Section 7. The Cost Opinion for the three options is as follows:

- Option 1 Upgrade Mount Brydges WWTF - $25,768,000;
- Option 2 Send Mount Brydges Flows to Strathroy- $29,067,000; and
- Option 3 New WWTF in Vicinity of Mount Brydges - $45,350,000.

Option 2 may require upsizing or twinning forcemain from Metcalfe SPS to Strathroy WWTF which will add cost to project. The cost to Mount Brydges consumers related to joining the Strathroy WWTF is not included. In taking Mount Brydges wastewater flows, the Strathroy WWTF's future ADF capacity is

projected to be reduced from 2,966 m^3/day to approximately 566 m^3/day in 2046. Option 3 costs will depend on where property is located (length of forcemain) and its value.

It would be recommended that the Municipality proceed with a Schedule C MCEA to determine wastewater treatment system. This would be undertaken as detained in Figure 9-1 below. Phase 2 of the MCEA process would analyse the capacity options in detail to determine which of Options 1, 2, or 3 would be recommended to be implemented. Phase 3 of the MCEA process confirm the details of the chosen solution.

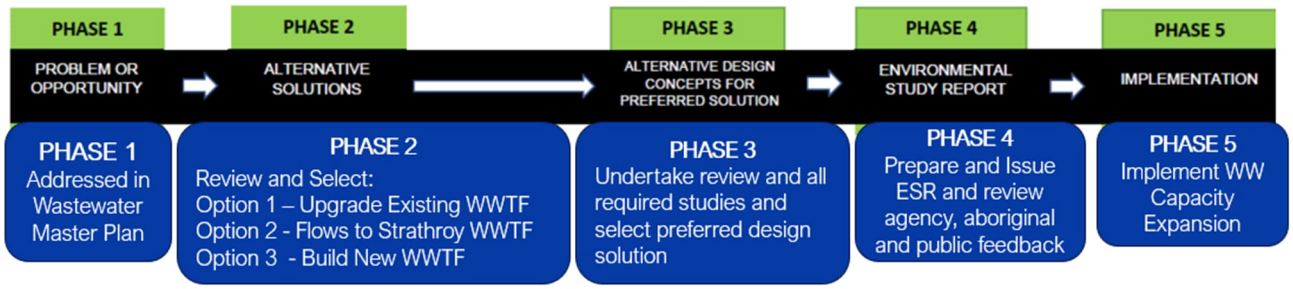


Figure 9-2: MCEA Flow Chart for Wastewater Treatment Capacity Solution in Mount Brydges

For the purpose of high-level Master Plan, Option 1 Upgrade Mount Brydges WWTF is included for budgetary analysis.

9.4.2.2 Expansion of the WWCS

There are three general options with regard to the provision of a collection system to 11,600 m of existing streets in Mount Brydges. These are as follows:

- Option 1 – Provide all utilities and full urban road/right of way reconstruction per SCSS;
- Option 2 – Retain existing water main but provide all other utilities and full urban road reconstruction per SCSS; and
- Option 3 - Retain existing water main, do not install storm sewer and do a partial road/right of way reconstruction.

Based on the linear costs established in Section 9.2, it would be assumed that the servicing would be undertaken over the period from 2026 to 2046. To provide a cost opinion, it is assumed that the WWCS expansion will include storm sewers and road improvements only.

Table 9-4: Mount Brydges Wastewater Treatment Capacity Options

Item No.	Option 1 Upgrade Mount Brydges WWTF		Option 2 Send Mount Brydges Flows to Strathroy		Option 3 New WWTF in Vicinity of Mount Brydges	
	Item Description	Cost Opinion	Item Description	Cost Opinion	Item Description	Cost Opinion
1	Schedule C MCEA to determine wastewater treatment system	$350,000	Schedule C MCEA to determine wastewater treatment system	$350,000	Schedule C MCEA to determine wastewater treatment system	$350,000
2	Upgrade of Existing WWTF from 825 m^3/day to 2,348 m^3/day	$23,075,000	Main Sewage Pumping Station Upgrades for longer forcemain	$750,000	Main Sewage Pumping Station Upgrades for longer forcemain	$500,000
3			19.57 km Forcemain (300mm) from SPS to Park St	$17,613,000	2 km Forcemain (250mm)	$1,550,000
4			0.34 km Forcemain (300mm) from Clavert Dr to easement along Park St	$823,000	Wastewater Treatment Plant (2,348 m^3/day)	$36,000,000
5			Twinning 600 mm sewer (2500 m)	$3,138,000	Administration Building & Garage	$1,500,000
6			Metcalfe Sewage Pumping Station (from 75 L/s to 186 L/s for pumps) Upgrades	$2,500,000	Decommissioning and Disposal of Existing WWTF	$1,250,000
7			Decommissioning and Disposal of Existing WWTF	$1,250,000		
	Subtotal	$23,425,000	**Subtotal**	$26,424,000	**Subtotal**	**$41,150,000**
	Engineering and Testing	$2,343,000	**Engineering and Testing**	$2,643,000	**Engineering and Testing**	$3,200,000
	Property Acquisition	$0	**Property Acquisition**	$0	**Property Acquisition**	$1,000,000
	Total (Base Estimate)	**$25,768,000**	**Total (Base Estimate)**	**$29,067,000**	**Total (Base Estimate)**	**$45,350,000**
	Total (Low Range)	$18,038,000	**Total (Low Range)**	$20,347,000	**Total (Low Range)**	$31,745,000
	Total (High Range)	$38,652,000	**Total (High Range)**	$43,601,000	**Total (High Range)**	$68,025,000

Table 9-5: Mount Brydges WWCS Options Costing

Component	Per m Cost	Length (m)	Cost	% of Total Costs
Option 1 All Utilities and Full Urban Road Reconstruction				
Road and Drainage (storm sewer, road, curb)	$3,574	11600	$41,470,000	60.42%
Sanitary Sewers	$1,080	11600	$12,530,000	18.25%
Watermain	$1,262	11600	$14,640,000	21.33%
Total Option 1	**$5,916**		**$68,640,000**	**100.00%**
Option 2 Retain Existing Watermain and Full Urban Road Reconstruction				
Road and Drainage (storm sewer, road, curb)	$3,574	11600	$41,470,000	76.80%
Sanitary Sewers	$1,080	11600	$12,530,000	23.20%
Watermain	$0	11600	$0	0.00%
Total	**$4,654**		**$54,000,000**	**100.00%**
Option 3 Retain Existing Watermain, No Storm Sewer and Partial Road Reconstruction				
Component	Per m Cost	Length		% of Total Costs
Road and Drainage (storm sewer, road, curb)	$2,145	11600	$24,880,000	46.08%
Sanitary Sewers	$1,080	11600	$12,527,000	23.20%
Watermain	$0	11600	$0	0.00%
Total	**$4,654**		**$37,407,000**	100.00%

For the purpose of high-level Master Plan, Option 2 Retain Existing Watermain and Full Urban Road is included for budgetary analysis.

9.4.3 Hydraulic Modeling

It would be recommended that the Municipality provide an allotment of $50,000 for the next five-year period ($250,000) to work on enhancement of the wastewater hydraulic model. Additionally, we would recommend that approximately every 10-years the Municipality update the model (total $150,000).

9.5 Stormwater Management

To improve the current SWM approval and management process to balance meeting regulatory requirements, safety, environmental protection/enhancement, lifecycle cost, liability, and an equitable apportionment between new and existing development.

- Stage 1: Develop Overall SWM Policy for Council Endorsement;
- Stage 2: Update Procedures Facility Assessment and Assumption; and
- Stage 3: Implement SWM Lifecycle Management Program.

9.5.1 Stage 1: Develop Overall SWM Policy for Council Endorsement

Developing an overall SWM Policy could be undertaken internally by the Municipality, but it may be better to have a consultant undertake this work. The Scope of Work for the development of a SWM Policy would be as follows:

1. Background Review
    a. Review and confirm Gaps noted in this report,
    b. Confirm with Municipality staff scope of external consultation,
    c. Review and confirm SWM policy best practices of municipalities of similar size and development demands to Strathroy-Caradoc,
    d. Undertake consultation with Municipality staff, County Planning Staff, and stakeholders,
    e. Summarize review of review and report to Municipality staff;
2. Develop Draft Policy
    a. Develop draft policy and harmonize with municipal standards and subdivision/site plan terms and conditions,
    b. Review draft policy with Municipality staff,
    c. Undertake external review for comment if requested by Municipality staff,
    d. Finalize draft SWM policy document;
3. Present Policy to Council and Finalize
4. Assist Staff in the presentation of the draft SWM policy to council,
5. Finalize policy based on staff/council direction.

The cost for getting an external consultant to assist with the development of a SWM Policy would be approximately $100,000.

9.5.2 Stage 2: Stage 2: Assessment of Existing Facilities and Adoption of Assumption Procedures

Based upon the development of a SWM Policy for Strathroy-Caradoc, Table 6-2 summaries the anticipated costs for assessing existing SWM facilities and implementing assumption procedures. The total costs for completing Stage 2 is estimated at $279,000.

9.5.3 Stage 3: Implement SWM Lifecycle Management Program

Table 9-5 summaries the anticipated costs for the rehabilitation of existing SWM facilities and includes an allowance for 10% engineering fees. The specific costs for the rehabilitation of each facility should be updated based on the findings of Stage 2 of the proposed work program.

Table 9-6: High Level SWM Rehabilitation Costs for SWM Facilities

SWM Facility	Cost
SWMP-01- Pinetree Ln/Riverview Dr, Strathroy	$550,000
SWMP-02 - Parkview Dr/Parkview Cres (north)	$385,000
SWMP-03 - Parkview Dr/Parkview Cres (south)	$220,000
SWMP-04 - Second Str. & Adair Blvd., Strathroy	$550,000
SWMP-05 - Head St N/ Thorne Dr, Strathroy	$550,000
SWMP-06 - Molnar Industrial Park	$385,000
SWMP-07 - Bennett Cres, Mount Brydges	$550,000
SWMP-08 and 09 - Lucas St/Pondhaven Ln, Mount Brydges	$760,000
SWMP-010 - Agnes Drive Extension SWM Pond, Strathroy	$385,000
SWMP-011 - (not noted in CLI) Agnes Drive South, Strathroy	$440,000

9.5.4 SWM Lifecycle Management Implementation

Assuming that the Municipality commences the proposed SWM Lifecyle program, in 2025, the following would be the projected costs over the following 20-years:

- Stage 1: Develop Overall SWM Policy for Council Endorsement
  - Initial policy developed in 2025 and 2026,
  - 10-year policy review and updates,
  - Total 10-year cost $100,000,
  - Total (cumulative) 20-year cost $200,000;
- Stage 2: Update Procedures Facility Assessment and Assumption
  - SWM assessments undertaken between 2027 and 2029,
  - Total 10-year cost $279,000,
  - Stage 2 is a one-time cost; and
- Stage 3: Implement SWM Lifecycle Management Program
  - Once Stage 2 is complete, the order of the rehabilitation will be established based on the needs identified,
  - SWM Facility rehabilitation commences in 2029 with the engineering phase of the rehabilitation of the first SWM facility and it is assumed that rehabilitation is undertaken at the rate of one facility per year with the following year's facility in design.
  - Total 10-year cost $2,290,000,

- Total (cumulative) 20-year cost $5,325,000.

10.0 CAPITAL IMPLEMENTATION PLAN

Based on the review undertaken as part of this Master Plan, Table 10-1 summarizes the total cost for the projects identified in this Master Plan and a proposed target year for completion.

Table 10-1: Total Cost of Identified Master Plan Projects

Project	Area	Cost Opinion	Project Complete Year
Water System			
Centre Street Watermain Upgrades	S	$840,000	2032
Concord Drive Watermain Upgrades	S	$760,000	2032
Riverview Drive Watermain Upgrades	S	$760,000	2032
Oak Avenue Watermain Upgrades	S	$1,830,000	2032
North Street Watermain Upgrades	S	$1,770,000	2033
Locke Heights Watermain Upgrades	S	$1,430,000	2033
Lamore Crescent Watermain Upgrades	S	$1,210,000	2034
Mill Pond Crescent Watermain Upgrades	S	$1,430,000	2034
Head Street Watermain Upgrades	S	$2,030,000	2035
Storage Upgrades	MB	$2,575,000	2032
Updating of Water Hydraulic Model	SC	$400,000	2032
Water Total		**$15,035,000**	
Wastewater System			
WWTF Schedule C Class EA	MB	$350,000	2026
WWTF Cost	MB	$25,768,000	2030
Existing Servicing Phase 1-10	MB	$54,000,000	2028-2046
Annual Updating of Wastewater Hydraulic Model	SC	$600,000	2029, 2039
Wastewater Total		**$80,718,000**	
Stormwater Management			
Stage 1 SWM Policy Initial Policy & 1 Update	SC	$200,000	2026
Stage 2 SWM	SC	$315,000	2029
Stage 3 SWM	SC	$5,640,000	2027-2044
Stormwater Total		**$6,155,000**	
Pollution Prevention Control Plan			
PPCP Data Collection to update WW Hydraulic Model	SC	$300,000	2029, 2039
PPCP Total		**$300,000**	
TOTAL		**$102,208,000**	

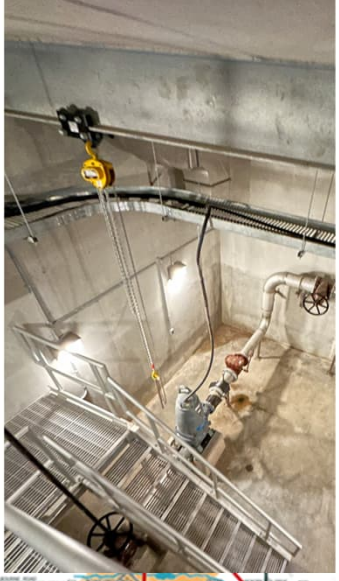
Appendix 5 shows the Master Plan Project Fact sheet that details the following:

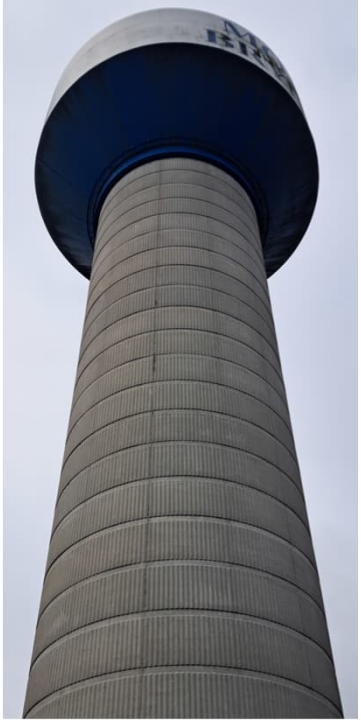
- Project and Location;
- Anticipated MCEA Schedule;
- Total Cost;

- Anticipated Timing for Projects from 2025 to 2046; and
- Summary of Cashflow over the period 2024 to 2046.

The timing provided is based upon the perceived need to undertake work to address growth when it is expected. Additionally, those projects which address other noted deficiencies are timed such that they occur as soon as possible with the intent to undertake them when there are growth related projects underway that are relatively high cost.

It is recommended that the Municipality review the proposed projects identified in this Master Plan and consider them within the context of their current 10-year Capital Plan and Asset Management Plan and update the Capital Plan according to the Municipality's priorities and capacity and those of other stakeholders to fund the required capital works.





MUNCIPALITY OF STRATHROY - CARADOC

Water, Wastewater and Stormwater Master Plan

Appendix 1 – Public Consultation Record

October 31, 2024

R.V. Anderson Associates Limited
557 Southdale Road East, Suite 200
London, ON N6E 1A2

APPENDIX 1.1

Public and Agency Notices

Public/Agency
Contact Register

Municipality of Strathroy-Caradoc
Water, Wastewater and Stormwater Master Plan
Technical Agency Stakeholder Contact List

Updated: 2024-10-01

Agency	Contact	Title	Email	Address	Phone	*Notes*	Date Added to List	Removed from List	Notice of Study (date sent)	SC WWWSWM Master Plan – FAQs	Notice of PIC1 (date sent)	Notice of PIC2 (date sent)
Provincial Ministries, Agencies and Departments												
Ministry of the Environment, Conservation and Parks (MECP)	Southwest Region		eanotification.swregion@ontario.ca	733 Exeter Road, London, ON N6E 1L3	1-800-265-7672	*Complete the* ***project information form*** *and send copy of notice + form by email* ***NOTICE OF COMMENCEMENT ONLY***			2023-11-21			2024-07-31
	General (Notices)		MEA.Notices.EAAB@ontario.ca			***NOTICE OF COMPLETION ONLY***			2023-11-21			2024-07-31
Ministry of Natural Resources and Forestry (MNRF)	Karina Cerniavskaja	District Planner - Aylmer	karina.cerniavskaja@ontario.ca	615 John Street N., Aylmer, ON N5H 2S8	519-773-4757				2023-11-21	2023-12-14		2024-07-31
Ministry of the Environment, Conservation and Parks (MECP)	Scott Abernethy	Surface Water Evaluator/Team Leader	scott.abernethy@ontario.ca	733 Exeter Road, London, ON N6E 1L3	519-873-4779				2023-11-21	2023-12-14		2024-07-31
Ministry of the Environment, Conservation and Parks (MECP)	Roland Plante	Water Inspector	roland.plante@ontario.ca	733 Exeter Road, London, ON N6E 1L3	519-281-1508				2023-11-21	2023-12-14		2024-07-31
~~MECP~~	~~Mark Badali~~	~~Regional Environmental Planner (REP)~~	~~Mark.Badali1@ontario.ca~~						2023-11-21	2023-12-14		2024-07-31
MECP	Monika Macki	~~Regional Environmental Planner (REP)~~	Monika.MacKi@ontario.ca									
Ministry of the Environment, Conservation and Parks (MECP)	Ron Griffiths	Surface Water Specialist	ron.griffiths@ontario.ca	733 Exeter Road, London, ON N6E 1L3	519-873-5015				2023-11-21	2023-12-14		2024-07-31
Ministry of the Environment, Conservation and Parks (MECP)	Kathryn Markham	Management Biologist	kathryn.markham@ontario.ca	615 John St. N, Aylmer, ON N5H 2S8	519-773-4711				2023-11-21	2023-12-14		2024-07-31
Ministry of the Environment, Conservation and Parks (MECP)	Mark Smith	Water Compliance Supervisor	Mark.Smith@ontario.ca	733 Exeter Road, London, ON N6E 1L3	519-317-8116				2023-11-21	2023-12-14		2024-07-31
Ministry of Municipal Affairs and Housing (EA Policy)	Erick Boyd	Manager (Acting)	erick.boyd@ontario.ca	659 Exeter Road, 2nd Floor, London, ON N6E 1L3	519-873-4031				2023-11-21	2023-12-14		2024-07-31
Ministry of Agriculture, Food and Rural Affairs	David Marriott	Rural Planner, Western Ontario	david.marriott@ontario.ca	1 Stone Road W, 3rd Floor, Guelph, ON N1G 4Y2	519-766-5990				2023-11-21	2023-12-14		2024-07-31
Ministry of Economic Development, Job Creation and Trade	David B. Meyer	Director	david.b.meyer@ontario.ca	30th Flr Suite 3001, 250 Yonge St, Toronto, ON M5B 2L7	416-212-6280				2023-11-21	2023-12-14		2024-07-31
Ministry of Tourism, Culture and Sport (MTCS)	Karla Barboza	Team Lead(A), Heritage Heritage Planning Unit Programs and Services Branch	karla.barboza@ontario.ca	Suite 1700, 401 Bay Street, Toronto ON M7A 0A7	416-314 7120	***Only contact Karla and Laura (below) with initial notices***			2023-11-21	2023-12-14		2024-07-31
Ministry of Tourism, Culture and Sport (MTCS)	Laura Romeo	Laura Romeo, Heritage Planner(A) Heritage Planning Unit	laura.romeo@ontario.ca	Suite 1700, 401 Bay Street, Toronto ON M7A 0A7	437-996-5218				2023-11-21	2023-12-14		2024-07-31
Ministry of Tourism, Culture and Sport (MTCS)	Joseph Harvey	Heritage Planner A (Heritage Program Unit)	joseph.harvey@ontario.ca	Suite 1700, 401 Bay Street, Toronto ON M7A 0A7	613-242-3743	***Do not contact until after first notice is sent***			2023-11-21	2023-12-14		2024-07-31
Ministry of Tourism, Culture and Sport (MTCS)	Laura E. Hatcher	Heritage Planner (Heritage Program Unit)	laura.e.hatcher@ontario.ca	Suite 1700, 401 Bay Street, Toronto ON M7A 0A7	437-239-3404	***Do not contact until after first notice is sent***			2023-11-21	2023-12-14		2024-07-31
Ministry of Tourism, Culture and Sport (MTCS)	Jack Mallon	Heritage Planner A (Heritage Program Unit)	jack.mallon@ontario.ca	Suite 1700, 401 Bay Street, Toronto ON M7A 0A7	437-522-6582	***Do not contact until after first notice is sent***			2023-11-21	2023-12-14		2024-07-31
Ministry of Tourism, Culture and Sport (MTCS)	Dan Minkin	Heritage Planner (Culture Services Unit)	Dan.Minkin@ontario.ca	Suite 1700, 401 Bay Street, Toronto, ON M7A 0A7	416-314-7147	***Do not contact until after first notice is sent***			2023-11-21	2023-12-14		2024-07-31
Ministry of Indigenous Affairs	Lise Chabot	Manager, Ministry Partnerships Unit	lise.Chabot@ontario.ca	Suite 400, 160 Bloor St. E, Toronto, ON M7A 2E6	647-532-0761				2023-11-21	2023-12-14		2024-07-31
Environmental Assessment and Permissions Branch		Director	enviropermissions@ontario.ca	135 St. Clair Avenue West, 1st Floor, Toronto ON M4V 1P5					2023-11-21	2023-12-14		2024-07-31
Municipal, MPs, MPPs												2024-07-31
Lambton - Kent - Middlesex	MP	Lianne Rood	Lianne.Rood@parl.gc.ca	65 Front Street West Strathroy, Ontario N7G 1X6	519-245-6561				2023-11-21	2023-12-14		2024-07-31
Lambton - Kent - Middlesex	MPP	Monte McNaughton	~~monte.mcnaughtonco@pc.ola.org~~	360 James St, Chatham-Kent, ON, N8A 2N5	519-627-1015				2023-11-21	2023-12-14		2024-07-31
London Middlesex Unit Health Unit			health@mlhu.on.ca	51 Front St. E, Strathroy, ON N7G 1Y5	519-663-5317				2023-11-21	2023-12-14		2024-07-31
Council Member - Strathroy Caradoc	Colin Grantham	Mayor	cgrantham@strathroy-caradoc.ca	52 Frank Street, Strathroy ON N7G 2R4	519-245-1070				2023-11-21	2023-12-14		2024-07-31
Council Member - Strathroy Caradoc	Mike McGuire	Deputy Mayor	mmcguire@strathroy-caradoc.ca	52 Frank Street, Strathroy ON N7G 2R4	519-245-1070				2023-11-21	2023-12-14		2024-07-31
Council Member - Strathroy Caradoc	John G. Brennan	Ward 1	jbrennan@strathroy-caradoc.ca	52 Frank Street, Strathroy ON N7G 2R4	519-245-1070				2023-11-21	2023-12-14		2024-07-31
Council Member - Strathroy Caradoc	Brian (Bo) Derbyshire	Ward 2	bderbyshire@strathroy-caradoc.ca	52 Frank Street, Strathroy ON N7G 2R4	519-245-1070				2023-11-21	2023-12-14		2024-07-31

Agency	Contact	Title	Email	Address	Phone	*Notes*	Date Added to List	Removed from List	Notice of Study (date sent)	SC WWWSWM Master Plan – FAQs	Notice of PIC1 (date sent)	Notice of PIC2 (date sent)
Council Member - Strathroy Caradoc	Sandi Hipple	Ward 2	shipple@strathroy-caradoc.ca	52 Frank Street, Strathroy ON N7G 2R4	519-245-1070				2023-11-21	2023-12-14		2024-07-31
Council Member - Strathroy Caradoc	Frank Kennes	Ward 1	fkennes@strathroy-caradoc.ca	52 Frank Street, Strathroy ON N7G 2R4	519-245-1070				2023-11-21	2023-12-14		2024-07-31
Council Member - Strathroy Caradoc	Donna Pammer	Ward 1	dpammer@strathroy-caradoc.ca	52 Frank Street, Strathroy ON N7G 2R4	519-245-1070				2023-11-21	2023-12-14		2024-07-31
Council Member - Strathroy Caradoc	Steve Pelkam	Ward 1	spelkman@strathroy-caradoc.ca	52 Frank Street, Strathroy ON N7G 2R4	519-245-1070				2023-11-21	2023-12-14		2024-07-31
Council Member - Strathroy Caradoc	Greg Willsie	Ward 2	gwillsie@strathroy-caradoc.ca	52 Frank Street, Strathroy ON N7G 2R4	519-245-1070				2023-11-21	2023-12-14		2024-07-31
Municipality of Strathroy Caradoc	Trishia McKibbin		tmckibbin@strathroy-caradoc.ca						2023-11-21	2023-12-14		2024-07-31
Municipality of Strathroy Caradoc	Brianna Hammer		bhammer@strathroy-caradoc.ca						2023-11-21	2023-12-14		2024-07-31
Municipality of Strathroy Caradoc	Jessy Van der Vaart		jvandervaart@strathroy-caradoc.ca						2023-11-21	2023-12-14		2024-07-31
Municipality of Strathroy Caradoc	Doug Payne		dpayne@strathroy-caradoc.ca						2023-11-21	2023-12-14		2024-07-31
Municipality of Strathroy Caradoc	Brent Smith		bsmith@strathroy-caradoc.ca						2023-11-21	2023-12-14		2024-07-31
~~Municipality of Strathroy Caradoc~~	~~Jake Straus~~		~~jstraus@strathroy-caradoc.ca~~						2023-11-21	2023-12-14		2024-07-31
Municipality of Strathroy Caradoc	Jennifer Huff		jhuff@strathroy-caradoc.ca						2023-11-21	2023-12-14		2024-07-31
Municipality of Strathroy Caradoc	Rob Lilbourne		rlilbourne@strathroy-caradoc.ca						2023-11-21	2023-12-14		2024-07-31
Municipality of Strathroy Caradoc	Stephen Beasley		sbeasley@strathroy-caradoc.ca						2023-11-21	2023-12-14		2024-07-31
Municipality of Strathroy Caradoc	Mark Campbell		mcampbell@spcs.on.ca			*undeliverable*			2023-11-21	2023-12-14		2024-07-31
Municipality of Strathroy Caradoc	Walter Easter		weaster@strathroy-caradoc.ca						2023-11-21	2023-12-14		2024-07-31
Municipality of Strathroy Caradoc	Robb Kennedy		rkennedy@strathroy-caradoc.ca						2023-11-21	2023-12-14		2024-07-31
Municipality of Strathroy Caradoc	Geoff Leclair		gleclair@strathroy-caradoc.ca						2023-11-21	2023-12-14		2024-07-31
Municipality of Strathroy Caradoc	Eric Crouch		Ecrouch@strathroy-caradoc.ca						2023-11-21	2023-12-14		2024-07-31
Municipality of Strathroy Caradoc	Jeff Helkaa		jhelkaa@strathroy-caradoc.ca						2023-11-21	2023-12-14		2024-07-31
Municipality of Strathroy Caradoc	Andy Stockton		astockton@strathroy-caradoc.ca						2023-11-21	2023-12-14		2024-07-31
Municipality of Strathroy Caradoc	Dave Verberne		dverberne@strathroy-caradoc.ca						2023-11-21	2023-12-14		2024-07-31
Municipality of Strathroy Caradoc	Brian Verberne		bverberne@strathroy-caradoc.ca						2023-11-21	2023-12-14		2024-07-31
Municipality of Strathroy Caradoc	Cam Tyler		ctyler@strathroy-caradoc.ca						2023-11-21	2023-12-14		2024-07-31
Municipality of Strathroy Caradoc	Bill Dakin		bdakin@strathroy-caradoc.ca						2023-11-22	2023-12-14		2024-07-31

Agency	Contact	Title	Email	Address	Phone	*Notes*	Date Added to List	Removed from List	Notice of Study (date sent)	SC WWWSWM Master Plan – FAQs	Notice of PIC1 (date sent)	Notice of PIC2 (date sent)
Middlesex Centre	Rae Piggott	Chief Administrative Officer	rpiggott@strathroy-caradoc.ca						2023-11-21	2023-12-14		2024-07-31
Adelaide Metcalfe	Paul Otis	Chief Administrative Officer	potis@strathroy-caradoc.ca						2023-11-21	2023-12-14		2024-07-31
SW Middlesex	Mike Henry	Chief Administrative Officer	mhenry@southwestmiddlesex.ca						2023-11-21	2023-12-14		2024-07-31
Middlesex County	Bill Rayburn	Chief Administrative Officer	cao@mdlsx.ca						2023-11-21	2023-12-14		2024-07-31
Middlesex County	Cathy Burghardt-Jesson	Warden	cburghardtjesson@middlesex.ca						2023-11-21	2023-12-14		2024-07-31
Regional Water Supply												2024-07-31
Lake Huron & Elgin Area Water Supply Systems	Andrew Henry	Director, Regional Water	ahenry@huronelginwater.ca	235 North Centre Rd., Suite 200 London, Ontario N5X 4E7	Tel.: 519.930.3505 ext.1355				2023-11-21	2023-12-14		2024-07-31
Conservation Authority												2024-07-31
St. Clair Region Conservation Authority			stclair@scrca.on.ca	205 Mill Pond Cres., Strathroy, Ontario N7G 3P9	Tel.: 519-245-3710				2023-11-21	2023-12-14		2024-07-31
Upper Thames River Conservation Authority	Tracy Annett	General Manager/ Secretary -Treasurer	annettt@thamesriver.on.ca	1424 Clarke Road, London, Ontario, Canada N5V 5B9					2023-11-21	2023-12-14		2024-07-31
Lower Thames Valley Conservation Authority	Mark Peacock	Chief Administrative Officer / Secretary-Treasurer	mark.peacock@ltvca.ca						2023-11-21	2023-12-14		2024-07-31
Indigenous Groups												
Metis Nation of Ontario	Margaret Frosh	Chief	MargaretF@metisnation.org	311-75 Sherbourne Street, Toronto, ON M5A 2P9					2023-11-21	2023-12-14		2024-07-31
~~Metis Nation of Ontario~~	~~Linda Norheim~~	~~Director, Lands, Resources and Consultations~~	~~lindan@metisnation.org~~		416-977-9881	*2023-12-01 Linda emailed to be removed off list only using general email below*			2023-11-21	2023-12-14		2024-07-31
Metis Nation of Ontario			consultations@metisnation.org	Métis Consultation Unit Métis Nation of Ontario Head Office Suite 1100 – 66 Slater Street Ottawa, ON K1P 5H1					2023-11-21	2023-12-14		2024-07-31
Aamjiwnaang First Nation	Chris Plan	Chief	chief.plain@aamjiwnaang.ca	978 Tashmoo Avenue, Sarnia, ON N7T 7H5	519-336-8410				2023-11-21	2023-12-14		2024-07-31
Aamjiwnaang First Nation	Sharilyn Johnston	Enviroment Coordinator	sjohnstong@aajiwnaang.ca	979 Tashmoo Avenue, Sarnia, ON N7T 7H5		undeliverable			2023-11-21	2023-12-14		2024-07-31
Caldwell First Nation	Robin Perkins	Acting Chief	chief@caldwellfirstnation.ca	P.O. Box 388 Leamington, ON N8H 3W3					2023-11-21	2023-12-14		2024-07-31
Caldwell First Nation	Nikki van Oirschot	Director of Operations	nikki@caldwellfirstnation.ca	P.O. Box 388 Leamington, ON N8H 3W4					2023-11-21	2023-12-14		2024-07-31
Caldwell First Nation	Brianna Sands	Consultation Coordinator	brianna@caldwellfirstnation.ca	P.O. Box 388 Leamington, ON N8H 3W5					2023-11-21	2023-12-14		2024-07-31
Chippewas of Kettle and Stony Point First Nation	Chief	Jason Henry	jason.henry@kettlepoint.org	6247 Indian Lane, Forest, ON N0N 1J0					2023-11-21	2023-12-14		2024-07-31
Chippewas of Kettle and Stony Point First Nation	Consultation Officer	Valerie George	valerie.george@kettlepoint.org	6248 Indian Lane, Forest, ON N0N 1J0					2023-11-21	2023-12-14		2024-07-31
Chippewa of the Thames First Nation	Fallon Burch	Consultation Coordinator - Lands & Environment	Nations Connect - See Tisha	320 Chippewa Road, Muncey, ON N0L 1Y0	519-289-2662 ext. 213				2023-11-21	2023-12-14		2024-07-31
Chippewa of the Thames First Nation	Leslee-White-Eye	Chief	Nations Connect - See Tisha						2023-11-21	2023-12-14		2024-07-31
Delaware Nation (Moravian of the Thames)	Denise Stonefish	Chief	~~denis.stonefish@delawarenation.on.ca~~	14760 School House Line RR3 Thamesville ON N0P 2K0					2023-11-21	2023-12-14		2024-07-31
Delaware Nation (Moravian of the Thames)- EELÜNAAPÉEWI LAHKÉEWIIT	Justin Logan	Lands and Resources Consultation Assistant	loganju@xplornet.ca	14761 School House Line RR3 Thamesville ON N0P 2K0					2023-11-21	2023-12-14		2024-07-31
Delaware Nation (Moravian of the Thames)- EELÜNAAPÉEWI LAHKÉEWIIT	Tina Jacobs	Lands and Resources Consultation Manager	tnajay@xplornet.ca	14762 School House Line RR3 Thamesville ON N0P 2K0					2023-11-21	2023-12-14		2024-07-31
Munsee-Delaware Nation	Roger Thomas	Chief	Chief.thomas@munsee-delaware.org	279 Jubilee Road, Muncey ON N0L 1Y0		undeliverable			2023-11-21	2023-12-14		2024-07-31
Munsee-Delaware Nation	Dan Miskokoman	Band Manager	band.manager@munsee-delware.org	280 Jubilee Road, Muncey ON N0L 1Y0		undeliverable			2023-11-21	2023-12-14		2024-07-31
Oneida of the Thames First Nation	Todd Cornelius	Chief	todd.cornelius@oneida.on.ca	2212 Elm Ave, Southwold, ON N0L 2G0	519-318-4605				2023-11-21	2023-12-14		2024-07-31
Oneida of the Thames First Nation	Brandon Doxtator	Economic Development	councillor.brandon@oneida.on.ca		226-378-4725				2023-11-21	2023-12-14		2024-07-31
Bkejwanong Territory (Walpole Island)	Dan Miskokomon	Chief	dan.miskokomon@wifn.org	117 Tahgahoning Road, Wallaceburg, ON N8A 4K9					2023-11-21	2023-12-14		2024-07-31
Bkejwanong Territory (Walpole Island)	Faye Johnson	Governance Manager	faye.johnson@wifn.org	118 Tahgahoning Road, Wallaceburg, ON N8A 4K9					2023-11-21	2023-12-14		2024-07-31
Residents												

Public Notices

Municipality of Strathroy-Caradoc

Notice of Study Commencement

Water, Wastewater and Stormwater Master Plan and Pollution Prevention Control Plan

The Municipality of Strathroy-Caradoc is preparing a **Master Plan** for its **water, wastewater, and stormwater infrastructure** as part of ongoing efforts to improve the performance of the Municipality's infrastructure. Additionally, the Municipality is undertaking a **Pollution Prevention Control Plan (PPCP)** to provide a road map for implementing infrastructure and operational improvements that will mitigate the impacts of wet weather sewer system overflows on the environment. The Master Plan and PPCP will provide the Municipality with guidance for capital planning and project implementation for water, wastewater, and stormwater services to accommodate growth for the next 20 years and beyond in a cost-effective and environmentally sustainable manner.

The study is being undertaken in accordance with the Municipal Class Environmental Assessment (EA) process for Master Plans (Municipal Engineer's Association Class EA document, March 2023). There will be opportunities to participate throughout the study. Two public engagement events will be held during the study to provide opportunities to review project information and provide feedback to the study team.

As the project proceeds, notices and information will be posted on the Strathroy-Caradoc website. Please refer to the Municipality of Strathroy-Caradoc's 'News and Public Notices' webpage (www.strathroy-caradoc.ca/Modules/News/en) for project updates. To be added to the study's distribution list to receive updates, or for more information, please contact a member of the study team below:

Paul Zuberbuhler B.Sc, B.Comm, C.E.T
Manager of Environmental Services
Municipality of Strathroy-Caradoc
Tel: 519-245-1105 ext. 274
pzuberbuhler@strathroy-caradoc.ca
52 Frank Street
Strathroy ON N7G 2R4

John Tyrrell, M.Sc. (Eng.), P. Eng.
Senior Project Manager
R.V. Anderson Associates Limited
Tel: 519-681-9916 ext. 5038
jtyrrell@rvanderson.com
557 Southdale Road East, Suite 200
London, ON N6E 1A2

Project information is being collected in accordance with the Environmental Assessment Act and Municipal Freedom of Information and Protection of Privacy Act. With the exception of personal information, all comments will form part of the public record.

This notice was distributed on November 21, 2023 **WWSMP-01**

Municipality of Strathroy-Caradoc

Notice of Public Information Session #1

Water, Wastewater and Stormwater Master Plan and Pollution Prevention Control Plan

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The Municipality of Strathroy-Caradoc is preparing a **Master Plan** for its **water, wastewater, and stormwater infrastructure** as part of ongoing efforts to improve the performance of the Municipality's infrastructure. Additionally, the Municipality is undertaking a **Pollution Prevention Control Plan (PPCP)** to provide a road map for implementation of infrastructure and operational improvements that will mitigate the impacts of wet weather sewer system overflows on the environment. The Master Plan and PPCP will provide the Municipality with guidance for capital planning and project implementation for water, wastewater, and stormwater services to accommodate growth for the next 20 years and beyond in a cost effective and environmentally sustainable manner.

The study is being undertaken in accordance with the Municipal Class Environmental Assessment (MCEA) 2023 process for Master Plans.

How do I participate?

When: Wednesday, January 10, 2024, from 6:00 – 8:00 p.m.

Where: Caradoc Community Centre. 565 Lions Park Drive, Mount Brydges, ON

How: In-person

The presentation boards from the meeting along with a summary of Question and Answers will be posted on the project webpage following the meeting: www.strathroy-caradoc.ca/en/city-hall/water-wastewater-and-stormwater-master-plan-and-pollution-prevention-control-plan.aspx.

For more information or to be added to the study's distribution list to receive updates, please contact a member of the study team below:

Paul Zuberbuhler B.Sc, B.Comm, C.E.T

Manager of Environmental Services
Municipality of Strathroy-Caradoc
Tel: 519-245-1105 ext. 274
pzuberbuhler@strathroy-caradoc.ca
52 Frank Street
Strathroy ON N7G 2R4

John Tyrrell, M.Sc. (Eng.), P. Eng.

Senior Project Manager
R.V. Anderson Associates Limited
Tel: 519-681-9916 ext. 5038
jtyrrell@rvanderson.com
557 Southdale Road East, Suite 200
London, ON N6E 1A2

Except for personal information, all comments will become part of the public record of the study. The study is being conducted according to the requirements of the MCEA, which is a planning process approved under Ontario's Environmental Assessment Act

This notice was distributed on December 7, 2023 **WWSMP-02**

Notice of Public Information Session #2 - Water, Wastewater and Stormwater Master Plan and PPCP

Posted on Thursday, August 01, 2024

The Municipality of Strathroy-Caradoc is preparing a Master Plan for its water, wastewater, and stormwater infrastructure as part of ongoing efforts to improve the performance of the Municipality ’s infrastructure. Additionally, the Municipality is undertaking a Pollution Prevention Control Plan (PPCP) to provide a road map for implementation of infrastructure and operational improvements that will mitigate the impacts of wet weather sewer system overflows on the environment. The Master Plan and PPCP will provide the Municipality with guidance for capital planning and project implementation for water, wastewater, and stormwater ser vices to accommodate growth for the next 20 years and beyond in a cost effective and environmentally sustainable manner.

The study is being undertaken in accordance with the Municipal Class Environmental Assessment (MCEA) 2023 process for Master Plans.

How can I participate?

The Municipality is hosting Public Information Meeting #2 to report on the progress of the study and provide members of the public with an opportunity to provide comments prior to its finalization. The Public Information Meeting will be hosted in person and will include presentation boards and the opportunity for the public to ask questions of the project team.

When: Wednesday, September 11, 2024, from 6:00 – 8:00 p.m.
Where: Gemini Sportsplex - 667 Adair Blvd., Strathroy, ON
How: In-person

The presentation boards from the meeting along with a summary of Question and Answers will be posted on the project webpage following the meeting: www.strathroy-caradoc.ca/en/city-hall/water-wastewater-and-stormwater-master-plan-and-pollution-prevention-control-plan.aspx (/en/city-hall/water-wastewater-and-stormwater-master-plan-and-pollution-prevention-control-plan.aspx). For more information or to be added to the study’s distribution list to receive updates, please contact a member of the study team below:

Paul Zuberbuhler B.Sc, B.Comm, C.E.T
Manager of Environmental Services
Municipality of Strathroy-Caradoc
Tel: 519-245-1105 ext. 274
pzuberbuhler@strathroy-caradoc.ca
(mailto:pzuberbuhler@strathroy-caradoc.ca)52 Frank Street
Strathroy ON N7G 2R4

John Tyrrell, M.Sc. (Eng.), P. Eng.
Senior Project Manager
R.V. Anderson Associates Limited
Tel: 519-681-9916 ext. 5038
jtyrrell@rvanderson.com
(mailto:jtyrrell@rvanderson.com)557 Southdale Road East, Suite 200

Except for personal information, all comments will become part of the public record of the study. The study is being conducted according to the requirements of the MCEA, which is a planning process approved under Ontario’s Environmental Assessment Act

- Notice of Public Information Session #2 (/en/resourcesGeneral/2024/EPW/public_information_session_notice_2.pdf) (PDF[86kB])

Contact Us

General Inquiries

The Municipality of Strathroy-Caradoc
52 Frank Street
Strathroy, Ontario N7G 2R4
Map this Location.

E-Mail General Inquiries

T. 519-245-1070
F. 519-245-6353

---

52 Frank Street,
Strathroy ON N7G 2R4
Phone: 519-245-1070
Fax: 519-245-6353

Customer Service:
Monday - Friday
9:00am - 4:00pm

The Municipality of Strathroy-Caradoc acknowledges that it is located on Pre-Confederation Treaty 25 territory. We are thankful to the generations of people who have taken care of this land, including The Chippewas of the Thames First Nation, The Munsee-Delaware First Nation, and The Oneida Nation of the Thames.

Agency Notices

Samya Chams

From:	Darika Sharma <DSharma@rvanderson.com>
Sent:	November 21, 2023 9:18 PM
To:	Paul Zuberbuhler
Cc:	John Tyrrell
Subject:	Strathroy-Caradoc Water, Wastewater &Stormwater Management Master Plan - Notice of Study Commencement
Attachments:	Notice of Study Commencement 2023Nov21.pdf
Categories:	Filed by Newforma

Good Evening,

The Municipality of Strathroy-Caradoc has initiated the process of developing a Water, Wastewater and Stormwater Management Master Plan (WWWSWM MP) that will be supported by a Pollution Prevention Control Plan (PPCP). The WWWSWM MP will provide the Municipality with strategic long-term water and wastewater servicing, and stormwater management strategies that support existing needs and accommodate projected population and employment growth to the year 2046. The PPCP will provide a road map for implementing the identified infrastructure and operational improvements.

You have been identified as potentially having interest and/or information that may assist the study team in developing the Master Plan.

Attached, please the Notice of Study Commencement regarding this study.

Thank you,

Darika Sharma, M.Eng, EIT

Process Designer

R.V. Anderson Associates Limited
557 Southdale Road East, Suite 200, London ON N6E 1A2
t 519 681 9916 ext. 5032 | m 647 648 0461
LinkedIn | Facebook | Website

Samya Chams

From:	Samya Chams
Sent:	December 1, 2023 9:58 AM
To:	eanotification.swregion@ontario.ca
Cc:	John Tyrrell; Paul Zuberbuhler; Darika Sharma
Subject:	Strathroy-Caradoc Water, Wastewater and Stormwater Master Plan and Pollution Prevention Control Plan- Notice of Study Commencement
Attachments:	Notice of Study Commencement 2023Nov21.pdf; streamlined_ea_project_information_form_2 (1) - 236786.xlsx
Categories:	Filed by Newforma

Good morning,

Please find attached a Project Information Form and Notice of Study Commencement for the Strathroy-Caradoc Water, Wastewater and Stormwater Master Plan and Pollution Prevention Control Plan.

Thank you,

Samya

Samya Chams, B.A. (she/her)

Administrative Assistant/ Project Support Coordinator

R.V. Anderson Associates Limited
557 Southdale Road East, Suite 200, London ON N6E 1A2
t 519 681 9916 ext. 5021
LinkedIn | Facebook | Website

APPENDIX 1.2

Indigenous Consultation

Indigenous Agency/Community Notices

SC WWWSWM Master Plan – FAQs

Participants: R.V. Anderson and Associates (RVA) Chippewas of the Thames First Nation

Subject: **SC WWWSWM Master Plan – FAQs**

TD

Created: 14-Dec-2023

Good morning,

On behalf of The Municipality of Strathroy-Caradoc, please find attached the Water, Wastewater and Stormwater Master Plan and Pollution Prevention Control Plan – Project Information and FAQ's.

Thank you,

Samya

SC WWWSWM Master Plan – FAQs.pdf

REPLY

SC WWWSWM Master Plan – FAQs

Participants: R.V. Anderson and Associates (RVA) Chippewas of the Thames First Nation

Subject: **SC WWWSWM Master Plan – FAQs**

TD

Created: 14-Dec-2023

Good morning,

On behalf of The Municipality of Strathroy-Caradoc, please find attached the Water, Wastewater and Stormwater Master Plan and Pollution Prevention Control Plan – Project Information and FAQ's.

Thank you,

Samya

SC WWWSWM Master Plan – FAQs.pdf

REPLY

Indigenous Agency/Community Responses

Deshkan Ziibiing
Chippewas of the Thames
First Nation Treaties, Lands
and Environment

320 Chippewa Road
Muncey, ON, N0L 1Y0
Tel: 519-289-5555
Fax: 519-289-2230
info@cottfn.com

Project Name:
Strathroy - Caradoc W and WW SWM MP

FN Consultation ID:
236786

Consulting Org Contact:
Tisha Doucette

Consulting Organization:
R.V. Anderson and Associates (RVA)

Date Received:
Tuesday, November 28, 2023

December 19, 2023

Dear: Tisha,

We have received information concerning the Strathroy - Caradoc W and WW SWM MP, dated November 28, 2023. The proposed project is located within the Longwoods treaty area to which Chippewas of the Thames First Nation (COTTFN) is the sole-signatory. It is also located within the Big Bear Creek Additions to Reserve (ATR) land selection area, as well as COTTFN Traditional Territory. After reviewing the information that has been provided at this time, we have identified the Master Plan to be of moderate concern.

The relationship our citizens have with Deshkan Ziibi (Thames River) and its Tributaries is integral to our First Nation's spiritual and physical health and wellbeing. The Thames River and its Tributaries continue to be a source of sustenance and areas for culturally significant practices for our peoples. Our First Nation has interests in the health and protection of the creeks, rivers and its animal and plant species that rely on these waterways for survival. These stewardship principles are derived from our cultural practices which we have practiced since time immemorial.

Chippewas of the Thames First Nation members continue to use the natural environment for hunting, fishing and the gathering of traditional medicinal plants. We look forward to the opportunity to review and provide input into the development of the Water, Wastewater Master Plan and the Pollution Prevention Control Plan.

We look forward to continuing this open line of communication. To implement meaningful consultation, COTTFN has developed its own protocols - a document and a process that will guide positive working relationships. As per ‘Appendix C’ of the Wiindmaagewin, a filing fee will reflected on the invoice issued. The invoice will come from COTTFN's Finance Department.

Please do not hesitate to contact me if you need further clarification of this letter.

Sincerely,

Original Signed
Fallon Burch
Consultation Coordinator
Chippewa of the Thames First Nation
320 Chippewa Road, Muncey, ON, N0L 1Y0
(519) 289-5555 Ext 251

Deshkan Ziibiing
Chippewas of the Thames
First Nation

320 Chippewa Road
Muncey, ON, N0L 1Y0
Tel: 519-289-5555
Fax: 519-289-2230
info@cottfn.com

January 18, 2024

Via Email

Jennifer Huff
Director of Building and Planning
52 Frank Street
Strathroy, ON N7G 2R4

Re: Municipality's Settlement Area Boundaries in Strathroy and Mt. Brydges

Dear Jennifer,

Thank you for the opportunity to review the preliminary recommendations for settlement area boundaries within the Municipality of Strathroy-Caradoc. We do value the early engagement and positive relationship building, however there is concern with the rapid expansion which does raise important questions from our perspective.

The relationship our citizens have with the Land is integral to our First Nation's spiritual and physical health and wellbeing. It is a source of sustenance and provides culturally significant practices for our peoples. Our First Nation has interests in the agency for the health and protection of the land, water, animals and plant species. Our citizens continue to utilize the land for hunting, fishing, and gathering of traditional medicinal plants, therefore any adverse impacts to the land and water within our Treaty and Traditional Territory are a violation to our inherent rights.

After reviewing the information provide, we would like to share our feedback and we look forward to your follow-up:

1. The proposed expansion takes place within Chippewas of the Thames First Nation (COTTFN) Longwoods Treaty (1822) area, COTTFN is the sole-signatory to this treaty.
2. The settlement area expansions are also within the Big Bear Creek Additions to Reserve Land Selection Area. In 2013, COTTFN settled a land claim with Canada. Within this agreement, COTTFN is entitled to purchase approximately 5,000 acres of land within Southwestern, Ontario to add to current reserve lands. Strathroy-Caradoc expanding towards COTTFN reserve land directly competes with COTTFN's ability to expand Reserve lands within the vicinity around COTTFN.

3. Future development causes displacement of various species and their habitats such as species at risk. Further to our concern how will non-species at risk be impacted? This includes deer (which COTTFN utilizes as a food source), plants and medicines that hold cultural significance to COTTFN.

4. COTTFN has Water Quality concerns relating to stormwater management and the lack of infrastructure in Mount Brydges. How will increased development impact local water courses? This includes impacts from stormwater, road salts and wastewater.

Deshkan Ziibiing
Chippewas of the Thames
First Nation

320 Chippewa Road
Muncey, ON, N0L 1Y0
Tel: 519-289-5555
Fax: 519-289-2230
info@cottfn.com

5. Some of the proposed development sites are adjacent to areas known to experience flooding. Will the Municipality proceed in residential development on sites known to experience flooding or avoid these locations?
6. In the case of Mount Brydges, how is the town equipped to support additional growth when there is currently insufficient infrastructure and amenities to support current residents? This includes enrollment constraints at the local elementary school, minimal local employment opportunities, and the absence of a sufficient grocery store. This leads to needing further understanding of the justification of removing greenspace for residential development when the town is unable to adequately support its current population.
7. As a partner in the Tri-Township Arena, COTTFN has a strong interest in any future recreation plans for the proposed settlement boundary expansion in Mount Brydges.

We look forward to continuing this open line of communication. If you have any questions, please feel free to contact me.

Sincerely,

Fallon Burch
Consultation Coordinator
Treaties, Lands and Environment (TLE) Department
Deshkan Ziibiing (Chippewa of the Thames First Nation)
(519) 289-5555 Ext. 251

APPENDIX 1.3

Public Information Centres

PIC # 1
INFORMATION

R.V. Anderson Associates Limited
557 Southdale Road East, Suite 200
London ON N6E 1A2 Canada
T 519 681 9916 **F** 855 833 4022
rvanderson.com

MEMORANDUM

To:	File	**Date:**	January 15, 2024
From:	John Tyrrell	**Project No.:**	236786.01
Subject:	Notes from PIC # 1		

1. PIC#1 was held on January 10, 2024, for the Municipality of Strathroy – Caradoc's Water, Wastewater and Stormwater Master Plan and Pollution Prevention Control Plan at the Caradoc Community Centre in Mount Brydges. The posted hours were from 6:00 PM to 8:00 PM.
2. In attendance for proponents were:

   Municipality of Strathroy – Caradoc
   Mayor - Colin Grantham
   Deputy Mayor – Mike McGuire
   Members of Council
   - John Brennan
   - Brian Derbyshire
   - Frank Kennes
   - Greg Willsie

   CAO – Trisha McKibbin
   Director, Engineering and Public Works – Jake Stauss
   Manager of Environmental Services – Paul Zuberbuhler
   Director of Building and Planning – Jennifer Huff
   Director of Human Resources – Doug Payne

   R.V. Anderson Associates Limited
   Project Manager – John Tyrrell
   Senior Wastewater Engineer – Harpreet Rai
   Process Designer – Darika Sharma
   Vice President – David Evans

3. Approximately 56 residents and landowners' names were noted on the sign in sheets for this event.
4. Handouts were provided and boards of the presentation were displayed.
5. Comment sheets were provided and a box to drop off comments was put out. Additionally a QR Code was provided should participants wish to provide electronic comments.
6. The presentation began at approximately 6:10 PM and was followed by a Q& A session.
7. The following is a summation of the questions from the Q& A session:
   a. Question on current and past Mount Brydges wastewater treatment plant performance in meeting effluent targets. Response was that the annual reports for

the wastewater treatment plants are available on the Municipal website and are linked here for reference.

i. 2022 Strathroy-Caradoc WWTP report https://www.strathroy-caradoc.ca/en/resourcesGeneral/2024/EPW/2022-Strathroy-WWTF-Annual-Report.pdf; and

ii. 2022 Mt Brydges WWTP report https://www.strathroy-caradoc.ca/en/resourcesGeneral/2024/EPW/2022-Mt-Brydges-WWTF-annual-report.pdf

iii. Mount Brydges and Strathroy 2011 to 2022 annual water systems reports https://www.strathroy-caradoc.ca/en/city-hall/Reports-and-Studies.aspx

b. Question from residents in Campbellville on high groundwater levels and surface flooding. Response was that while this is not within the scope of the Master Plan but that issues could be written down on the comment sheets for review of Municipality staff.

c. Question from consultant on apparent difference between Comprehensive Review - Mount Brydges meeting on January 8th and this meeting regarding growth numbers presented in this PIC. Response was that information from both meetings was based on the 2022 Residential Lands Needs Assessment Study (RLNA) prepared by Waterson & Associates Economists Ltd.

d. Question from resident on why current problems at Mount Brydges WWTP are not part of this meeting? Response was that the Master Plan is focussed on the future servicing and the upgrades to water/wastewater/SWM and that the Mount Brydges WWTP ongoing project is to bring it to its current approved capacity.

e. Question if need for capacity above current Mount Brydges WWTP is required in the 20-year period or past this, would it make sense to derate existing WWTP capacity and build another plant somewhere else. If WWTP capacity expansion is required, master plan will look at options to achieve this and propose a recommended option.

f. Question on what is the pollution in the PPCP? The response was that pollution refers to untreated or partially treated sewage that is discharged into the environment which usually occurs during unusually heavy rain or spring runoff events.

8. The Presentation and Q&A session was approximately an hour and a half in length.

9. Municipality and RVA staff remained available to respond to individual questions following the formal Presentation and Q&A session until 8:00 PM.

10. The meeting concluded at 8:00 PM.

11. Comments received via the electronic QR Code provided will be reviewed separately,

Memo Prepared by:

John Tyrrell, M.Sc.(Eng.), P.Eng.
Associate/Regional Manager
Project Manager

Attachments:

#	Attachment
1	PIC Notice
2	PIC # 1 Sign-in Sheet
3	PIC # 1 Presentation
4	Written comments received in comments box.

PIC # 1 NOTICE

Municipality of Strathroy-Caradoc

Notice of Public Information Session #1

Water, Wastewater and Stormwater Master Plan and Pollution Prevention Control Plan

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The Municipality of Strathroy-Caradoc is preparing a **Master Plan** for its **water, wastewater, and stormwater infrastructure** as part of ongoing efforts to improve the performance of the Municipality's infrastructure. Additionally, the Municipality is undertaking a **Pollution Prevention Control Plan (PPCP)** to provide a road map for implementation of infrastructure and operational improvements that will mitigate the impacts of wet weather sewer system overflows on the environment. The Master Plan and PPCP will provide the Municipality with guidance for capital planning and project implementation for water, wastewater, and stormwater services to accommodate growth for the next 20 years and beyond in a cost effective and environmentally sustainable manner.

The study is being undertaken in accordance with the Municipal Class Environmental Assessment (MCEA) 2023 process for Master Plans.

How do I participate?

When: Wednesday, January 10, 2024, from 6:00 – 8:00 p.m.

Where: Caradoc Community Centre. 565 Lions Park Drive, Mount Brydges, ON

How: In-person

The presentation boards from the meeting along with a summary of Question and Answers will be posted on the project webpage following the meeting: www.strathroy-caradoc.ca/en/city-hall/water-wastewater-and-stormwater-master-plan-and-pollution-prevention-control-plan.aspx.

For more information or to be added to the study's distribution list to receive updates, please contact a member of the study team below:

Paul Zuberbuhler B.Sc, B.Comm, C.E.T

Manager of Environmental Services
Municipality of Strathroy-Caradoc
Tel: 519-245-1105 ext. 274
pzuberbuhler@strathroy-caradoc.ca
52 Frank Street
Strathroy ON N7G 2R4

John Tyrrell, M.Sc. (Eng.), P. Eng.

Senior Project Manager
R.V. Anderson Associates Limited
Tel: 519-681-9916 ext. 5038
jtyrrell@rvanderson.com
557 Southdale Road East, Suite 200
London, ON N6E 1A2

Except for personal information, all comments will become part of the public record of the study. The study is being conducted according to the requirements of the MCEA, which is a planning process approved under Ontario's Environmental Assessment Act

This notice was distributed on December 7, 2023 **WWSMP-02**

PIC # 1
SIGN-IN SHEET

Municipality of Strathroy-Caradoc
Water, Wastewater and Stormwater Master Plan
and Pollution Prevention Control Plan

Public Information Session # 1
January 10, 2024

ATTENDANCE SHEET

Name	Affiliation (i.e., resident, landowner, agent, agency, consultant)	Contact Information (please include one of email address, phone number, address)
Alex Gubbels	resident	alex.gubbels@yahoo.ca
DEL DOWDING	"	del dowding@hotmail.com
Johnny Graansma	"	j.graansma@hotmail.com
James White	Resident	jameswhite27@live.ca
Anthony Gubbels	consultant	anthony.gubbels@LDSconsultants.ca.
Mike Speziale	Resident	maspeziale@hotmail.com
Rick MacKinnon	Resident	mackinnonrick5@gmail.com
Paul & Brenda Dennis	resident	bdennis1973@yahoo.ca
Bill & Barb Wardell	Resident	billwardell@skynet.ca
Jerry/Rose Bygnowski	resident	jbygnowski@execulink.com
Douglas McPhee	resident	mistermcphee@gmail.com
JIM BALICSAK	"	jbalicsak@gmail.com
Raymond Franke	"	raymond.franke85c@gmail.com
PAUL & KAREN POMNIKOW	"	pomnikowp@gmail.com
L. VanderTuin	Resident	thevandertuins@gmail.com.
D. Tomchick	resident	darcytomchick@gmail.com
K. Bennett	Resident	Kbennettca@yahoo.ca.
J & T Williamson	resident	

Municipality of Strathroy-Caradoc
Water, Wastewater and Stormwater Master Plan
and Pollution Prevention Control Plan

Public Information Session # 1
January 10, 2024

ATTENDANCE SHEET

Name	Affiliation (i.e., resident, landowner, agent, agency, consultant)	Contact Information (please include one of email address, phone number, address)
Alan Johnson	Resident	
Greg Willsie		
Jaye Evans		
D. Evans		
C&D Donald	landowner	
Sheila Pelletier	resident	
Charlie & Myrt Payne	Residents	
Lisa & Jake Friesen	Residents/landowner	
R&L Demeulenaere	landowner	
Fred Warren	Resident	
Clem Louthjan	Resident	
MIKE EARLEY		
[illegible]	RESIDENT	
SHELLY MORRISON	RESIDENT	
JAMES BURR	RESIDENT	
CONNOR JOHNSTONE	RESIDENT	
Peter Meluck	Resident	
[illegible]	11	

Municipality of Strathroy-Caradoc
Water, Wastewater and Stormwater Master Plan
and Pollution Prevention Control Plan

Public Information Session # 1
January 10, 2024

ATTENDANCE SHEET

Name	Affiliation (i.e., resident, landowner, agent, agency, consultant)	Contact Information (please include one of email address, phone number, address)
Suzie Flegel	resident	suziefiegel@hotmail.com
Catherine Nikota	resident/landowner	catherniko@yahoo.ca
Brian Nikota	resident	brianiko@yahoo.ca
Joel DeBoer +Rachel	Resident	Joel_deboer@Hotmail.com
Michelle Green	Resident	acanadianwhocares@yahoo.ca
Brian Derbyshire	councillor	
Robert Brunet	landowner	rahbrunet@hotmail.com
Gary Lawton	Resident	grlawton315@gmail.com
Frank Konecny	Councillor	
MIKE NOLAN	CONTRACTOR	FOR TOWN
PATTIE PEARN	Resident	
Rob Waters	Resident	
Jonathan Longman	Resident	

PIC # 1
PRESENTATION

January 10, 2024

Municipality of Strathroy – Caradoc

Water, Wastewater and Stormwater Master Plan and Pollution Prevention Control Plan

Public Information Centre #1

PURPOSE OF MEETING

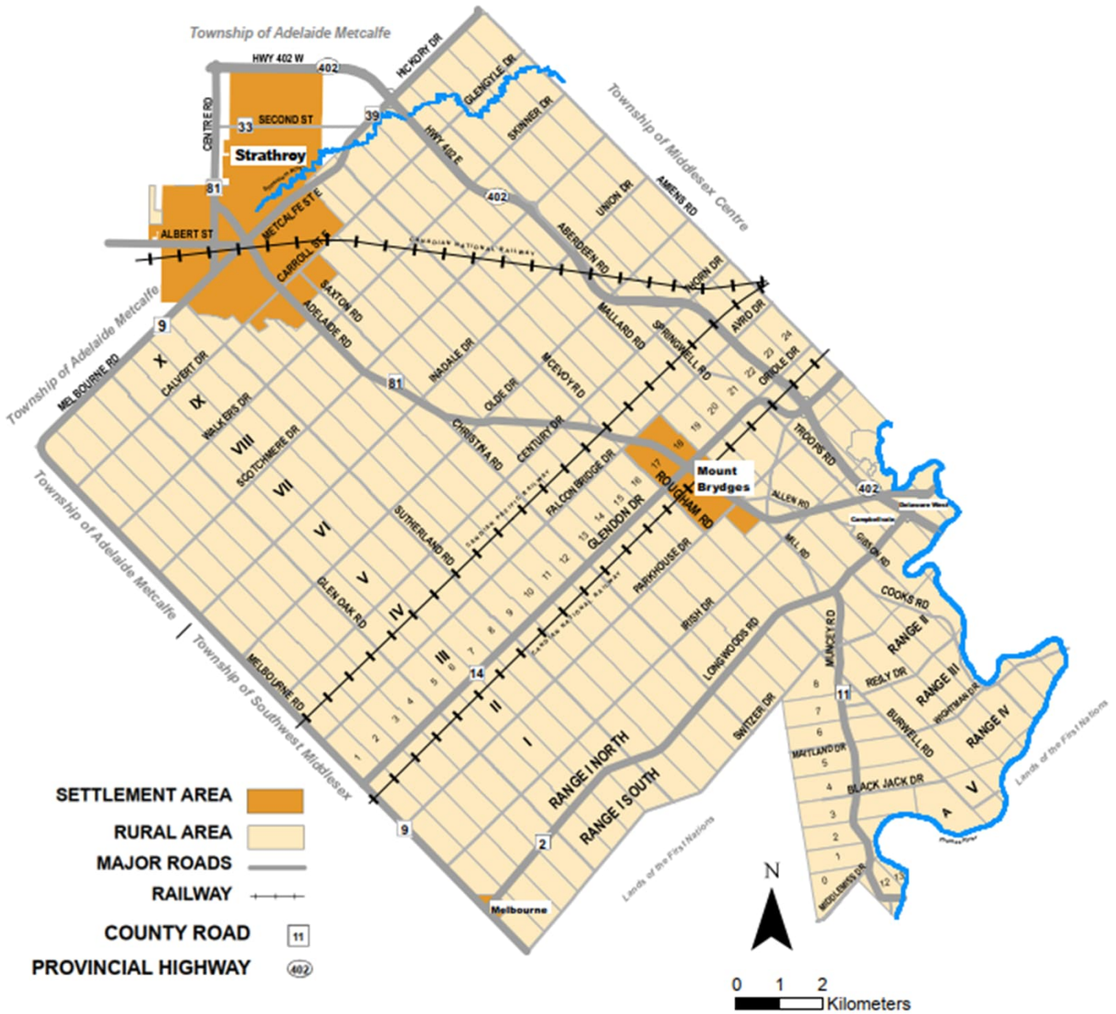
- Introduce you to the study
- Provide an overview of the study process
- Identify the issues and reason for this study
- Summarize the Municipality's water, wastewater and stormwater systems
- Present information on what we have found to date

We want to hear from you!

- Do you have any observations that you would like to share?
- Do you have any questions regarding the study?
- Do you have any questions regarding the Master Plan process?

Background – Strathroy-Caradoc

- Formed in 2001 from an amalgamation of the Town of Strathroy and the Township of Caradoc
- Covers an area of approximately 27,000 ha.
- Urban-rural municipality with large agricultural areas and a few urban settlements.
- 2021 Census population 23,871 residing in 9,695 private dwellings.
- Two main urban settlement areas – Strathroy and Mount Brydges – and smaller settlements comprising of Melbourne, Campbellville, and Delaware West.
- The Master Plan focuses on the municipal services in the two urban settlement areas (Strathroy and Mount Brydges).



Municipality of Strathroy Caradoc – Official Plan

An Official Plan is a legal policy that guides the short-term and long-term development in your community. The plan is developed through a public and legislative process in accordance with the Ontario Planning Act, and the community input helps ensure that future planning and development will meet the specific needs of your community.

Some policies that Official Plans deals with include:

- Where new housing, industry, offices and shops will be located;
- What services like roads, watermains, sewers, parks and schools will be needed;
- When, and in what order, parts of your community will grow; and
- Community improvement initiatives.

Once an Official Plan is in effect, it guides all Municipal planning decisions, meaning:

- The local council and municipal officials must follow the Plan;
- All new services, sewer or watermains etc. must conform to the Plan; and
- All bylaws must conform to the official plan.

Municipality of Strathroy Caradoc – Official Plan

- Under the Municipality's Official Plan, Strathroy, Mount Brydges and Melbourne are designated as settlement areas.
- Only settlements of Strathroy and Mount Brydges are fully serviced by both Water Distribution System and Wastewater Collection & Treatment System.
- Service-Related Policies:
  - By-Law No. 14-20 mandates connection to municipal WDS of all housing units including buildings fronting or adjacent to watermain, and water consumption to be metered. Once connection is established, alternative water supply cannot be used and cannot enter municipal sanitary sewer system.
  - By-Law 64-14 mandates connection to sanitary sewer mains of housing units including buildings, provided treatment capacity is available. Sewage entering sewer may only contain water originating from municipal WDS (except for homes connected prior to enactment of this by-law, and for commercial/industrial properties that have entered a discharge agreement.

Master Plan and PPCP Purpose and Objectives

Master Plans rely on the analysis and detailed policies developed in municipal Official Plans such as speed of growth, growth location, and types of growth to determine infrastructure needs.

Master Planning provides a basis for integrating water, wastewater and stormwater infrastructure requirements for existing and future land uses as follows:

- Provides the Municipality the benefit of reducing time and costs associated with undertaking specific studies to support individual project planning; and
- Projects may be proposed in this Master Plan and some may require additional investigation (Schedule B and C projects) per the Municipal Class Environmental Assessment (MCEA) process.

A Pollution Prevention Plan (PPCP) is:

- Intended to be a part of the Municipality's ongoing efforts to improve the performance of sanitary and storm sewer infrastructure; and
- The aim is to minimize the discharge of untreated or partially treated wastewater during extreme weather events.

Summary of Differences between Official Plan and Master Plan

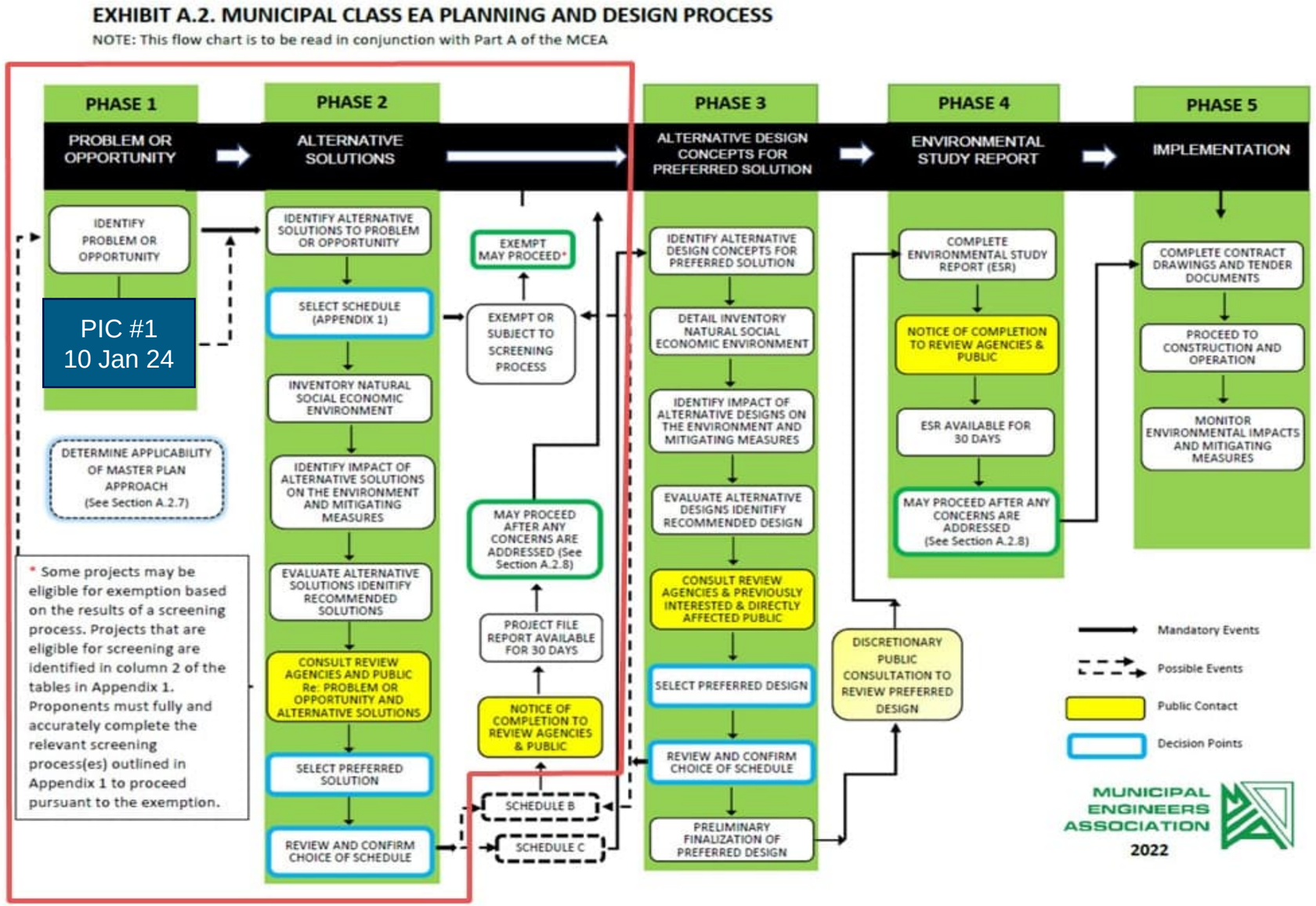
Official Plan (OP)

- The local council and municipal officials must follow the Plan;
- All new services, sewer or watermains etc. must conform to the Plan;
- All bylaws must conform to the official plan; and
- An OP deals mainly with issues such as:
  - where new housing, industry, offices and shops will be located,
  - what services like roads, watermains, sewers, parks and schools will be needed,
  - when, and in what order, parts of your community will grow.

Master Plan (MP)

- Governed by Environmental Assessment Act;
- Build upon the analysis and detailed policies developed through OP;
- Plans on how to service growth detailed in the OP in municipal servicing (roads, water, wastewater, stormwater);
- No policies/bylaws created; and
- Can be undertaken:
  - As a high-level review for planning infrastructure services and support future planning of specific projects based on OP (MCEA Approach 1),
  - In conjunction with OP, Secondary Plans, or subdivision plans and/or include planning of specific infrastructure (MCEA Approaches 2 and 3).

CLASS EA / MASTER PLAN PROCESS



Master Plan Approach

The Strathroy-Caradoc Master Plan will be developed following Approach #1 of the MCEA process, which entails:

- Phase 1 - Identification of problem (deficiency) or opportunity;
- Phase 2 – Identification of alternative solutions to address the problem or opportunity; and
- Provide the public and review agency the opportunity for comments prior to being finalized.

The Master Plan would therefore become the basis for and be used in support of future investigations for the specific Schedule B and C projects identified within it.

Master Plan Purpose

The final WWSMP and PPCP deliverables are generally described as to:

- ✓ Conduct a high-level validation of water demand and wastewater flow design criteria;
- ✓ Propose projects for the 20-year WWWSWM Capital Implementation Plan (2025 to 2046) detailed in five-year horizons - 2025-2029, 2030-2034, 2035-2039 and 2040-2046;
- ✓ Identify future Class EA Study requirements for applicable water wastewater and stormwater capital projects; and
- ✓ Establish a framework from which development infrastructure can be appropriately identified, costed and phased in Development Charges according to DC policies.

Master Plan Problem and Opportunity Statement

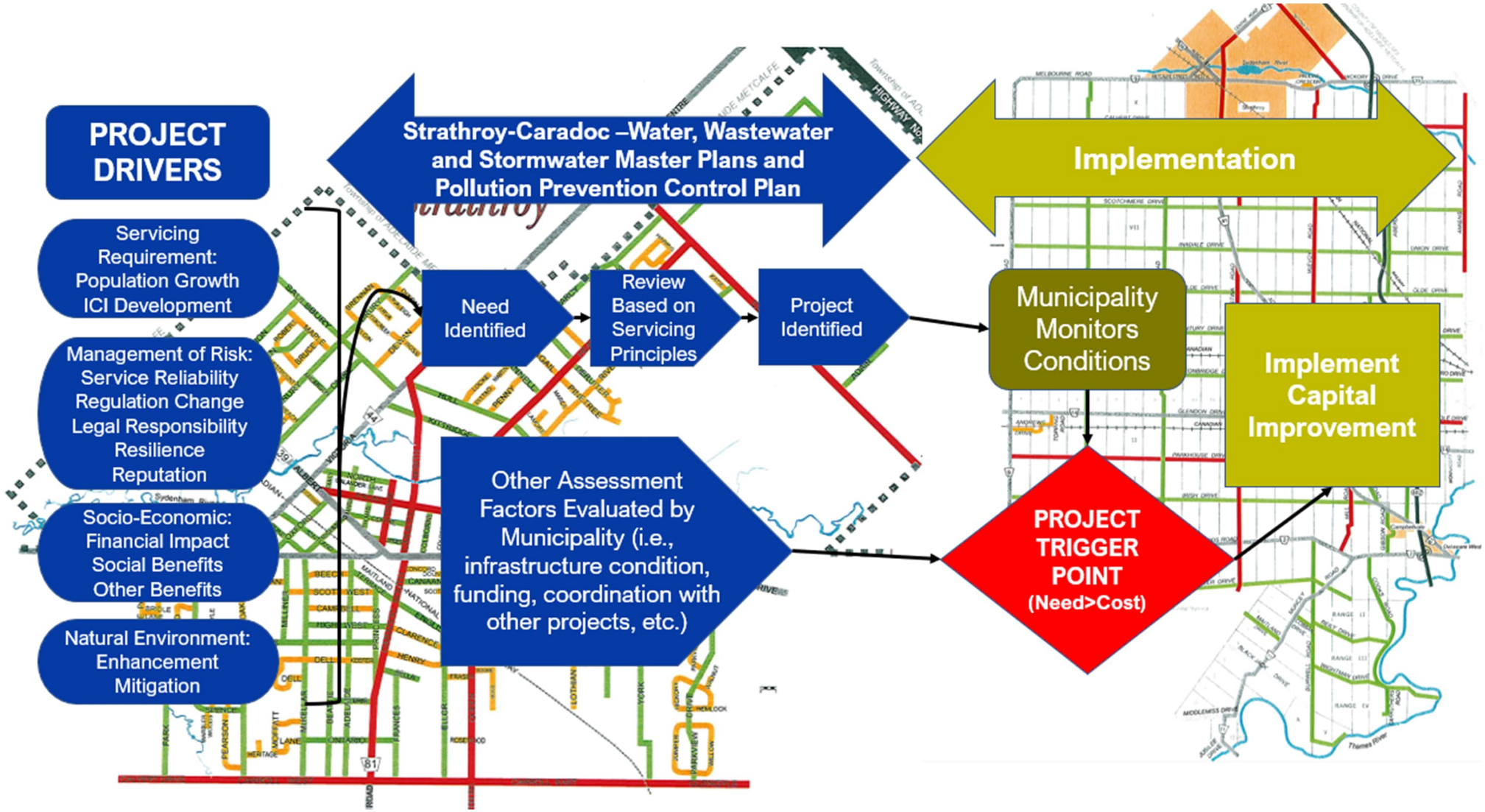
- As the first step in Phase 1 of the Class EA process, the proponent (the Municipality) must identify and describe the problem or opportunity that the project is intended to address.
- The Problem and Opportunity Statement outlines the need for the project and establishes the general parameters of the study.
- The Municipality has chosen the following as its statement of the Problem and Opportunity Statement to be addressed by the Master Plan/PPCP:

  To identify preferred water and wastewater serving strategies to meet the Municipality of Strathroy-Caradoc's growth needs to 2046 as well as provide effective on-going continuity to existing serviced community areas across the Municipality of Strathroy-Caradoc as appropriate.

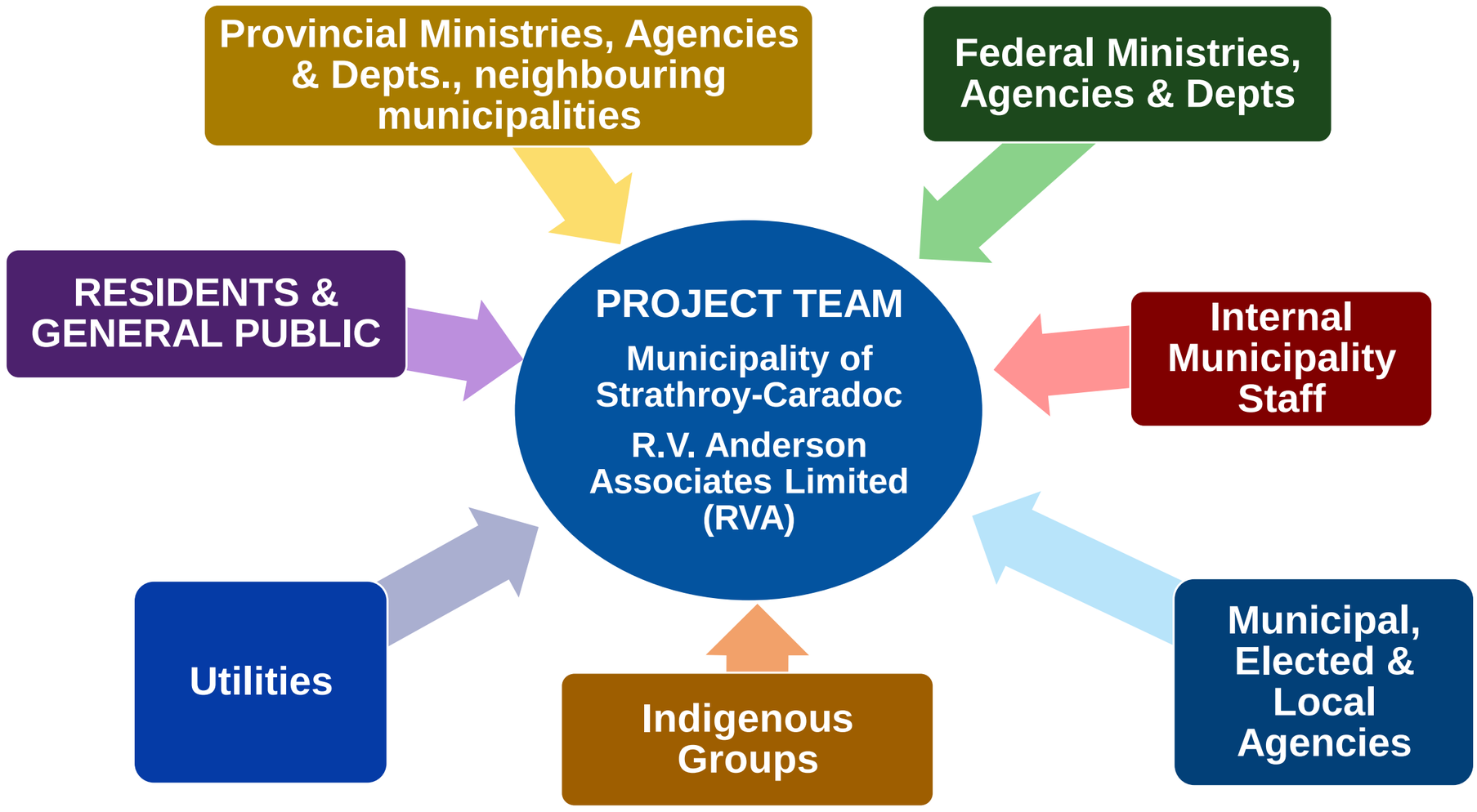
Master Plan Charter Principles

#	Principle	#	Principle
1	The Master Plan and PPCP should be informed by the Strathroy-Caradoc's Strategic Plan.	8	Proven, cost effective technologies that should be in long term use and are capable of continuous improvement should be utilized.
2	The Master Plan and PPCP should support the Strathroy-Caradoc's Official Plan and Green Initiatives and other initiatives to address Climate Change.	9	Consider solutions that build upon the current assets provided they are still viable over the horizon of the Master Plan.
3	Master Plan and PPCP solutions should suit the Strathroy-Caradoc's Growth Plan – If Strathroy-Caradoc wishes growth in an area, the Master Plan would not prevent it.	10	Recommended Master Plan solution be 20-year solutions and ensure that there is expandability to 40-years, if possible (or to the life expectancy of the infrastructure).
4	Preference should be for long term servicing solutions over interim solutions.	11	PPCP solutions should be long term solutions that "fix" the pollution issue.
5	All services to be fully funded through adequate planning, budgeting and identified revenue streams.	12	Synergy - Look for synergies with current or potential future infrastructure requirements with other municipalities and regional systems if this is in the best interest of the Strathroy-Caradoc.
6	Master Plan and PPCP solutions should be developed which minimize risk to the Strathroy-Caradoc, users, and others during construction, commissioning, and operation of the upgrades.	13	Minimize Complexity – Examples include minimizing mechanical components and pumping.
7	The PPCP solution should integrate the collection system, pumping stations and the WWTPs to achieve the F-5-5-5 requirements.		

Master Plan/PPCP Implementation Framework

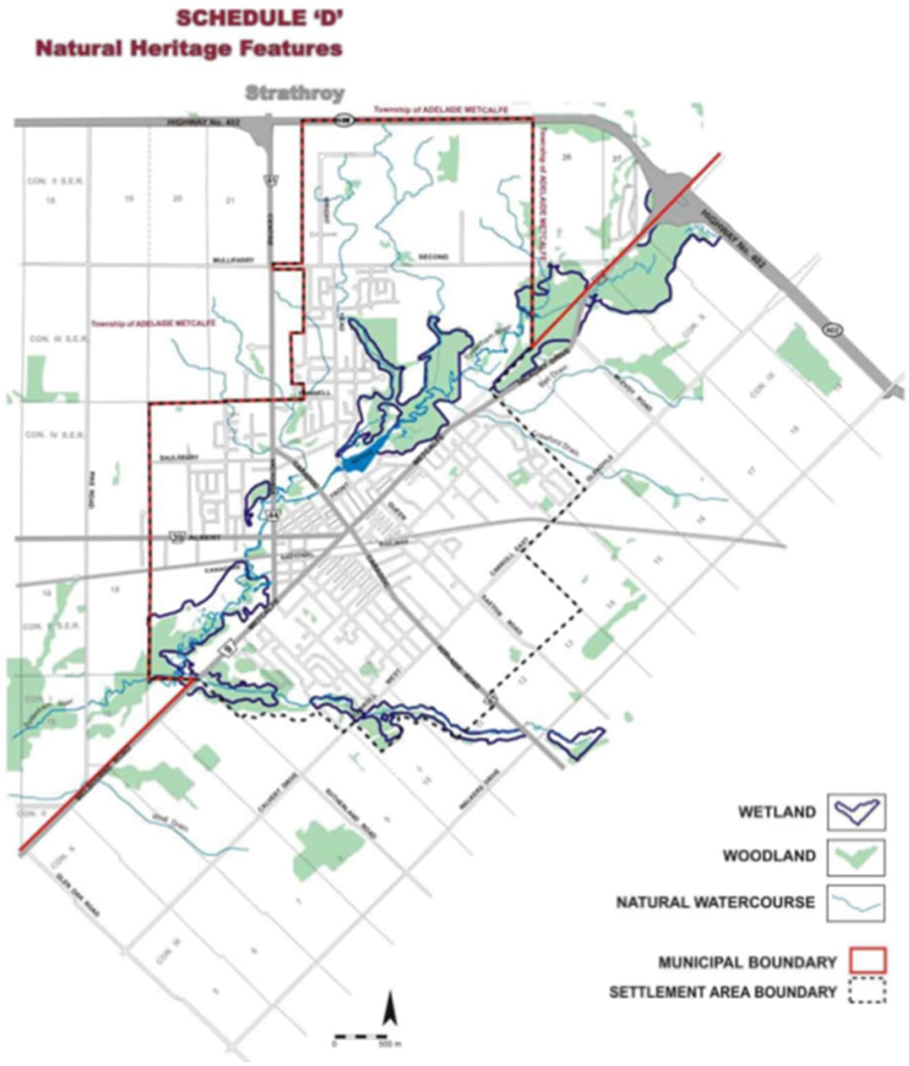


Input Into Master Plan



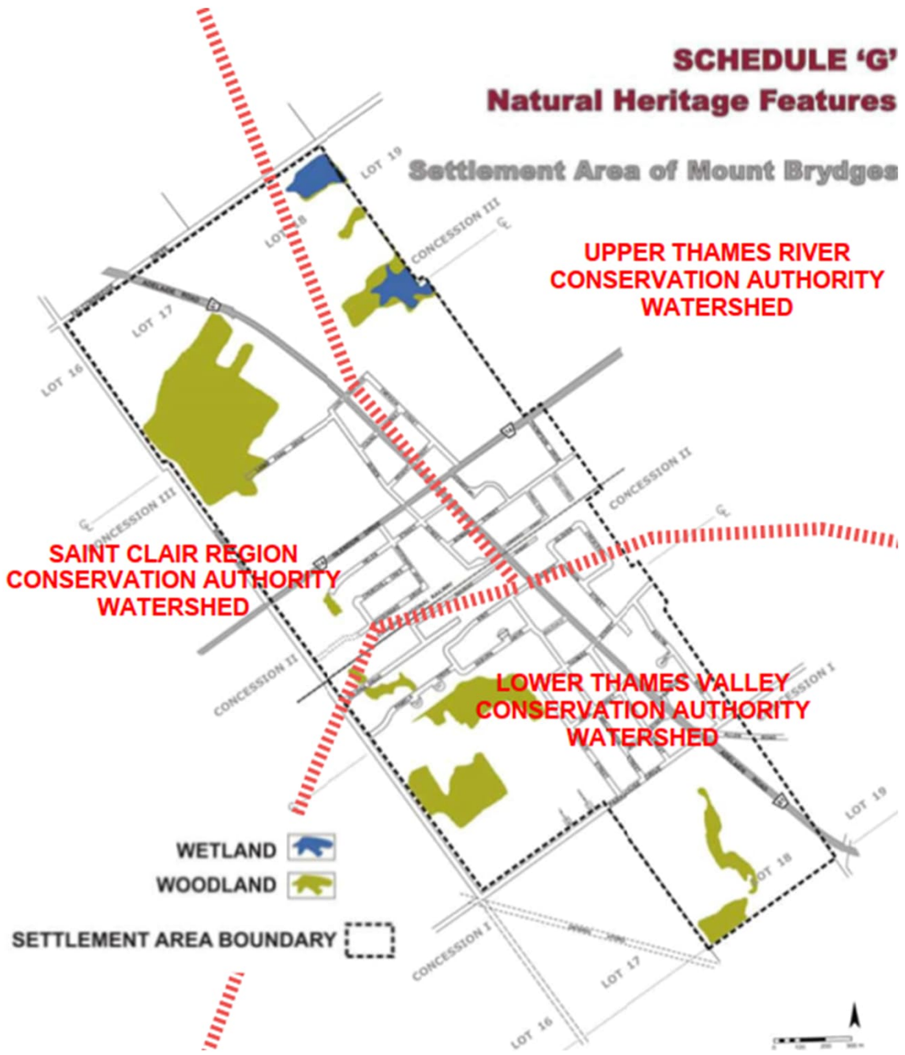
Natural Environment

- Land Use within the Strathroy portion of the Study Area is generally:
  - Urban (residential, commercial, industrial);
  - Wetland and woodland features within the valley lands of the Sydenham River and its tributaries; and
  - Agricultural lands to the south.
- Strathroy portion of the Study Area is in the St. Clair Region Conservation Authority watershed.



Natural Environment

- Land Use within the Mount Brydges portion of the Study Area is generally Urban (residential, commercial, industrial).
- Mount Brydges portion of the Study Area is within the following watersheds:
  - St. Clair Regional Conservation Authority;
  - Upper Thames River Conservation Authority; and
  - Lower Thames Valley Conservation Authority.



Population Projections

2022 Residential Lands Needs Assessment Study (RLNA) prepared by Waterson & Associates Economists Ltd.

Year / Population	2021	2026	2031	2036	2041	2046
Strathroy-Caradoc	24,700	27,030	30,190	32,400	33,960	35,360

<u>Town of Strathroy:</u>

- Total population of 23,900 by 2046, with an average annual growth rate of 1.5%; and
- 3,920 additional houses at an annual growth rate of approximately 157 houses, bringing the total to 10,480 by 2046.

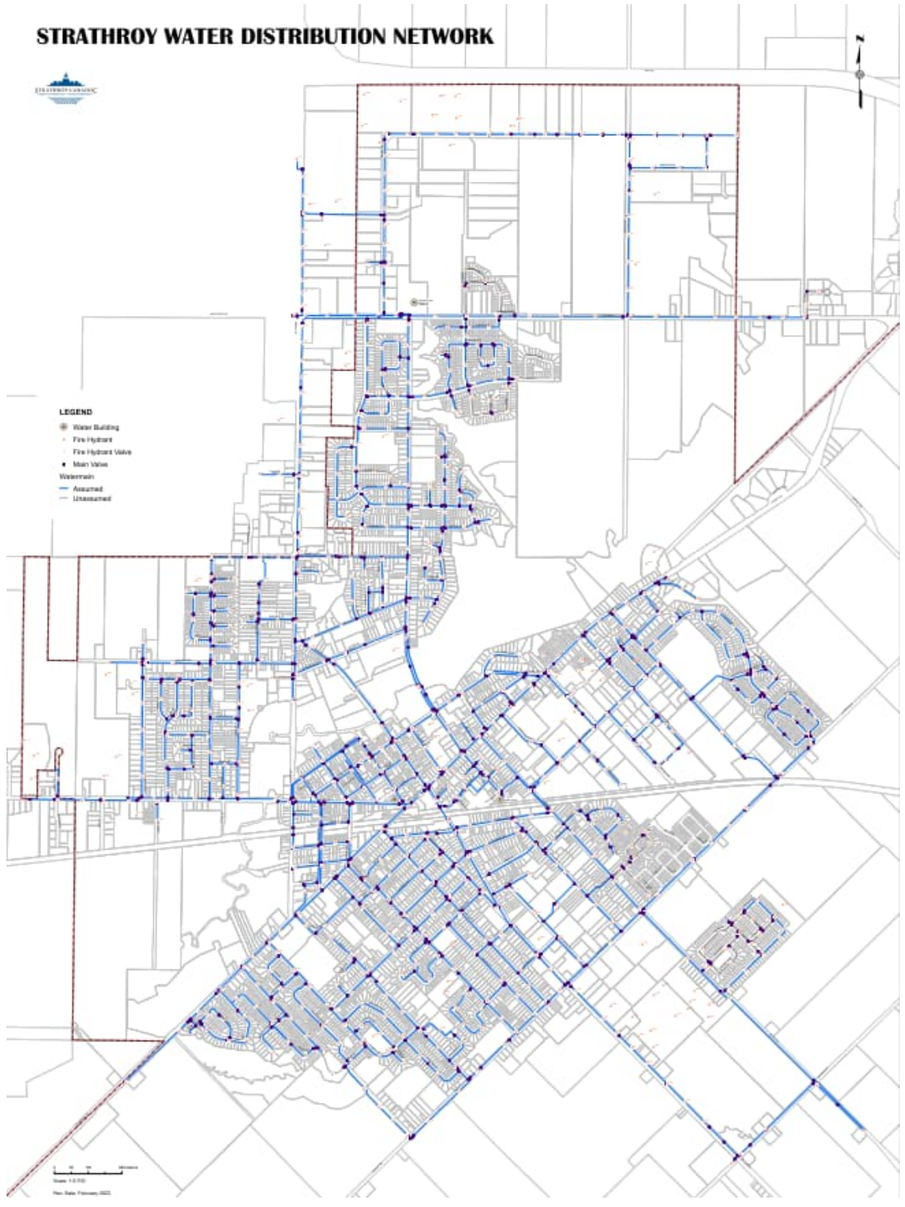
<u>Town of Mount Brydges:</u>

- Will have a total population of 7,500 by 2046, with an average annual growth rate of 3.3%; and
- It will also see 1,750 additional houses at an annual growth rate of approximately 70 houses, bringing the total to 2,940 by 2046.

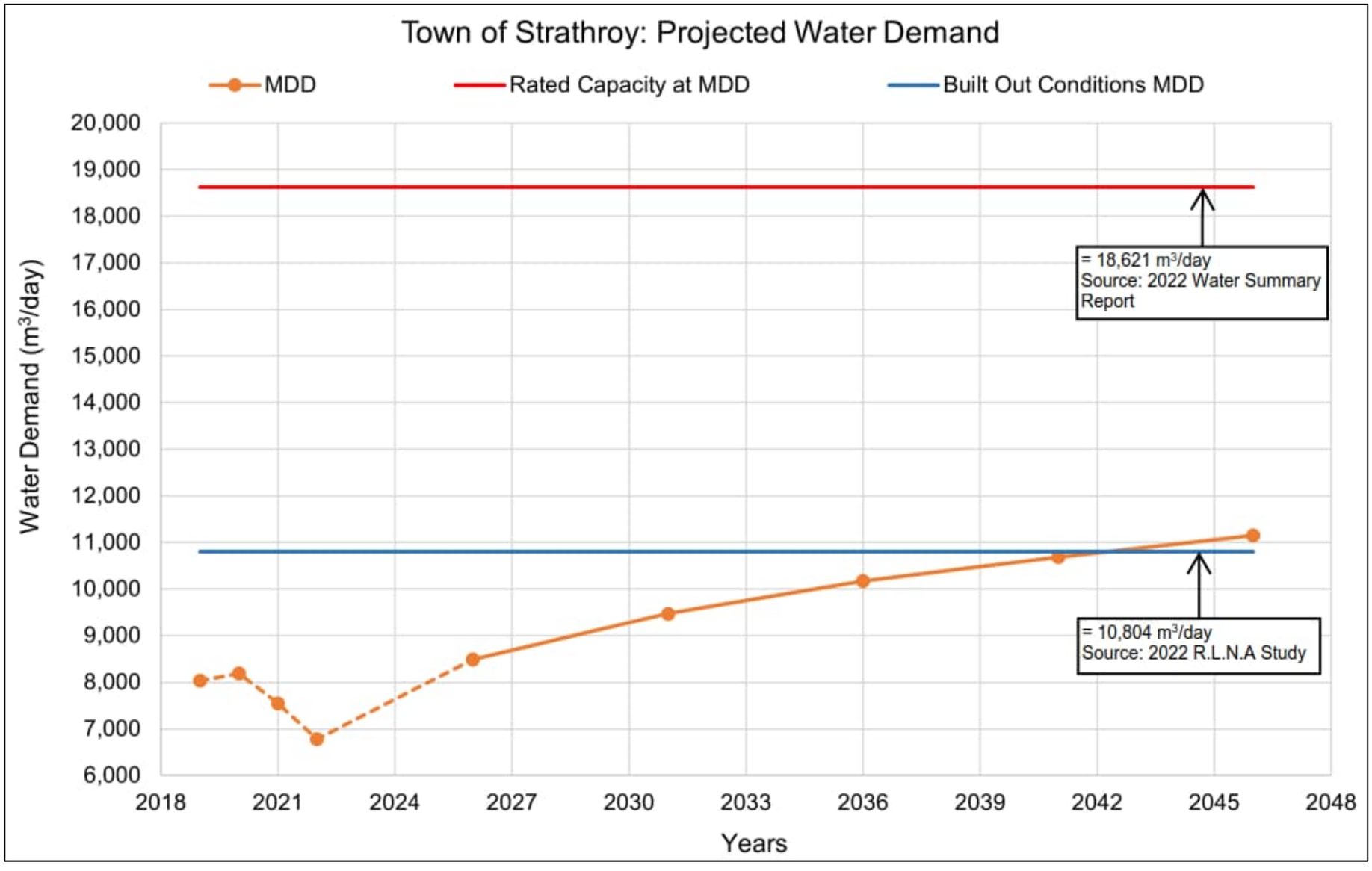
Strathroy – Water Distribution System

- Zone 1 located south of the booster pumping station with lower elevations; and
- Zone 2 which is located north of the booster pumping station and is on higher elevated ground.
- Second Street pumping station which has a 3-celled storage reservoir, each of volume 3,750 m^3 for a total capacity of 11,250 m^3;
- One elevated water tower with a total volume of 1,900 m^3; and
- Approximately 107 km of watermains and 685 fire hydrants.

Year	Supplied (m^3)	Billed (m^3)	Non-Revenue Volume (m^3)	Distribution (% of supplied volume)	
				Billed	Non-Revenue Volume
2022 - 2023 July-Jun.	964,812	898,462	66,350	93	7



Strathroy Water Demand Projection



Rated Capacity to be confirmed in Water Master Plan

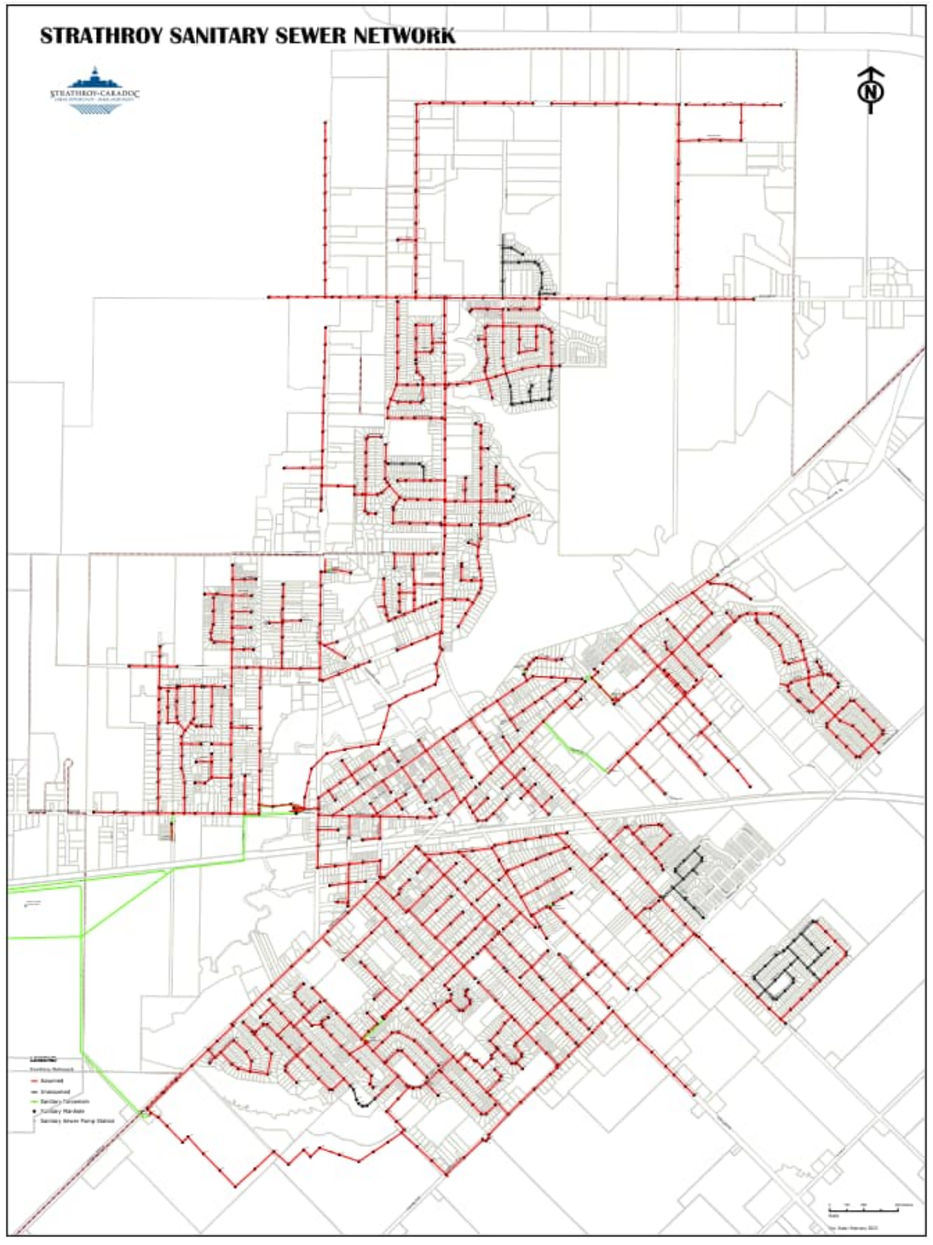
Strathroy – Wastewater Collection and Treatment System

Collection System:

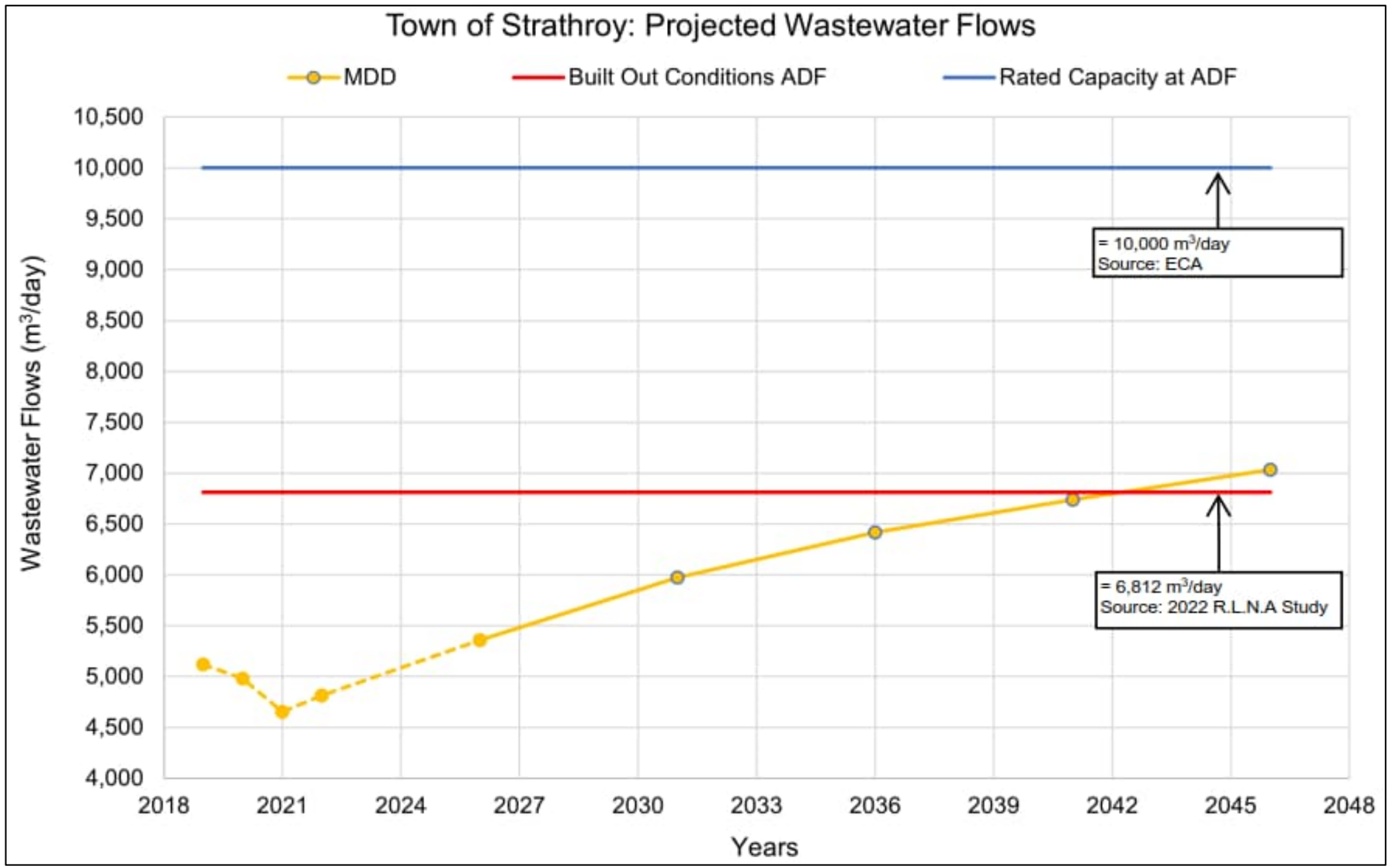
- Nine (9) sanitary pump stations;
- 90 km of gravity sewers and 6 km of forcemains; and
- 1,236 maintenance holes.

Wastewater Treatment Plant

- Mechanical treatment plant with a design rated capacity of 10,000 m^3/day.
- Liquid train comprises of mechanical screening, one aeration basin, chemical phosphorus removal, two secondary clarifiers, filtration and UV disinfection.
- Sludge storage is provided by an onsite lagoon.



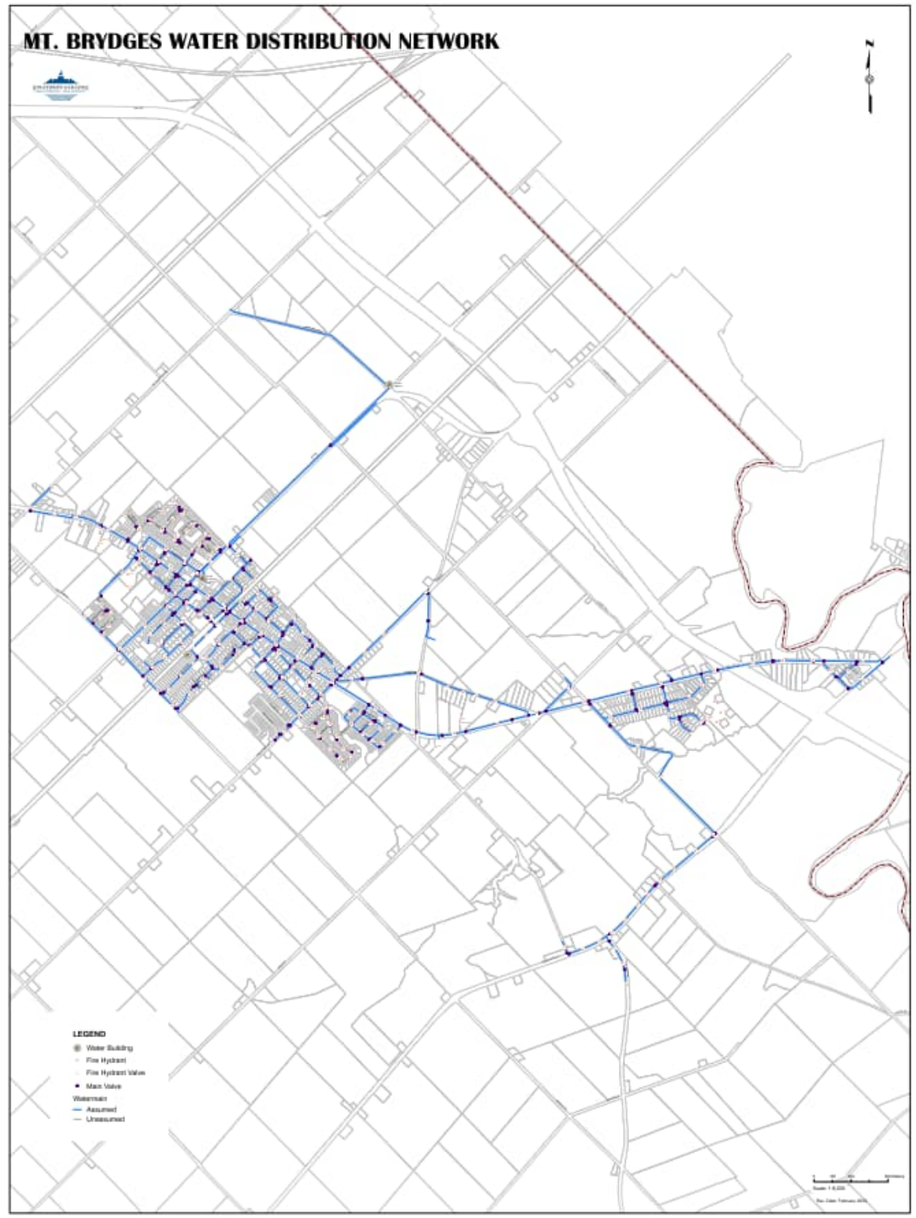
Strathroy Wastewater Flow Projection



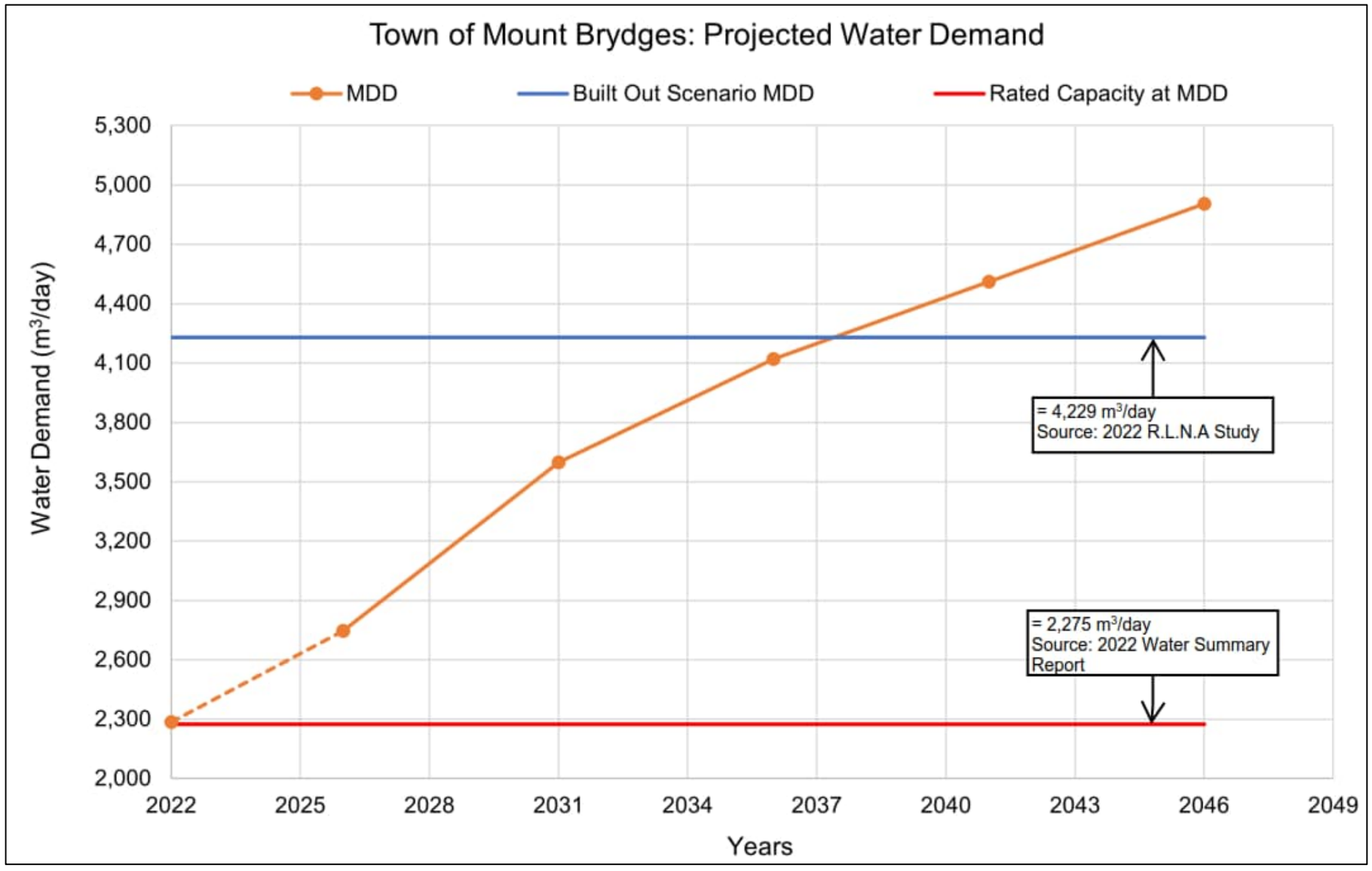
Mount Brydges – Water Distribution System

- The Glendon Drive High Lift PS (HLPS) that has an underground 2-celled storage reservoir with total capacity of 1,630 m^3. The HLPS has back-up power;
- Oriole Drive Monitoring and Re-chlorination Facility (Monitoring Station #3) that also has backup-power;
- Water Tower with a total volume of 720 m^3; and
- The system consists of 45 km of watermains and 179 fire hydrants.

Year	Supplied (m^3)	Billed (m^3)	Non-Revenue Water Volume (m^3)	Distribution (% of supplied volume)	
				Billed	Non-Revenue
2022 - 2023 July-Jun.	179,504	173,883	5,621	97	3



Mount Brydges Water Demand Projection



Rated Capacity to be confirmed in Water Master Plan

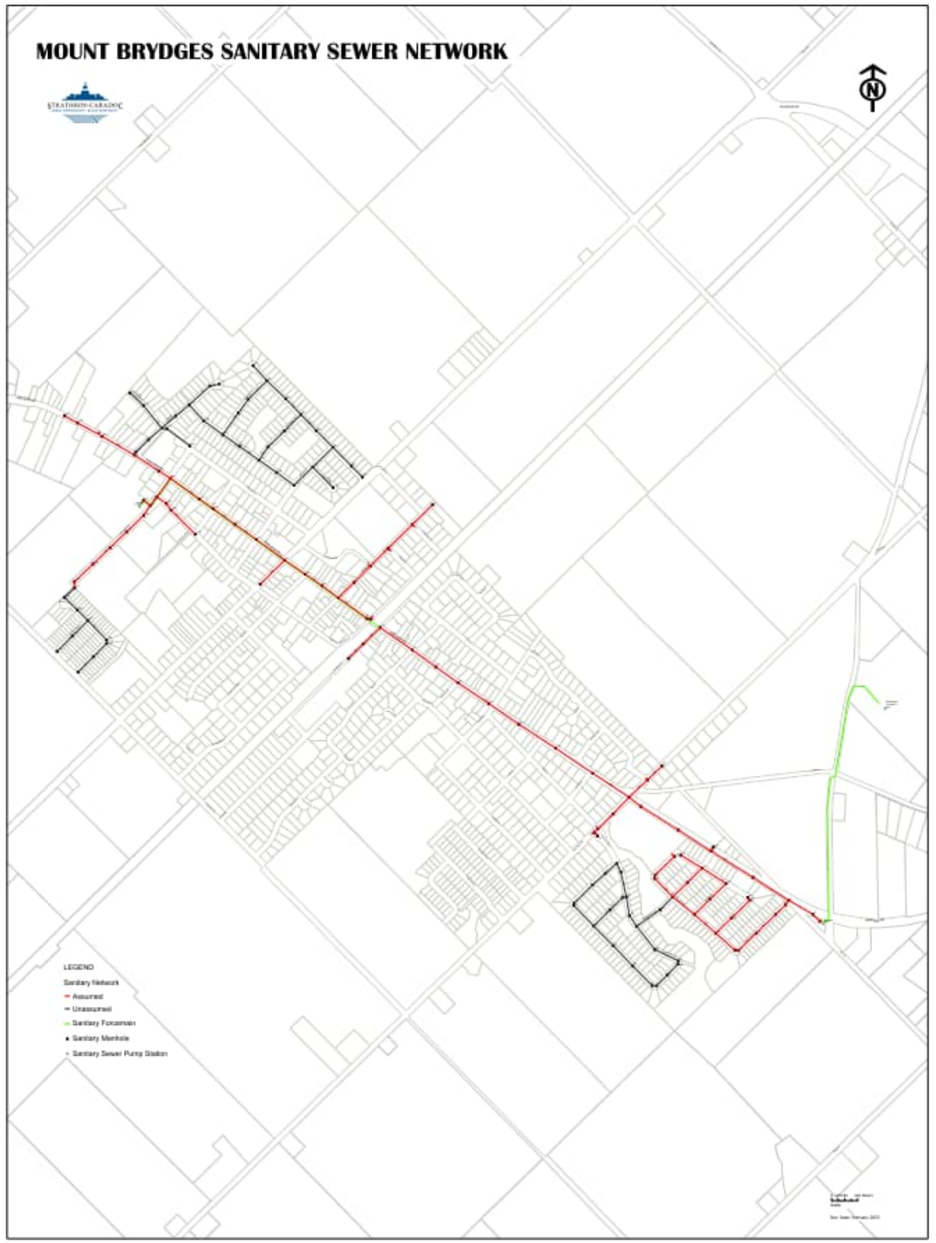
Mount Brydges – Wastewater Collection and Treatment System

Collection System:

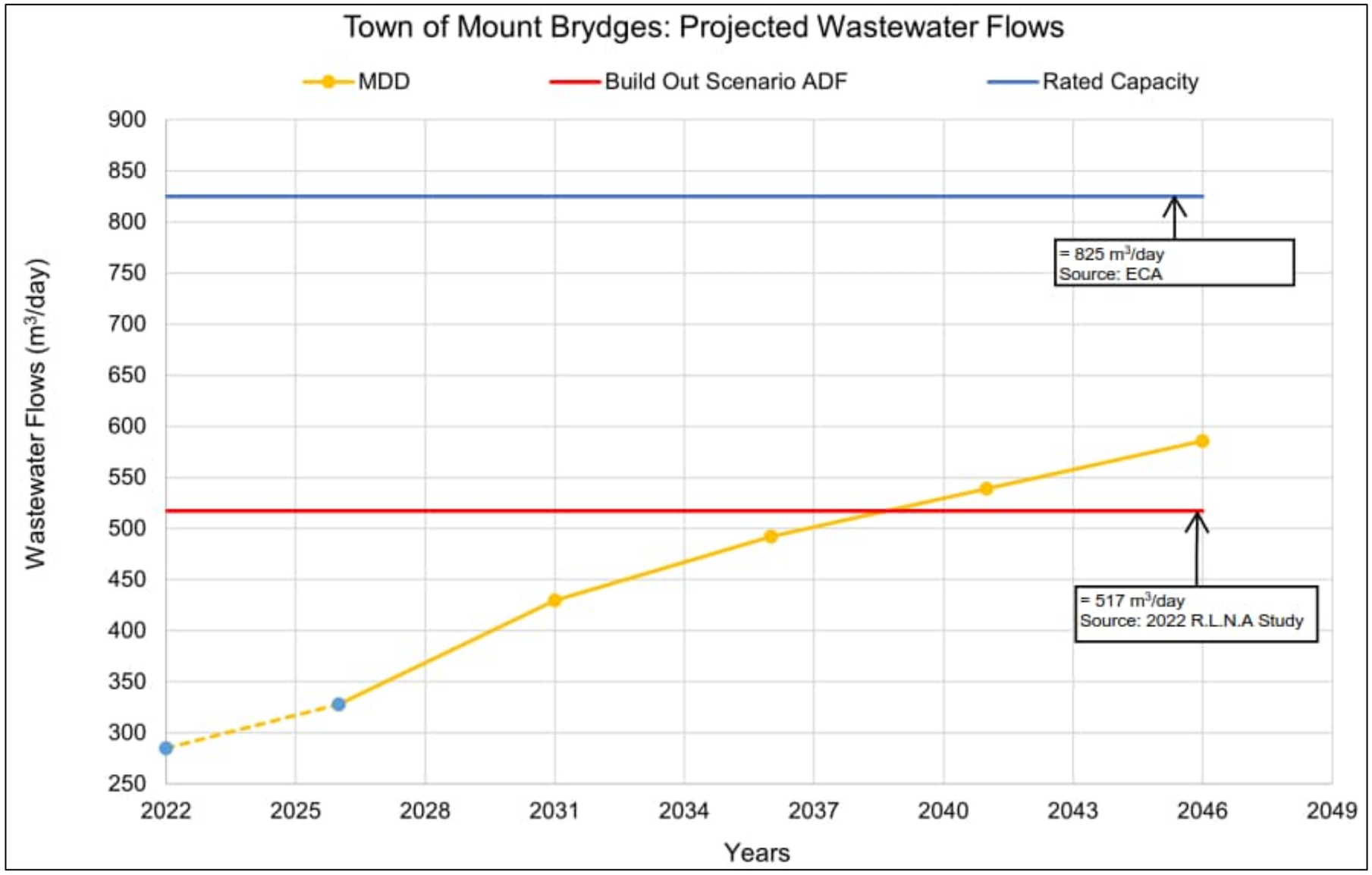
- 11 km of gravity sewers and 2 km of forcemains; and
- 145 maintenance holes and two (2) sanitary pump stations.

Wastewater Treatment Plant

- Rotating Biological Contactor (RBC) based WWTP.
- Liquid train comprises of an inlet flow distribution chamber, two rotating biological contactor units, two secondary clarifiers, three continuous backwash filters, chemical addition, and UV disinfection. The rated capacity of the plant is 825 m^3/day.
- Some areas of Mount Brydges remain serviced by private on-site sewage disposal systems.



Mount Brydges Wastewater Flow Projection

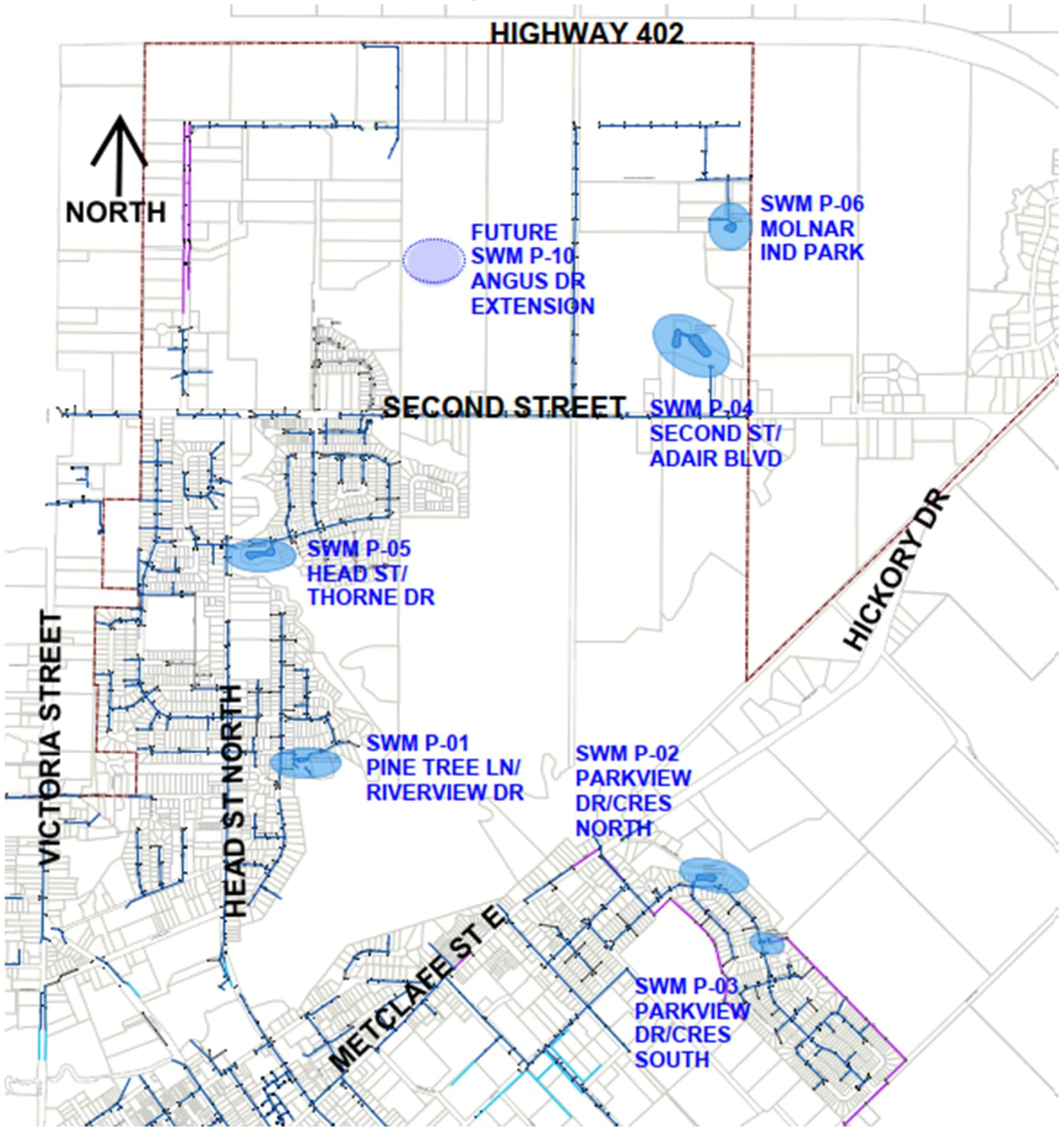


Stormwater Management (SWM) Facilities

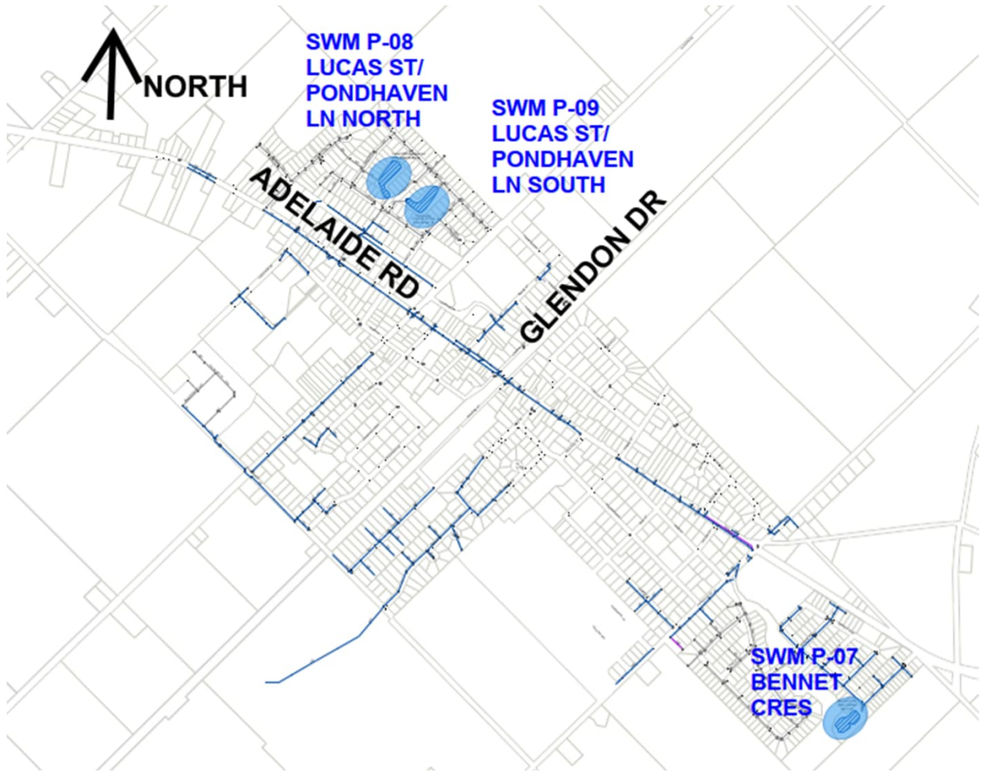
- SWM facilities are generally required for new development and are intended to protect the environment by:
  - Matching post development to predevelopment flow rates (quantity treatment),
  - Providing water quality treatment primarily through sediment removal with some biological treatment (depending on time of year); and
  - Providing other benefits such as thermal control of runoff and environmental enhancement.
- Quantity facilities were first installed in 1980's and Quantity/Quality facilities in the 1990's
- Like water and wastewater systems, SWM facilities are regulated by the MECP
- MECP's *Environmental Compliance Approval for a Municipal Stormwater Management System ECA Number: 058-S701, Issue Number: 1 dated February 8, 2023, Schedule B*, identifies nine SWM facilities (SWMP 01 to 09)
- Agnes Drive Roadway Extension SWM Pond in Strathroy is a future SWMP-10 currently under review by MECP.

SWM Facilities

Strathroy SWM Facilities



Mount Brydges SWM Facilities



Project Schedule

- Undertake PIC # 1- January 10, 2024
- Completion of water modeling – February 2024
- Completion of wastewater modeling – March 2024
- Develop Water System Master Plan – January to April 2024
- Develop Wastewater System Master Plan– January to April 2024
- Develop Stormwater Master Plan – January to April 2024
- Undertake Pollution Prevention Plan– January to April 2024
- Council Presentation of Master Plan Progress (Council Presentation # 1) – February 2024 - if required
- Undertake PIC # 2 – June 2024
- Municipality Council Presentation of Master Plan Report (Council Presentation # 2) – July 2024
- Municipality Issues Notice of Completion – July 2024
- Master Plan Completed (following 30-day review period) – August 2024

Strathroy – Caradoc W/WW SWM MP

QUESTIONS?

Thank you for attending this meeting.

Material on this meeting will be posted on the **News & Public Notices Page:**

https://www.strathroy-caradoc.ca/en/city-hall/water-wastewater-and-stormwater-master-plan-and-pollution-prevention-control-plan.aspx

Please feel free to ask a question or submit your comments via email or phone a member of the study team

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PIC # 1
COMMENTS RECEIVED
IN COMMENT BOX

Comment 1

Municipality of Strathroy-Caradoc

Comments and Questions Form

Water, Wastewater and Stormwater Master Plan and Pollution Prevention Control Plan

If you have any comments/questions you would like to provide to the Study Team, please fill out this form. The Study Team will review your comments and send you a response.

Name:	
Contact Information: *(to provide a reply)*	***Please provide one of the following:*** *email address* ***OR*** *phone number* ***OR*** *mailing address*

Comments and Questions:

Space for additional comments is available on the back of the page

Please submit comments in comment box at meeting or else forward your comments to the following members of the study team below:

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Comment 1

Comments and Questions:

1. Pulelu
Availability of water/wastewater/PPCP Reports
2. Settlement boundary discussed - with in relation to NSW flow zones in Mt Bryden
3. Drainage issues of stormwater/GW in some neighborhoods
4. Have different perception of capacity needs at Mt Bryden. Seems to more than plant capacity
WWTP

Comment 2

Municipality of Strathroy-Caradoc

Comments and Questions Form

Water, Wastewater and Stormwater Master Plan and Pollution Prevention Control Plan

If you have any comments/questions you would like to provide to the Study Team, please fill out this form. The Study Team will review your comments and send you a response.

Name:	
Contact Information: *(to provide a reply)*	***Please provide one of the following:*** *email address* ***OR*** *phone number* ***OR*** *mailing address*

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Comment 2

Comments and Questions:

Was flow projection inclusive of Infill?

PIC # 2
INFORMATION

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MEMORANDUM

To:	File	**Date:**	September 12, 2024
From:	John Tyrrell	**Project No.:**	236786.01
Subject:	Notes from PIC # 2		

1. PIC#2 was held on September 11, 2024, for the Municipality of Strathroy – Caradoc's Water, Wastewater and Stormwater Master Plan and Pollution Prevention Control Plan at the Gemini Sportsplex in Strathroy. The posted hours were from 6:00 PM to 8:00 PM.
2. In attendance for proponents were:

Municipality of Strathroy – Caradoc	R.V. Anderson Associates Limited
Councillor - Steve Pelkman CAO – Trisha McKibbin Director, Engineering and Public Works – Mark Ortiz Manager of Environmental Services – Paul Zuberbuhler	Project Manager – John Tyrrell Process Designer – Darika Sharma

3. Present at the meeting were:
   - 5 residents;
   - 2 consultants; and
   - 1 developer.
4. Handouts were provided and boards of the presentation were displayed. Comment sheets were provided and a box to drop off comments was put out. Additionally, a QR Code was provided should participants wish to provide electronic comments. The presentation began at approximately 6:10 PM and Municipal staff and RVA attended following the presentation to address any questions from participants.
5. Questions from the Presentation
   a. Population Forecast

      Q1: What is the basis of the population forecast?
      A1: As directed by the Municipality, the 2022 Residential Lands Needs Assessment (RLNA) was prepared by Watson & Associates Economists Ltd.

      Q2: What if this under counts actual population growth?
      A2: The intent of the Master Plan is to provide a 20-year forecast but for this to be updated every 5 years. The next Master Plan will take into consideration actual population growth and updated planning projections for population.

b. Water Supply

Q: Is it confirmed that there is sufficient water supply capacity for Mount Brydges?
A: As noted in the water supply slide for Strathroy and Mount Brydges, the water supply from the LHPWSS is sufficient for future needs.

c. Campbellvale

Q: What are the surface water and high groundwater issues not addressed as part of this study?
A: This issue is not within the scope of the Water/Wastewater/SWM Master Plan nor the PPCP. Staff will review this issue and look to address this with Campbellvale residents separate from the Master Plan/PPCP.

d. Mount Brydges

Q: What would be the timing to address the Water Storage and Wastewater Treatment issues in Mount Brydges?
A: Municipal staff stated that they will review the findings of the Master Plan and look to confirm the timing for the needed projects to address these issues and that it would likely be in the near term.

6. The Presentation and Q&A session was approximately an hour in length.
7. Municipality and RVA staff remained available to respond to individual questions following the formal Presentation and Q&A session until 8:00 PM.
8. The meeting concluded at 8:00 PM.
9. Comments received via the electronic QR Code provided will be reviewed separately.

Memo Prepared by:

John Tyrrell, M.Sc.(Eng.), P.Eng.
Project Manager

Attachments:

#	Attachment
1	PIC Notice
2	PIC # 2 Sign-in Sheet
3	PIC # 2 Presentation
4	Written comments received in comments box.

PIC # 2 NOTICE

Notice of Public Information Session #2 - Water, Wastewater and Stormwater Master Plan and PPCP

Posted on Thursday, August 01, 2024

The Municipality of Strathroy-Caradoc is preparing a Master Plan for its water, wastewater, and stormwater infrastructure as part of ongoing efforts to improve the performance of the Municipality ’s infrastructure. Additionally, the Municipality is undertaking a Pollution Prevention Control Plan (PPCP) to provide a road map for implementation of infrastructure and operational improvements that will mitigate the impacts of wet weather sewer system overflows on the environment. The Master Plan and PPCP will provide the Municipality with guidance for capital planning and project implementation for water, wastewater, and stormwater ser vices to accommodate growth for the next 20 years and beyond in a cost effective and environmentally sustainable manner.

The study is being undertaken in accordance with the Municipal Class Environmental Assessment (MCEA) 2023 process for Master Plans.

How can I participate?

The Municipality is hosting Public Information Meeting #2 to report on the progress of the study and provide members of the public with an opportunity to provide comments prior to its finalization. The Public Information Meeting will be hosted in person and will include presentation boards and the opportunity for the public to ask questions of the project team.

When: Wednesday, September 11, 2024, from 6:00 – 8:00 p.m.
Where: Gemini Sportsplex - 667 Adair Blvd., Strathroy, ON
How: In-person

The presentation boards from the meeting along with a summary of Question and Answers will be posted on the project webpage following the meeting: www.strathroy-caradoc.ca/en/city-hall/water-wastewater-and-stormwater-master-plan-and-pollution-prevention-control-plan.aspx (/en/city-hall/water-wastewater-and-stormwater-master-plan-and-pollution-prevention-control-plan.aspx). For more information or to be added to the study’s distribution list to receive updates, please contact a member of the study team below:

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Except for personal information, all comments will become part of the public record of the study. The study is being conducted according to the requirements of the MCEA, which is a planning process approved under Ontario’s Environmental Assessment Act

- Notice of Public Information Session #2 (/en/resourcesGeneral/2024/EPW/public_information_session_notice_2.pdf) (PDF[86kB])

Contact Us

General Inquiries

The Municipality of Strathroy-Caradoc
52 Frank Street
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Map this Location.

E-Mail General Inquiries

T. 519-245-1070
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52 Frank Street,
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Fax: 519-245-6353

Customer Service:
Monday - Friday
9:00am - 4:00pm

The Municipality of Strathroy-Caradoc acknowledges that it is located on Pre-Confederation Treaty 25 territory. We are thankful to the generations of people who have taken care of this land, including The Chippewas of the Thames First Nation, The Munsee-Delaware First Nation, and The Oneida Nation of the Thames.

PIC # 2
SIGN-IN SHEET

Municipality of Strathroy-Caradoc
Water, Wastewater and Stormwater Master Plan
and Pollution Prevention Control Plan

Public Information Session # 2
September 11, 2024

ATTENDANCE SHEET

Name	Affiliation (i.e., resident, landowner, agent, agency, consultant)	Contact Information (please include one of email address, phone number, address)
Erin deVos	Resident	devoserin@hotmail.com.
Terry Fleguel	Resident	Tel. (519) 264-2321
Catherine Nikota	"	catherniko@yahoo.ca
Josh Master	consultant	jmaster@mte85.com
Doug McPhee	resident	mistermcphee@gmail.com
Rob Brunet	"	rahbrunet@hotmail.com
Jim Banman	Cirrus Dev.	jim@cirrusdevelopments.ca
Mike Pletch	Dillon	mpletch@dillon.ca

PIC # 2
PRESENTATION

September 11, 2024

Municipality of Strathroy – Caradoc

Water, Wastewater and Stormwater Master Plan and Pollution Prevention Control Plan

Public Information Centre #2

Purpose of Meeting

- Provide details on findings of the Water, Wastewater and Stormwater Management (SWM) Master Plan
- Provide details on findings of the Pollution Prevention Plan (PPCP) Identify the issues and reason for this study
- Summarize the recommendations and costs associated with the Master Plan and PPCP

We want to hear from you!

- Do you have any observations that you would like to share?
- Do you have any questions regarding the study?
- Do you have any questions regarding the Master Plan process?

Master Plan/PPCP Project Schedule

- Undertake PIC # 2 – September 11, 2024
- Comments Received from PIC # 2 – September 25, 2024
- Finalize Master Plan and PPCP
- Municipality Council Presentation of Master Plan Report and PPCP - October 2024
- Municipality Issues Notice of Completion – October 2024
- Master Plan and PPCP Completed (following 30-day review period) – November 2024

Master Plan/PPCP Purpose and Objectives

Master Plans rely on the analysis and detailed policies developed in municipal Official Plans such as speed of growth, growth location, and types of growth to determine infrastructure needs.

The Municipality has chosen the following as its statement of the Problem and Opportunity Statement to be addressed by the Master Plan/PPCP:

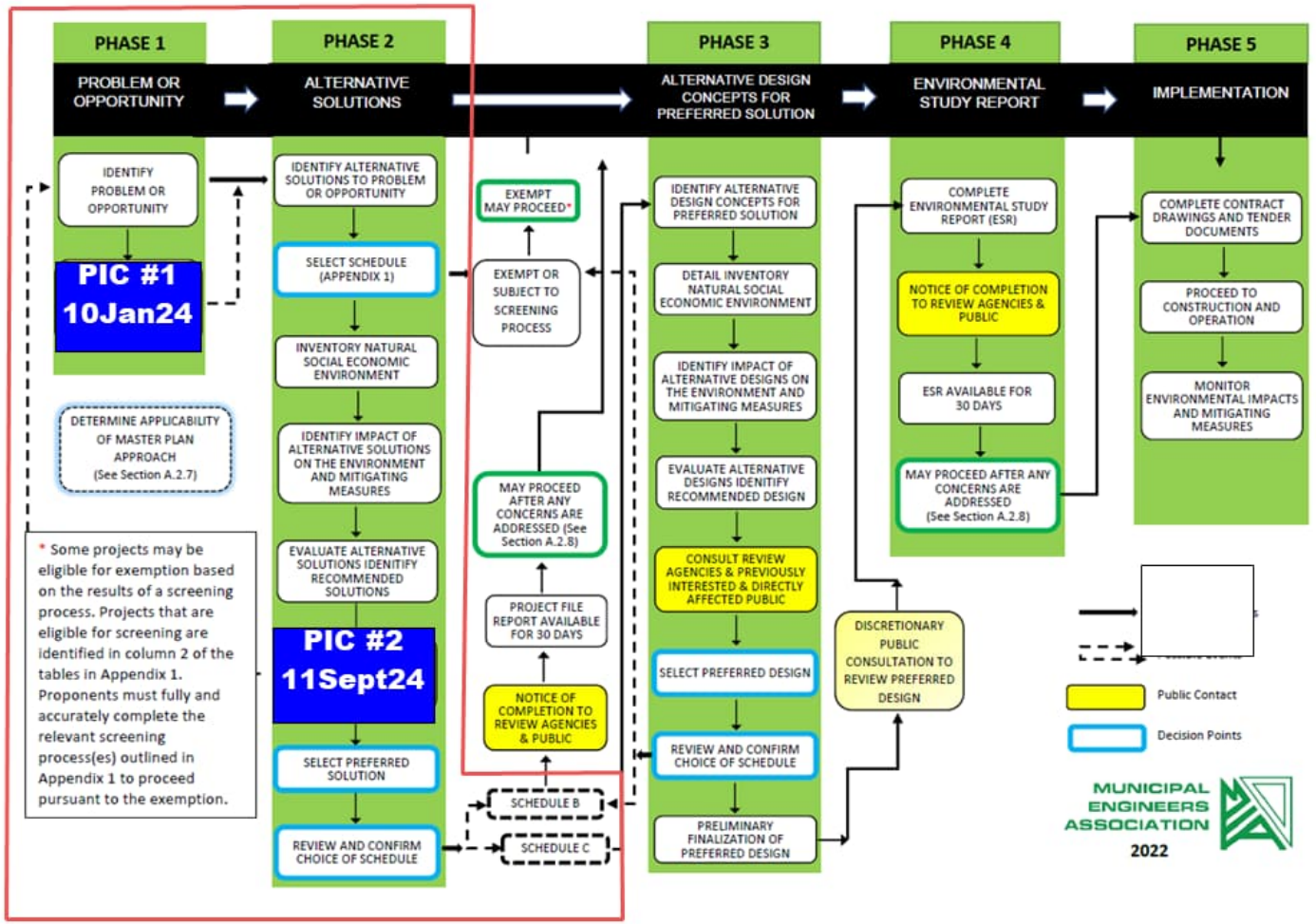
> *To identify preferred water and wastewater serving strategies to meet the Municipality of Strathroy-Caradoc's growth needs to 2046 as well as provide effective on-going continuity to existing serviced community areas across the Municipality of Strathroy-Caradoc as appropriate.*

The Master Plan follows Approach #1 of the MCEA process

A Pollution Prevention Control Plan (PPCP) is Intended to be a part of the Municipality's ongoing efforts to improve the performance of sanitary and storm sewer infrastructure

The Master Plan and PPCP focus on the two urban settlement areas (Strathroy and Mount Brydges)

Class EA / Master Plan Process

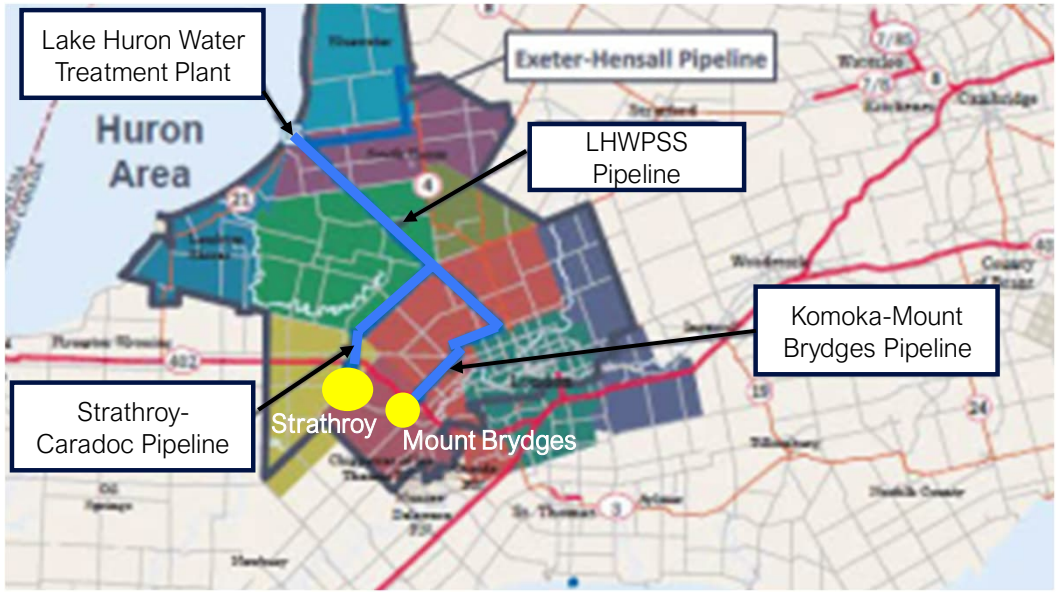


Master Plan Charter Principles

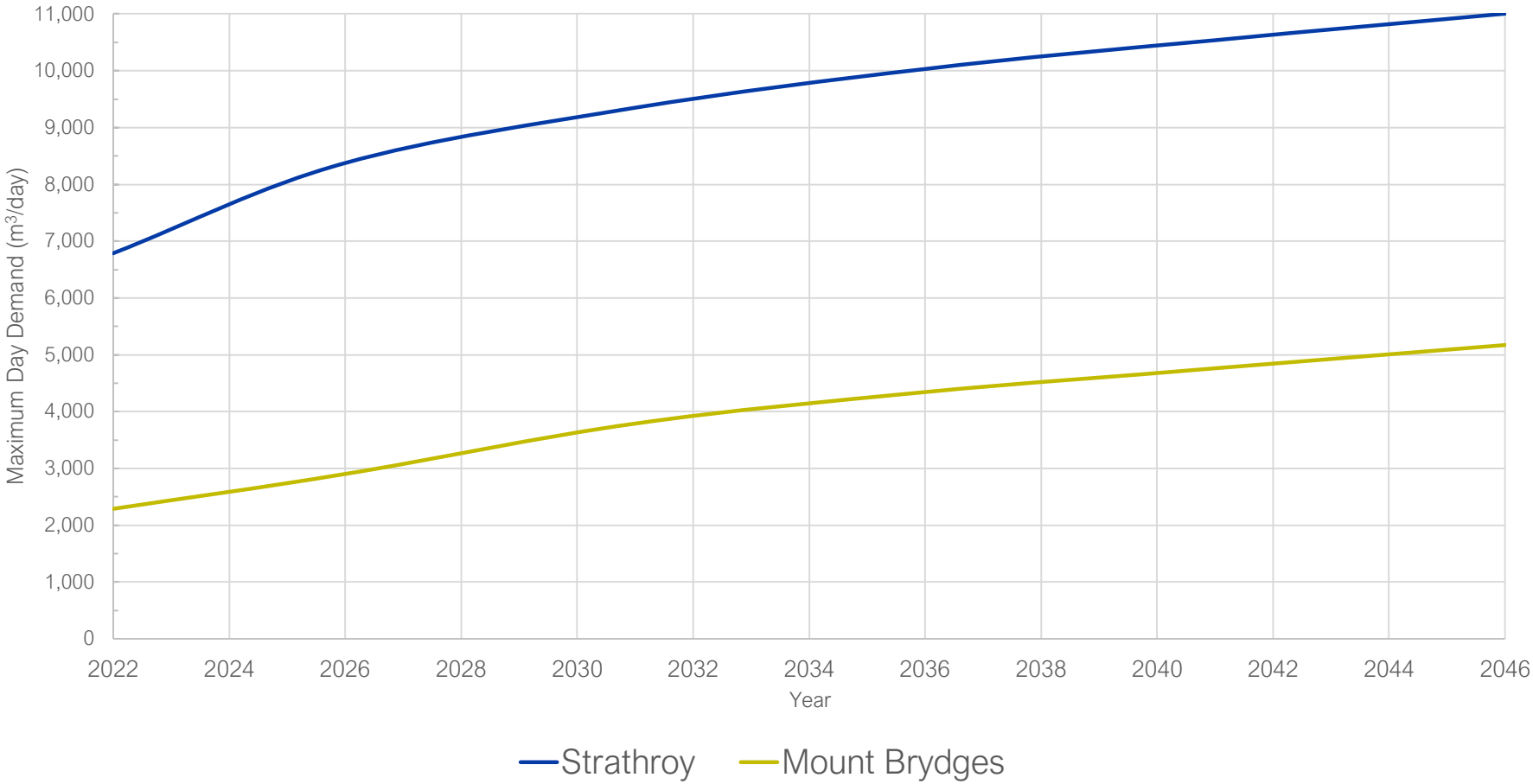
#	Principle
1	The Master Plan and PPCP should be informed by the Strathroy-Caradoc's Strategic Plan.
2	The Master Plan and PPCP should support the Strathroy-Caradoc's Official Plan and Green Initiatives and other initiatives to address Climate Change.
3	Master Plan and PPCP solutions should suit the Strathroy-Caradoc's Growth Plan – If Strathroy-Caradoc wishes growth in an area, the Master Plan would not prevent it.
4	Preference should be for long term servicing solutions over interim solutions.
5	All services to be fully funded through adequate planning, budgeting and identified revenue streams.
6	Master Plan and PPCP solutions should be developed which minimize risk to the Strathroy-Caradoc, users, and others during construction, commissioning, and operation of the upgrades.
7	The PPCP solution should integrate the collection system, pumping stations and the WWTFs to achieve the F-5-5-5 requirements.
8	Proven, cost effective technologies that should be in long term use and are capable of continuous improvement should be utilized.
9	Consider solutions that build upon the current assets provided they are still viable over the horizon of the Master Plan.
10	Recommended Master Plan solution be 20-year solutions and ensure that there is expandability to 40-years, if possible (or to the life expectancy of the infrastructure).
11	PPCP solutions should be long term solutions that "fix" the pollution issue.
12	Synergy - Look for synergies with current or potential future infrastructure requirements with other municipalities and regional systems if this is in the best interest of the Strathroy-Caradoc.
13	Minimize Complexity – Examples include minimizing mechanical components and pumping.

Water Distribution Systems

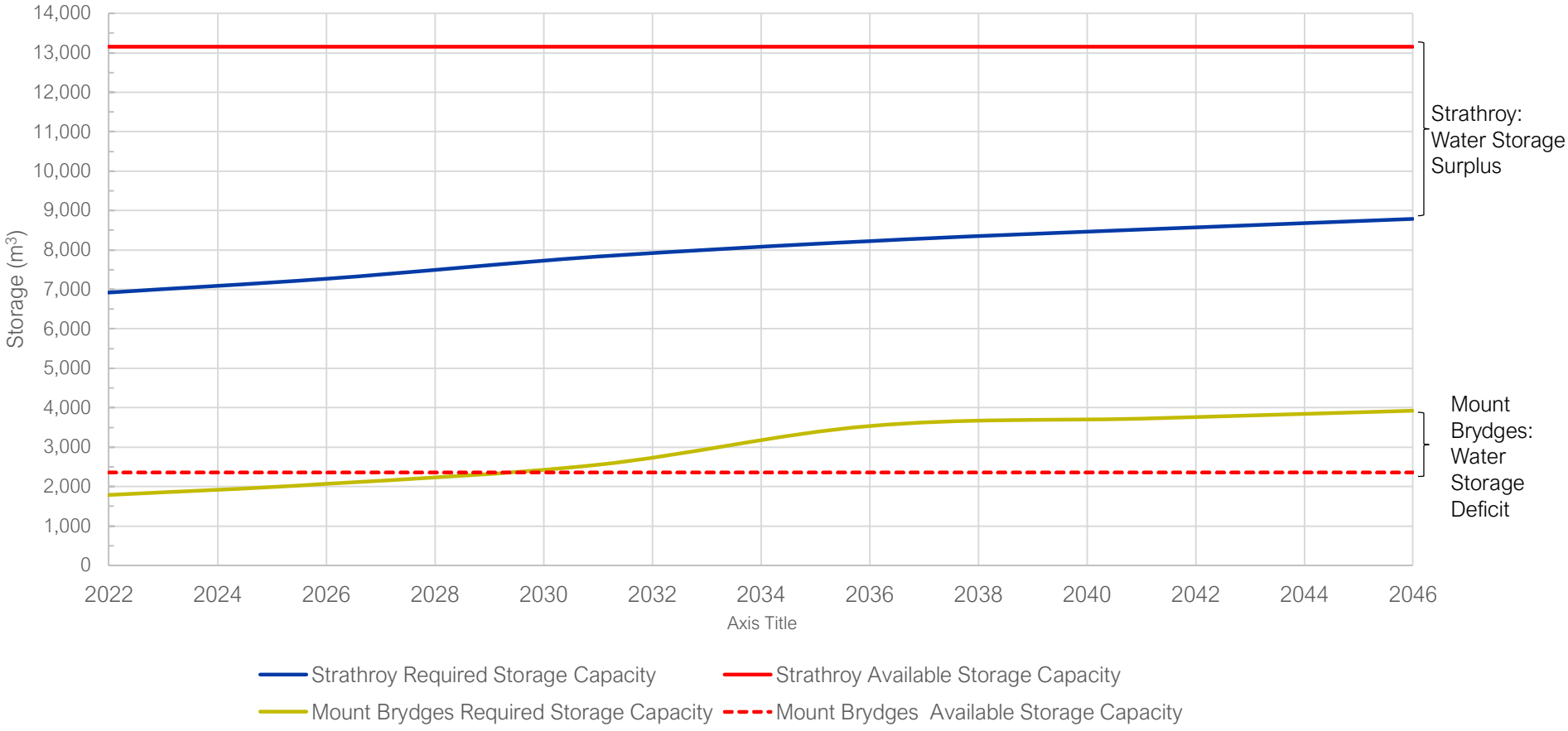
- Strathroy WDS and Mount Brydges WDS are both supplied water from the Lake Huron Primary Water Supply System (LHPWSS) through separate connections
- LHPWSS current capacity is 340 mega-litres per day and the 2023 maximum day flow was 198.5 ML/d
- The current water supply agreements with LHPWSS does not specify a maximum day limit on water supply to either community
- Water supply to address growth is not expected to be an issue given LHWPSS' capacity



Water Demand

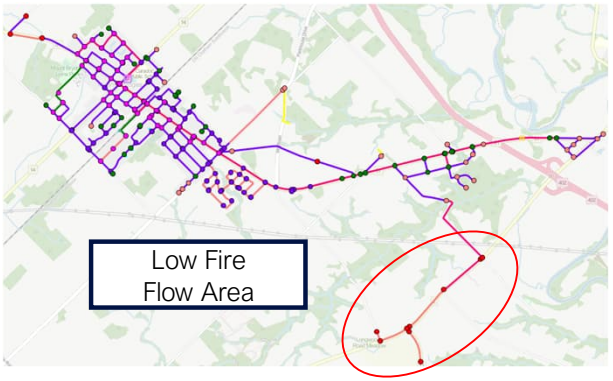


Water Storage



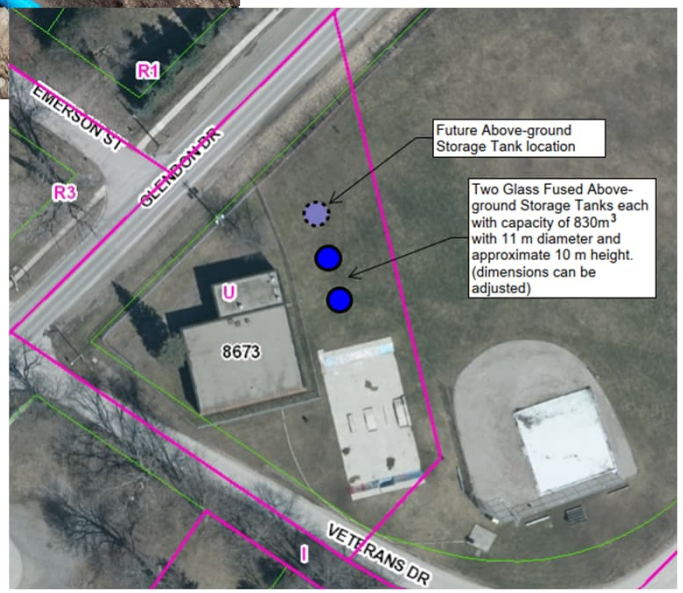
Water Modeling and Storage Assessment

- Undertook storage assessment and modeling WDS to 2046 expected demands
- Strathroy Findings
  - No issues were noted related to growth
  - 9 sections of undersized watermains in the distribution system that need to be upsized to meet fire flow targets
- Mount Brydges
  - Currently have 2,350 m^3 of storage but will need additional storage capacity by 2031 with a total required of 3,913 m^3 for 2046
  - Some isolated rural areas east of Adelaide Rd. and Gibson Rd. have lower than required fire flows



Recommended Water Strategy

- Upsize 9 sections of undersized watermains in Strathroy (2025 to 2035)
- Upgrade Mount Brydges storage with two above ground storage tanks on current Glendon Rd Storage Facility (2025-2026)
- Upgrading watermain sizes for isolated rural areas east of Adelaide Rd. and Gibson Rd. will impact water quality and operations, therefore treat these areas like rural residents for fire protection

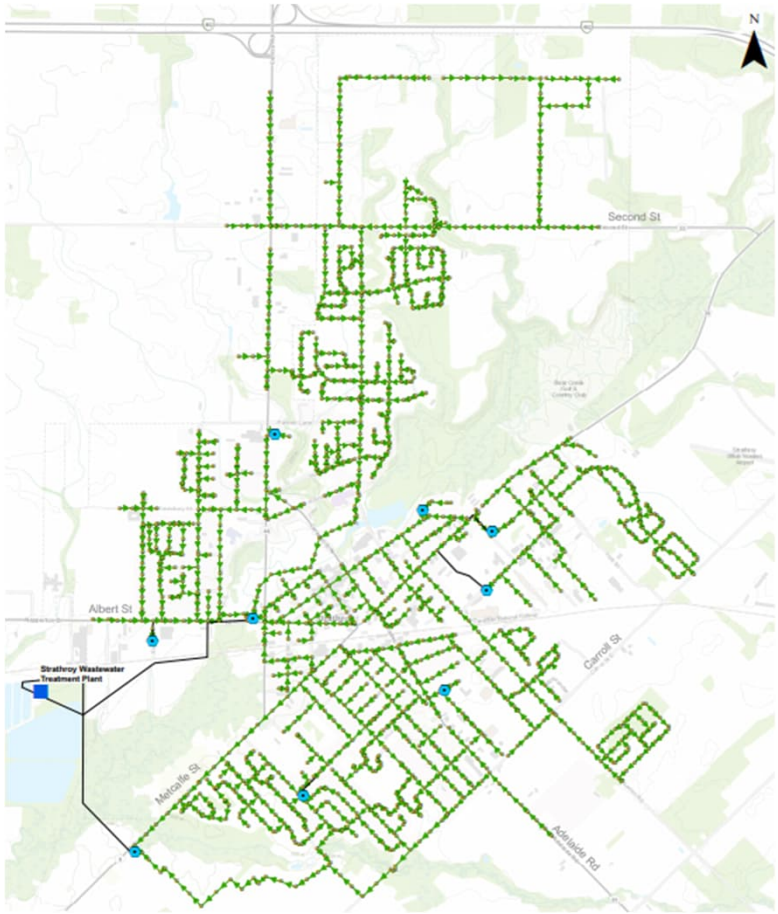


Strathroy – WW Collection and Treatment

- Wastewater flow projections to 2046 were undertaken and are shown in the table below

Parameter	2026	2031	2036	2041	2046
Population	18,200	20,300	21,800	22,900	23,900
Average Day Flow (ADF)	5,357	5,975	6,416	6,740	7,034

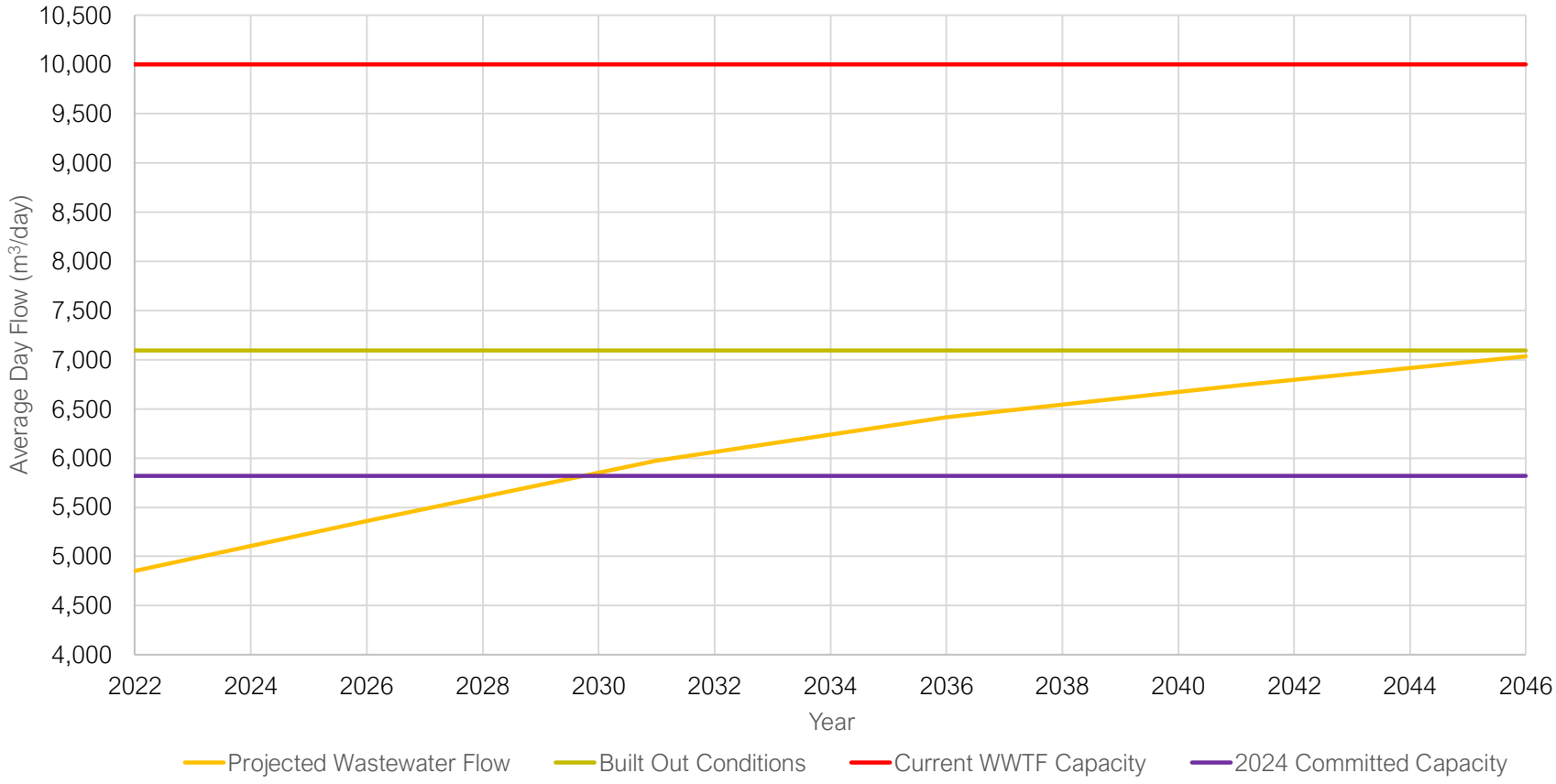
- The Strathroy wastewater collection system was modelled (PS, forcemains and sewers)
- Existing collection system adequate for flows to 2046
- The Strathroy WWTF has a ADF capacity of 10,000 m^3/day and does not need to be expanded for capacity in the period to 2046



Strathroy– WW Collection and Treatment

- Strathroy WWTF:
  - Due to operational issues, an upgrade program for WWTF was begun in 2020
  - Phase 1 of the upgrades was replacement of the tertiary filters which were in poor working condition (completed in 2022)
  - Phase 2 upgrades include:
    - Addition of a new lagoon with same capacity as the existing lagoon to provide redundancy including aeration
    - New air blowers replacing the existing blowers to supply the required air demand for both the existing and the new lagoons
    - Construction of a new headworks building
    - Modifications to the existing lagoon to provide the same level of treatment as the new lagoon
    - Replacement of the existing generator with new generator sized to include for upgrades
    - Modifications and additions to the yard works, electrical system, process piping and controls
  - This work is independent of the Master Plan and the costs for this are not included in any capital forecast projections

Strathroy Wastewater Flow Projection



Mount Brydges WW Collection and Treatment

- Wastewater flow projections to 2046 were undertaken and are shown in the table below

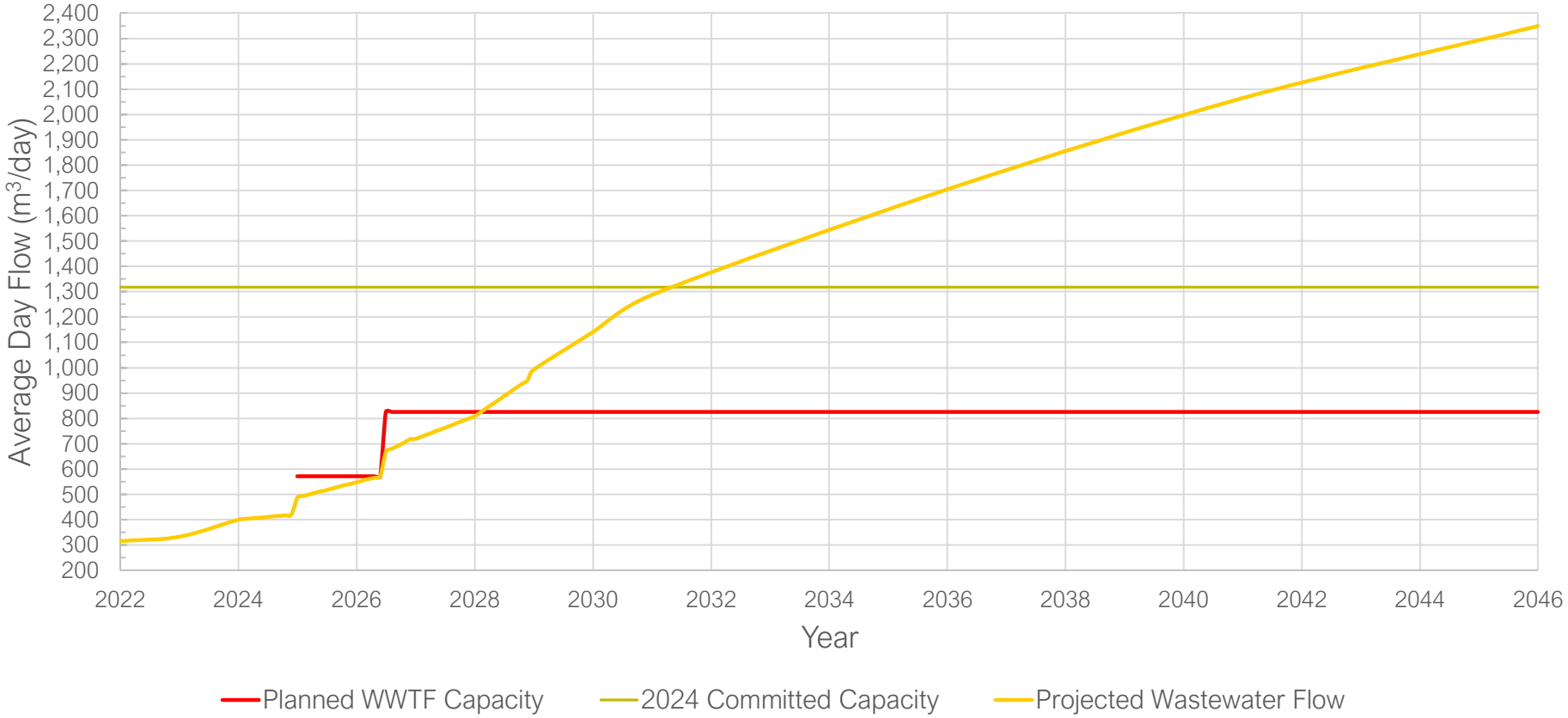
	Years				
Parameter	2026	2031	2036	2041	2046
Total Population	4,200	5,500	6,300	6,900	7,500
Connected Population Growth	2,295	4,111	5,440	6,593	7,500
WWTF Capacity Requirement (m^3/day)	718	1,287	1,703	2,064	2,348

- Municipality is intending to connect all population in Mount Brydges by 2046
- The Mount Brydges wastewater collection system was modelled (PS, forcemains and sewers)
- Existing collection system adequate for flows from currently connected areas
- Collection system will have to be upgraded to bring in existing non-serviced residents (not including new growth)

Mount Brydges – WW Collection and Treatment

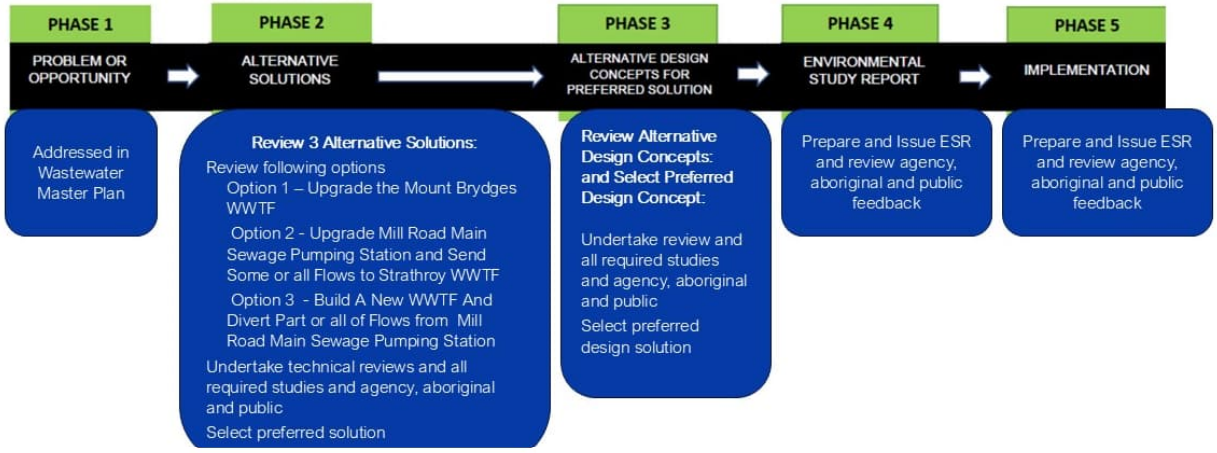
- Mount Brydges WWTF:
  - Constructed in 2011 and has a capacity of 825 m^3/day ADF per the Approval issued by MECP
  - WWTF consists of 2 Rotating Biological Contactors (RBC's); 2 Final Settling Tanks; Tertiary Filter System; 3 backwash filters; and UV Disinfection System
  - Operational constrains currently restrict the Mount Brydges WWTF to significantly less than allowable capacity
    - Municipality has actively engaged with MECP to mitigate these issues
    - These issues have not allowed the WWTF to operate to is allowable Capacity of 825 m^3/day
    - Municipality acted in 2021 to modify the Main SPS to better control peak flows to the WWTF
  - Resolution to this issue:
    - Construction of an equalization tank to provide an interim capacity of 571 m^3/day (expected completion December 2024)
    - Construction of headworks and conversion of biological process to Extended Aeration to restore treatment capacity of WWTF to 825 m^3/day (expected completion December 2026)
  - As this work is separate from the Master Plan, this work has not been included in the capital costs were not included in the Master Plan capital forecasts

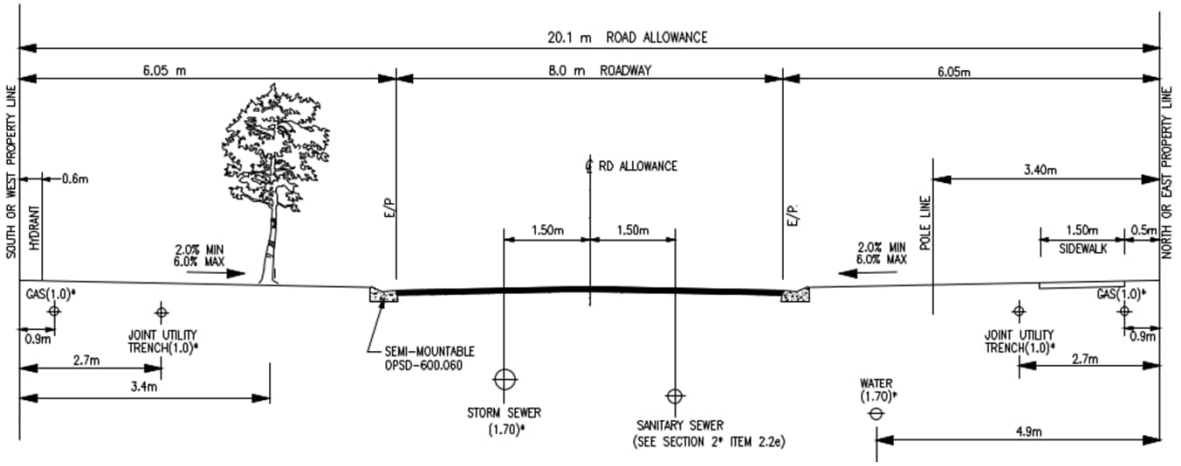
Mount Brydges Wastewater Flow Projection



Mount Brydges WW Capacity Expansion

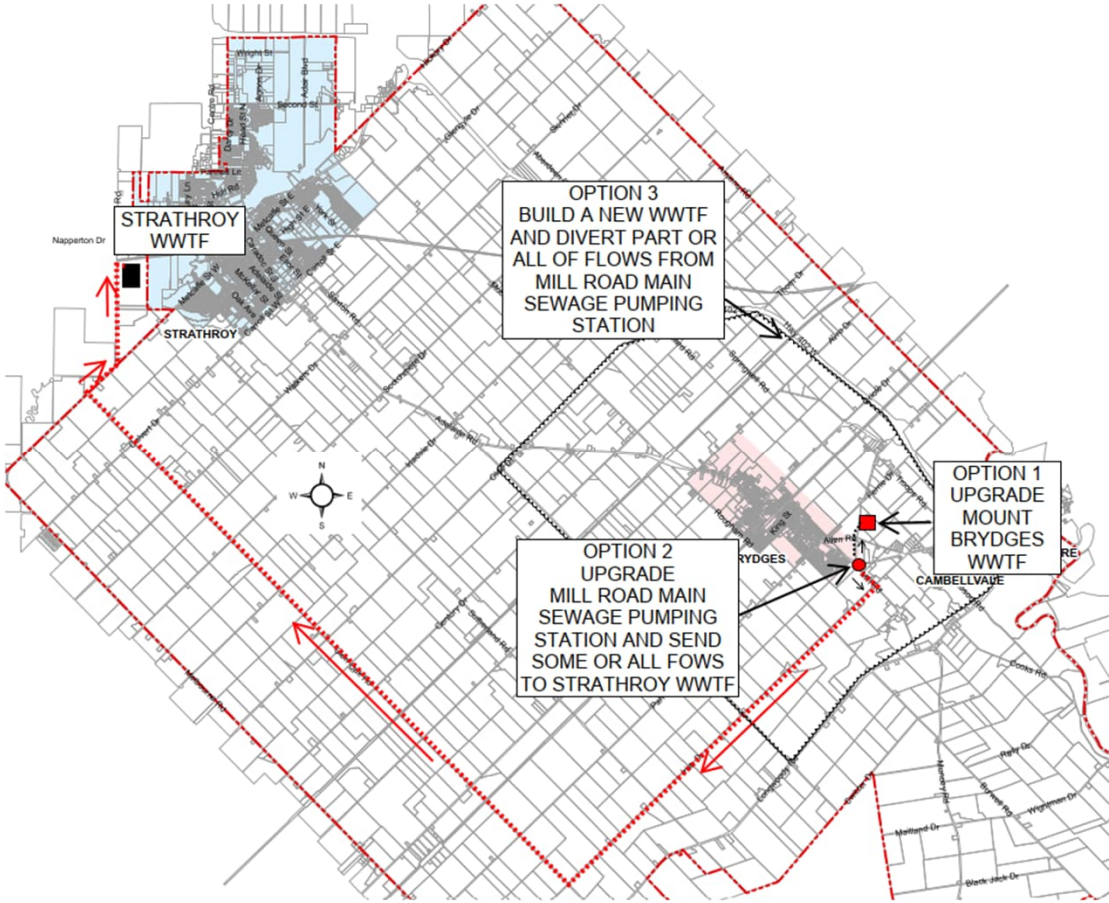
- WWTF treatment capacity of 825 m^3/day will be restored by end of 2026
- WWTF expansion from 825 to 2,348 m^3/day is required
- MCEA Schedule C Class EA study is required to confirm wastewater treatment capacity
- To connect the existing population, 11.6 km of new sanitary sewers will be required
- Road and storm sewers will be evaluated along with sanitary sewer construction





Mount Brydges WW Capacity Expansion

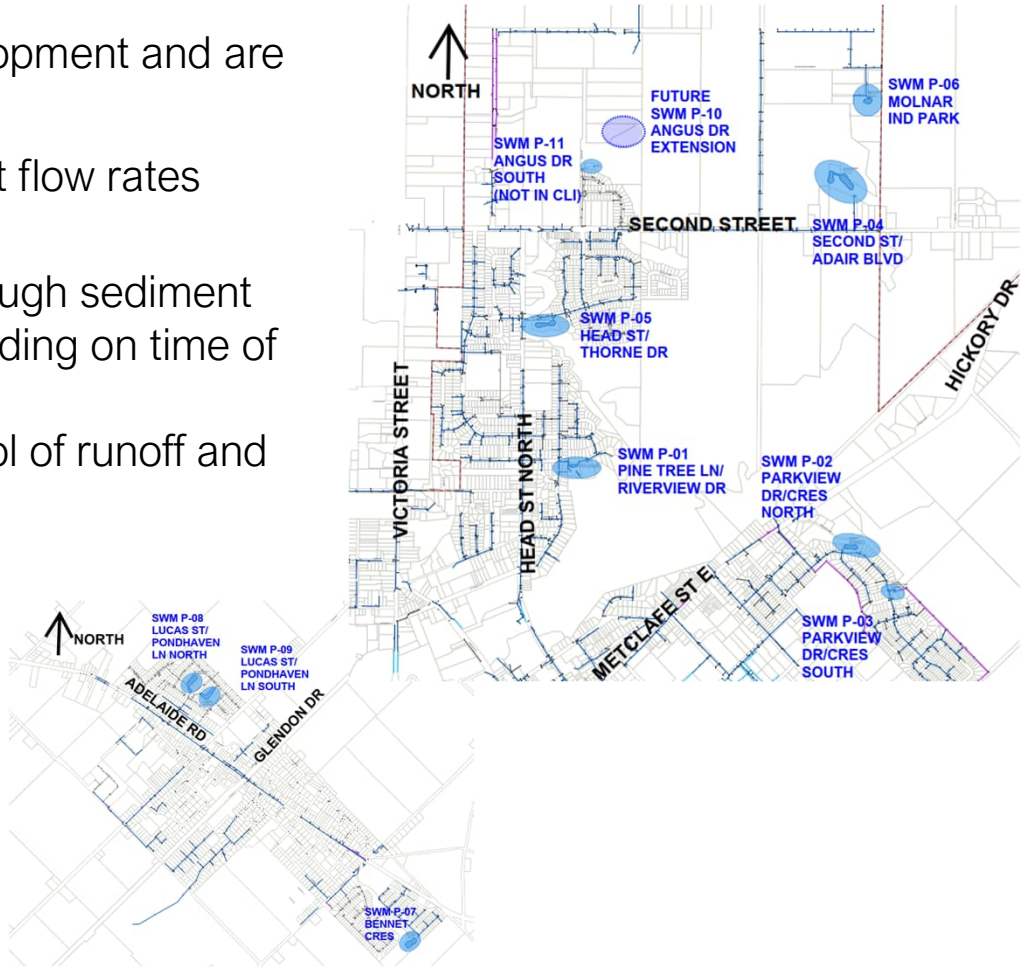
- Options :
  1. Upgrade Existing Mount Brydges WWTF
  2. Upgrade Mill Road Main Sewage Pumping Station and construct new forcemain to pump flows to Strathroy WWTF
  3. Build New WWTF, upgrade Mill Road Main Sewage Pumping Station and construct new forcemain to pump flows to New WWTF



Stormwater Management (SWM)

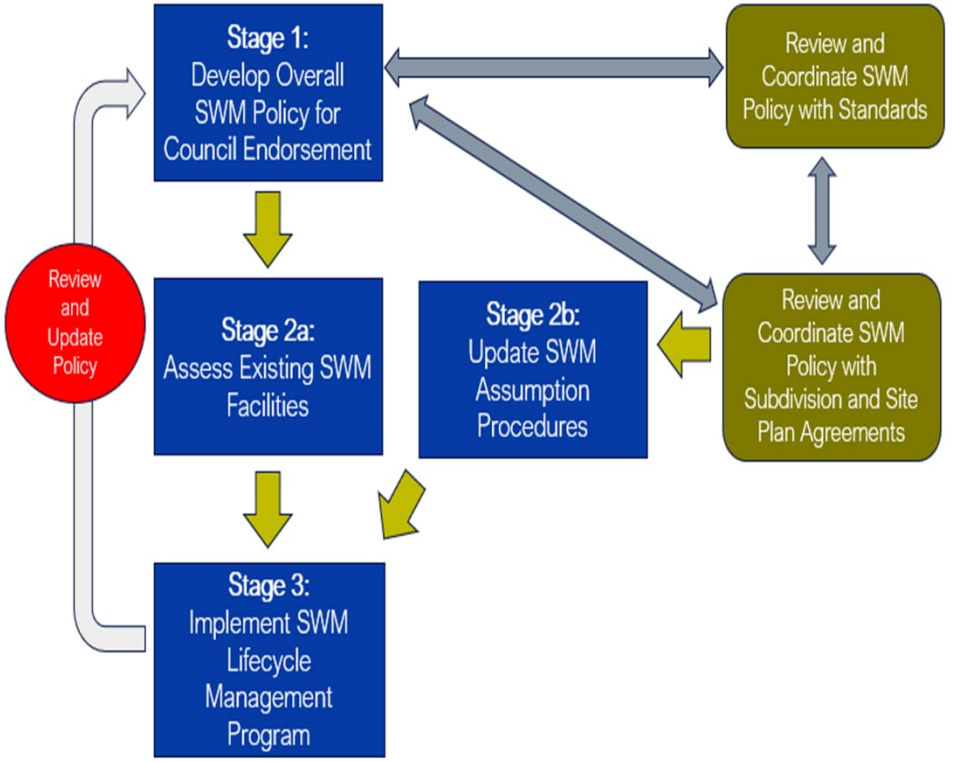
- SWM facilities are generally required for new development and are intended to protect the environment by:
  - Matching post development to predevelopment flow rates (quantity treatment)
  - Providing water quality treatment primarily through sediment removal with some biological treatment (depending on time of year)
  - Providing other benefits such as thermal control of runoff and environmental enhancement

- Municipality has 11 SWM facilities 10 of which are included in the MECP *Environmental Compliance Approval for a Municipal Stormwater Management System ECA Number: 058-S701*



Stormwater Management (SWM)

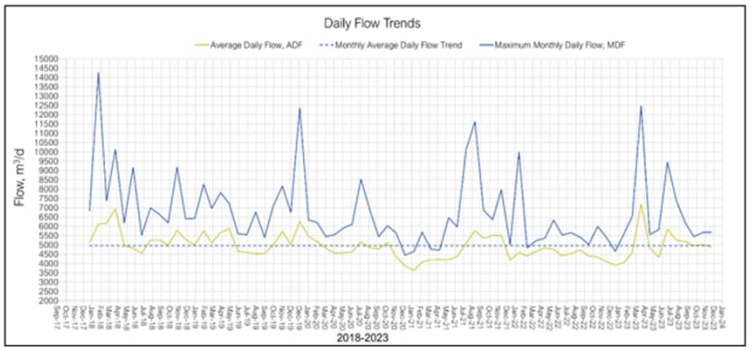
- Municipality's policies, standards, development agreements, capital budget and asset management plan was reviewed
- Gaps were noted in aspects of the Current Subdivision Agreement, Site Plan Agreement and the current SCSS
- The current 10-year capital plan appears to underfund the required management and maintenance of SWM Facilities tha is needed over their lifecycle to maintain function and reduce risks and impacts to Municipality
- Recommended program for SWM Facility management includes
    - Stage 1: Develop Overall SWM Policy for Council Endorsement
    - Stage 2: Update Procedures Facility Assessment and Assumption
    - Stage 3: Implement SWM Lifecycle Management Program to prioritize the rehabilitation of SWM Facilities

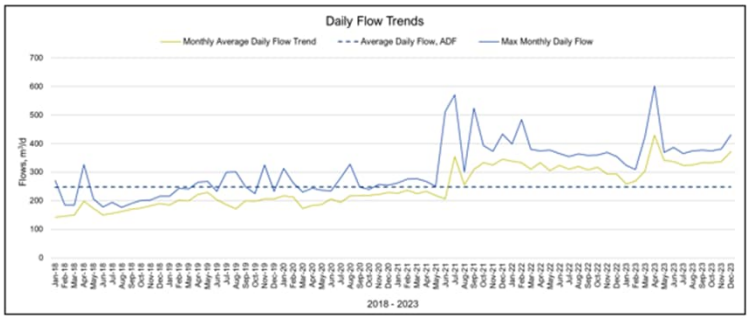


SWM Policy Implementation

Pollution Prevention Control Plan (PPCP)

- PPCP was
  - Undertaken concurrently with the Master Plan
  - Evaluated the collection system with regards to influence of extraneous flows via inflow and infiltration (I&I)
  - Used the hydraulic model of the Municipality's sanitary sewer system to characterize issues and develop solutions with respect to the ability of the system to convey normal and wet weather flows
  - Reviewed data on the quantity and quality of system overflows and by-passes and its impact to the natural environment
- Findings of PPCP were as follows:
  - A review of historical data from 2019 through 2023 did not find records of any overflows in the conveyance system in both Strathroy and Mount Brydges





Pollution Prevention Control Plan (PPCP)

- Findings of PPCP were as follows:
  - Modeling completed corroborated that the existing conveyance system will have sufficient capacity as flows increase to 2046
  - The Municipality had no recorded sewage overflows in the period reviewed and is therefore in compliance with MECP Procedure F-5-1 and F-5-5
  - A review of historical data from 2019 through 2023 found minor by-passes at the WWTFs in both Strathroy and Mount Brydges however none of these occurrences were caused by wet weather flows
  - By-passes at the Mount Brydges WWTF were the result of equipment failures and will be addressed through the on-going upgrades
- PPCP recommendations area as follows:
  - Any cross connections found should be addressed through separation and storm sewer installation
  - To improve the accuracy of the sanitary hydraulic model, combined sewer and pumping station surveys should be undertaken to gather any missing, incomplete or inaccurate data

Master Plan Cost Opinion

- Opinions are Class 5 based on a design definition of 0-2% complete and are considered to have a range of accuracy of -30% to +50%
- Linear construction costing is based on data from 2023 linear urban infrastructure renewal projects in Strathroy-Caradoc
- Water and wastewater facility and study costing is based on recent projects in Ontario
- SWM restoration costs are based on recent public tenders for the rehabilitation of SWM Facilities
- Hydraulic model costs include field work to confirm systems, upgrades to model from additional data and new infrastructure, and upgrades to modelling software over the time of the Master Plan
- It is recommended that the Municipality review the proposed projects identified and consider them within the context of:
  - The 10-year Capital Plan
  - The Asset Management Plan
  - Other Municipal policies, studies and initiatives
  - The Municipality's financial capacity
- NOTE: Cost estimates to not include current work being undertaken at Strathroy WWTF and Mount Brydges WWTF

Master Plan Cost Opinion

	Project	Area	Cost Opinion
Water System	**Water System**		
	Centre Street Watermain Upgrades	S	$840,000
	Concord Drive Watermain Upgrades	S	$760,000
	Riverview Drive Watermain Upgrades	S	$760,000
	Oak Avenue Watermain Upgrades	S	$1,830,000
	North Street Watermain Upgrades	S	$1,770,000
	Locke Heights Watermain Upgrades	S	$1,430,000
	Lamore Crescent Watermain Upgrades	S	$1,210,000
	Mill Pond Crescent Watermain Upgrades	S	$1,430,000
	Head Street Watermain Upgrades	S	$2,030,000
	Storage Upgrades	MB	$1,950,000
	Updating of Water Hydraulic Model	SC	$400,000
	Water Total		**$14,410,000**
Wastewater System	**Wastewater System**		
	WWTF Schedule C Class EA	MB	$350,000
	WWTF Cost	MB	$25,975,000
	Existing Servicing Phase 1-10	MB	$54,000,000
	Updating of Wastewater Hydraulic Model	SC	$600,000
	Wastewater Total		**$80,925,000**
SWM	**Stormwater Management**		
	Stage 1 SWM Policy Initial Policy & 1 Update	SC	$200,000
	Stage 2 SWM	SC	$315,000
	Stage 3 SWM	SC	$5,640,000
	Stormwater Total		**$6,155,000**
PPCP	**Pollution Prevention Control Plan**		
	PPCP Data Collection to Update WW Hydraulic Model	SC	$300,000
	PPCP Total		**$300,000**
		TOTAL	$101,790,000

Strathroy – Caradoc W/WW SWM MP and PPCP

Material on this meeting will be posted on the **News & Public Notices Page:**

https://www.strathroy-caradoc.ca/en/city-hall/water-wastewater-and-stormwater-master-plan-and-pollution-prevention-control-plan.aspx

Please feel free to ask a question or submit your comments via email or phone a member of the study team.

We would request that questions and comments be submitted by September 25, 2024, so that the Municipality can complete the Master Plan process.

Paul Zuberbuhler B.Sc, B.Comm, C.E.T.
Manager of Environmental Services
Municipality of Strathroy-Caradoc
Tel: 519-245-1105 ext. 274
pzuberbuhler@strathroy-caradoc.ca
52 Frank Street
Strathroy ON N7G 2R4

John Tyrrell, M.Sc. (Eng.), P. Eng.
Senior Project Manager
R.V. Anderson Associates Limited
Tel: 519-681-9916 ext. 5038
jtyrrell@rvanderson.com
557 Southdale Road East, Suite 200
London, ON N6E 1A2

PIC # 2
COMMENTS RECEIVED
IN COMMENT BOX

Municipality of Strathroy-Caradoc

Comments and Questions Form

Water, Wastewater and Stormwater Master Plan and Pollution Prevention Control Plan

If you have any comments/questions you would like to provide to the Study Team, please fill out this form. The Study Team will review your comments and send you a response.

Name:	TERRY FLEGEL
Contact Information: *(to provide a reply)*	***Please provide one of the following:*** *email address* ***OR*** *phone number* ***OR*** *mailing address* (519) 264-2321

Comments and Questions:
We have severe water issues in our area and would like to hear some solutions.

Space for additional comments is available on the back of the page

Please submit comments in comment box at meeting or else forward your comments to the following members of the study team below:

Paul Zuberbuhler B.Sc, B.Comm, C.E.T

Manager of Environmental Services
Municipality of Strathroy-Caradoc
Tel: 519-245-1105 ext. 274
pzuberbuhler@strathroy-caradoc.ca
52 Frank Street
Strathroy ON N7G 2R4

John Tyrrell, M.Sc. (Eng.), P. Eng.

Senior Project Manager
R.V. Anderson Associates Limited
Tel: 519-681-9916 ext. 5038
jtyrrell@rvanderson.com
557 Southdale Road East, Suite 200
London, ON N6E 1A2

Municipality of Strathroy-Caradoc

Comments and Questions Form

Water, Wastewater and Stormwater Master Plan and Pollution Prevention Control Plan

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Name:	Douglas McPhee
Contact Information: *(to provide a reply)*	***Please provide one of the following:*** *email address **OR** phone number **OR** mailing address* mistermcphee@gmail.com

Comments and Questions:
We understand this is a master plan meeting, but we encourage you to include more local projects in the presentation because it is not likely the municipality is going to hold a special meeting for a community the size of Ompellhale. Could you also consider posting an agenda.

Space for additional comments is available on the back of the page

Please submit comments in comment box at meeting or else forward your comments to the following members of the study team below:

Paul Zuberbuhler B.Sc, B.Comm, C.E.T

Manager of Environmental Services
Municipality of Strathroy-Caradoc
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Municipality of Strathroy-Caradoc

Comments and Questions Form

Water, Wastewater and Stormwater Master Plan and Pollution Prevention Control Plan

If you have any comments/questions you would like to provide to the Study Team, please fill out this form. The Study Team will review your comments and send you a response.

Name:	Catherine Nikota
Contact Information: *(to provide a reply)*	***Please provide one of the following:*** *email address* ***OR*** *phone number* ***OR*** *mailing address* catherniko@yahoo.ca

Comments and Questions:

Campbellvale has significant stormwater issues due to a lack of proper drainage & a high water table. Individual residents have implemented individual solutions that have caused additional issues for their neighbours. All homes have septic systems that can be compromised by these compounding issues. In addition, mature (30yr.) trees have been lost. We need a collective municipally funded + implemented solution to resolve these issues.

Space for additional comments is available on the back of the page

Please submit comments in comment box at meeting or else forward your comments to the following members of the study team below:

Paul Zuberbuhler B.Sc, B.Comm, C.E.T

Manager of Environmental Services
Municipality of Strathroy-Caradoc
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pzuberbuhler@strathroy-caradoc.ca
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Senior Project Manager
R.V. Anderson Associates Limited
Tel: 519-681-9916 ext. 5038
jtyrrell@rvanderson.com
557 Southdale Road East, Suite 200
London, ON N6E 1A2

APPENDIX 1.4

Responses Received

Public Responses

Samya Chams

From: Jim Banman <jim@cirrusdevelopments.ca>
Sent: November 24, 2023 4:53 PM
To: Darika Sharma
Cc: Paul Zuberbuhler; John Tyrrell
Subject: Re: Strathroy-Caradoc Water, Wastewater &Stormwater Management Master Plan - Notice of Study Commencement

Categories: Filed by Newforma

Thank you for providing me with the notice of the study.
Please continue to keep me informed on any developments in this particular study, and I look forward to any participation that may be of value to the community.

Kind Regards
Have a good weekend.

JIM BANMAN
PRESIDENT

CIRRUS
DEVELOPMENTS

4090 CARRIAGE ROAD, DELAWARE, ON, N0L 1E0
E: JIM@CIRRUSDEVELOPMENTS.CA P: 519-630-5800

On Nov 21, 2023, at 9:17 PM, Darika Sharma <DSharma@rvanderson.com> wrote:

Good Evening,

The Municipality of Strathroy-Caradoc has initiated the process of developing a Water, Wastewater and Stormwater Management Master Plan (WWWSWM MP) that will be supported by a Pollution Prevention Control Plan (PPCP). The WWWSWM MP will provide the Municipality with strategic long-term water and wastewater servicing, and stormwater management strategies that support existing needs and accommodate projected population and employment growth to the year 2046. The PPCP will provide a road map for implementing the identified infrastructure and operational improvements.

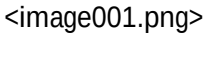
You have been identified as potentially having interest and/or information that may assist the study team in developing the Master Plan.

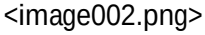
Attached, please the Notice of Study Commencement regarding this study.

Thank you,

Darika Sharma, M.Eng, EIT

Process Designer

 R.V. Anderson Associates Limited
557 Southdale Road East, Suite 200, London ON N6E 1A2
t 519 681 9916 ext. 5032 | m 647 648 0461
LinkedIn | Facebook | Website



<Notice of Study Commencement 2023Nov21.pdf>

Samya Chams

From:	katelyn.c@zpplan.com
Sent:	December 4, 2023 1:26 PM
To:	pzuberbuhler@strathroy-caradoc.ca; John Tyrrell
Cc:	'Randy Lucas'; 'Jared Flynn'; 'Dave Hannam'
Subject:	Strathroy-Caradoc Water, Wastewater &Stormwater Management Master Plan - Notice of Study Commencement

Hi Paul and John,

We received notice thatr the Municipality has initiated the process of developing a Water, Wastewater and Stormwater Management Master Plan (WWWSWM MP) that will be supported by a Pollution Prevention Control Plan (PPCP). I would like to ensure that myself, along with those cc'd on this email, be added to the circulation list for any updates or information on this process. We are consultants for the owner of the below noted properties:

137 Frank St, Strathroy
25788 Melbourne Rd, Strathroy
8396 Glengyle Drive, Strathroy

Kind Regards,

Katelyn Crowley, BA
Intermediate Planner

Zelinka Priamo Ltd.
London Office

318 Wellington Rd.
London, ON N6C 4P4
Office: 519-474-7137
Cell: 519-319-6092
Katelyn.c@zpplan.com
www.zpplan.com

Samya Chams

From: Rob Brunet <rob@brunetco.com>
Sent: January 10, 2024 12:40 PM
To: John Tyrrell
Cc: Anthony Gubbels; Darika Sharma; Paul Zuberbuhler
Subject: RE: Strathroy-Caradoc Water, Wastewater &Stormwater Management Master Plan - Notice of Study Commencement

Thank-you, John. We are aware of the current plan for Delaware, which includes a forcemain to pump wastewater up to the Komoka WWTP. The fifteen year old plan for Delaware has not been acted upon, to my understanding due to cost, and there continue to be issues for Delaware residents on septic systems due to seasonal flooding and high groundwater tables. This is a longstanding problem and the Mayor was thus receptive to exploring alternative solutions, particularly those that allow Delaware to be serviced by gravity to a downstream WWTP that is shared with Strathroy-Caradoc, which is at least partially funded through available infrastructure grants arising from the Province's Affordable Housing initiatives.

The topography of Mt. Brydges is complex, with three watersheds and several pumping stations required to service existing development. For future growth to be cost effective for the municipality, careful analysis of servicing cost for land proposed to be added to the settlement boundary needs to be undertaken as part of an integrated approach to updating the OP. I have spoken publicly about the need for the OP amendment process to consider the Stormwater and Sanitary Servicing Master Plan as a key input before final boundary decisions are made, in an effort to eliminate the need for additional pumping stations and stormwater flowing across watershed boundaries. I look forward to speaking with you tonight about the topographical analysis we conducted and what we consider to be the best long term solution (a new WWTP downstream of Delaware on the Thames), with short term solutions that effectively utilize existing infrastructure to facilitate the current growth needs of Strathroy-Caradoc.

Best regards,

Robert A.H. Brunet, BESc., MESc., P.Eng
Principal | Registered Patent Agent
T **+1-877-880-6043 x101**
P **+1-519-474-0700**
F **+1-519-474-0800**
E **rob@brunetco.com**

Schedule a Meeting

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Toronto, ON, CANADA M5H 2Y4

495 Richmond St., Suite 501,
London, ON, CANADA N6A 5A9 | brunetco.com

From: John Tyrrell <JTyrrell@rvanderson.com>
Sent: Monday, January 8, 2024 8:57 AM
To: Rob Brunet <rob@brunetco.com>
Cc: Anthony Gubbels <anthony.gubbels@LDSConsultants.ca>; Darika Sharma <DSharma@rvanderson.com>; Paul Zuberbuhler <pzuberbuhler@strathroy-caradoc.ca>
Subject: RE: Strathroy-Caradoc Water, Wastewater &Stormwater Management Master Plan - Notice of Study Commencement

Hi Rob,

We do acknowledge receipt of your November 23rd email and your comments will be considered when we undertake the Wastewater Master Planning portion of this assignment.

Additionally, your correspondence will be included in the Master Plan document when it is prepared and submitted for public review.

You may wish to review your proposal as the current Middlesex Centre Master Servicing Plan (https://www.middlesexcentre.on.ca/articles/servicing-master-plan) envisages wastewater from Delaware being sent to the Komoka WWTP via a pumping station. The Komoka WWTP was upgraded in 2008 with the intention of being expanded to take in flows from new and existing development in Delaware. That appears to be the current plan.

John Tyrrell, M.Sc.(Eng.), P.Eng.
Associate/Regional Manager

R.V. Anderson Associates Limited
557 Southdale Road East, Suite 200, London ON N6E 1A2
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LinkedIn | Facebook | Website

From: Rob Brunet <rob@brunetco.com>
Sent: Friday, January 5, 2024 2:21 PM
To: Darika Sharma <DSharma@rvanderson.com>; Paul Zuberbuhler <pzuberbuhler@strathroy-caradoc.ca>
Cc: John Tyrrell <JTyrrell@rvanderson.com>; Anthony Gubbels <anthony.gubbels@LDSConsultants.ca>
Subject: RE: Strathroy-Caradoc Water, Wastewater &Stormwater Management Master Plan - Notice of Study Commencement

[CAUTION EXTERNAL EMAIL] Make Sure that it is legitimate **before** Replying or Clicking on any links

Hi Darika,

Happy New Year to you. I am following up on this correspondence of November 23. I did not receive any acknowledgement of receipt of the correspondence, nor a response to my offer to meet with you and the project team to discuss the engineering work we conducted.

Can you please confirm receipt and advise whether you wish to meet?

Best regards,

Robert A.H. Brunet, BESc., MESc., P.Eng
Principal | Registered Patent Agent
T **+1-877-880-6043 x101**
P **+1-519-474-0700**
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495 Richmond St., Suite 501,
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From: Rob Brunet
Sent: Thursday, November 23, 2023 7:37 PM
To: Darika Sharma <DSharma@rvanderson.com>; Paul Zuberbuhler <pzuberbuhler@strathroy-caradoc.ca>
Cc: John Tyrrell <JTyrrell@rvanderson.com>; Anthony Gubbels <anthony.gubbels@LDSConsultants.ca>
Subject: RE: Strathroy-Caradoc Water, Wastewater &Stormwater Management Master Plan - Notice of Study Commencement

Hi Darika,

During the Public Meeting held April 19, 2022, to review Strathroy-Caradoc's Development Charges By-Law, I presented to Council the attached information. This package of information was prepared by our engineering consultant, Land Development Solutions Inc. (LDS), and includes a topographic study and assessment of constraints and capabilities of existing wastewater infrastructure.

The ultimate conclusion of the work was to support the construction of a new facility (or at least the purchase of land in anticipation of the need for such a facility in future) along the Thames river near Longwoods Rd. Importantly, such a

facility could be shared with the neighboring Municipality of Middlesex Centre, which is faced with a servicing constraint that limits further development in the Town of Delaware. I have also included a letter of support for further investigation of a shared WWTF from the Mayor of Middlesex Center and have received a verbal indication from the previous Minister of Infrastructure that financial support would be available, particularly given the urgent need to provide housing in the Province.

Much of the detailed engineering work behind this study is not provided in these high-level documents presented to Council. Both Anthony Gubbels of LDS and I are available for further discussion of these details at an appropriate time, in the spirit of reaching an optimal sanitary servicing solution for the Municipality.

Best regards,

Robert A.H. Brunet, BESc., MESc., P.Eng
Principal | Registered Patent Agent

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From: Darika Sharma <DSharma@rvanderson.com>
Sent: Tuesday, November 21, 2023 9:18 PM
To: Paul Zuberbuhler <pzuberbuhler@strathroy-caradoc.ca>
Cc: John Tyrrell <JTyrrell@rvanderson.com>
Subject: Strathroy-Caradoc Water, Wastewater &Stormwater Management Master Plan - Notice of Study Commencement

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Thank you,

Darika Sharma, M.Eng, EIT

Process Designer

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t 519 681 9916 ext. 5032 | m 647 648 0461

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Samya Chams

From:	Rob Brunet <rob@brunetco.com>
Sent:	November 23, 2023 7:37 PM
To:	Darika Sharma; Paul Zuberbuhler
Cc:	John Tyrrell; Anthony Gubbels
Subject:	RE: Strathroy-Caradoc Water, Wastewater &Stormwater Management Master Plan - Notice of Study Commencement
Attachments:	Conceptual Sanitary Servicing Master Plan; RE: Conceptual Sanitary Servicing Master Plan

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Best regards,

Robert A.H. Brunet, BESc., MESc., P.Eng
Principal | Registered Patent Agent

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Toronto, ON, CANADA M5H 2Y4

495 Richmond St., Suite 501,

From: Darika Sharma <DSharma@rvanderson.com>
Sent: Tuesday, November 21, 2023 9:18 PM
To: Paul Zuberbuhler <pzuberbuhler@strathroy-caradoc.ca>
Cc: John Tyrrell <JTyrrell@rvanderson.com>
Subject: Strathroy-Caradoc Water, Wastewater &Stormwater Management Master Plan - Notice of Study Commencement

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Thank you,

Darika Sharma, M.Eng, EIT

Process Designer

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557 Southdale Road East, Suite 200, London ON N6E 1A2
t 519 681 9916 ext. 5032 | m 647 648 0461
LinkedIn | Facebook | Website

Samya Chams

From:	Paul Zuberbuhler <pzuberbuhler@strathroy-caradoc.ca>
Sent:	January 9, 2024 8:56 AM
To:	R L Demeulenaere
Cc:	John Tyrrell; Darika Sharma
Subject:	RE: Strathroy-Caradoc Water, Wastewater &Stormwater Management Master Plan - Notice of Study Commencement
Attachments:	Notice-of-Public-Information-Session-1.pdf

Hi Loretta,
Thank you for your email. Please see attached with regards to date/time of the Public Information Session on Wednesday.

Regards,

Paul Zuberbuhler B.Sc, B.Comm, C.E.T.
Manager of Environmental Services

Municipality of Strathroy-Caradoc
52 Frank Street | Strathroy, ON | N7G 2R4

Phone: 519-245-1105 x274
Email: pzuberbuhler@strathroy-caradoc.ca

Visit us online at www.strathroy-caradoc.ca

From: R L Demeulenaere <Ronnie.loretta@hotmail.com>
Sent: January-09-24 8:52 AM
To: Paul Zuberbuhler <pzuberbuhler@strathroy-caradoc.ca>
Subject: FW: Strathroy-Caradoc Water, Wastewater &Stormwater Management Master Plan - Notice of Study Commencement

Good morning Paul.
We received the attached email back in November. I am not sure why we are on the list to receive the email. We have land that is in the proposed boundary for future expansion of Mt Brydges.

Is there a meeting that is coming up regarding this study?

Thank you,
Loretta Demeulenaere

From: Darika Sharma <DSharma@rvanderson.com>
Sent: November 21, 2023 9:18 PM
To: Paul Zuberbuhler <pzuberbuhler@strathroy-caradoc.ca>
Cc: John Tyrrell <JTyrrell@rvanderson.com>
Subject: Strathroy-Caradoc Water, Wastewater &Stormwater Management Master Plan - Notice of Study Commencement

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You have been identified as potentially having interest and/or information that may assist the study team in developing the Master Plan.

Attached, please the Notice of Study Commencement regarding this study.

Thank you,

Darika Sharma, M.Eng, EIT

Process Designer

R.V. Anderson Associates Limited
557 Southdale Road East, Suite 200, London ON N6E 1A2
t 519 681 9916 ext. 5032 | m 647 648 0461
LinkedIn | Facebook | Website

Samya Chams

From: Colin Grantham <cgrantham@strathroy-caradoc.ca>
Sent: November 22, 2023 9:04 AM
To: Darika Sharma; Paul Zuberbuhler
Cc: John Tyrrell
Subject: RE: Strathroy-Caradoc Water, Wastewater &Stormwater Management Master Plan - Notice of Study Commencement

Thanks and I look forward to chatting

Colin J Grantham

Mayor of Strathroy-Caradoc
Middlesex County Councillor
519 808 0614

From: Darika Sharma <DSharma@rvanderson.com>
Sent: November 21, 2023 9:18 PM
To: Paul Zuberbuhler <pzuberbuhler@strathroy-caradoc.ca>
Cc: John Tyrrell <JTyrrell@rvanderson.com>
Subject: Strathroy-Caradoc Water, Wastewater &Stormwater Management Master Plan - Notice of Study Commencement

Good Evening,

The Municipality of Strathroy-Caradoc has initiated the process of developing a Water, Wastewater and Stormwater Management Master Plan (WWWSWM MP) that will be supported by a Pollution Prevention Control Plan (PPCP). The WWWSWM MP will provide the Municipality with strategic long-term water and wastewater servicing, and stormwater management strategies that support existing needs and accommodate projected population and employment growth to the year 2046. The PPCP will provide a road map for implementing the identified infrastructure and operational improvements.

You have been identified as potentially having interest and/or information that may assist the study team in developing the Master Plan.

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Thank you,

Darika Sharma, M.Eng, EIT

Process Designer

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t 519 681 9916 ext. 5032 | m 647 648 0461

LinkedIn | Facebook | Website

Samya Chams

From: Paul Zuberbuhler <pzuberbuhler@strathroy-caradoc.ca>
Sent: January 17, 2024 7:32 AM
To: Darika Sharma
Cc: John Tyrrell
Subject: FW: Water, Waste Water and Stormwater Master Plan …

[CAUTION EXTERNAL EMAIL] Make Sure that it is legitimate **before** Replying or Clicking on any links

FYI

Regards,

Paul Zuberbuhler B.Sc, B.Comm, C.E.T.
Manager of Environmental Services

Municipality of Strathroy-Caradoc
52 Frank Street | Strathroy, ON | N7G 2R4

Phone: 519-245-1105 x274
Email: pzuberbuhler@strathroy-caradoc.ca

Visit us online at www.strathroy-caradoc.ca

From: catherine nikota <catherniko@yahoo.ca>
Sent: January-16-24 7:08 PM
To: Paul Zuberbuhler <pzuberbuhler@strathroy-caradoc.ca>; jtyrrell@rvanderson.com
Subject: Water, Waste Water and Stormwater Master Plan ...

Why did we not receive proper notice of the Master Plan meeting? A friend of a friend of a friend let us know. All affected residents should have had proper and ample notice.

Why is Campbellvale not included in the Water, Wastewater & Stormwater Master Plan?

It should be. We have serious stormwater drainage issues that are killing trees and could cause septic systems to fail. Between our backyard neighbour and ourselves we have lost 8, 30 year old cedar trees due to the stormwater that has accumulated in our back yards during the heavy spring rains we've experienced in recent years. We have moved dirt to our yard in a attempt to resolve the issue, to no avail. The rain we received in the spring of 2023 was so significant, we had a small lake in our yard complete with ducks. We had to buy a pump and very long hose to direct the water to the drains on Highway 81 or we would cause flooding issues for our neighbours to the east of us. It took several days to

remove most of the water. Still it took a few months for the ground to dry sufficiently to be able to cut the grass. We invited a person from the municipality to come and see our issue. Nothing was resolved.

The problems we are experiencing cannot be resolved by a single individual homeowner without negatively affecting the surrounding neighbours.

Campbellvale and the proposed development that may take place in the vicinity needs to be a part of this Water Master Plan to ensure that our issues are resolved and that they do not worsen.

Catherine Nikota
786 Clark St.
519-494-9862
catherniko@yahoo.ca

Samya Chams

From: Darika Sharma
Sent: August 2, 2024 9:34 AM
To: Samya Chams
Subject: FW: New Response Completed for Water Study Comments and Questions Form

Hi Samya,

Please add this to the comments log.

Thanks.

Darika Sharma, M.Eng, EIT

Process Designer

R.V. Anderson Associates Limited
557 Southdale Road East, Suite 200, London ON N6E 1A2
t 519 681 9916 ext. 5032 | m 647 648 0461
LinkedIn | Facebook | Website

From: Paul Zuberbuhler <pzuberbuhler@strathroy-caradoc.ca>
Sent: Tuesday, July 16, 2024 2:33 PM
To: John Tyrrell <JTyrrell@rvanderson.com>; Darika Sharma <DSharma@rvanderson.com>; Erika Frost <efrost@rvanderson.com>
Subject: FW: New Response Completed for Water Study Comments and Questions Form

Hello,
Please see the masterplan comment below.

Regards,

Paul Zuberbuhler B.Sc, B.Comm, C.E.T.
Manager of Environmental Services

Municipality of Strathroy-Caradoc
52 Frank Street | Strathroy, ON | N7G 2R4

Phone: 519-245-1105 x274
Email: pzuberbuhler@strathroy-caradoc.ca

Visit us online at www.strathroy-caradoc.ca

From: noreply@esolutionsgroup.ca <noreply@esolutionsgroup.ca>
Sent: July-16-24 2:31 PM
To: Paul Zuberbuhler <pzuberbuhler@strathroy-caradoc.ca>
Subject: New Response Completed for Water Study Comments and Questions Form

Hello,

Please note the following response to Water Study Comments and Questions Form has been submitted at Tuesday July 16th 2024 2:26 PM with reference number 2024-07-16-003.

- Name
  Ryan Kelly
- Contact Information (to provide a reply)
  Ryan
- Comments and Questions
  Hello I am a suggestion for strathroy ballpart and splash pad the river and the creek to go through there should be dug out and then it could be more clean and less of the water coming over the banks of the river and at the same time. Make the river the focal point
  Of are town

[This is an automated email notification -- please do not respond].

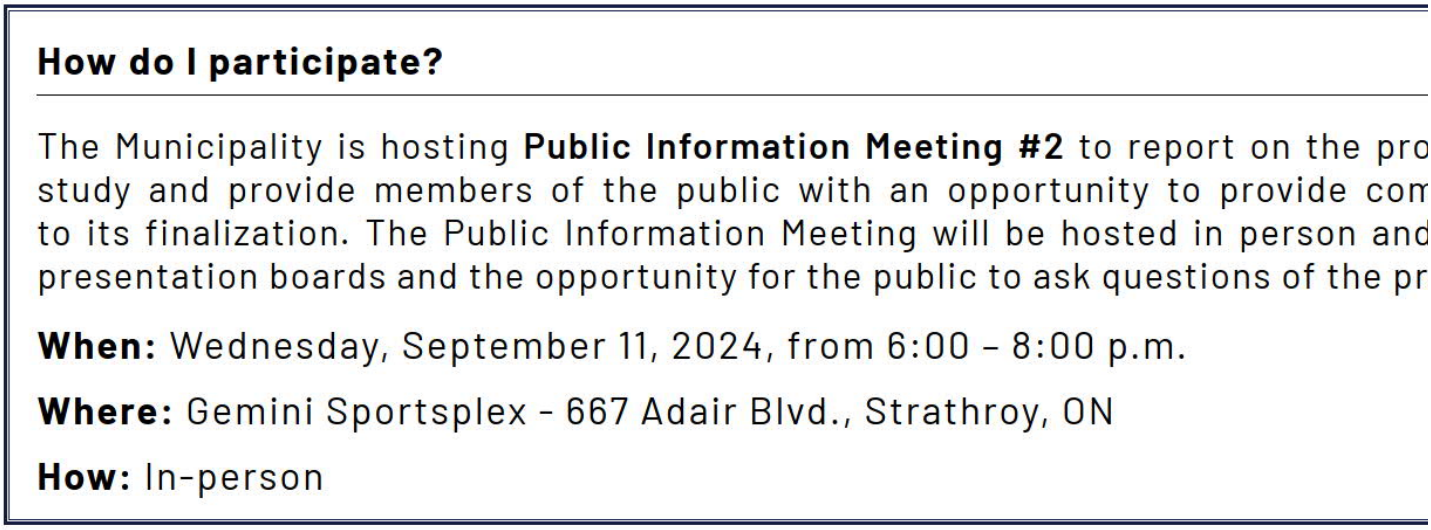
Samya Chams

From:	Samya Chams
Sent:	August 1, 2024 11:39 AM
To:	Pattie Pearn
Cc:	Paul Zuberbuhler; John Tyrrell
Subject:	RE: Strathroy-Caradoc Water, Wastewater &Stormwater Management Master Plan - Notice of PIC #2
Attachments:	SC W-WW SWM MP Notice of PIC #2.pdf
Categories:	Filed by Newforma

Good morning Pattie,

Thank you for your email.

The details for the PIC#2 are located in the attached Notice. Please see below snippet with location and time.



How do I participate?

The Municipality is hosting **Public Information Meeting #2** to report on the pro
study and provide members of the public with an opportunity to provide com
to its finalization. The Public Information Meeting will be hosted in person and
presentation boards and the opportunity for the public to ask questions of the pr

When: Wednesday, September 11, 2024, from 6:00 – 8:00 p.m.

Where: Gemini Sportsplex - 667 Adair Blvd., Strathroy, ON

How: In-person

Thank you,

Samya

Samya Chams, B.A. (she/her)

Administrative Assistant

R.V. Anderson Associates Limited
557 Southdale Road East, Suite 200, London ON N6E 1A2
t 519 681 9916 ext. 5021

LinkedIn | Facebook | Website

From: Pattie Pearn <pattiepearn@gmail.com>
Sent: Thursday, August 1, 2024 11:25 AM
To: Samya Chams <schams@rvanderson.com>
Subject: Re: Strathroy-Caradoc Water, Wastewater &Stormwater Management Master Plan - Notice of PIC #2

Good Morning
When is the 2 nd meeting and where

I could not find it in your cover email

Patricia (Pattie) Pearn

pattiepearn@gmail.com 519-671-9144

On Thu, Aug 1, 2024 at 11:06 AM Samya Chams <schams@rvanderson.com> wrote:

> Dear Sir/Madam,
>
> On behalf of the Municipality of Strathroy - Caradoc, please find attached the Notice of Public Information Session (PIC) #2 for the Water, Wastewater and Stormwater Master Plan and Pollution Prevention Control Plan. A webpage has been created and all relevant documents have been uploaded including the Notice of Study Commencement. This webpage can be found here: https://www.strathroy-caradoc.ca/en/city-hall/water-wastewater-and-stormwater-master-plan-and-pollution-prevention-control-plan.aspx
>
> The project team values the participation of all stakeholders and wishes to ensure that the community's interests and concerns are taken into consideration. Please contact the project team members listed on the attached notice should you require further information on this project.
>
> Thank you,

Samya

Samya Chams, B.A. (she/her)

Administrative Assistant

R.V. Anderson Associates Limited

557 Southdale Road East, Suite 200, London ON N6E 1A2

t 519 681 9916 ext. 5021

LinkedIn | Facebook | Website

Agency Responses

Samya Chams

From: Marcy McKillop <mmckillop@huronelginwater.ca>
Sent: September 23, 2024 2:03 PM
To: Samya Chams
Cc: Andrew Henry; Marcus Schaum; Submissions; John Tyrrell; Darika Sharma; Paul Zuberbuhler; Jessy Van der Vaart; Trisha McKibbin
Subject: RE: Strathroy-Caradoc Water, Wastewater &Stormwater Management Master Plan - Notice of PIC #2

Good afternoon,

Thank for continuing to provide updates regarding the Strathroy-Caradoc Water, Wastewater and Stormwater Management Master Plan.

Please ensure any municipal planning, development, design and construction projects consider the importance and location of LHPWSS transmission infrastructure and any easements, and includes applicable consultation and coordination with the LHPWSS. Any planning or development documentation should continue to be shared with LHPWSS through email to submissions@huronelginwater.ca

Please note that member municipalities are responsible for water distribution system infrastructure, including operation, replacement/upgrade and maintenance, as well as equalization, emergency and fire storage, in accordance with applicable provincial guidelines and regulations.

The Lake Huron Primary Water Supply System (LHPWSS) is currently undertaking a Master Plan. A Notice of Commencement and PIC #1 will be issued this fall. More information will be made available here as the Master Plan advances over the next year: https://www.huronelginwater.ca/lake-huron-primary-water-supply-system-master-plan/

Please note that the LHPWSS is providing a transmission connection to Oneida Nation of the Thames. Our engineering consultant, Stantec Consulting, will continue to work with Strathroy-Caradoc municipal staff regarding this project, and will circulate detailed design drawings for review this fall. The transmission main will extend from northeast of Mount Brydges along Falconbridge Road to Christina Road and construction is anticipated for spring 2025. It was noted that two wastewater servicing/treatment alternatives for Mount Brydges, shown in Public Information Centre #2, included new sanitary sewers (or forcemains) that would cross existing or new transmission infrastructure. Please consider the location of LHPWSS transmission infrastructure as part of any evaluation of alternatives.

Best regards,

Marcy McKillop, P.Eng. (she/her)
Environmental Services Engineer, Regional Water Supply

Lake Huron & Elgin Area Primary Water Supply Systems
235 North Centre Road, Suite 200
London, Ontario N5X 4E7
T: 519-930-3505 ext. 4976
E: mmckillop@huronelginwater.ca
https://huronelginwater.ca
www.facebook.com/RegionalWaterSupply

The Lake Huron and Elgin Area Primary Water Supply Systems serve communities and people within the traditional lands of the Anishinaabek, Haudenosaunee, Lūnaapéewak and Attawandaron. We honour and respect the history, languages and culture of the diverse Indigenous people who call this territory home. This region is currently home to many First Nations, Inuit and Métis. We are grateful to have the opportunity to work and live in this territory.

From: Samya Chams <schams@rvanderson.com>
Sent: Thursday, August 1, 2024 11:06 AM
To: Samya Chams <schams@rvanderson.com>
Cc: John Tyrrell <JTyrrell@rvanderson.com>; Darika Sharma <DSharma@rvanderson.com>; Paul Zuberbuhler <pzuberbuhler@strathroy-caradoc.ca>; Jessy Van der Vaart <jvandervaart@strathroy-caradoc.ca>; Trisha McKibbin <tmckibbin@strathroy-caradoc.ca>
Subject: Strathroy-Caradoc Water, Wastewater &Stormwater Management Master Plan - Notice of PIC #2

> You don't often get email from schams@rvanderson.com. Learn why this is important

Dear Sir/Madam,

On behalf of the Municipality of Strathroy - Caradoc, please find attached the Notice of Public Information Session (PIC) #2 for the Water, Wastewater and Stormwater Master Plan and Pollution Prevention Control Plan. A webpage has been created and all relevant documents have been uploaded including the Notice of Study Commencement. This webpage can be found here: https://www.strathroy-caradoc.ca/en/city-hall/water-wastewater-and-stormwater-master-plan-and-pollution-prevention-control-plan.aspx

The project team values the participation of all stakeholders and wishes to ensure that the community's interests and concerns are taken into consideration. Please contact the project team members listed on the attached notice should you require further information on this project.

Thank you,

Samya

Samya Chams, B.A. (she/her)
Administrative Assistant

R.V. Anderson Associates Limited
557 Southdale Road East, Suite 200, London ON N6E 1A2
t 519 681 9916 ext. 5021
LinkedIn | Facebook | Website

Ministry of Citizenship and Multiculturalism

Heritage Planning Unit
Heritage Branch
Citizenship, Inclusion and Heritage Division
5th Flr, 400 University Ave
Tel.: 613-242-3743

Ministère des Affaires civiques et du Multiculturalisme

Unité de la planification relative au patrimoine
Direction du patrimoine
Division des affaires civiques, de l'inclusion et du patrimoine
Tél.: 613-242-3743

Ontario

December 7, 2023 EMAIL ONLY

Paul Zuberbuhler B.Sc, B.Comm, C.E.T
Manager of Environmental Services
Municipality of Strathroy-Caradoc
pzuberbuhler@strathroy-caradoc.ca

MCM File	**:**	**0020701**
Proponent	**:**	**Municipality of Strathroy-Caradoc**
Subject	**:**	**Notice of Commencement - Master Plan**
Project	**:**	**Water, Wastewater and Stormwater Master Plan and Pollution Prevention Control Plan**
Location	**:**	**Municipality of Strathroy-Caradoc, County of Middlesex**

Dear Paul Zuberbuhler:

Thank you for providing the Ministry of Citizenship and Multiculturalism (MCM) with the Notice of Commencement for this project.

MCM's interest in this master plan relates to its mandate of conserving Ontario's cultural heritage, which includes archaeological resources, built heritage resources and cultural heritage landscapes.

MCM understands that master plans are long range plans which integrate infrastructure requirements for existing and future land use with environmental assessment planning principles. The Municipal Class Environmental Assessment (MCEA) outlines a framework for master plan and associated studies which should recognize the planning and design Process of this Class EA, and should incorporate the key principles of successful environmental assessment planning identified in Section A.1.1. The master planning process will, at minimum, address Phases 1 and 2 of the Planning and Design Process of the MCEA.

This letter provides advice on how to incorporate consideration of cultural heritage in the above-mentioned master planning process by outlining the technical cultural heritage studies and the level of detail required to address cultural heritage in master plans. In accordance with the MCEA, cultural heritage resources should be identified early in the process in order to determine known and potential resources and potential impacts.

Master Plan Summary
The Municipality of Strathroy-Caradoc is preparing a Master Plan for its water, wastewater, and stormwater infrastructure as part of ongoing efforts to improve the performance of the

Municipality's infrastructure. Additionally, the Municipality is undertaking a Pollution Prevention Control Plan (PPCP) to provide a road map for implementing infrastructure and operational improvements that will mitigate the impacts of wet weather sewer system overflows on the environment. The Master Plan and PPCP will provide the Municipality with guidance for capital planning and project implementation for water, wastewater, and stormwater services to accommodate growth for the next 20 years and beyond in a cost-effective and environmentally sustainable manner. The study is being undertaken in accordance with the MCEA process for Master Plans.

It is unclear what approach is being taken in accordance with the Master Planning Process outlined in the MCEA. We recommend you clearly identify your proposed study approach. Any individual undertakings proceeding as part of this master plan should be screened for impacts to cultural heritage resources.

Identifying Cultural Heritage Resources
MCM understands that the final public notice for the master plan could become the notice of completion for the Schedule B and C MCEAs within it and that this approach would likely result in extensive documentation should the master plan include numerous Schedule C MCEA undertakings. In regards to cultural heritage resources, the Master Plan document should:

- identify existing baseline environmental conditions,
- identify expected environmental impacts and,
- Include measures to mitigate potential negative impacts.

Archaeological Resources
Any undertakings included as part of the master plan should be screened using the Ministry's *Criteria for Evaluating Archaeological Potential* and *Criteria for Evaluating Marine Archaeological Potential* (if shoreline or in-water works are proposed) to determine if an archaeological assessment is needed. If the EA project area exhibits archaeological potential, then an archaeological assessment (AA) should be undertaken by an archaeologist licensed under the Ontario Heritage Act and submitted for MCM review prior to the completion of the master plan.

Built Heritage Resources and Cultural Heritage Landscapes
A Cultural Heritage Report: Existing Conditions and Preliminary Impact Assessment will be undertaken for the entire study area during the planning phase and will be summarized in the EA Report. This study will:

1. Describe the existing baseline cultural heritage conditions within the study area by identifying all known or potential built heritage resources and cultural heritage landscapes, including a historical summary of the study area. The Ministry has developed screening criteria that may assist with this exercise: *Criteria for Evaluating for Potential Built Heritage Resources and Cultural Heritage Landscapes*.

2. Identify preliminary potential project-specific impacts on the known and potential built heritage resources and cultural heritage landscapes that have been identified. The report should include a description of the anticipated impact to each known or potential built heritage resource or cultural heritage landscape that has been identified.

3. Recommend measures to avoid or mitigate potential negative impacts to known or potential built heritage resources and cultural heritage landscapes. The proposed mitigation measures are to inform the next steps of project planning and design.

Given that this project covers a large study area, MCM recommends that the Cultural Heritage Report is carried out so that step 1 described above is undertaken early in the planning process. Then, steps 2 and 3 can be undertaken once the preferred alternatives have been selected.

Where a known or potential built heritage resource or cultural heritage landscape may be directly and adversely impacted, and where it has not yet been evaluated for Cultural Heritage Value or Interest (CHVI), completion of a Cultural Heritage Evaluation Report (CHER) is required to fully understand its CHVI and level of significance. The CHER must be completed as part of the final EA report. If a potential resource is found to be of CHVI, then a Heritage Impact Assessment (HIA) will need to be undertaken and included in the final EA report. Please send the HIA to MCM for review and make it available to local organizations or individuals who have expressed interest in review.

While some cultural heritage landscapes are contained within individual property boundaries, others span across multiple properties. For certain cultural heritage landscapes, it will be more appropriate for the CHER and HIA to include multiple properties, in order to reflect the extent of that cultural heritage landscape in its entirety.

Community input should be sought to identify locally recognized and potential cultural heritage resources. Sources include, but are not limited to, municipal heritage committees, community heritage registers, historical societies and other local heritage organizations.

Cultural heritage resources are often of critical importance to Indigenous communities. Indigenous communities may have knowledge that can contribute to the identification of cultural heritage resources, and we suggest that any engagement with Indigenous communities includes a discussion about known or potential cultural heritage resources that are of value to them.

Environmental Assessment Reporting
Technical cultural heritage studies are to be undertaken by a qualified person who has expertise, recent experience, and knowledge relevant to the type of cultural heritage resources being considered and the nature of the activity being proposed. Please advise MCM whether any technical heritage studies will be completed for this master plan and provide them to MCM before issuing a Notice of Completion.

Please note that the responsibility for administration of the *Ontario Heritage Act* and matters related to cultural heritage have been transferred from the Ministry of Tourism, Culture and Sport (MTCS) to the Ministry of Citizenship and Multiculturalism (MCM). Individual staff roles and contact information remain unchanged. Please continue to send any notices, report and/or documentation to both Karla Barboza and Joseph Harvey.

- Karla Barboza, Team Lead - Heritage | Heritage Planning Unit (Citizenship and Multiculturalism) | 416-660-1027 | karla.barboza@ontario.ca
- Joseph Harvey, Heritage Planner | Heritage Planning Unit (Citizenship and Multiculturalism) | 613-242-3743 | joseph.harvey@ontario.ca

Thank you for consulting MCM on this project. Please continue to do so through the master plan process and contact Joseph Harvey for any questions or clarification.

Sincerely,

Erika Leclerc
On behalf of

Joseph Harvey
Heritage Planner
Joseph.harvey@ontario.ca

Copied to: John Tyrell, Senior Project Manager, R.V. Anderson Associates Limited
Darika Sharma, Process Designer, R.V. Anderson Associates Limited
Karla Barboza, Team Lead – Heritage Planning Unit, MCM

Should previously undocumented archaeological resources be discovered, they may be a new archaeological site and therefore subject to Section 48(1) of the *Ontario Heritage Act*. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out an archaeological assessment, in compliance with Section 48(1) of the *Ontario Heritage Act*.

The *Funeral, Burial and Cremation Services Act, 2002, S.O. 2002, c.33* requires that any person discovering human remains must cease all activities immediately and notify the police or coroner. If the coroner does not suspect foul play in the disposition of the remains, in accordance with *Ontario Regulation 30/11* the coroner shall notify the Registrar, Ontario Ministry of Public and Business Service Delivery, which administers provisions of that Act related to burial sites. In situations where human remains are associated with archaeological resources, the Ministry of Citizenship and Multiculturalism should also be notified (at archaeology@ontario.ca) to ensure that the archaeological site is not subject to unlicensed alterations which would be a contravention of the *Ontario Heritage Act*.

Ministry of the Environment, Conservation and Parks

Environmental Assessment Branch

1st Floor
135 St. Clair Avenue W
Toronto ON M4V 1P5
Tel.: 416 314-8001
Fax.: 416 314-8452

Ministère de l'Environnement, de la Protection de la nature et des Parcs

Direction des évaluations environnementales

Rez-de-chaussée
135, avenue St. Clair Ouest
Toronto ON M4V 1P5
Tél. : 416 314-8001
Téléc. : 416 314-8452

December 28, 2023

Paul Zuberbuhler
Manager of Environmental Services
Municipality of Strathroy-Caradoc
pzuberbuhler@strathroy-caradoc.ca

BY EMAIL ONLY

Re: **Strathroy-Caradoc Water, Wastewater and Stormwater Master Plan and Pollution Prevention Control Plan**
Municipality of Strathroy-Caradoc
Municipal Class Environmental Assessment, Master Plan
Acknowledgement of Notice of Commencement

Dear Paul Zuberbuhler,

This letter is in response to the Notice of Commencement for the above noted Master Plan. The Ministry of the Environment, Conservation and Parks (MECP) acknowledges that the Municipality of Strathroy-Caradoc (proponent) has indicated that the study is following the approved environmental planning process for a Master Plan under the Municipal Class Environmental Assessment (Class EA).

The **updated (August 2022)** attached "Areas of Interest" document provides guidance regarding the ministry's interests with respect to the Class EA process. Please address all areas of interest in the EA documentation at an appropriate level for the EA study. Proponents who address all the applicable areas of interest can minimize potential delays to the project schedule. **Further information is provided at the end of the Areas of Interest document relating to recent changes to the Environmental Assessment Act through Bill 197, Covid-19 Economic Recovery Act 2020.**

The Crown has a legal duty to consult Aboriginal communities when it has knowledge, real or constructive, of the existence or potential existence of an Aboriginal or treaty right and contemplates conduct that may adversely impact that right. Before authorizing the projects identified in this Master Plan, the Crown must ensure that its duty to consult has been fulfilled, where such a duty is triggered. Although the duty to consult with Aboriginal peoples is a duty of the Crown, the Crown may delegate procedural aspects of this duty to project proponents while retaining oversight of the consultation process.

The proposed Master Plan projects may have the potential to affect Aboriginal or treaty rights protected under Section 35 of Canada's *Constitution Act* 1982. Where the Crown's duty to consult is triggered in relation to the proposed projects**, the MECP is delegating the procedural aspects of rights-based consultation to the proponent through this letter.** The Crown intends to rely on the delegated consultation process in discharging its duty to consult and maintains the right to participate in the consultation process as it sees fit.

Based on information provided to date and the Crown`s preliminary assessment the proponent is required to consult with the following communities who have been identified as potentially affected by the proposed Master Plan projects:

- Aamjiwnaang First Nation
- Bkejwanong (Walpole Island)
- Caldwell First Nation
- Chippewas of Kettle and Stony Point
- Chippewas of the Thames First Nation
- Oneida Nation of the Thames

Steps that the proponent may need to take in relation to Aboriginal consultation for the proposed projects are outlined in the "Code of Practice for Consultation in Ontario's Environmental Assessment Process". Additional information related to Ontario's Environmental Assessment Act is available online at: www.ontario.ca/environmentalassessments.

Please also refer to the attached document "A Proponent's Introduction to the Delegation of Procedural Aspects of consultation with Aboriginal Communities" for further information, including the MECP's expectations for EA report documentation related to consultation with communities.

The proponent must contact the Director of Environmental Assessment Branch (EABDirector@ontario.ca) under the following circumstances after initial discussions with the communities identified by the MECP:

- Aboriginal or treaty rights impacts are identified to you by the communities;
- You have reason to believe that your proposed projects may adversely affect an Aboriginal or treaty right;
- Consultation with Indigenous communities or other stakeholders has reached an

impasse; or
- A Section 16 Order request is expected based on impacts to Aboriginal or treaty rights

The MECP will then assess the extent of any Crown duty to consult for the circumstances and will consider whether additional steps should be taken, including what role you will be asked to play should additional steps and activities be required.

Please ensure a copy of the final notice is sent to the ministry's Southwestern Region EA notification email account (eanotification.swregion@ontario.ca).

Should you or any members of your project team have any questions regarding the material above, please contact me at mark.badali1@ontario.ca.

Sincerely,

Mark Badali
Senior Project Evaluator
Environmental Assessment Program Support, Environmental Assessment Branch

Cc: Pierre Adrien, Manager, London District Office, MECP
Adam Grant, Water Compliance Supervisor, London District Office, MECP
John Tyrrell, Senior Project Manager, R.V. Anderson Associates Limited

Enclosed: Areas of Interest

Attached: Client's Guide to Preliminary Screening for Species at Risk

A Proponent's Introduction to the Delegation of Procedural Aspects of Consultation with Aboriginal Communities

AREAS OF INTEREST (v. August 2022)

It is suggested that you check off each section after you have considered / addressed it.

☐ **Planning and Policy**

- Applicable plans and policies should be identified in the report, and the proponent should describe how the proposed Master Plan projects adhere to the relevant policies in these plans.
    - Projects located in MECP Central, Eastern or West Central Region may be subject to **A Place to Grow: Growth Plan for the Greater Golden Horseshoe (2020)**.
    - Projects located in MECP Central or Eastern Region may be subject to the **Oak Ridges Moraine Conservation Plan (2017)** or the **Lake Simcoe Protection Plan (2014)**.
    - Projects located in MECP Central, Southwest or West Central Region may be subject to the **Niagara Escarpment Plan (2017)**.
    - Projects located in MECP Central, Eastern, Southwest or West Central Region may be subject to the **Greenbelt Plan (2017)**.
    - Projects located in MECP Northern Region may be subject to the **Growth Plan for Northern Ontario (2011).**

- The **Provincial Policy Statement (2020)** contains policies that protect Ontario's natural heritage and water resources. Applicable policies should be referenced in the report, and the proponent sdvhould describe how the proposed projects are consistent with these policies.

- In addition to the provincial planning and policy level, the report should also discuss the planning context at the municipal and federal levels, as appropriate.

☐ **Source Water Protection**

The *Clean Water Act*, 2006 (CWA) aims to protect existing and future sources of drinking water. To achieve this, several types of vulnerable areas have been delineated around surface water intakes and wellheads for every municipal residential drinking water system that is located in a source protection area. These vulnerable areas are known as a Wellhead Protection Areas (WHPAs) and surface water Intake Protection Zones (IPZs). Other vulnerable areas that have been delineated under the CWA include Highly Vulnerable Aquifers (HVAs), Significant Groundwater Recharge Areas (SGRAs), Event-based modelling areas (EBAs), and Issues Contributing Areas (ICAs). Source protection plans have been developed that include policies to address existing and future risks to sources of municipal drinking water within these vulnerable areas.

Projects that are subject to the Environmental Assessment Act that fall under a Class EA, or one of the Regulations, have the potential to impact sources of drinking water if they occur in designated vulnerable areas or in the vicinity of other at-risk drinking water systems (i.e. systems that are not municipal residential systems). MEA Class EA projects may include activities that, if located in a vulnerable area, could be a threat to sources of drinking water (i.e. have the potential to adversely affect the quality or quantity of drinking water sources) and the activity could therefore be subject to policies in a source protection plan. Where an activity poses a risk to drinking water, policies in the local source protection plan may impact how or where that activity is undertaken. Policies may prohibit certain activities, or they may require risk management measures for these activities. Municipal Official Plans, planning decisions, Class EA projects (where the project includes an activity that is a threat to drinking water) and prescribed instruments must conform with policies that address significant risks to drinking water and must have regard for policies that address moderate or low risks.

- In October 2015, the MEA Parent Class EA document was amended to include reference to the Clean Water Act (Section A.2.10.6) and indicates that proponents undertaking a Municipal Class EA project must identify early in their process whether a project is or could potentially be occurring with a vulnerable area. **Given this requirement, please include a section in the report on source water protection.**

    - The proponent should identify the source protection area and should clearly document how the proximity of the project to sources of drinking water (municipal or other) and any delineated vulnerable areas was considered and assessed. Specifically, the report should discuss whether or not the project is located in a vulnerable area and provide applicable details about the area.

    - If located in a vulnerable area, proponents should document whether any project activities are prescribed drinking water threats and thus pose a risk to drinking water (this should be consulted on with the appropriate Source Protection Authority). Where an activity poses a risk to drinking water, the proponent must document and discuss in the report how the project adheres to or has regard to applicable policies in the local source protection plan. This section should then be used to inform and be reflected in other sections of the report, such as the identification of net positive/negative effects of alternatives, mitigation measures, evaluation of alternatives etc.

- While most source protection plans focused on including policies for significant drinking water threats in the WHPAs and IPZs it should be noted that even though source protection plan policies may not apply in HVAs, these are areas where aquifers are sensitive and at risk to impacts and within these areas, activities may impact the quality of sources of drinking water for systems other than municipal residential systems.

- In order to determine if these Master Plan projects are occurring within a vulnerable area, proponents can use Source Protection Information Atlas, which is an online mapping tool

available to the public. Note that various layers (including WHPAs, WHPA-Q1 and WHPA-Q2, IPZs, HVAs, SGRAs, EBAs, ICAs) can be turned on through the "Map Legend" bar on the left. The mapping tool will also provide a link to the appropriate source protection plan in order to identify what policies may be applicable in the vulnerable area.

- For further information on the maps or source protection plan policies which may relate to their project, proponents must contact the appropriate source protection authority. **Please consult with the local source protection authority to discuss potential impacts on drinking water. Please document the results of that consultation within the report and include all communication documents/correspondence.**

More Information

For more information on the *Clean Water Act*, source protection areas and plans, including specific information on the vulnerable areas and drinking water threats, please refer to Conservation Ontario's website where you will also find links to the local source protection plan/assessment report.

A list of the prescribed drinking water threats can be found in section 1.1 of Ontario Regulation 287/07 made under the *Clean Water Act*. In addition to prescribed drinking water threats, some source protection plans may include policies to address additional "local" threat activities, as approved by the MECP.

☐ **Climate Change**

The document "Considering Climate Change in the Environmental Assessment Process" (Guide) is now a part of the Environmental Assessment program's Guides and Codes of Practice. The Guide sets out the MECP's expectation for considering climate change in the preparation, execution and documentation of environmental assessment studies and processes. The guide provides examples, approaches, resources, and references to assist proponents with consideration of climate change in EA. Proponents should review this Guide in detail.

- **The MECP expects proponents of Class EA projects to:**

1. Consider during the assessment of alternative solutions and alternative designs, the following:
    a. the project's expected production of greenhouse gas emissions and impacts on carbon sinks (climate change mitigation); and
    b. resilience or vulnerability of the undertaking to changing climatic conditions (climate change adaptation).
2. Include a discrete section in the report detailing how climate change was considered in the EA.

How climate change is considered can be qualitative or quantitative in nature and should be scaled to the project's level of environmental effect. In all instances, both a project's impacts on

climate change (mitigation) and impacts of climate change on a project (adaptation) should be considered.

- The MECP has also prepared another guide to support provincial land use planning direction related to the completion of energy and emission plans. The "Community Emissions Reduction Planning: A Guide for Municipalities" document is designed to educate stakeholders on the municipal opportunities to reduce energy and greenhouse gas emissions, and to provide guidance on methods and techniques to incorporate consideration of energy and greenhouse gas emissions into municipal activities of all types. We encourage you to review the Guide for information.

Air Quality, Dust and Noise

- If there are sensitive receptors in the surrounding area of these Master Plan projects, a quantitative air quality/odour impact assessment will be useful to evaluate alternatives, determine impacts and identify appropriate mitigation measures. The scope of the assessment can be determined based on the potential effects of the proposed alternatives, and typically includes source and receptor characterization and a quantification of local air quality impacts on the sensitive receptors and the environment in the study area. The assessment will compare to all applicable standards or guidelines for all contaminants of concern. **Please contact this office for further consultation on the level of Air Quality Impact Assessment required for these projects if not already advised.**

- If a quantitative Air Quality Impact Assessment is not required for a project, the MECP expects that the report contain a qualitative assessment which includes:

    - A discussion of local air quality including existing activities/sources that significantly impact local air quality and how the project may impact existing conditions;
    - A discussion of the nearby sensitive receptors and the project's potential air quality impacts on present and future sensitive receptors;
    - A discussion of local air quality impacts that could arise from this project during both construction and operation; and
    - A discussion of potential mitigation measures.

- As a common practice, "air quality" should be used an evaluation criterion for all road projects.

- Dust and noise control measures should be addressed and included in the construction plans to ensure that nearby residential and other sensitive land uses within the study area are not adversely affected during construction activities.

- The MECP recommends that non-chloride dust-suppressants be applied. For a comprehensive list of fugitive dust prevention and control measures that could be applied,

refer to *Cheminfo Services Inc. Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities* report prepared for Environment Canada. March 2005.

- The report should consider the potential impacts of increased noise levels during the operation of the completed project. The proponent should explore all potential measures to mitigate significant noise impacts during the assessment of alternatives.

Ecosystem Protection and Restoration

- Any impacts to ecosystem form and function must be avoided where possible. The report should describe any proposed mitigation measures and how project planning will protect and enhance the local ecosystem.

- Natural heritage and hydrologic features should be identified and described in detail to assess potential impacts and to develop appropriate mitigation measures. The following sensitive environmental features may be located within or adjacent to the study area:
  - Key Natural Heritage Features: Habitat of endangered species and threatened species, fish habitat, wetlands, areas of natural and scientific interest (ANSIs), significant valleylands, significant woodlands; significant wildlife habitat (including habitat of special concern species); sand barrens, savannahs, and tallgrass prairies; and alvars.
  - Key Hydrologic Features: Permanent streams, intermittent streams, inland lakes and their littoral zones, seepage areas and springs, and wetlands.
  - Other natural heritage features and areas such as: vegetation communities, rare species of flora or fauna, Environmentally Sensitive Areas, Environmentally Sensitive Policy Areas, federal and provincial parks and conservation reserves, Greenland systems etc.

We recommend consulting with the Ministry of Natural Resources and Forestry (MNRF), Fisheries and Oceans Canada (DFO) and your local conservation authority to determine if special measures or additional studies will be necessary to preserve and protect these sensitive features. In addition, for projects located in Central Region you may consider the provisions of the Rouge Park Management Plan if applicable.

Species at Risk

- The Ministry of the Environment, Conservation and Parks has now assumed responsibility of Ontario's Species at Risk program. Information, standards, guidelines, reference materials and technical resources to assist you are found at https://www.ontario.ca/page/species-risk.

- The Client's Guide to Preliminary Screening for Species at Risk (Draft May 2019) has been attached to the covering email for your reference and use. Please review this document for next steps.

- For any questions related to subsequent permit requirements, please contact SAROntario@ontario.ca.

Surface Water

- The report must include enough information to demonstrate that there will be no negative impacts on the natural features or ecological functions of any watercourses within the study area. Measures should be included in the planning and design process to ensure that any impacts to watercourses from construction or operational activities (e.g. spills, erosion, pollution) are mitigated as part of the proposed undertaking.

- Additional stormwater runoff from new pavement can impact receiving watercourses and flood conditions. Quality and quantity control measures to treat stormwater runoff should be considered for all new impervious areas and, where possible, existing surfaces. The ministry's Stormwater Management Planning and Design Manual (2003) should be referenced in the report and utilized when designing stormwater control methods. **A Stormwater Management Plan should be prepared as part of the Class EA process** that includes:

    - Strategies to address potential water quantity and erosion impacts related to stormwater draining into streams or other sensitive environmental features, and to ensure that adequate (enhanced) water quality is maintained
    - Watershed information, drainage conditions, and other relevant background information
    - Future drainage conditions, stormwater management options, information on erosion and sediment control during construction, and other details of the proposed works
    - Information on maintenance and monitoring commitments.

- Ontario Regulation 60/08 under the *Ontario Water Resources Act* (OWRA) applies to the Lake Simcoe Basin, which encompasses Lake Simcoe and the lands from which surface water drains into Lake Simcoe. If the proposed sewage treatment plant is listed in Table 1 of the regulation, the report should describe how the proposed Master Plan projects and its mitigation measures are consistent with the requirements of this regulation and the OWRA.

- Any potential approval requirements for surface water taking or discharge should be identified in the report. A Permit to Take Water (PTTW) under the OWRA will be required

for any water takings that exceed 50,000 L/day, except for certain water taking activities that have been prescribed by the Water Taking EASR Regulation – *O. Reg. 63/16*. These prescribed water-taking activities require registration in the EASR instead of a PTTW. Please review the Water Taking User Guide for EASR for more information. Additionally, an Environmental Compliance Approval under the OWRA is required for municipal stormwater management works.

Groundwater

- The status of, and potential impacts to any well water supplies should be addressed. If the Master Plan projects involve groundwater takings or changes to drainage patterns, the quantity and quality of groundwater may be affected due to drawdown effects or the redirection of existing contamination flows. In addition, project activities may infringe on existing wells such that they must be reconstructed or sealed and abandoned. Appropriate information to define existing groundwater conditions should be included in the report.

- If the potential construction or decommissioning of water wells is identified as an issue, the report should refer to Ontario Regulation 903, Wells, under the OWRA.

- Potential impacts to groundwater-dependent natural features should be addressed. Any changes to groundwater flow or quality from groundwater taking may interfere with the ecological processes of streams, wetlands or other surficial features. In addition, discharging contaminated or high volumes of groundwater to these features may have direct impacts on their function. Any potential effects should be identified, and appropriate mitigation measures should be recommended. The level of detail required will be dependent on the significance of the potential impacts.

- Any potential approval requirements for groundwater taking or discharge should be identified in the report. A Permit to Take Water (PTTW) under the OWRA will be required for any water takings that exceed 50,000 L/day, with the exception of certain water taking activities that have been prescribed by the Water Taking EASR Regulation – *O. Reg. 63/16*. These prescribed water-taking activities require registration in the EASR instead of a PTTW. Please review the Water Taking User Guide for EASR for more information.

- Consultation with the railroad authorities is necessary wherever there is a plan to use construction dewatering in the vicinity of railroad lines or where the zone of influence of the construction dewatering potentially intercepts railroad lines.

Excess Materials Management

- In December 2019, MECP released a new regulation under the Environmental Protection Act, titled "On-Site and Excess Soil Management" (O. Reg. 406/19) to support improved management of excess construction soil. This regulation is a key step to support proper management of excess soils, ensuring valuable resources don't go to waste and to provide clear rules on managing and reusing excess soil. New risk-based standards referenced by this regulation help to facilitate local beneficial reuse which in turn will reduce greenhouse gas emissions from soil transportation, while ensuring strong protection of human health and the environment. The new regulation is being phased in over time, with the first phase in effect on January 1, 2021. For more information, please visit https://www.ontario.ca/page/handling-excess-soil.

- The report should reference that activities involving the management of excess soil should be completed in accordance with O. Reg. 406/19 and the MECP's current guidance document titled "Management of Excess Soil – A Guide for Best Management Practices" (2014).

- All waste generated during construction must be disposed of in accordance with ministry requirements

Contaminated Sites

- Any current or historical waste disposal sites should be identified in the report. The status of these sites should be determined to confirm whether approval pursuant to Section 46 of the EPA may be required for land uses on former disposal sites. We recommend referring to the MECP's D-4 guideline for land use considerations near landfills and dumps.
    - Resources available may include regional/local municipal official plans and data; provincial data on large landfill sites and small landfill sites; Environmental Compliance Approval information for waste disposal sites on Access Environment.

- Other known contaminated sites (local, provincial, federal) in the study area should also be identified in the report (Note – information on federal contaminated sites is found on the Government of Canada's website).

- The location of any underground storage tanks should be investigated in the report. Measures should be identified to ensure the integrity of these tanks and to ensure an appropriate response in the event of a spill. The ministry's Spills Action Centre must be contacted in such an event.

- Since the removal or movement of soils may be required, appropriate tests to determine contaminant levels from previous land uses or dumping should be undertaken. If the soils are contaminated, you must determine how and where they are to be disposed of, consistent with *Part XV.1 of the Environmental Protection Act* (EPA) and Ontario Regulation 153/04, Records of Site Condition, which details the new requirements related to site assessment and clean up. Please contact the appropriate MECP District Office for further consultation if contaminated sites are present.

Servicing, Utilities and Facilities

- The report should identify any above or underground utilities in the study area such as transmission lines, telephone/internet, oil/gas etc. The owners should be consulted to discuss impacts to this infrastructure, including potential spills.

- The report should identify any servicing infrastructure in the study area such as wastewater, water, stormwater that may potentially be impacted by the Master Plan projects.

- Any facility that releases emissions to the atmosphere, discharges contaminants to ground or surface water, provides potable water supplies, or stores, transports or disposes of waste must have an Environmental Compliance Approval (ECA) before it can operate lawfully. Please consult with MECP's Environmental Permissions Branch to determine whether a new or amended ECA will be required for any proposed infrastructure.

- We recommend referring to the ministry's environmental land use planning guides to ensure that any potential land use conflicts are considered when planning for any infrastructure or facilities related to wastewater, pipelines, landfills or industrial uses.

Mitigation and Monitoring

- Contractors must be made aware of all environmental considerations so that all environmental standards and commitments for both construction and operation are met. Mitigation measures should be clearly referenced in the report and regularly monitored during the construction stage of the Master Plan projects. In addition, we encourage proponents to conduct post-construction monitoring to ensure all mitigation measures have been effective and are functioning properly.

- Design and construction reports and plans should be based on a best management approach that centres on the prevention of impacts, protection of the existing environment, and opportunities for rehabilitation and enhancement of any impacted areas.

- The proponent's construction and post-construction monitoring plans must be documented in the report, as outlined in Section A.2.5 and A.4.1 of the MEA Class EA parent document.

Consultation

- The report must demonstrate how the consultation provisions of the Class EA have been fulfilled, including documentation of all stakeholder consultation efforts undertaken during the planning process. This includes a discussion in the report that identifies concerns that were raised and **describes how they have been addressed by the proponent** throughout the planning process. The report should also include copies of comments submitted on the Master Plan by interested stakeholders, and the proponent's responses to these comments (as directed by the Class EA to include full documentation).

- Please include the full stakeholder distribution/consultation list in the documentation.

Class EA Process

- There are several different approaches that can be used to conduct a Master Plan, examples of which are outlined in Appendix 4 of the Class EA. **The Master Plan should clearly indicate the selected approach for conducting the plan**, by identifying whether the levels of assessment, consultation and documentation are sufficient to fulfill the requirements for Schedule B or C projects. Please note that any Schedule B or C projects identified in the plan would be subject to Part II Order Requests under the Environmental Assessment Act, although the plan itself would not be. **Please include a description of the approach being undertaken (use Appendix 4 as a reference).**

- Any identified projects should also include information on the MCEA schedule associated with the project.

- The report should provide clear and complete documentation of the planning process in order to allow for transparency in decision-making.

- The Class EA requires the consideration of the effects of each alternative on all aspects of the environment (including planning, natural, social, cultural, economic, technical). The report should include a level of detail (e.g. hydrogeological investigations, terrestrial and aquatic assessments, cultural heritage assessments) such that all potential impacts can be identified, and appropriate mitigation measures can be developed. Any supporting studies conducted during the Class EA process should be referenced and included as part of the report.

- Please include in the report a list of all subsequent permits or approvals that may be required for the implementation of the preferred alternative, including but not limited to, MECP's PTTW, EASR Registrations and ECAs, conservation authority permits, species at risk permits, MTO permits and approvals under the *Impact Assessment Act*, 2019.

- Ministry guidelines and other information related to the issues above are available at http://www.ontario.ca/environment-and-energy/environment-and-energy. We encourage you to review all the available guides and reference any relevant information in the report.

Amendments to the EAA through the Covid-19 Economic Recovery Act, 2020
Once the EA Report is finalized, the proponent must issue a Notice of Completion providing a minimum 30-day period during which documentation may be reviewed and comment and input can be submitted to the proponent. The Notice of Completion must be sent to the appropriate MECP Regional Office email address.

The public can request a higher level of assessment on any of the Schedule B or Schedule C projects identified in the Master Plan if they are concerned about potential adverse impacts to constitutionally protected Aboriginal and treaty rights. In addition, the Minister may issue an order on his or her own initiative within a specified time period. The Director (of the Environmental Assessment Branch) will issue a Notice of Proposed Order to the proponent if the Minister is considering an order for the project(s) within 30 days after the conclusion of the comment period on the Notice of Completion. At this time, the Director may request additional information from the proponent. Once the requested information has been received, the Minister will have 30 days within which to make a decision or impose conditions on your project(s).

Therefore, the proponent cannot proceed with the Master Plan projects until at least 30 days after the end of the comment period provided for in the Notice of Completion. Further, the proponent may not proceed after this time if:

- a Section 16 Order request has been submitted to the ministry regarding potential adverse impacts to constitutionally protected Aboriginal and treaty rights, or
- the Director has issued a Notice of Proposed order regarding the project(s).

Please ensure that the Notice of Completion advises that outstanding concerns are to be directed to the proponent for a response, and that in the event there are outstanding concerns regarding potential adverse impacts to constitutionally protected Aboriginal and treaty rights, Section 16 Order requests on those matters should be addressed in writing to:

Minister of the Environment, Conservation and Parks
Ministry of the Environment, Conservation and Parks
777 Bay Street, 5th Floor
Toronto ON M7A 2J3
minister.mecp@ontario.ca

and

Director, Environmental Assessment Branch
Ministry of Environment, Conservation and Parks
135 St. Clair Ave. W, 1st Floor
Toronto ON, M4V 1P5
EABDirector@ontario.ca

Ontario

A PROPONENT'S INTRODUCTION TO THE DELEGATION OF PROCEDURAL ASPECTS OF CONSULTATION WITH ABORIGINAL COMMUNITIES

DEFINITIONS

The following definitions are specific to this document and may not apply in other contexts:

Aboriginal communities – the First Nation or Métis communities identified by the Crown for the purpose of consultation.

Consultation – the Crown's legal obligation to consult when the Crown has knowledge of an established or asserted Aboriginal or treaty right and contemplates conduct that might adversely impact that right. This is the type of consultation required pursuant to s. 35 of the *Constitution Act, 1982*. Note that this definition does not include consultation with Aboriginal communities for other reasons, such as regulatory requirements.

Crown – the Ontario Crown, acting through a particular ministry or ministries.

Procedural aspects of consultation – those portions of consultation related to the process of consultation, such as notifying an Aboriginal community about a project, providing information about the potential impacts of a project, responding to concerns raised by an Aboriginal community and proposing changes to the project to avoid negative impacts.

Proponent – the person or entity that wants to undertake a project and requires an Ontario Crown decision or approval for the project.

I. PURPOSE

The Crown has a legal duty to consult Aboriginal communities when it has knowledge of an existing or asserted Aboriginal or treaty right and contemplates conduct that may adversely impact that right. In outlining a framework for the duty to consult, the Supreme Court of Canada has stated that the Crown may delegate procedural aspects of consultation to third parties. This document provides general information about the Ontario Crown's approach to delegation of the procedural aspects of consultation to proponents.

This document is not intended to instruct a proponent about an individual project, and it does not constitute legal advice.

II. WHY IS IT NECESSARY TO CONSULT WITH ABORIGINAL COMMUNITIES?

The objective of the modern law of Aboriginal and treaty rights is the *reconciliation* of Aboriginal peoples and non-Aboriginal peoples and their respective rights, claims and interests. Consultation is an important component of the reconciliation process.

The Crown has a legal duty to consult Aboriginal communities when it has knowledge of an existing or asserted Aboriginal or treaty right and contemplates conduct that might adversely impact that right. For example, the Crown's duty to consult is triggered when it considers

issuing a permit, authorization or approval for a project which has the potential to adversely impact an Aboriginal right, such as the right to hunt, fish, or trap in a particular area.

The scope of consultation required in particular circumstances ranges across a spectrum depending on both the nature of the asserted or established right and the seriousness of the potential adverse impacts on that right.

Depending on the particular circumstances, the Crown may also need to take steps to accommodate the potentially impacted Aboriginal or treaty right. For example, the Crown may be required to avoid or minimize the potential adverse impacts of the project.

III. THE CROWN'S ROLE AND RESPONSIBILITIES IN THE DELEGATED CONSULTATION PROCESS

The Crown has the responsibility for ensuring that the duty to consult, and accommodate where appropriate, is met. However, the Crown may delegate the procedural aspects of consultation to a proponent.

There are different ways in which the Crown may delegate the procedural aspects of consultation to a proponent, including through a letter, a memorandum of understanding, legislation, regulation, policy and codes of practice.

If the Crown decides to delegate procedural aspects of consultation, the Crown will generally:

- Ensure that the delegation of procedural aspects of consultation and the responsibilities of the proponent are clearly communicated to the proponent;
- Identify which Aboriginal communities must be consulted;
- Provide contact information for the Aboriginal communities;
- Revise, as necessary, the list of Aboriginal communities to be consulted as new information becomes available and is assessed by the Crown;
- Assess the scope of consultation owed to the Aboriginal communities;
- Maintain appropriate oversight of the actions taken by the proponent in fulfilling the procedural aspects of consultation;
- Assess the adequacy of consultation that is undertaken and any accommodation that may be required;
- Provide a contact within any responsible ministry in case issues arise that require direction from the Crown; and
- Participate in the consultation process as necessary and as determined by the Crown.

IV. THE PROPONENT'S ROLE AND RESPONSIBILITIES IN THE DELEGATED CONSULTATION PROCESS

Where aspects of the consultation process have been delegated to a proponent, the Crown, in meeting its duty to consult, will rely on the proponent's consultation activities and documentation of those activities. The consultation process informs the Crown's decision of whether or not to approve a proposed project or activity.

A proponent's role and responsibilities will vary depending on a variety of factors including the extent of consultation required in the circumstance and the procedural aspects of consultation the Crown has delegated to it. Proponents are often in a better position than the Crown to discuss a project and its potential impacts with Aboriginal communities and to determine ways to avoid or minimize the adverse impacts of a project.

A proponent can raise issues or questions with the Crown at any time during the consultation process. If issues or concerns arise during the consultation that cannot be addressed by the proponent, the proponent should contact the Crown.

a) What might a proponent be required to do in carrying out the procedural aspects of consultation?

Where the Crown delegates procedural aspects of consultation, it is often the proponent's responsibility to provide notice of the proposed project to the identified Aboriginal communities. The notice should indicate that the Crown has delegated the procedural aspects of consultation to the proponent and should include the following information:

- a description of the proposed project or activity;
- mapping;
- proposed timelines;
- details regarding anticipated environmental and other impacts;
- details regarding opportunities to comment; and
- any changes to the proposed project that have been made for seasonal conditions or other factors, where relevant.

Proponents should provide enough information and time to allow Aboriginal communities to provide meaningful feedback regarding the potential impacts of the project. Depending on the nature of consultation required for a project, a proponent also may be required to:

- provide the Crown with copies of any consultation plans prepared and an opportunity to review and comment;
- ensure that any necessary follow-up discussions with Aboriginal communities take place in a timely manner, including to confirm receipt of information, share and update information and to address questions or concerns that may arise;

- as appropriate, discuss with Aboriginal communities potential mitigation measures and/or changes to the project in response to concerns raised by Aboriginal communities;
- use language that is accessible and not overly technical, and translate material into Aboriginal languages where requested or appropriate;
- bear the reasonable costs associated with the consultation process such as, but not limited to, meeting hall rental, meal costs, document translation(s), or to address technical & capacity issues;
- provide the Crown with all the details about potential impacts on established or asserted Aboriginal or treaty rights, how these concerns have been considered and addressed by the proponent and the Aboriginal communities and any steps taken to mitigate the potential impacts;
- provide the Crown with complete and accurate documentation from these meetings and communications; and
- notify the Crown immediately if an Aboriginal community not identified by the Crown approaches the proponent seeking consultation opportunities.

b) What documentation and reporting does the Crown need from the proponent?

Proponents should keep records of all communications with the Aboriginal communities involved in the consultation process and any information provided to these Aboriginal communities.

As the Crown is required to assess the adequacy of consultation, it needs documentation to satisfy itself that the proponent has fulfilled the procedural aspects of consultation delegated to it. The documentation required would typically include:

- the date of meetings, the agendas, any materials distributed, those in attendance and copies of any minutes prepared;
- the description of the proposed project that was shared at the meeting;
- any and all concerns or other feedback provided by the communities;
- any information that was shared by a community in relation to its asserted or established Aboriginal or treaty rights and any potential adverse impacts of the proposed activity, approval or disposition on such rights;
- any proposed project changes or mitigation measures that were discussed, and feedback from Aboriginal communities about the proposed changes and measures;
- any commitments made by the proponent in response to any concerns raised, and feedback from Aboriginal communities on those commitments;
- copies of correspondence to or from Aboriginal communities, and any materials distributed electronically or by mail;

- information regarding any financial assistance provided by the proponent to enable participation by Aboriginal communities in the consultation;
- periodic consultation progress reports or copies of meeting notes if requested by the Crown;
- a summary of how the delegated aspects of consultation were carried out and the results; and
- a summary of issues raised by the Aboriginal communities, how the issues were addressed and any outstanding issues.

In certain circumstances, the Crown may share and discuss the proponent's consultation record with an Aboriginal community to ensure that it is an accurate reflection of the consultation process.

c) Will the Crown require a proponent to provide information about its commercial arrangements with Aboriginal communities?

The Crown may require a proponent to share information about aspects of commercial arrangements between the proponent and Aboriginal communities where the arrangements:

- include elements that are directed at mitigating or otherwise addressing impacts of the project;
- include securing an Aboriginal community's support for the project; or
- may potentially affect the obligations of the Crown to the Aboriginal communities.

The proponent should make every reasonable effort to exempt the Crown from confidentiality provisions in commercial arrangements with Aboriginal communities to the extent necessary to allow this information to be shared with the Crown.

The Crown cannot guarantee that information shared with the Crown will remain confidential. Confidential commercial information should not be provided to the Crown as part of the consultation record if it is not relevant to the duty to consult or otherwise required to be submitted to the Crown as part of the regulatory process.

V. WHAT ARE THE ROLES AND RESPONSIBILITIES OF ABORIGINAL COMMUNITIES' IN THE CONSULTATION PROCESS?

Like the Crown, Aboriginal communities are expected to engage in consultation in good faith. This includes:

- responding to the consultation notice;
- engaging in the proposed consultation process;
- providing relevant documentation;

- clearly articulating the potential impacts of the proposed project on Aboriginal or treaty rights; and
- discussing ways to mitigates any adverse impacts.

Some Aboriginal communities have developed tools, such as consultation protocols, policies or processes that provide guidance on how they would prefer to be consulted. Although not legally binding, proponents are encouraged to respect these community processes where it is reasonable to do so. Please note that there is no obligation for a proponent to pay a fee to an Aboriginal community in order to enter into a consultation process.

To ensure that the Crown is aware of existing community consultation protocols, proponents should contact the relevant Crown ministry when presented with a consultation protocol by an Aboriginal community or anyone purporting to be a representative of an Aboriginal community.

VI. WHAT IF MORE THAN ONE PROVINCIAL CROWN MINISTRY IS INVOLVED IN APPROVING A PROPONENT'S PROJECT?

Depending on the project and the required permits or approvals, one or more ministries may delegate procedural aspects of the Crown's duty to consult to the proponent. The proponent may contact individual ministries for guidance related to the delegation of procedural aspects of consultation for ministry-specific permits/approvals required for the project in question. Proponents are encouraged to seek input from all involved Crown ministries sooner rather than later.

Client's Guide to Preliminary Screening for Species at Risk

Ministry of the Environment, Conservation and Parks

Species at Risk Branch, Permissions and Compliance

DRAFT - May 2019

Table of Contents

1.0 Purpose, Scope, Background and Context

1.1 Purpose of this Guide

This guide has been created to:

- help clients better understand their obligation to gather information and complete a preliminary screening for species at risk before contacting the ministry,
- outline guidance and advice clients can expect to receive from the ministry at the preliminary screening stage,
- help clients understand how they can gather information about species at risk by accessing publicly available information housed by the Government of Ontario, and
- provide a list of other potential sources of species at risk information that exist outside the Government of Ontario.

It remains the client's responsibility to:

- carry out a preliminary screening for their projects,
- obtain best available information from all applicable information sources,
- conduct any necessary field studies or inventories to identify and confirm the presence or absence of species at risk or their habitat,
- consider any potential impacts to species at risk that a proposed activity might cause, and
- comply with the *Endangered Species Act* (ESA).

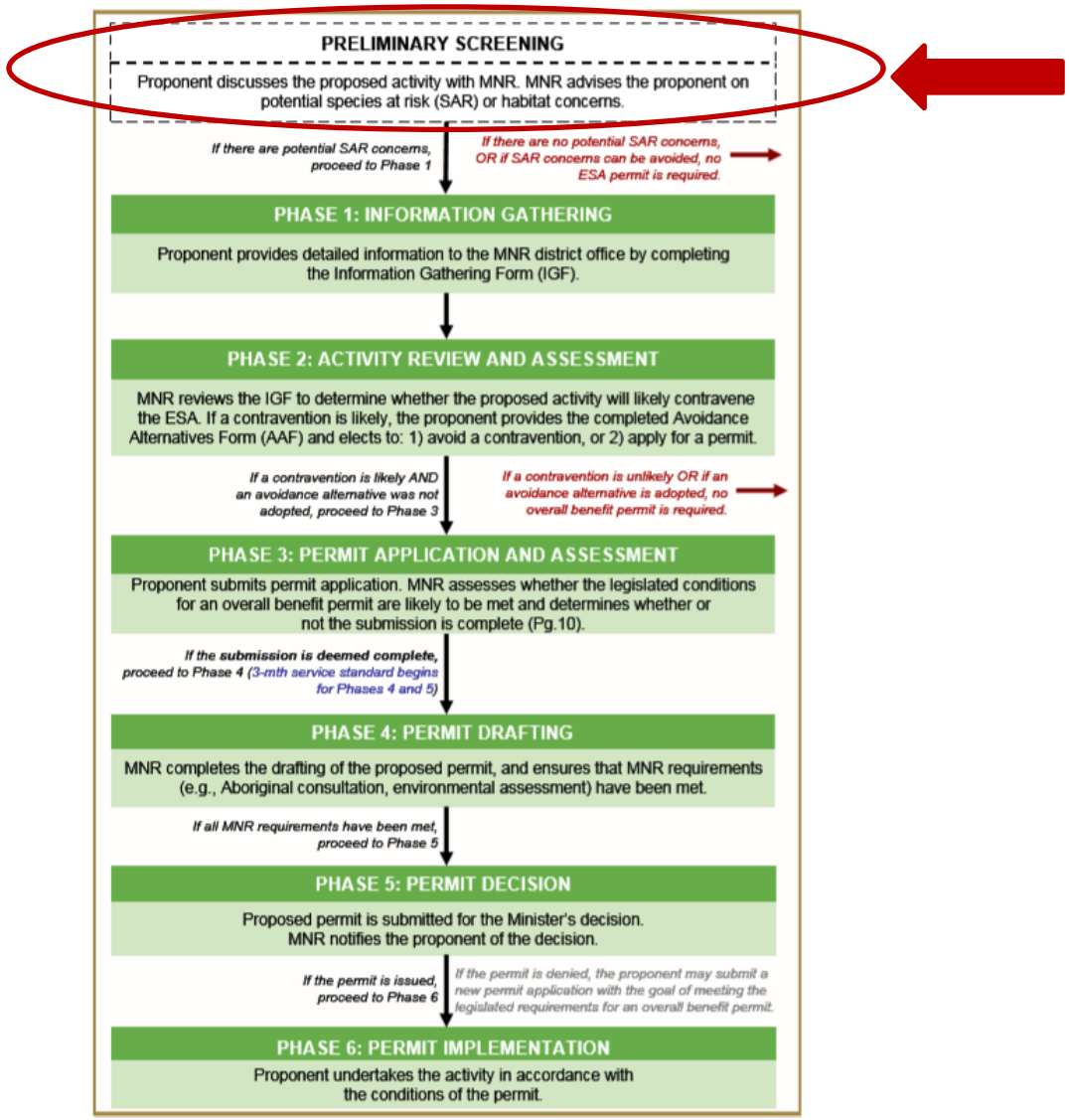
To provide the most efficient service, clients should initiate species at risk screenings and seek information from all applicable information sources identified in this guide, at a minimum, prior to contacting Government of Ontario ministry offices for further information or advice.

1.2 Scope

This guide is a resource for clients seeking to understand if their activity is likely to impact species at risk or if they are likely to trigger the need for an authorization under the ESA. It is not intended to circumvent any detailed site surveys that may be necessary to document species at risk or their habitat nor to circumvent the need to assess the impacts of a proposed activity on species at risk or their habitat. This guide is not an exhaustive list of available information sources for any given area as the availability of information on species at risk and their habitat varies across the province. This guide is intended to support projects and activities carried out on Crown and private land, by private landowners, businesses, other provincial ministries and agencies, or municipal government.

1.3 Background and Context

To receive advice on their proposed activity, clients must first determine whether any species at risk or their habitat exist or are likely to exist at or near their proposed activity, and whether their proposed activity is likely to contravene the ESA. Once this step is complete, clients may contact the ministry at SAROntario@ontario.ca to discuss the main purpose, general methods, timing and location of their proposed activity as well as information obtained about species at risk and their habitat at, or near, the site. At this stage, the ministry can provide advice and guidance to the client about potential species at risk or habitat concerns, measures that the client is considering to avoid adverse effects on species at risk or their habitat and whether additional field surveys are advisable. This is referred to as the "Preliminary Screening" stage. For more information on additional phases in the diagram below, please refer to the *Endangered Species Act Submission Standards for Activity Review and 17(2)(c) Overall Benefit Permits* policy available online at https://www.ontario.ca/page/species-risk-overall-benefit-permits



2.0 Roles and Responsibilities

To provide the most efficient service, clients should initiate species at risk screenings and seek information from all applicable information sources identified in this guide prior to contacting Government of Ontario ministry offices for further information or advice.

Step 1: Client seeks information regarding species at risk or their habitat that exist, or are likely to exist, at or near their proposed activity by referring to all applicable information sources identified in this guide.

Step 2: Client reviews and consider guidance on whether their proposed activity is likely to contravene the ESA (see section 3.4 of this guide for guidance on what to consider).

Step 3: Client gathers information identified in the checklist in section 4 of this guide.

Step 4: Client contacts the ministry at SAROntario@ontario.ca to discuss their preliminary screening. Ministry staff will ask the client questions about the main purpose, general methods, timing and location of their proposed activity as well as information obtained about species at risk and their habitat at, or near, the site. Ministry staff will also ask the client for their interpretation of the impacts of their activity on species at risk or their habitat as well as measures the client has considered to avoid any adverse impacts.

Step 5: Ministry staff will provide advice on next steps.

Option A: Ministry staff may advise the client they can proceed with their activity without an authorization under the ESA where the ministry is confident that:

- no protected species at risk or habitats are likely to be present at or near the proposed location of the activity; or
- protected species at risk or habitats are known to be present but the activity is not likely to contravene the ESA; or
- through the adoption of avoidance measures, the modified activity is not likely to contravene the ESA.

Option B: Ministry staff may advise the client to proceed to Phase 1 of the overall benefit permitting process (i.e. Information Gathering in the previous diagram), where:

- there is uncertainty as to whether any protected species at risk or habitats are present at or near the proposed location of the activity; or
- the potential impacts of the proposed activity are uncertain; or
- ministry staff anticipate the proposed activity is likely to contravene the ESA.

3.0 Information Sources

Land Information Ontario (LIO) and the Natural Heritage Information Centre (NHIC) maintain and provide information about species at risk, as well as related information about fisheries, wildlife, crown lands, protected lands and more. This information is made available to organizations, private individuals, consultants, and developers through online sources and is often considered under various pieces of legislation or as part of regulatory approvals and planning processes.

The information available from LIO or NHIC and the sources listed in this guide should not be considered as a substitute for site visits and appropriate field surveys. Generally, this information can be regarded as a starting point from which to conduct further field surveys, if needed. While this data represents best available current information, it is important to note that a lack of information for a site does not mean that species at risk or their habitat are not present. There are many areas where the Government of Ontario does not currently have information, especially in more remote parts of the province. The absence of species at risk location data at or near your site does not necessarily mean no species at risk are present at that location. On-site assessments can better verify site conditions, identify and confirm presence of species at risk and/or their habitats.

Information on the location (i.e. observations and occurrences) of species at risk is considered sensitive and therefore publicly available only on a 1km square grid as opposed to as a detailed point on a map. This generalized information can help you understand which species at risk are in the general vicinity of your proposed activity and can help inform field level studies you may want to undertake to confirm the presence, or absence of species at risk at or near your site.

Should you require specific and detailed information pertaining to species at risk observations and occurrences at or near your site on a finer geographic scale; you will be required to demonstrate your need to access this information, to complete data sensitivity training and to obtain a Sensitive Data Use License from the NHIC. Information on how to obtain a license can be found online at https://www.ontario.ca/page/get-natural-heritage-information.

Many organizations (e.g. other Ontario ministries, municipalities, conservation authorities) have ongoing licensing to access this data so be sure to check if your organization has this access and consult this data as part of your preliminary screening if your organization already has a license.

3.1 Make a Map: Natural Heritage Areas

The Make a Natural Heritage Area Map (available online at http://www.gisapplication.lrc.gov.on.ca/mamnh/Index.html?site=MNR_NHLUPS_NaturalHeritage&viewer=NaturalHeritage&locale=en-US provides public access to natural heritage information, including species at risk, without the user needing to have Geographic Information System (GIS) capability. It allows users to view and identify generalized species at risk information, mark areas of interest, and create and print a custom map directly from the web application. The tool also shows topographic information such as roads, rivers, contours and municipal boundaries.

Users are advised that sensitive information has been removed from the natural areas dataset and the occurrences of species at risk has been generalized to a 1-kilometre grid to mitigate the risks to the species (e.g. illegal harvest, habitat disturbance, poaching).

The web-based mapping tool displays natural heritage data, including:

- Generalized Species at risk occurrence data (based on a 1-km square grid),
- Natural Heritage Information Centre data.

Data cannot be downloaded directly from this web map; however, information included in this application is available digitally through Land Information Ontario (LIO) at https://www.ontario.ca/page/land-information-ontario.

3.2 Land Information Ontario (LIO)

Most natural heritage data is publicly available. This data is managed in a large provincial corporate database called the LIO Warehouse and can be accessed online through the LIO Metadata Management Tool at https://www.javacoeapp.lrc.gov.on.ca/geonetwork/srv/en/main.home. This tool provides descriptive information about the characteristics, quality and context of the data. Publicly available geospatial data can be downloaded directly from this site.

While most data are publicly available, some data may be considered highly sensitive (i.e. nursery areas for fish, species at risk observations) and as such, access to some data maybe restricted.

3.3 Additional Species at Risk Information Sources

- The Breeding Bird Atlas can be accessed online at http://www.birdsontario.org/atlas/index.jsp?lang=en
- eBird can be accessed online at https://ebird.org/home
- iNaturalist can be accessed online at https://www.inaturalist.org/
- The Ontario Reptile and Amphibian Atlas can be accessed online at https://ontarionature.org/programs/citizen-science/reptile-amphibian-atlas
- Your local Conservation Authority. Information to help you find your local Conservation Authority can be accessed online at https://conservationontario.ca/conservation-authorities/find-a-conservation-authority/

  Local naturalist groups or other similar community-based organizations
- Local Indigenous communities
- Local land trusts or other similar Environmental Non-Government Organizations
- Field level studies to identify if species at risk, or their habitat, are likely present or absent at or near the site.
- When an activity is proposed within one of the continuous caribou ranges, please be sure to consider the caribou Range Management Policy. This policy includes figures and maps of the continuous caribou range, can be found online at https://www.ontario.ca/page/range-management-policy-support-woodland-caribou-conservation-and-recovery

3.4 Information Sources to Support Impact Assessments

- Guidance to help you understand if your activity is likely to adversely impact species at risk or their habitat can be found online at https://www.ontario.ca/page/policy-guidance-harm-and-harass-under-endangered-species-act and https://www.ontario.ca/page/categorizing-and-protecting-habitat-under-endangered-species-act
- A list of species at risk in Ontario is available online at https://www.ontario.ca/page/species-risk-ontario. On this webpage, you can find out more about each species, including where is lives, what threatens it and any specific habitat protections that apply to it by clicking on the photo of the species.

4.0 Check-List

Please feel free to use the check list below to help you confirm you have explored all applicable information sources and to support your discussion with Ministry staff at the preliminary screening stage.

- ✓ Land Information Ontario (LIO)
- ✓ Natural Heritage Information Centre (NHIC)
- ✓ The Breeding Bird Atlas
- ✓ eBird
- ✓ iNaturalist
- ✓ Ontario Reptile and Amphibian Atlas
- ✓ List Conservation Authorities you contacted:_____

  _____
- ✓ List local naturalist groups you contacted:_____

  _____
- ✓ List local Indigenous communities you contacted:_____

  _____
- ✓ List any other local land trusts or Environmental Non-Government Organizations you contacted:_____

  _____
- ✓ List and field studies that were conducted to identify species at risk, or their habitat, likely to be present or absent at or near the site: _____

  _____
- ✓ List what you think the likely impacts of your activity are on species at risk and their habitat (e.g. damage or destruction of habitat, killing, harming or harassing species at risk):_____

  _____

Samya Chams

From:	Badali, Mark (He/Him) (MECP) <Mark.Badali1@ontario.ca>
Sent:	November 27, 2023 2:01 PM
To:	Darika Sharma; Paul Zuberbuhler
Cc:	John Tyrrell
Subject:	RE: Strathroy-Caradoc Water, Wastewater &Stormwater Management Master Plan - Notice of Study Commencement
Attachments:	Notice of Study Commencement 2023Nov21.pdf; Instructions for Providing Class EA Notices to the Ministry of the Environment Conservation and Parks.pdf; Instructions for Completing the Streamlined EA Project Information Form.pdf
Categories:	Filed by Newforma

Hi Darika,

Thank you for providing the attached Notice of Commencement. I am presently acting as the Regional Environmental Planner (REP) who is assigned to your project.

As per the ministry's mandatory notification procedure for providing Class EA notices (see attached), please provide a corresponding Project Information Form (PIF) to the appropriate MECP Regional EA email address (in this case, the project is located in MECP South West Region). Upon receipt of the PIF, I will return a Letter of Acknowledgement in response to this Notice.

Also, moving forward, please do not send notices to other MECP contacts besides the appropriate Regional EA email address and the assigned REP. The reason MECP implemented the regional email address notification procedure is to create certainty for proponents/consultants on where to send notices and to avoid situations where proponents send notices to multiple contacts in the MECP which complicates internal processes unnecessarily.

Thank you,

Mark Badali (he/him) | Senior Project Evaluator
Environmental Assessment Program Support | Environmental Assessment Branch
Ontario Ministry of the Environment, Conservation and Parks
Mark.Badali1@ontario.ca | (416) 457-2155

From: Darika Sharma <DSharma@rvanderson.com>
Sent: November 21, 2023 9:18 PM
To: Paul Zuberbuhler <pzuberbuhler@strathroy-caradoc.ca>
Cc: John Tyrrell <JTyrrell@rvanderson.com>
Subject: Strathroy-Caradoc Water, Wastewater &Stormwater Management Master Plan - Notice of Study Commencement

Good Evening,

The Municipality of Strathroy-Caradoc has initiated the process of developing a Water, Wastewater and Stormwater Management Master Plan (WWWSWM MP) that will be supported by a Pollution Prevention Control Plan (PPCP). The WWWSWM MP will provide the Municipality with strategic long-term water and wastewater servicing, and stormwater management strategies that support existing needs and accommodate projected population and employment growth to the year 2046. The PPCP will provide a road map for implementing the identified infrastructure and operational improvements.

You have been identified as potentially having interest and/or information that may assist the study team in developing the Master Plan.

Attached, please the Notice of Study Commencement regarding this study.

Thank you,

Darika Sharma, M.Eng, EIT

Process Designer

R.V. Anderson Associates Limited
557 Southdale Road East, Suite 200, London ON N6E 1A2
t 519 681 9916 ext. 5032 | m 647 648 0461
LinkedIn | Facebook | Website

Samya Chams

From:	Marcy McKillop <mmckillop@huronelginwater.ca>
Sent:	September 23, 2024 2:03 PM
To:	Samya Chams
Cc:	Andrew Henry; Marcus Schaum; Submissions; John Tyrrell; Darika Sharma; Paul Zuberbuhler; Jessy Van der Vaart; Trisha McKibbin
Subject:	RE: Strathroy-Caradoc Water, Wastewater &Stormwater Management Master Plan - Notice of PIC #2

Good afternoon,

Thank for continuing to provide updates regarding the Strathroy-Caradoc Water, Wastewater and Stormwater Management Master Plan.

Please ensure any municipal planning, development, design and construction projects consider the importance and location of LHPWSS transmission infrastructure and any easements, and includes applicable consultation and coordination with the LHPWSS. Any planning or development documentation should continue to be shared with LHPWSS through email to submissions@huronelginwater.ca

Please note that member municipalities are responsible for water distribution system infrastructure, including operation, replacement/upgrade and maintenance, as well as equalization, emergency and fire storage, in accordance with applicable provincial guidelines and regulations.

The Lake Huron Primary Water Supply System (LHPWSS) is currently undertaking a Master Plan. A Notice of Commencement and PIC #1 will be issued this fall. More information will be made available here as the Master Plan advances over the next year: https://www.huronelginwater.ca/lake-huron-primary-water-supply-system-master-plan/

Please note that the LHPWSS is providing a transmission connection to Oneida Nation of the Thames. Our engineering consultant, Stantec Consulting, will continue to work with Strathroy-Caradoc municipal staff regarding this project, and will circulate detailed design drawings for review this fall. The transmission main will extend from northeast of Mount Brydges along Falconbridge Road to Christina Road and construction is anticipated for spring 2025. It was noted that two wastewater servicing/treatment alternatives for Mount Brydges, shown in Public Information Centre #2, included new sanitary sewers (or forcemains) that would cross existing or new transmission infrastructure. Please consider the location of LHPWSS transmission infrastructure as part of any evaluation of alternatives.

Best regards,

Marcy McKillop, P.Eng. (she/her)
Environmental Services Engineer, Regional Water Supply

Lake Huron & Elgin Area Primary Water Supply Systems
235 North Centre Road, Suite 200
London, Ontario N5X 4E7
T: 519-930-3505 ext. 4976
E: mmckillop@huronelginwater.ca
https://huronelginwater.ca
www.facebook.com/RegionalWaterSupply

The Lake Huron and Elgin Area Primary Water Supply Systems serve communities and people within the traditional lands of the Anishinaabek, Haudenosaunee, Lūnaapéewak and Attawandaron. We honour and respect the history, languages and culture of the diverse Indigenous people who call this territory home. This region is currently home to many First Nations, Inuit and Métis. We are grateful to have the opportunity to work and live in this territory.

From: Samya Chams <schams@rvanderson.com>
Sent: Thursday, August 1, 2024 11:06 AM
To: Samya Chams <schams@rvanderson.com>
Cc: John Tyrrell <JTyrrell@rvanderson.com>; Darika Sharma <DSharma@rvanderson.com>; Paul Zuberbuhler <pzuberbuhler@strathroy-caradoc.ca>; Jessy Van der Vaart <jvandervaart@strathroy-caradoc.ca>; Trisha McKibbin <tmckibbin@strathroy-caradoc.ca>
Subject: Strathroy-Caradoc Water, Wastewater &Stormwater Management Master Plan - Notice of PIC #2

> You don't often get email from schams@rvanderson.com. Learn why this is important

Dear Sir/Madam,

On behalf of the Municipality of Strathroy - Caradoc, please find attached the Notice of Public Information Session (PIC) #2 for the Water, Wastewater and Stormwater Master Plan and Pollution Prevention Control Plan. A webpage has been created and all relevant documents have been uploaded including the Notice of Study Commencement. This webpage can be found here: https://www.strathroy-caradoc.ca/en/city-hall/water-wastewater-and-stormwater-master-plan-and-pollution-prevention-control-plan.aspx

The project team values the participation of all stakeholders and wishes to ensure that the community's interests and concerns are taken into consideration. Please contact the project team members listed on the attached notice should you require further information on this project.

Thank you,

Samya

Samya Chams, B.A. (she/her)
Administrative Assistant

R.V. Anderson Associates Limited
557 Southdale Road East, Suite 200, London ON N6E 1A2
t 519 681 9916 ext. 5021
LinkedIn | Facebook | Website

Samya Chams

From: Paul Zuberbuhler <pzuberbuhler@strathroy-caradoc.ca>
Sent: September 16, 2024 7:37 AM
To: John Tyrrell; Darika Sharma
Subject: FW: Strathroy-Caradoc Water, Wastewater &Stormwater Management Master Plan - Meeting Follow Up
Attachments: Projects of Interest.pdf

Hi John/Darika,
Please see attached questions below from the Public Meeting. Are you able to answer these?

Regards,

Paul Zuberbuhler B.Sc, B.Comm, C.E.T.
Manager of Environmental Services

Municipality of Strathroy-Caradoc
52 Frank Street | Strathroy, ON | N7G 2R4

Phone: 519-245-1105 x274
Email: pzuberbuhler@strathroy-caradoc.ca

Visit us online at www.strathroy-caradoc.ca

From: Joshua Monster <JMonster@mte85.com>
Sent: September-16-24 7:20 AM
To: Paul Zuberbuhler <pzuberbuhler@strathroy-caradoc.ca>
Subject: Strathroy-Caradoc Water, Wastewater &Stormwater Management Master Plan - Meeting Follow Up

Hello Paul,

Good to see you last Wednesday, thanks for proactively approaching to see if I had any questions.

As discussed, we have a client with parcels of land located within, and in the vicinity of, the Town of Strathroy. Our client has requested that we follow the Master Plan process to ensure that his parcels are being considered in the evaluation of the system and the proposed upgrades.

The parcels and the conceptual development proposals are roughly indicated on the attached figure. Our questions are summarized below, we recognize that the Master Plan is a high-level study and we cannot expect answers on specific infrastructure projects / upgrades but are hoping to confirm that the proposed developments would fit into the growth intensities and areas used in the study update.

- The Melbourne Road and Glengyle Road properties are currently located outside of the Town's settlement boundary. Is the growth being considered in the study allowing for any expansion of the growth boundary in the next 20 years?
- To what extent was intensification of the downtown area considered? Would an apartment complex fit within this projection?
- The 2006 Sanitary Servicing Master Plan completed by BM Ross included allowances for development in the area of the Glengyle property. Does this Master Plan give any consideration to growth in that area and the associated works required to service that growth?
- There is an existing sanitary trunk sewer which snakes through the east side of the Melbourne Road property. We assume that this property has been accounted for in the design of that sewer, that development of the property should be included in the growth estimates, and that infrastructure projects associated with servicing the property (Water, Storm) should also be considered. Please confirm.

Thanks,

Josh

Joshua Monster, P.Eng. | **Technical Practice Leader – Land**
MTE Consultants Inc.
T: 519-204-6510 x2202 | JMonster@mte85.com
123 St George St., London, Ontario N6A 3A1
www.mte85.com | LinkedIn | Instagram | Facebook

UPPER THAMES RIVER
CONSERVATION AUTHORITY

Thames
Canadian Heritage River

"Inspiring a Healthy Environment"

January 8, 2024

R.V. Anderson Associates Limited
557 Southdale Road East, Suite #200
London, ON
N6E 1A2

Municipality of Strathroy-Caradoc
52 Frank Street
Sthrathroy-Caradoc
N7G 2R4

Attention: **John Tyrrell, R.V Anderson -** (sent via e-mail: jtyrrell@rvanderson.com)

Paul Zuberbuhler, Strathroy-Caradoc
– (sent via e-mail: pzuberbuhler@strathroy-caradoc.ca)

Re: **Water, Wastewater and Stormwater Master Plan and Pollution Prevention Control Plan**
Notice of Study Commencement
Municipality of Strathroy-Caradoc

Upper Thames River Conservation Authority (UTRCA) staff are in receipt of the Notice of Study Commencement for the Municipality of Strathroy-Caradoc's Water, Wastewater and Stormwater Master Plan and Pollution Prevention Control Plan (PPCP). We are further of the understanding the Master Plan is being prepared as part of ongoing efforts to improve the performance of the municipality's infrastructure while the PPCP will provide a road map for implementing infrastructure and operational improvements that will mitigate the impacts of wet weather sewer system overflows on the environment.

We offer the following comments under Ontario Regulation 157/06 and our responsibilities as a commenting agency providing technical review and advisement related to water resources, pollution prevention and natural hazard management pursuant to relevant legislation and policies set out in the UTRCA Planning Policy Manual (June 28, 2006).:

General Comments

1) We would appreciate the opportunity for our technical staff to review and provide comments on any upcoming draft documents and proposed alternatives including any draft Master Plan or PPCP. Please note that our scope of review is based on the

policies set out in the Upper Thames River Conservation Authority Planning Policy Manual (June 28, 2006). SMP and subsequent detail design project review for site specific works would generally be guided by, but not limited to, natural hazard and pollution prevention areas of concern for lands regulated within our jurisdiction.

Conservation Authority Regulated Areas

2) The UTRCA has identified that the study area contains natural [water] hazard lands due to the presence of: a) a variety of watercourses including the main branch of the Thames River; b) riverine flooding and erosion hazard lands associated with these watercourses; c) Wetland (including wetlands that have been designated as Provincially or Locally Significant); and, d) the Area of Interference surrounding these wetland features.

3) While it is understandable that some of the water/wastewater/storm infrastructure (such as water and wastewater trunk lines) will need to cross over/under watercourses any new or expanded structures (such as water storage facilities, pumping stations and stormwater management facilities) should be located entirely outside the hazard lands (flood, erosion, wetland).

4) Portions of the study areas either lie outside our watershed or are shared with the the St. Clair Region Conservation Authority (SCRCA) or the Lower Thames Valley Conservation Authority (LTVCA) who also have jurisdiction for those areas. We recommend you contact the other relevant Conservation Authorities directly for their comments regarding any works/plans proposed in their portions of the study area.

Digital Mapping

5) Our staff can provide digital mapping which outlines the approximate boundaries of the natural hazard features as well as Drinking Water Source Protection Areas present within the UTRCA portion of the study area. Our digital mapping may be obtained by contacting our GIS department (contact: Phil Simm, 519-451-2800 x 247). Generally there is a fee involved with obtaining digital mapping of our natural hazard features but this fee will be waived as the mapping is intended for use by one of our watershed municipalities for a Servicing Master Plan and PPCP.

Drinking Water Source Protection

6) This Master Plan and PPCP is the best time to consider regulatory requirements of the Ontario *Clean Water Act* and local Source Protection Plans as well as designated vulnerable areas. The Master Planning process offers an excellent opportunity to document how these factors have been considered in assessing alternatives through the planning process.

7) Wastewater and Storm Water Management is an activity which may be considered a drinking water threat and thus any WW or SWM plan should consider its impact to these designated vulnerable areas and features. Within this municipality, the

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vulnerable areas include: Highly Vulnerable Aquifers and Significant Groundwater Recharge Areas. Neither of which have significant policies that need to be addressed but there should be regard for these areas and use Best Management Practices where possible. While it is important to maintain the quantity of water recharged to these vulnerable aquifers it is also important to consider the quality of the water recharged in these vulnerable areas.

8) If the Water and Wastewater Master Plan preferred option is either a new well, change in location of existing well, or expansion of current well, please engage our office as soon as you can as this is subject to s.34 amendments to the Thames-Sydenham Source Protection Plans and Assessment Reports as per the *Clean Water Act, 2006*. These changes could affect the Wellhead Protection Area delineation for which polices could apply.

9) If the proponents have questions on how source protection and the local plan may affect the proposed alternatives they may contact UTRCA Drinking Water Source Protection (DWSP) staff or their municipal Risk Management Official (RMO).

Comments Specific to Stormwater Management

While most of the following stormwater management comments could be dealt with at the detail design stage we are providing them at the beginning of the study for information and future planning purposes.

10) For details on our policies regarding stormwater management, you may wish to refer to Section 3.5.2 – Policies for Stormwater Management and Erosion and Sediment Control Measures contained within our Environmental Planning Policy Manual for the Upper Thames River Conservation Authority (June 2006, revised October 2017), available on our website at:

https://thamesriver.on.ca/wp-content/uploads/EnvPlanningPolicyManual-update2017.pdf

11) Please note the UTRCA takes the 1: 250 Year Storm as our regulatory storm event standard. The UTRCA requires quantity controls on all future stormwater management (SWM) facilities to ensure that post-development flows will be controlled to pre-development flows for all storm events up to and including the Regulatory (1: 250) Year Storm;

12) If any pond is proposed to outlet to an existing storm sewer, then the pond should be designed to the capacity of the receiving storm sewer up to and including the 250-year storm under the post-development conditions.

13) Any proposed SWM outlets discharging to open watercourses should be sized to handle the Regulatory (1: 250) Year Storm.

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14) Enhanced Water Quality Control control (80% long-term average TSS removal), as per MECP's SWM Planning and Design Manual, is recommended for all future stormwater management facilities.

15) With regards to any proposed 'Low-Impact Stormwater Controls' only clean and/or treated water should be considered for infiltration. If there are any wetlands associated with the site a Water Balance supported by HydroG may be required.

16) UTRCA does not support the diversion of stormwater from one catchment to another.

Summary

Please note that given the broad concept proposal at this time, we are unable to provide detailed technical comments regarding the project. However, we appreciate being contacted early in the process and are always open to meeting with you to discuss and work through any concerns or complications along the way.

Our office would like to be included in future circulations regarding this project. We would appreciate receiving information and reports as they become available in order to ensure that we can meet the project deadlines with our comments.

If you have any questions regarding the above information, please contact the undersigned.

Yours truly,
UPPER THAMES RIVER CONSERVATION AUTHORITY

Karen M. Winfield

Karen Winfield
Land Use Regulations Officer
JW/KW/kw

c.c. – Darika Sharma, R.V. Anderson – (via e-mail: DSharma@rvanderson.com)
Laura Biancolin, UTRCA
Eric Gaskin, UTRCA
Cari Ramsey, UTRCA
Julie Welker, UTRCA
Melissa Diesley, SCRCA
Valerie Towsley, LTVCA

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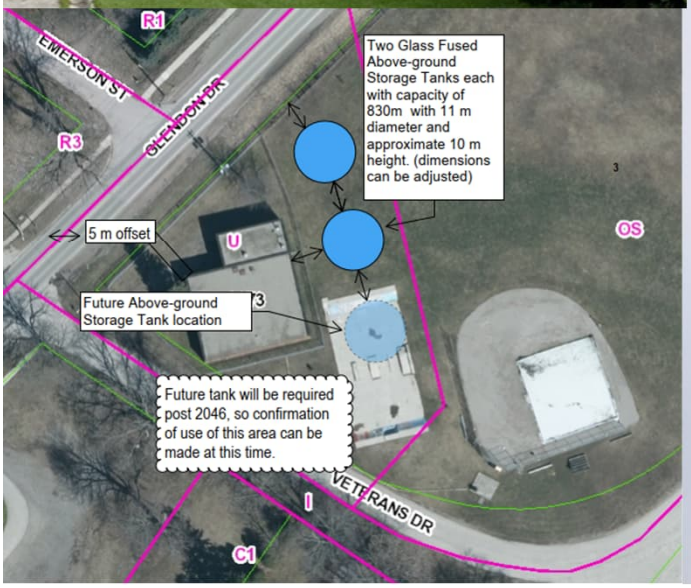

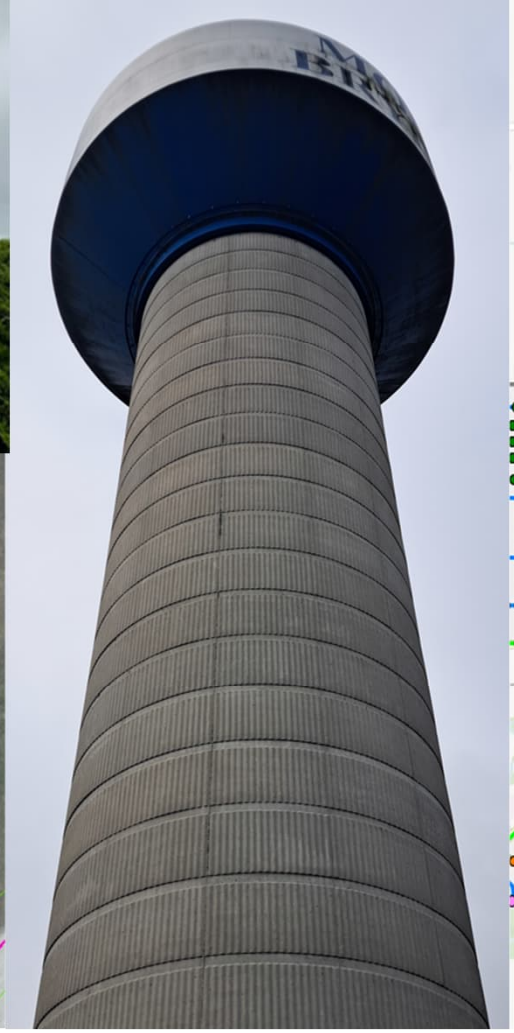

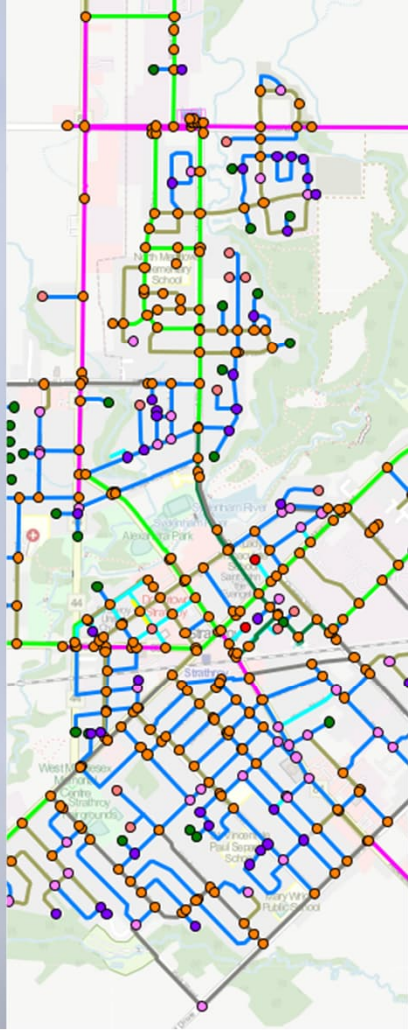

MUNCIPALITY OF STRATHROY - CARADOC

Water, Wastewater and Stormwater Master Plan

Appendix 2 – Water Master Plan

October 31, 2024

R.V. Anderson Associates Limited
557 Southdale Road East, Suite 200
London, ON N6E 1A2

WATER MASTER PLAN TECHNICAL MEMORANDUM

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GLOSSARY OF WATER SYSTEM DESIGN PARAMETERS

Guidelines

The *Safe Drinking Water Act* was implemented following the Walkerton Water Crisis (2000), at which time there was no formal regulation of drinking water treatment, operation, record taking, and remedial actions for unsafe drinking water in Ontario. Ontario Regulation 170 (O. Reg 170) under the SDWA provides the requirement for municipal water supply systems which includes reference to the Ten State Standards and the MECP document titled *Procedure for Disinfection of Drinking Water*. The MECP *Design Guidelines for Drinking-Water Systems* (Water Guidelines) is used for the analysis of the Municipality's supply and distribution systems; but it is understood that the guidelines do allow some individual municipal discretion on items such as municipal fire protection.

Average Day Demand (ADD) is the average of the daily recorded water demand over a given year. The ADD for each DWS is obtained from the 2019-2022 *Annual Report for Water Systems (ARWS)* provided by Municipality. A 4-year average is used to obtain an accurate representation of the water demand.

Maximum Day Demand (MDD) is defined by the MECP Water Guidelines defines the MDD as:

> *"The [MDD is the] average usage on the maximum day. When actual water demand data are available, the designer should review the data and eliminate statistical outliers (e.g., excessive water demands that occurred as a result of a major trunk main break, and erroneous metering or recording) before selecting a value."*

Maximum Day Factor (MDF) is the MDD divided by the ADD.

Peak Hour Demand (PHD) is calculated based on the Water Guidelines and is based on the serviced population.

Firm Capacity as per the Water Guidelines requires that:

- "The drinking-water system including the water treatment plant and treated water storage should be designed to satisfy the greater of the following demands:
    - Maximum day demand plus fire flow (where fire protection is to be provided); or,
    - Peak hour demand."

Fire Flow Requirements are defined in the SCSS which requires that water demand for fire fighting be estimated using the "Water Supply for Public Fire Protection - A Guide to Recommended Practice" prepared by Fire Underwriters Survey(FUS Guideline). Specific requirements vary based on the property use, its building materials, the size of the buildings

on site and the proximity to other structure. This requirement is generally addressed as part of the detailed hydraulic modeling for developments.

Water Storage Guidelines are calculated for each serviced area using the following formula from the Water Guidelines:

1. Water Storage Requirement = A + B + C
2. Where A is the required fire storage based on the recommended fire flow, B is the equalization storage (25% of maximum day demand), and C is the emergency storage (25% of the sum of A and B). The recommended fire flow from the MECP guidelines is provided in Table GL-1.

Table GL-1: Suggested Fire Flow from the MECP Design Guidelines for Drinking Water Systems

Equivalent Population	Suggested Fire Flow (L/s)	Duration (hours)
500 to 1,000	38	2
1,000	64	2
1,500	79	2
2,000	95	2
3,000	110	2
4,000	125	2
5,000	144	2
6,000	159	3
10,000	189	3
13,000	220	3
17,000	250	4
27,000	318	5
33,000	348	5
40,000	378	6

Pumping Capacity Requirements are determined by the Water Guidelines which provides the following for determining the pumping requirements of a system:

- The drinking water system should be designed to satisfy the greater of maximum day demand plus fire flow (where fire protection is to be provided), or the peak hour demand.
- In systems without floating storage:
    - Pumping capacity should be sized for the greater of peak hour, or maximum day demand plus fire flow; and

    - The firm pumping capacity should be calculated based on the assumption that they two largest pumps are out-of-service especially when there is only one source of supply in the area;
- In systems with floating storage for fire protection and balancing:
    - Pumping capacity should be sized for maximum day demands, provided that the floating storage is capable of providing peak hour and fire flow demands; the firm capacity should assume that the largest pump is out of service; and
    - The FUS guidelines recommend that a reliable pumping system is achieved when the MDD and maximum require fire flow is maintained with the two most important pumps out of service.

Non-Revenue Water is non-metered consumed water leads to water loss and is labelled as non-revenue. Non-revenue water comprises real loss (leakage) and apparent loss (unrecorded water-use such as hydrant flushing, park irrigation, etc.). Non-revenue water could result from meter error or inaccuracies, unauthorized consumption, distribution system leakage and storage reservoir leakage or overflow. The Water Guidelines directs that where flow records or estimates for an existing distribution system show that non-revenue water exceeds 15% of average daily demand.

Water Distribution Operating Pressure per the Water Guidelines should be between 350 to 480 kPa (50 to 70 psi) and not less than 275 kPa (40 psi).

1.0 INTRODUCTION

1.1 Background

As a part of the 2025 Water, Wastewater and Stormwater Master Plan (WWSMP), the Municipality of Strathroy-Caradoc (Municipality) has undertaken a review of the existing water distribution systems via to:

- Provide the Municipality with an assessment of its current water treatment and supply system assets with respect to its ability to address short-term and long-term demands;
- Provide the Municipality with an appropriate design criteria and demand projections over the master planning period for each system;
- Determine future water servicing requirements by assessing servicing alternatives (new sources/ treatment/storage/supply/reuse), potential to decommission certain assets, issues, and opportunities;
- Develop preferred servicing and treatment strategy;
- Confirm Capital Implementation Plan including a common costing framework; and
- Develop project fact sheets for each identified project.

Hydraulic models developed for the Strathroy and Mount Brydges water distribution systems (WDS) is simulated for various scenarios and time horizons. The model can be used:

- As an analytical tool to identify hydraulic bottlenecks in the distribution system; and
- As a planning tool to identify upgrades of the water distribution system needed to maintain adequate pressures and fire flows for existing and future development.

The models were assessed for impacts due to changes in demand and/or infrastructure conditions over specific study periods as detailed in this report. The relative severity of this impact provided the necessary information to develop a list of proposed upgrades necessary to continue maintaining the Municipality's level of service.

2.0 EXISTING WATER INFRASTRUCTURE

2.1 Strathroy

2.1.1 Water Supply

The Strathroy WDS is supplied water from the LHPWSS as shown in Figure 2-1. The feed is from a dedicated 600 mm transmission main from the main 1200 mm transmission main northeast of Strathroy. Strathroy is connected at the LHPWSS Monitoring Station #2 located at the Second Street Reservoir between Second St and Highway 402 on the north side of the settlement area. The LHPWSS has a maximum current capacity to deliver treated water of 340 mega-litres (ML) per day and the 2023 maximum day flow was 198.5 ML/d. The current water supply agreement with LHPWSS does not specify a maximum day limit on water supply to Strathroy. With the Strathroy MDD expected to increase by 3.0 MLD in 2046 to approximately 11.0 ML/d and given the available LHPWSS capacity, water supply is not expected to be an issue. The Municipality should convey its future demand requirements to the LHPWSS so that the LHPWSS can undertake its own future supply planning.

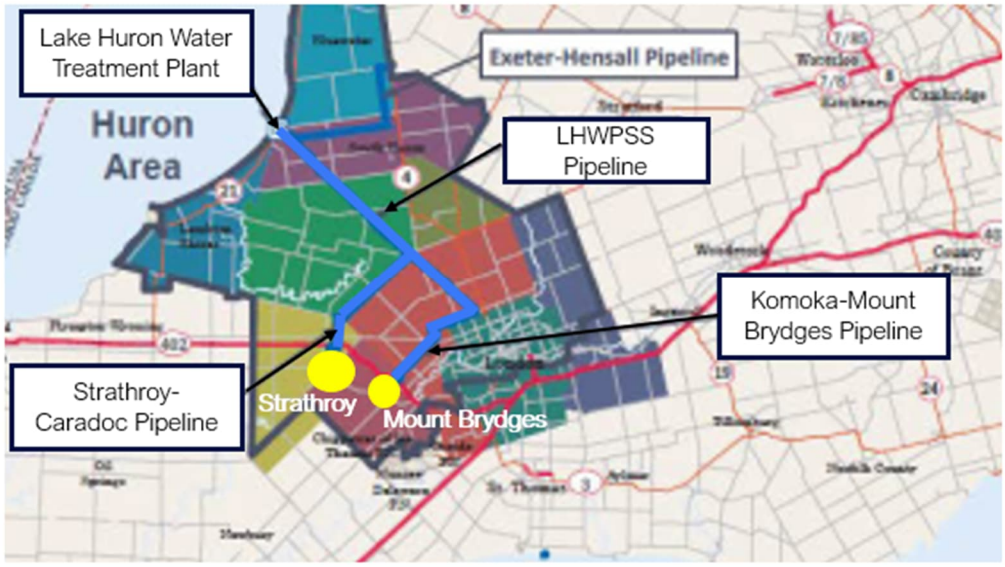


Figure 2-1: Water Supplies for Strathroy and Mount Brydges

2.1.2 Pumping and Storage

The Strathroy WDS operates in two pressure Zones, Zone 1 to the south in in the lower elevations of the settlement area and Zone 2 in the north. The system consists of the Second Street Pumping Station/Reservoir with re-chlorination and Reservoir (capacity 11,250 m³), the Head Street Water Tower (capacity 1,900 m³). Table 2-1 summaries the Strathroy storage.

Table 2-1: Strathroy Water Storage

Storage	Volume (m^3)
Second St Reservoir Cell # 1	3,750
Second St Reservoir Cell # 2	3,750
Second St Reservoir Cell # 3	3,750
Elevated Water Tower	1,900
Total	13,150

Chlorine residual is monitored at the Second Street PS and at the water tower. Both zones are supplied by the Second St. reservoir, with each zone being interconnected to supply back up flow in adverse events. Per Strathroy-Caradoc's *Water System Operations Manual*, Pumps No. 1 and No. 2 are operated to maintain the water pressures in Zone 1, and Pumps No. 4 and No. 5 are alternated as duty pumps periodically by the operators to maintain acceptable pressures in Zone 2. Pump No. 3 is available for the fire duty or to service the higher demand scenarios for Zone 2. The PS has 2 pump wells and five vertical turbine pumps. Figure 2-1 shows the pressure zones and Table 2-2 summarizes the pump information.

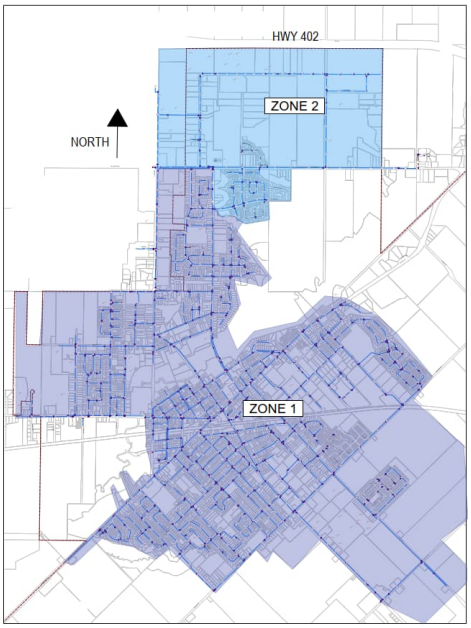


Figure 2-2: Strathroy WDS Pressure Zones

The water distribution system (WDS) also supplies portions of neighbouring Township of Adelaide-Metcalfe generally along the Centre Road (County Road 81) corridor.

Table 2-2: Strathroy DS Pump Information

Pump No.	Pump Type	HP	Design Capacity (L/s)	Design Capacity (m^3/day)	TDH (m)
1	Constant Speed	75	66	5,702	42
2	VFD	125	139	12,010	54
3	Constant Speed	300	212	18,317	49
4	VFD	40	39	3,370	51
5	VFD	40	39	3,370	51

2.1.3 Watermain Inventory

Based on watermain inventory (GIS shapefile) data, Strathroy has approximately 106.6 km of watermain consisting of cast iron pipe (16%), ductile iron pipe (35%) and polyvinyl chloride (PVC) pipe (49%).

2.2 Mount Brydges

2.2.1 Water Supply

The Mount Brydges water distribution system (WDS) is supplied water from the Lake Huron Primary Water Supply System (LHPWSS) as shown in Figure 2-1. The water supply is from the Komoka-Mount Brydges Transmission System which is fed from a dedicated pumping station at the Arva Reservoir (Pumping Station # 4) and transmitted via a dedicated 400 mm/350 Komoka-Mount Brydges transmission main to the Mount Brydges WDS. The current water supply agreement with LHPWSS does not specify a maximum day limit on water supply to Mount Brydges. With the Mount Brydges MDD expected to increase by 2.9 MLD in 2046 to approximately 5.2 ML/d and given the available LHPWSS capacity, water supply is not expected to be an issue. The Municipality should convey its future demand requirements to the LHPWSS so that the LHPWSS can undertake its own future supply planning.

2.2.2 Pumping and Storage

The Mount Brydges WDS consists of:

- The Glendon Drive High Lift PS (HLPS) that has an underground 2-celled storage reservoir with total capacity of 1,630 m^3. The HLPS has back-up power;
- Oriole Drive Monitoring and Re-chlorination Facility (Monitoring Station #3) that also has backup-power; and
- The Railroad Street Water Tower with a total volume of 720 m^3.

The system consists of 45 km of watermains.

2.3 Current Water Demand

2.3.1 Strathroy

Per the 2023 Annual Water Summary Reports, the rated capacity of the SWDS at ADD is 10,345 m^3/day and at MDD is 18,621 m^3/day. The historical water consumption obtained from the 2019-2023 reports are shown in Table 2-3.

Table 2-3: Strathroy Historical Average Water Consumption Data

Parameter	Units	2019	2020	2021	2022	2023	Average
Average Day Demand (ADD	m^3/day	4,363	4,551	4,591	4,725	4,499	**4,546**
ADD	L/cap/d	282	281	284	285	255	**271**
Maximum Day Demand (MDD)	m^3/day	8,031	8,187	7,541	6,782	7,516	**7,611**
MDD	L/cap/d	508	505	454	399	434	**460**
Maximum Day Factor (MDF)	-	1.8	1.8	1.6	1.4	1.7	**1.7**

Based on water data from 2019 to 2023, the average per capita Maximum Day Demand (MDD) for Strathroy is 460 L/cap/day. The required storage capacity calculated per MECP guidelines for the 2023 population is 6,916 m^3.

2.3.2 Mount Brydges

The historical water consumption obtained from the 2019-2023 reports are shown in Table 2-4.

Table 2-4: Mount Brydges Historical Average Water Consumption Data

Parameter	Units	2019	2020	2021	2022	2023	Average
ADD	m^3/day	795	892	949	934	910	**896**
ADD	L/cap/d	272	290	286	273	247	**284**
MDD	m^3/day	1,658	2,248	2,547	2,285	2,601	**2,268**
MDD	L/cap/d	572	725	772	654	716	**717** [1]
MDF	-	2.1	2.5	2.7	2.4	2.9	**2.6** [1]

Note 1: 2019 per capital flow excluded from average due to variance compared to other years.

Based on water data from 2019 to 2023, the average per capita Maximum Day Demand (MDD) for Mount Brydges is 717 L/cap/day. The required storage capacity calculated per MECP guidelines for the 2023 population is 1,784 m^3.

The per capita MDD demand in Mount Brydges is significantly higher than what would be expected for a community and therefore the Municipality should consider reviewing this issue.

3.0 FUTURE WATER DEMAND

Note: *RVA projections of servicing are based on the projected settlement populations calculated in the 2022 Residential Lands Needs Assessment (RLNA) was prepared by Watson & Associates Economists Ltd.* as part of the review and update of the Municipality's Official Plan. *study. Our analysis of committed and/or anticipated development is intended to provide a picture of the anticipated progress of growth as of mid-2024 and use this as a tool to consider the expected rate and extent of growth in our analysis. The reader should consult current Municipality and County Planning reports and Council minutes to confirm the status of development.*

3.1 Strathroy

Table 3-13-1 shows the forecasted water demand to the study horizon of year 2046 and Figure 3-1 shows the demand projection. Additionally, the corresponding water storage required capacity and the remaining available capacity is also shown. The total current available storage volume from Reservoir Cells 1 to 3, from the Water Tower and from the Emergency Storage is 13,150 m^3. The forecasted storage capacity for the year 2046 is 11,870 m^3. Therefore, as shown in Figure 3-2, Strathroy's current WDS has ample storage capacity to the service growth beyond the 25-year study period.

Table 3-1 – Strathroy WDS Projected Water and Storage Demand

Parameter	Units	2023	2026	2031	2036	2041	2046
MDD	m^3/day	7,516	8,374	9,341	10,031	10,537	10,997
Required Storage Capacity	m^3	6,916	7,264	7,823	8,222	8,515	8,781
Remaining Available Storage Capacity[1]	m^3	6,234	5,886	5,327	4,928	4,635	4,369

1: Available Capacity = 13,150 m^3

Table 3-2 provides the updated list of committed development data in Strathroy provided by the Municipality in May 2024. Per MECP D-5-1 document, the formula for calculating uncommitted reserve capacity of water treatment plants only considers the number of future approved lots (but currently unconnected). In the table below, applications under Proposed and Zoning By-Law amendments stage mean they have not been committed to yet as their applications are still in initial stages. Only the developments that are in Subdivision or Site Plan Approval stage are counted as committed development.

Table 3-2 – Strathroy Committed Development Data

Development	Development Type	# of Units	Population
Subdivision Stage			
430 Head Street	Singles/Semis	21	50
Cuddy Farms - Saulsbury Development	Townhomes	151	362
	Singles/Semis	323	775
Fieldcrest	Townhomes	119	286
	Singles/Semis	186	446
Southgrove Meadows	Singles/Semis	24	58
Zoning By-Law Amendments			
390 Second Street	Apartments	226	362
	Townhomes	137	329
24648 Adelaide Road	Apartments	54	86
360 Carroll Road	Townhomes	74	178
	Singles/Semis	72	173
24633 Adelaide Road	Singles/Semis	47	113
599 Albert Street	Apartments	85	136
251 Burns Street	Townhomes	22	53
	Singles/Semis	2	5
Site Plan Approval			
100 Second Street	Singles/Semis	35	84
Darcy Drive	Townhomes	72	173
Strathroy Crossing	Apartments	36	58
50 Carroll Street	Townhomes	40	96
392 Second Street	Apartments	48	77
Proposed Development			
Darcy Drive	Townhomes	79	190
101 Hull Road	Townhomes	21	50
24621 Adelaide Road	Apartments	95	152
	Townhomes	56	134
	Singles/Semis	81	194
	Total	**2,446**	**5,435**

Based on water data from 2019 to 2023, the average per capita Maximum Day Demand (MDD) for Strathroy is 460 L/cap/day. Therefore, based on the updated development information from the Planning Department, the current committed capacity is calculated as shown below:

- A = 2023 MDD flow per 2023 Annual Water Report is 7,516 m^3/day;
- B = Total MDD from the committed developments (Subdivision and Site Plan Approval stage) is the sum of their populations (2,465 people) x 0.460 m^3/cap/day = 1,139 m^3/day; and
- Therefore, total committed capacity as of 2023 is A + B = 8,650 m^3/day.

3.2 Mount Brydges

The water demand projections to 2046 are provided in Table 3-4 and Figure 3-1. Table 3-4 also shows the required storage capacity projections to the year 2046 as does Figure 3-2. Remaining available storage capacity is calculated based on a storage volume of 2,350 m^3 provided by the Glendon Pumping Station reservoir and the Railroad Water Tower. As shown, the required storage capacity will be in deficit post year 2026.

Table 3-3 – Mount Brydges WDS Projected Water and Storage Demand

Parameter	Units	2023	2026	2031	2036	2041	2046
MDD	m^3/day	2,601	2,893	3,788	4,339	4,753	5,166
Required Storage Capacity	m^3	1,784	2,063	2,547	3,533	3,723	3,913
Remaining Available Storage Capacity[1]	m^3	566	287	-197	-1,183	-1,373	-1,563

1: Available Capacity = 2,350 m^3

Table 3-5 provides the updated planned development for the community.

Since only 32 units are in Zoning By Law stage, they are included in the committed capacity as the difference by excluding them is insignificant. Following the same approach used for Strathroy, the Mount Brydges committed capacity is:

- A = 2,601 m^3/day;
- B = 2,784 people x 0.688 m^3/cap/day = 1,915 m^3/day.; and
- Therefore, total committed capacity as of 2023 is A + B = 4,516 m^3/day.

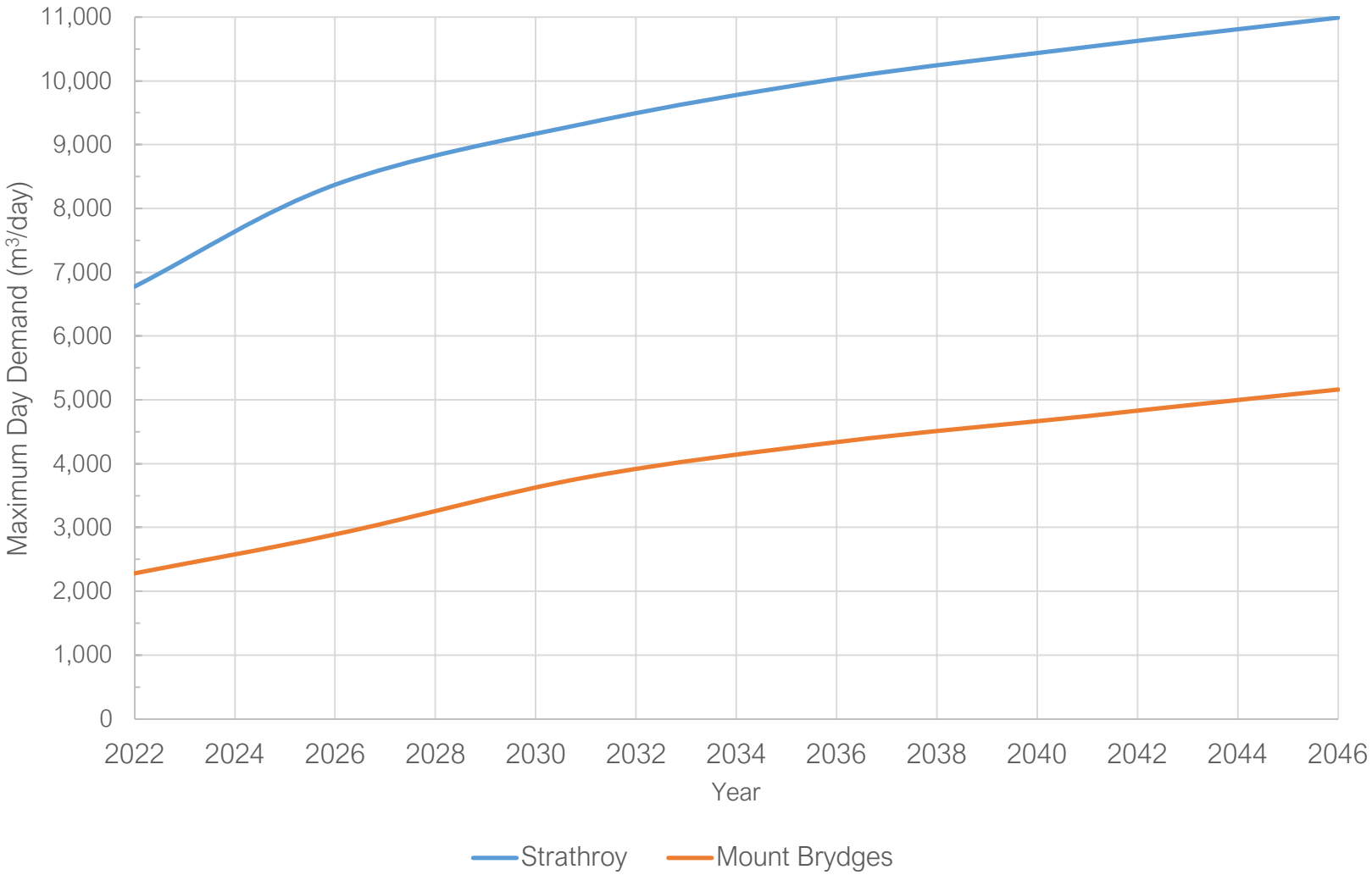


Figure 3-1: Strathroy and Mount Brydges Water Demand Projections

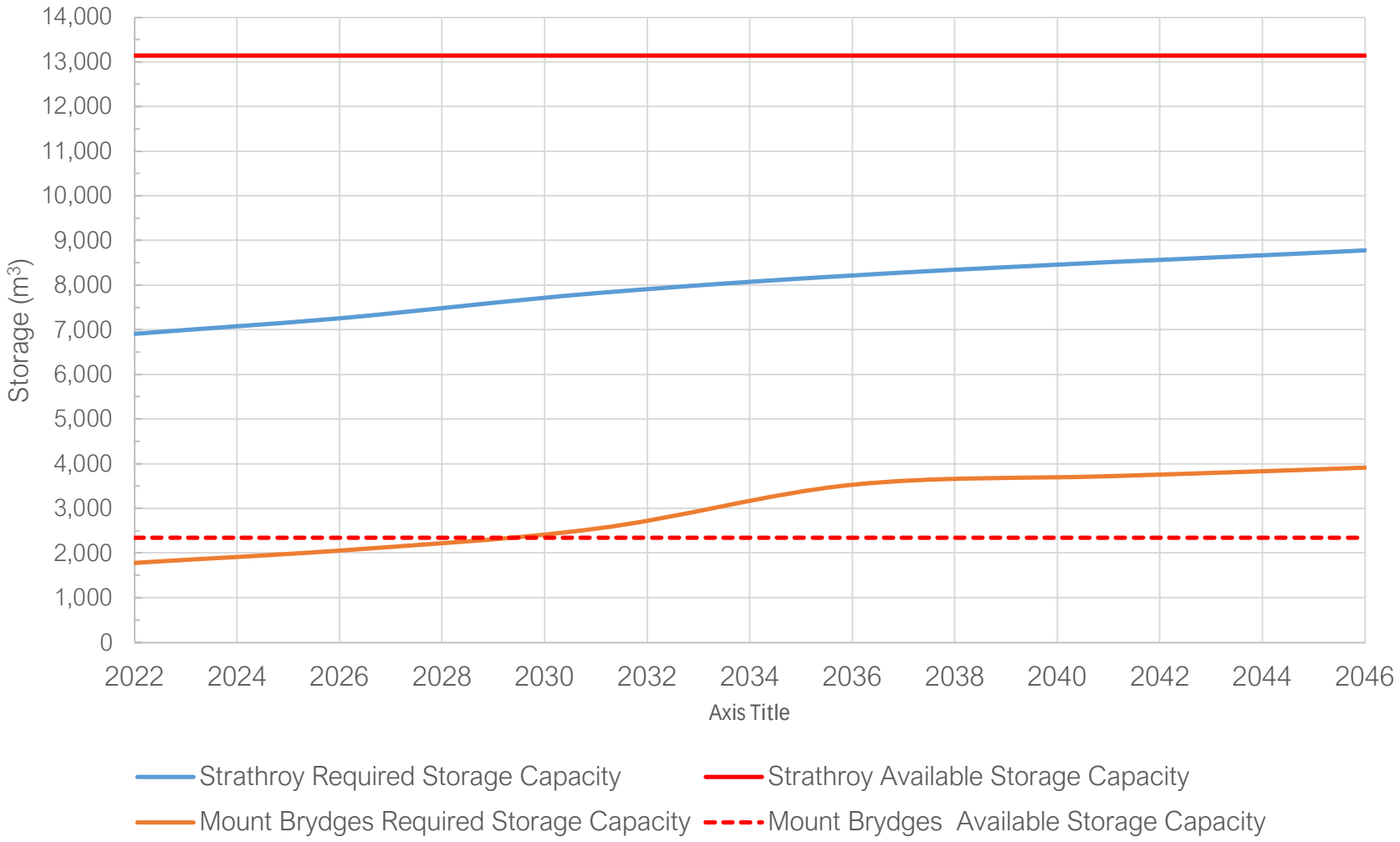


Figure 3-2: Strathroy and Mount Brydges Water Storage Projections

Table 3-4 - Mount Brydges Committed Development Data

Development	Development Type	# of Units	Population
Zoning By-Law Amendments			
22182 Adelaide Road	Singles/Semis	32	77
Subdivision Stage			
Falconbridge	Townhomes	106	254
	Singles/Semis	107	257
Falconbridge West	Townhomes	168	403
	Singles/Semis	111	266
Edgewood	Singles/Semis	83	199
	Singles/Semis	55	132
Forest View	Townhomes	64	154
	Singles/Semis	104	250
22696 Adelaide Road	Singles/Semis	225	540
2585 Queen Street	Singles/Semis	45	108
8532 Glendon Drive	Singles/Semis	30	72
Timberview	Singles/Semis	30	72
	Total	1,160	2,784

4.0 ASSET MANAGEMENT

4.1 2021 Strathroy-Caradoc Asset Management Plan

The 2021 Asset Management Plan (AMP) for the Municipality prepared by PSD Research Consulting establishes the approach for the management of the Municipality's assets. The recommendations and capital project lists in the Water Master Plan will be based on the following AMP strategies:

- Lifecycle management strategies including identifying project type under categories of preventative and/or general maintenance, rehabilitation and/or renewal, replacement, and upgrades; and
- Risk management strategies which states that precedence of asset prioritization is (1) condition of the asset; (2) its importance to service delivery; and (3) impact of its failure or disrepair.

The GIS data provides the pipe age, material and size that will allow analyzing the Municipality's water distribution system based on the above two points.

4.2 Levels of Service Requirements

The hydraulic model prepared for the communities of Strathroy and Mount Brydges will also investigate the *Community* and the *Technical Levels of Service* (LOS) as defined in the 2021 AMP. Specifically, the water hydraulic model will assess the fire flow availability and % of growth that can be connected to the water supply system with the aim to meet the Municipality's proposed LOS targets.

The 2021 AMP provides the *estimated useful life* (EUL) and *service life remaining* (SLR) of the Municipality's existing water infrastructure assets which will be used to develop the project recommendations.

4.3 Capital Forecast

The Municipality has provided the planned 10-year capital forecast from 2024 to 2033 for water projects. This list is provided in Appendix A for reference. The Total Capital Budget is estimated at $25.4 million of this:

- $6.5 million for renewal and upgrades to existing facilities;
- $5.5 million for extensions of the water distribution system for new growth; and
- $13.4 million for renewal projects.

Table 4-1 provides a summary of the water facility projects identified for renewal and upgrades during this period.

Table 4-1 – Identified Water Facility Projects

Year	Project	WW Portion of the Budget
2027	Adelaide St Strathroy - Reconstruction Ph 2	$745,500
2025	Adelaide St Strathroy -Design	$42,600
2026	Adelaide St Strathroy -Reconstruction Ph 1	$532,500
2031	Alternate Trunk Watermain - MacDonald to Pannell Construction	$200,000
2030	Alternate Trunk Watermain - MacDonald to Pannell Design	$75,000
2030	Caradoc Street Capacity Improvement - Design	$106,500
2029	Caradoc Street Capacity Improvement - Design - Carroll St to Metcalfe St	$21,300
2025	Carroll Street - Sidewalk and upgrades south side West of Saxton (Existing Urban)	$15,975
2024	DC Municipal BTE Share Allowance	$213,000
2025	DC Municipal BTE Share Allowance	$213,000
2026	DC Municipal BTE Share Allowance	$213,000
2027	DC Municipal BTE Share Allowance	$213,000
2028	DC Municipal BTE Share Allowance	$213,000
2029	DC Municipal BTE Share Allowance	$213,000
2024	Downtown Streetscaping Improvements Construction	$2,556,000
2024	Ellor Street Reconstruction Ph 2 #325 to Caroll St	$213,000
2025	Extension of Adair Blvd (North Meadows Secondary Plan)	$362,100
2027	Extension of Thorn Dr (North Meadows Secondary Plan), East of Adair Blvd	$404,700
2024	Extension of Thorn Dr (North Meadows Secondary Plan), West of Adair Blvd	$745,500
2030	Falconbridge Drive and Springwell Drive Design	$31,950
2027	Falconbridge Road Reconstruction - Rougham to Adelaide	$639,000
2026	Glengyle Drive Design	$31,950
2025	Head Street Reconstruction	$852,000
2030	Infrastructure Renewal Annual Design Allocation	$63,900
2031	Infrastructure Renewal Annual Design Allocation	$63,900
2032	Infrastructure Renewal Annual Design Allocation	$63,900
2031	Infrastructure Renewal Annual Reconstruction Allocation	$745,500
2032	Infrastructure Renewal Annual Reconstruction Allocation	$745,500
2024	Instrumentation Upgrades	$25,000

Year	Project	WW Portion of the Budget
2025	Instrumentation Upgrades	$25,000
2025	Instrumentation Upgrades	$150,000
2026	Instrumentation Upgrades	$25,000
2027	Instrumentation Upgrades	$25,000
2029	Jenna Drive Extension - Design	$21,300
2030	Jenna Drive Extension -Construction	$127,800
2024	McKellar Ph 2 Reconstruction	$745,500
2027	MOUNT Brydges Reservoir Tanks, Drainage & Paving Improvements	$300,000
2024	Mount Brydges Reservoir Electrical/Structural Construction	$1,100,000
2026	Mount Brydges Tower Painting	$750,000
2027	New Road Street A - Adair Blvd to Muni Boundary	$101,175
2026	New Road Street B - Adair Blvd to Muni Boundary	$340,800
2027	New Road Street C - Street B to Terminus	$138,450
2025	New Road Street D - Wright St to Second St	$564,450
2028	New Road Street E - Parallel to Adair Blvd to Adair Blvd	$234,300
2028	New Road Street F - Parallel to Adair Blvd to Adair Blvd	$234,300
2028	New Road Street G - Parallel to Adair Blvd to Adair Blvd	$234,300
2024	North End Water Tower Design and land acquisition	$200,000
2026	Oxford St & Richmond St Reconstruction	$1,512,300
2029	Pannell Lane & Dominion Street Extension - Construction	$852,000
2028	Pannell Lane & Dominion Street Extension - Design	$63,900
2026	Pannell Lane Design - Head to Centre	$31,950
2024	Relocation of Mount. Brydges WTS ECA & Design	$200,000
2024	Replacement of Copper services on Darcy Dr	$40,000
2025	Replacement of Copper services on Darcy Dr	$40,000
2026	Replacement of Copper services on Darcy Dr	$40,000
2030	Rougham Road Construction - Glendon to Parkhouse	$745,500
2024	Rougham Road Design - Glendon to Falconbridge	$63,900
2029	Rougham Road Design - Glendon to Parkhouse	$42,600
2025	Rougham Road Reconstruction - North of Glendon	$745,500
2032	Saulsbury Street (Drury to Victoria) Design	$31,950
2024	Saxton Road Redesign and Reconstruction	$319,500
2027	Saxton Road South Design	$21,300

Year	Project	WW Portion of the Budget
2025	Strathroy Reservoir generator replacement	$300,000
2026	Strathroy Reservoir electrical/generator upgrade construction	$1,250,000
2025	Strathroy Reservoir electrical/generator upgrade design	$100,000
2024	Strathroy Reservoir Pavement and Drainage improvements/ladder/crack injection	$250,000
2025	Strathroy Tower Construction	$2,000,000
2024	Valve Repairs	$15,000
2025	Valve Repairs	$15,000
2026	Water Facility Inspections 5 year	$25,000
2024	Water meter reading equipment replacement	$25,000
2027	York Street Servicing	$745,500
	Total	$25,354,550
1 - For linear and BTE projects, water portion is assumed to be 21.3 % of the total 2- For instrumentation upgrades and valve repair, water portion is assumed to be 50.0 % of the total		

The recommended projects from in this Master Plan should be reviewed and considered within the context of the current 10-year capital plan should they be needed within this timeframe.

4.4 Infrastructure Condition Assessment

Site assessment of the water supply infrastructure of both communities were undertaken in September 2023. No issues were identified in the infrastructure's capability to continue providing water supply service. RVA conducted a detailed visual inspection of the WDS building infrastructure in 2019 and the findings were compiled in the 2019 *Municipality of Strathroy-Caradoc Water and Wastewater Condition Assessment* report. The report reported improvements needed for Process Electrical, Building Architectural, Building Electrical and Building Mechanical in the Water Towers and Booster Pumping Stations in Strathroy and Mount Brydges. Of these recommendations, upgrades to the Mount Brydges Monitoring Station #3 building was completed in 2022.

5.0 WATER SERVICING EVALUATION STRATEGY

5.1 Alternative Solutions

The MCEA process requires that a reasonable range of alternative management techniques be developed for the water servicing constraints identified through the master planning process. The first strategy is the *Do-Nothing* scenario which is a compulsory check per the MCEA process. The remaining strategies are taken from the 2021 AMP which identifies *preventative maintenance, rehabilitation and/or replacement* as the best practice strategies for watermains. Therefore, the problems or opportunities identified in the hydraulic model will be categorized into these 4 strategies to ensure they meet the Municipality's asset management goals.

The following subsections provides details on the type of projects that will be identified for the Strathroy and Mount Brydges WDSs and which category they fall under.

5.1.1 Do Nothing

This alternative solution is required baseline condition that considers the anticipated impacts if no remedial or mitigation measures are taken to address the identified issues. Under this scenario, no improvements or changes would be undertaken to address the current and future water supply and storage requirements.

5.1.2 Preventative Maintenance

This alternative solution will address the identified constraints by proposing operational strategies that will reduce risks to water servicing, including:

- Maintaining or improving water quality through operational procedures such as routine flushing; and
- Ensuring storage infrastructure is maintained to full capacity by implementing proper maintenance procedures.

5.1.3 Rehabilitation

This alternative solution will target optimization of the water conveyance infrastructure to increase capacity, including:

- Improvements to existing booster pumping stations;
- Replacing aging watermains in locations where water demand is projected to increase so to mitigate servicing risks; and
- Maintaining redundancy in the system via provision of watermain looping and of multiple supply points for major watercourse/highway crossings.

5.1.4 Replacement

This alternative solution will be recommended when the previous 3 alternative prove incapable of meeting growing system demands. Strategies that will be explored include:

- Expansion of existing pumping station or provision of new pumping stations to provide the required level of service;
- Upsizing or running additional watermains to meet maximum day demand and fire flow service; and
- Expansion of existing or provision of reservoirs and/or standpipes to meet storage requirements.

5.2 Evaluation Criteria

The preliminary evaluation of each recommendation included an assessment to identify any component of the natural, cultural heritage or built environment that may e impacted by the proposed changes.

5.2.1 MCEA Evaluation Criteria Description

An evaluation criterion to evaluate the alternative solutions is developed based on the MCEA requirements. It comprises of four categories with specific criteria that must be met to satisfy them as listed in Table 5-1.

Table 5-1 – MCEA Evaluation Criteria

Category	General Criteria to Assess Impact
Technical	• Constructability • Improvements to operation • Infrastructure Required • Approval Requirements
Social and Cultural	• Public Requirements • Impact to built heritage resources and cultural heritage landscapes
Environmental	• Impact to aquatic and terrestrial species and habitat • Impact to surface water quantity and quality • Climate Change resiliency
Economic	• Capital Costs • Operational and Maintenance Costs • User Value

5.2.2 Evaluation

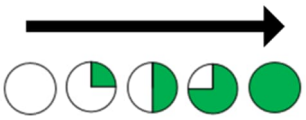
The Safe Drinking Water Act and MECP guidelines require that a potable water system is safe, reliable, providing a continuous supply of water at adequate pressure with consideration for peak demands, fire protection, and other emergencies without causing undue water retention.

MCEA guidelines suggest that any project undertaken to meet the above should be justified and where two or more solutions exist, the alternatives should be discussed. The selected alternative should meet financial considerations, and maintenance and operational requirements.

5.2.3 Criteria Measurement

The evaluation criteria is applied to each alternative solution to rate their ability of meeting the Master Plan's Problem and Opportunity Statement and narrow down to the preferred solution. Table 5-2 illustrates the rating scale used.

Table 5-2 – Evaluation Criteria Measurement

Evaluation Rating Scale		
Highest Impact (Most Negative Solution)		Lowest Impact (Most Positive Solution)

5.3 Project Implementation Strategy

Initially, the time horizons selected for the simulation were 2025 – 2029, 2030 – 2034 and 2035 – 2044. However, these have since been revised to reflect the 2024 development applications in the Municipality. The approach is detailed in Section 6.2. In addition to the above, the recommended timelines will also be based on the following:

- Improvements required to maintain level of service for the projected population;
- Projects identified in the Municipality's 2023 – 2030 capital plan with an effort to collaborate the projects; and
- Collaborating the projects with those planned in areas undergoing development or have development proposals submitted.

6.0 DRINKING WATER SYSTEM HYDRAULIC ANALYSIS

6.1 Background Data Review

The background data review involved the acquisition and evaluation of a number of key pieces of information which included:

- Previously developed hydraulic model for both distribution systems;
- GIS water infrastructure inventory including watermains, valves, hydrants, pump stations, and storage facilities;
- As-built drawings of pump stations, storage facilities, and new sub-divisions development;
- Digital elevation data;
- Historical water billing data;
- Operational SCADA data (flow, pressure, and water levels);
- Pumps design data and operational control set points;
- Pressure reducing valve (PRV) information, such as size, setting and location;
- Planned sub-divisions and capital projects;
- Previous reports and design criteria; and
- Population projections.

A report of the hydraulic modelling and analysis can be found in Appendix B.

6.2 Demand Estimation and Allocation

6.2.1 Existing Conditions

The “existing conditions” is taken as being the year 2023. Therefore, to update the 2021 model to existing conditions (as of 2023), the 2023 population and corresponding Average Day Demand (ADD), Maximum Day Demand (MDD), and Peak Hour Demand (PHD) for both WDSs was computed. The methodology used based on determining an annul growth rate base on the 15-year RLNA projection for low density, medium density and high-density units. This provided the forecasted populations for 2021, 2026, 2031, 2036, 2041, and 2046.

Table 6-1: Population Projection using RLNA Methods

Area	Year					
	2021	2022	2023	2024	2025	2026
Strathroy	16,600	16,952	17,304	17,656	18,008	18,360
Mount Brydges	3,300	3,466	3,631	3,797	3,962	4,128

Then, the 2023 MDD, ADD and PHD is computed using the historical rolling average per-capita factors. The results are shown in Table 6-2.

Table 6-2: Municipality WDS Historical Water Demand

Community	ADD (L/s)	MDD (L/s)	PHD (L/s)
Strathroy-Caradoc	54.7	93.0	155.9
Mount Brydges	10.8	25.9	52.1

Finally, each demand junction in the models was upscaled by the ratio of the existing demand calculated in Table 6-2 above to the demand allocated in the 2021 model. This step ensures that the demand from the top ten large water users were allocated consistent with the model allocation methodology used in 2021. In the 2021 model, the demand for specific junctions were classified as large water users, and therefore the demand at the nearest junction was increased to reflect this categorization. Doing this ensures that these specific points (connected to large water users) in the system are stressed further compared to the other junctions to identify any constraints related to capacity and/or water pressures.

The demands generated for the future scenarios is calculated as described in the following sections. It is then allocated and modelled in this updated model.

6.2.2 Committed Developments

A list of residential and industrial development proposals as of 2023 was provided. The proposals were categorized based on their application phase as follows:

- Proposed Developments (No applications submitted);
- Site Plan Approval Stage;
- Zoning by-law Amendments Stage; and
- Subdivision (Permitting Stage).

These committed developments will impact the water demands and reduces the uncommitted or remaining available capacity of the WDS; therefore, they must be assessed in the hydraulic model. Since it is difficult to ascertain the exact timeline of when they would be both completed and populated, a strategy was developed to allot the committed developments to specific time horizons.

1. First, the projected population to the year 2046 for each community was obtained from the RLNA study and then, the development proposals were grouped and categorized into realistic timelines based on their application phase. That is, proposals in the phase *Site Plan Approval* and *Subdivision Stage* are assumed to have met similar application requirements and could therefore be grouped together as Group #1. This group is also assumed to be the first that will be fully developed and populated and falls under “Committed Development” in Table 6-3.

2. Likewise, the proposals in the *Proposed Developments* and *Zoning by-law Amendments Stage* were grouped together as Group #2 and are assumed to be fully developed and populated following completion of the Group 1. This scenario – where lots from both groups are fully built out and all lots populated – will be titled "All Proposed Developments" in Table 6-3.
3. Following this, the population that would be generated from each group was calculated for each community. The population from the first group are then added to the 2023 population which is the *total population of the community after all committed development is built and populated*.
4. Likewise, the population from "All Proposed Developments" (all 4 application stages) is added to the 2023 population which provides the *total population of the community after all proposed developments are built and populated.* Results of Steps 3 and 4 are shown in Table 6-3

Table 6-3: Municipality Proposed Development Population Projections

Population Type	Strathroy	Mount Brydges
Committed Development	2,465	2,635
All Proposed Developments	2,970	77
2023 Residential Population (2022 RLNA)	17,304	3,631
Committed Development + 2023 Population	19,769	6,266
Committed Development + All Proposed Developments + 2023 Population	22,739	6,343

5. To estimate the year that the communities will grow to the respective populations calculated in step 3 and 4, they are graphed on top of the population projections graph from RLNA. The results are shown in Figure 6-1 for Strathroy and Figure 6-2 for Mount Brydges.

The graphs show that:

1. Strathroy:
    a) Will see the population post *Committed Development* scenario in the year 2030. A numerical check using Method 1 shows that population per RLNA will be 19,768. This completely coincides with the population projection estimated for this development scenario, thereby supporting the assumptions made for this scenario.
    b) Will see the population post *All Proposed Developments* scenario in the year 2041. RLNA' shows a population of 22,900 for this year which is 161 people more than what the

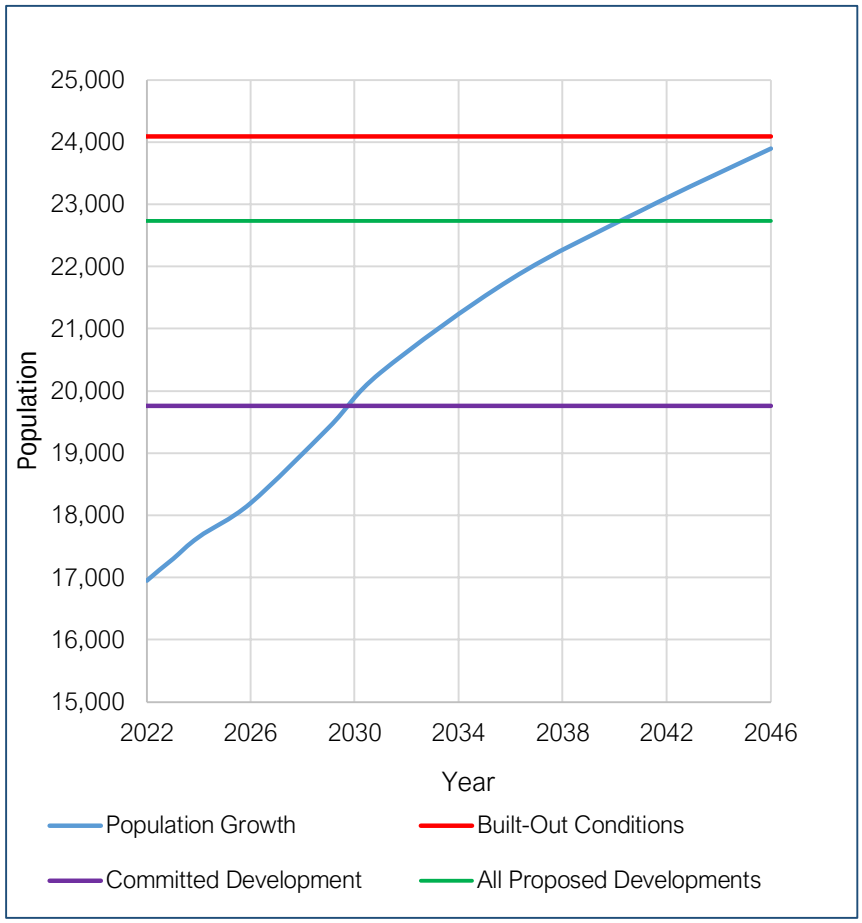


Figure 6-1: Strathroy Proposed Population Projection

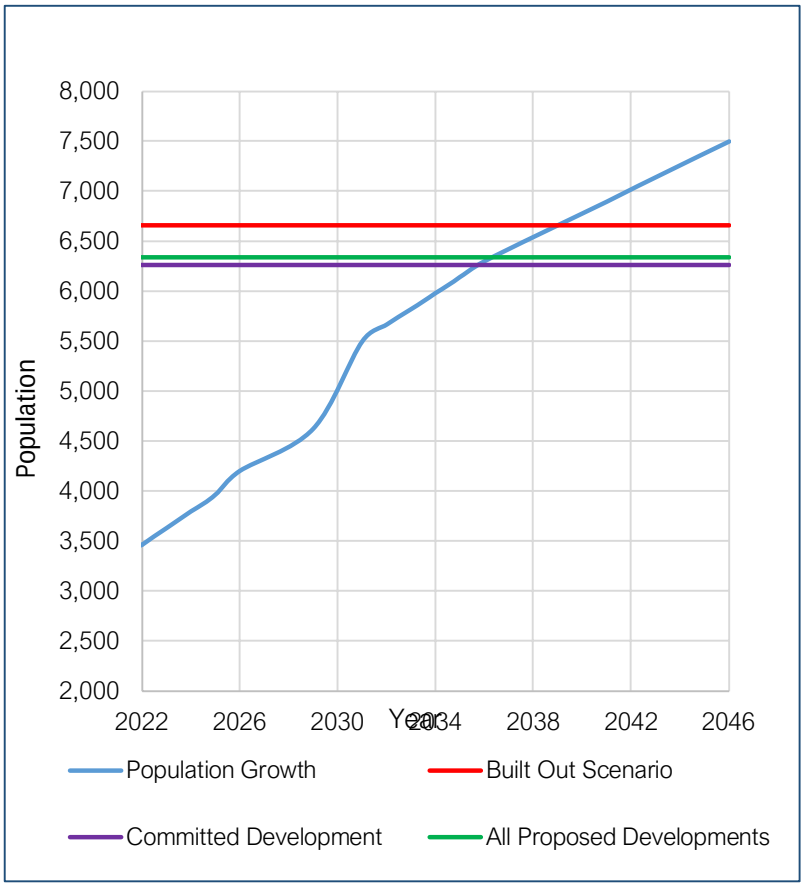


Figure 6-2: Mount Brydges Population Projection

developments can accommodate. Therefore, these additional 161 people have been allocated to the south area of Strathroy since that area has larger pipes and has more room for development per the 2023 Strathroy Caradoc Official Plan (Ref: Schedule 'C' Special Study Areas Map)

2. Mount Brydges:

   a) Will see the population post Committed Development scenario in the year 2035 and post All Proposed Developments scenario in the year 2036. Since these scenarios practically happen within the same timeline, only the "*All Proposed Developments*" scenario in 2036 is modeled. Using Method 1, RLNA's population for this year is 6,300 which is 43 less people than the number of people all proposed developments can accommodate. Therefore, these have been allotted to specific areas undergoing preliminary studies as detailed in 6.2.3.

6.2.3 Capital Plan Timelines

The critical timelines for the hydraulic model based on the above analysis are then the following:

- 2024-2030, 2031-2041 and 2046 (ultimate) for Strathroy; and
- 2024-2036 and 2046 (ultimate) for Mount Brydges.

2046 is taken as common for both communities as the Master Plan is being developed as a 25-year study horizon. Hence, an understanding of the population distribution across both communities for the 2046 or ultimate scenario is needed.

The RLNA study provides a 2046 population of 23,900 for Strathroy and 7,500 for Mount Brydges. The study also provided the remaining vacant available lots within the boundary as of 2023 which signify '*Built-Out Conditions*'. Then, following the same methodology as for the proposed developments, the populations generated from the built-out conditions added to the 2023 population will provide the *total population of the community after all the available residential lots are developed and populated*. Table 6-4 and Table 6-5 provides the results of this method for Strathroy and Mount Brydges respectively.

Table 6-4 – Strathroy Built Out Conditions Population Projection

Development Type	# of Units	PPU	Population
Low Density	1,614	2.4	3,874
Medium Density	728	2.4	1,747
High Density	732	1.6	1,171
		Total	**6,792**
Total Population (PPU x Remaining Available Lots + 2023 Population)			**24,096**

Table 6-5: Mount Brydges Built Out Conditions Population Projection

Development Type	# of Units	PPU	Population
Low Density	888	2.4	2,131
Medium Density	318	2.4	763
High Density	84	1.6	134
		Total	3,029
Total Population (PPU x Remaining Available Lots + 2023 Population)			6,660

For Strathroy, since the total population that can be accommodated within the boundary (24,096) is greater than the 2046 population, the hydraulic model for the 2046/ultimate scenario will be built for 23,900 population and no further actions must be taken.

However, for Mount Brydges, the total population that can be accommodated within the boundary (6,660) is less than the projected 2046 population. Hence, the additional 840 people (7,500 – 6,660) will have to be allotted in the model for the 2046/ultimate scenario. This is done by assigning demands on the edge of the existing boundary.

6.3 System Analysis

To evaluate the demands for the capital plan timelines established in 6.2.3, the hydraulic model for the following study periods was developed:

- 2023 (existing), 2030, 2041 and 2046 for Strathroy-Caradoc; and
- 2023 (existing), 2036 and 2046 for Mount Brydges.

The software used was Innovyze InfoWater Pro which uses GIS data that was provided by the Municipality. Additional information on the model appears in Appendix B.

The following criteria, obtained from the Strathroy-Caradoc Servicing Standards (October 2021) were utilized to evaluate the performance of each WDS:

- The normal operating pressure in the distribution system should be approximately 350 to 480 kPa (50 to 70 psi) and not less than 275 kPa (40 psi);
- The system should be designed to maintain a minimum pressure of 140 kPa (20 psi) at ground level at all points in the distribution system under maximum day demand plus fire flow conditions;
- The maximum pressures in the distribution system should not exceed 700 kPa (100 psi) to avoid damage to household plumbing and unnecessary water and energy consumption; and
- The requirement for fire flow requirements is to be completed using the “Water Supply for Public Fire Protection – A guide to Recommended Practice” prepared by Fire Underwriters Survey for a particular development. There is no minimum overall requirement for fire

protection stipulated by the Municipality. It was assumed that a minimum fire protection of 67 L/s is required in the Municipality's water system.

For modelling scenarios representing future conditions, flow demands allocated to future developments were distributed to the nearest junction already connected to an existing watermain. The modelling results for current and future demand conditions are summarized in the subsequent sections for Strathroy and Mount Brydges distribution systems. System improvement recommendations are proposed for those results which do not meet the above listed criteria.

6.3.1 Strathroy-Caradoc WDS

Service pressures in the Strathroy WDS range from 313 kPa to 521 kPa under existing and all future study periods, which fall which fall within the acceptable range.

Fire flow simulation showed that most areas within the system can achieve the minimum fire flow requirement of 67 L/s, except in areas with small diameter and/or dead-end watermains. This is a normal impact/result of low diameter watermains or lack of properly looped watermain connections. Table 6-6 provides a list of locations with watermains that cannot meet fire flow demand conditions.

6.3.2 Mount Brydges WDS

Service pressures in the Mount Brydges WDS range from 360 kPa (53 psi) to 571 kPa (83 psi) under existing and all future study periods, which fall which fall within the acceptable range.

Fire flow simulation showed that areas east of Adelaide Rd. and Gibson Rd., are consistently lower than the proposed minimum fire protection of 67 L/s. This can be attributed to various factors, large distance from water source, going from lower elevation to a higher elevation area, small diameter pipes, and presence of dead end watermains. Areas with lower fire flow availability are remote areas and only look to service a few single-family homes.

Table 6-6: WDS Hydraulic Analysis Recommendations

Location	Location Type/Watermain Type	Hydrant Flow (L/s)	Hydrant Pressure at Flow (kPa)	Pipe Material and Diameter	Alternate 1	Alternate 2	Proposed Pipe Material and Diameter	Pipe Length (m)
Strathroy WDS								
Center St. NW of Metcalfe	Residential Area, Dead End Main	26	138	Cast Iron 100 mm	Upgrade water main on Center St. to a 150 mm PVC pipe	-	PVC 150 mm	141
Concord St.	Residential Area, Dead End Main	28	138	Cast Iron 100 mm	Upgrade water main on Concord St. to a 150 mm PVC pipe	-	PVC 150 mm	127
Riverview Drive, N of Joel Court	Residential Area, Dead End Main	42	138	Ductile Iron 150 mm	Upgrade watermain on Riverview Dr. to a 200 mm PVC pipe	Extend watermain from Riverview Dr. using a 150 mm PVC watermain to connect to the 300 mm watermain on Head St. N	PVC (Alternate 1 = 150 mm) (Alternate 2 = 200 mm)	127 (Alternate 1) 155 (Alternate 2)
Oak Ave., NW of Laughton Cres.-	Residential Area, Dead End Main	45	138	Cast Iron 150 mm	Upgrade watermain on Oak Ave. to 150 mm PVC pipe	-	PVC 150 mm	308
North St., W of Victoria Rd. to Emily St.	Residential Area, Looped watermain	53	138	Cast Iron 100 mm	Upgrade watermain on North St. W. up until Emily St. to a 150 mm PVC pipe	-	PVC 150 mm	299
Locke Heights, N of Hull Rd.	Residential Area, Dead End Main	57	138	Ductile Iron 150 mm	Upgrade watermain on Locke Heights to a 200 mm PVC pipe	-	PVC 200 mm	241
Lamore Cres., W of	Residential Area, Dead End Main	58	138	Ductile Iron 150 mm	Upgrade watermain on Locke Heights to a 200 mm PVC pipe	-	PVC 200 mm	203

Location	Location Type/Watermain Type	Hydrant Flow (L/s)	Hydrant Pressure at Flow (kPa)	Pipe Material and Diameter	Alternate 1	Alternate 2	Proposed Pipe Material and Diameter	Pipe Length (m)
Riverview Dr.								
Mill Pond Cres, N of Front St. E	Residential Area, Dead End Main	60	138	Ductile Iron 150 mm	Upgrade watermain on Locke Heights to a 200 mm PVC pipe	-	PVC 200 mm	241
Head St., Looped main to Canaan St.	Residential Area, Looped watermain	64	138	Cast Iron 100 mm	Extend the looped main using a 150 mm PVC watermain to connect with the 350 mm PVC running parallel on Canaan St.	Upgrade the 100 mm cast iron loop to a 150 mm PVC watermain	PVC 150 mm	2.8 (Alternate 1) 342 (Alternate 2)

Mount Brydges WDS									
Location	Location Type/Watermain Type	Hydrant Flow (L/s)	Hydrant Pressure at Flow (kPa)	Pipe Material and Diameter	Alternate 1	Alternate 2	Alternate 3	Proposed Pipe Material and Diameter	Pipe Length (m)
East of Adelaide Rd and Gibson Rd	Along rural road rights of way	<40	>414	PVC 200	Provision of BPS	Provision of Tanker Truck for Fire Protection	Upsize upstream 150 mm watermain	PVC 200	500

7.0 RECOMMENDATIONS

7.1 Strathroy Water System

The proposed Strathroy WDS improvements include new and/or upsizing of existing watermains to improve both fire flow. The recommendations specifically target dead-end main scenarios and achieve looped watermains. Each identified location listed in Table 6-6 is evaluated per the criterion establish in Section 5.1 and 5.2. The results of the evaluation are in Table 7-1.

7.2 Mount Brydges Water System

7.2.1 Water Storage

The required water storage capacity will be in deficit post 2026. To service growth and provide fire protection, the storage capacity is to be increased from its current volume of 2,350 m^3 to 3,950 m^3. New water storage infrastructure can be installed by the Glendon Drive High Lift Pumping Station (HLPS). This location is optimal as growth in the community and planned development falls within the vicinity of this HLPS, which minimizes piping and pumping capacity upgrades. Figure 5-1 shows the buildable area (shaded in blue) behind the HLPS that can incorporate the additional 1,600 m^3 of storage needed.

Figure 7-1: Proposed Location of Mount Brydges Water Storage

Two alternative solutions for water storage infrastructure are:

- Aboveground Potable Water Storage Tanks: This solution would look at providing two storage tanks, each with a volume of 800m^3 for a total volume of 1,600 m^3. Providing two

tanks allows for redundancy. Tank dimensions can be designed such that a future 800m^3 tank can be accommodated at the proposed location, allowing for future growth beyond the study horizon of 2046; or

- Underground Water Reservoirs: This solution is an underground reservoir with a minimum volume of 1,600 m^3. This solution must meet the following MECP requirements:
    - Pumps connected to ground storage reservoirs are to be sized to meet the maximum day plus fire flow demands or the peak domestic demand whichever is greatest,
    - Reservoir to be ideally above the groundwater table, which can impact structural costs,
    - A minimum distance of 15m is required to between the reservoir and sewers and other potential sources of contamination; and
    - The buried reservoir is to be design with at least two cells which can operate independently.

Appendix C illustrates the two water storage options and both alternative strategies are shown in evaluated in Table 7-2.

7.2.2 Fire Flow Issues East of Adelaide Rd and Gibson Rd

The proposed improvements to the Mount Brydges WDS to address fire flow availability in areas East of the intersection of Adelaide Rd. and Gibson Rd are listed below. Results from the hydraulic analysis indicate that available fire flows in this area are consistently lower than the proposed minimum of 67 L/s (FUS requirement). The three alternative strategies can address this deficiency.

1. Booster Pump at the Sanitary Pumping Station on Mill Road: Install a booster pump servicing the potable water system at the existing SPS located at the intersection of Mill Road and Adelaide Road. The booster pump will address the insufficient fire flows available on Gibson Rd. and in those areas Southwest of Gibson Rd. Installing the booster pump at the existing SPS reduces the capital costs associated with the solution.
2. Tanker Truck for Fire Flow Requirements: As the areas which do not meet the fire flow requirements are considered isolated with limited anticipated development planning, tanker trucks can be used to provide the additional flow.
3. Upsize Watermains in Targeted Areas:
    a. For Areas southwest of Gibson Road, the existing watermain on Gibson Road from Adelaide Road is 150mm for a stretch of 769 m before it becomes a 250mm main.

This stretch should be replaced/upsized to a 250mm as it induces headloss during fire flows.; and

b. For Areas east of the intersection of Adelaide Road and Gibson Road, installing a new booster pump at the Sanitary Pumping Station on Mill Road with a higher capacity will ensure fire flow supply to those areas.

Note that the above recommendations assume that during a fire flow requirement, the elevated tank located within the town limits acts as a supply point (rather than a demand point), which in addition to the water pumping station, supplies the fire hydrants. These alternative strategies are shown and evaluated in Table 7-3.

Table 7-1: Strathroy WDS Improvement of Fire Flow Alternative Solution Evaluation

Strathroy	Do Nothing	Preventative Maintenance	Rehabilitation	Replacement
Description	Implement no solution	Regular flushing / swabbing of manholes	Relining of watermains	Replace pipes
Technical	• In many cases these watermains are old cast iron pipe that is prone to failure and close to service life. • Dead-end mains impact water quality but even more when pipe sizes are small.	• Not a long-term solution as it involves significant operational changes. • Does not address fire flow supply issues.	• This could improve the C-factor; thereby lowering friction and headlosses. • Lining of pipes reduces internal diameter. This will offset the improvements in the C-factor	• Upgraded pipe material and pipe size will adhere to recommended standards. • All MCEA Schedule B projects with minimum to no permit requirements.
Social and Cultural	• Insufficient fire protection puts risk of losses on public. • Availability of water-trucks is always needed. • Older pipes.	• Availability of water-trucks is always needed. • Insufficient fire .protection puts risk of losses on public.	All water services connected to the watermain will have to be re-installed or replaced. This may have some impact on social and cultural aspects but can be mitigated through construction practices.	• Provision of efficient fire protection is generally supported by public opinion. • Watermain construction may have some impact on social and cultural aspects but can be mitigated through construction practices.
Environment	Can have adverse impact to environment depending on fire incident.	Can have adverse impact to environment depending on fire incident.	General construction impacts only.	• Projects are confined to existing public right- of-ways and/or Municipality properties where impacts to natural environment is minimal. • General construction impacts only.

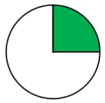
Strathroy	Do Nothing	Preventative Maintenance	Rehabilitation	Replacement
Economic	• Water trucks will be needed in case of fire. • Older pipes pose high risks of leakage which will increase non-revenue water supply.	• Lower cost than *Rehabilitation* and *Replacement* alternatives • Marginal improvement only but increased operational costs • Increased flushing demand will increase non-revenue water supply	Lower cost than replacement but will not have same life expectancy gained from replacement of pipes.	• Capital investments required may not justify the project unless costs are shared. High-cost implementation to occur over time • Lower maintenance and operational costs • Infrastructure-related risks are mitigated with new pipes
Overall Strategy	For areas with minimal to no planned development, this is a viable option. However, for areas that are undergoing development planning, this strategy will risk supply of water and fire flow protection to serviced population.	This option does not address the risk of lack of fire flow supply. It also increases maintenance activities and, subsequently, associated costs. This is not a suitable long-term solution.	The current issues include small diameter (100mm) aging pipes. Since relining of these pipes will further reduce their diameters, this is not a viable solution.	This strategy will require some capital investment; however, it will ensure that all of Strathroy community meets its servicing goals as established for its public assets.
Score				

Table 7-2: Mount Brydges Water Storage Capacity Alternative Solutions Evaluation

Mount Brydges	Do Nothing	Strategy 1	Strategy 2
Description	Implement No Solution	Above Ground Storage Tank	Buried Storage Reservoir
Technical	• Low water storage capacity may strain the water system and risks negative pressures in the distribution network during peak demand scenarios. • Water storage system will not meet recommended municipal guidelines.	• Provision of two tanks will allow isolation of each for routine maintenance. • Proposed location has space for an additional tank for complete redundancy or if needed for more storage beyond 2046. • Above ground infrastructure simplifies inspection and maintenance activities • Design, equipment, and warranty is provided by tank supplier.	• Reservoir to be separated into two cells to allow isolation of each for routine maintenance. • Inspection and maintenance for buried tanks will need *Confined Space Entry* licence.
Social and Cultural	Lack of water storage will directly impact the service level of the municipality's water supply system to the serviced population.	• Above ground infrastructure will need to be secured to prevent access by the public. • Proper water storage will ensure adequate water supply to serviced population.	Proper water storage will ensure adequate water supply to serviced population.
Environment	No impact to the environment .	• Water tanks proposed location is not in a significant natural environment area. • General construction impacts only which can be mitigated with construction practices.	General construction impacts only which can be mitigated with construction practices. Area is not a significant natural environment area.
Economic	Risk of contamination of distribution network .	Total cost is estimated at $2,300,000 (excluding HST) which includes the cost of the above ground tanks and associated equipment, construction costs, and engineering design.	Total cost is estimated at $4,400,000 (excluding HST) which includes construction cost and engineering design.

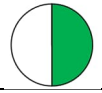
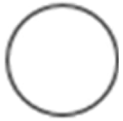
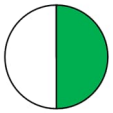
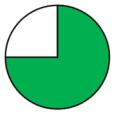
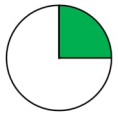
Mount Brydges	Do Nothing	Strategy 1	Strategy 2
Overall Strategy	This strategy is not recommended as it will significantly impede proper distribution .	This strategy will meet the requirements of the water system at a much lower cost than alternative 2. Additional planning may be required to protect the infrastructure from public access.	This strategy will meet the requirements of water system but will need more complicated maintenance procedures compared to Alternative 1.
Score			

Table 7-3: Fire Flow Issues East of Adelaide Rd and Gibson Rd

Mount Brydges	Do Nothing	Strategy 1	Strategy 2	Strategy 3
Description	Implement no solution.	Provision of Tanker Truck for Fire Protection.	Put in new Booster Pumping Station in area to meet fire flow demands.	Replacement of upstream 150 mm watermain with larger watermain.
Technical	Number of tanker trucks or other source of water needed for non-covered areas to be estimated yearly as demand will change with growth.	• Addresses insufficient fire flows but will cause high pressures in areas just downstream of booster station. • Project falls under 'Exempt' schedule per MCEA category; therefore, ECA not required.	• Addresses insufficient fire flows supply issue. • Existing standard practice for surrounding rural areas.	• Upsized watermains are exempt projects under the MCEA schedule. • Since the upsize is only for fire flow protection, they will be oversized for average daily demand.
Social and Cultural	• Insufficient fire protection puts risk of losses on public. • Availability of water-trucks is always needed.	Provision of efficient fire protection is generally supported by public opinion.	Provision of efficient fire protection is generally supported by public opinion.	• Provision of efficient fire protection is generally supported by public opinion. • Construction related social and cultural impacts can be addressed by construction practices.
Environment	Can have adverse impact to environment depending on fire incident.	General construction impacts only.	No adverse impact to the environment.	General construction impacts only.
Economic	No associated cost	Project capital cost is higher than Preventative Maintenance solution but much lower than Replacement solution.	Cost of water trucks will only arise during a fire incident in the specific area.	• Large initial capital cost. Cost may not be justified as solution is extensive as compared to the issue being addressed.

Mount Brydges	Do Nothing	Strategy 1	Strategy 2	Strategy 3
				• Increased watermain flushing means larger volume of non-revenue water.
Overall Strategy	This strategy does not ensure fire protection for the specified areas, and therefore does not address the identified issue.	This strategy will address the identified issue, however, high pressurized areas downstream of the booster pump may cause additional unforeseen issues.	This strategy addresses the identified issues efficiently as it is economically justifiable based on the long-term trends with respect to population growth anticipated development in the specified areas.	This strategy has high costs that may not be justified when compared to the operation changes solution which is more economically justifiable.
Score				

8.0 CAPITAL IMPLEMENTATION PLAN

8.1 Development of Multi-year Capital Implementation Plan

ASTM E 2516 (Standard Classification for Cost Estimate Classification System) provides a five-level classification system based on several characteristics, with the primary characteristic being the level of project definition (i.e., percentage of design completion). The ASTM standard, shown in Table 8-1, illustrates the typical accuracy ranges that may be associated with the general building industries.

Table 8-1 – ASTM E2516 Accuracy Range of Cost Opinions for General Building Industries

Cost Estimate Class	Expressed as % of Design Completion	Anticipated Accuracy Range as % of Actual Cost
5	0-2	-30 to +50
4	1-15	-20 to +30
3	10-40	-15 to +20
2	30-70	-10 to +15
1	50-100	-5 to +10

The cost estimates developed in this report would be best described as a **Class 5 Cost Estimate** which is typically used for high level study project.

8.2 Linear Construction Costs

Based upon data from 2023 linear urban infrastructure renewal projects in Strathroy-Caradoc, Table 8-2 summarizes the costs for infrastructure reconstruction. It is assumed that a full reconstruction of the roadway will be undertaken and that the existing watermain and storm sewer will also be replaced (or added) at the time of this work to ensure that the roadway is up to the current municipal standard. This is shown in Figure 8-1. The Municipality should determine the extent of construction on a case-by-case basis to determine the extent of work required for growth, lifecycle improvement and service level.

Table 8-2 – Estimated 2024 Linear Construction Costs (per m)

Component	Construction	+15% Engineering	% of Total Costs
Total General Tax Base (Storm sewer, road, curb)	$3,108	$3,575	60.4%
Sanitary Sewers (funded through Sewer Rate)	$939	$1,080	18.3%
Watermain (funded through Water Rate)	$1,097	$1,262	21.3%
Total	**$5,145**	**$5,917**	**100.0%**

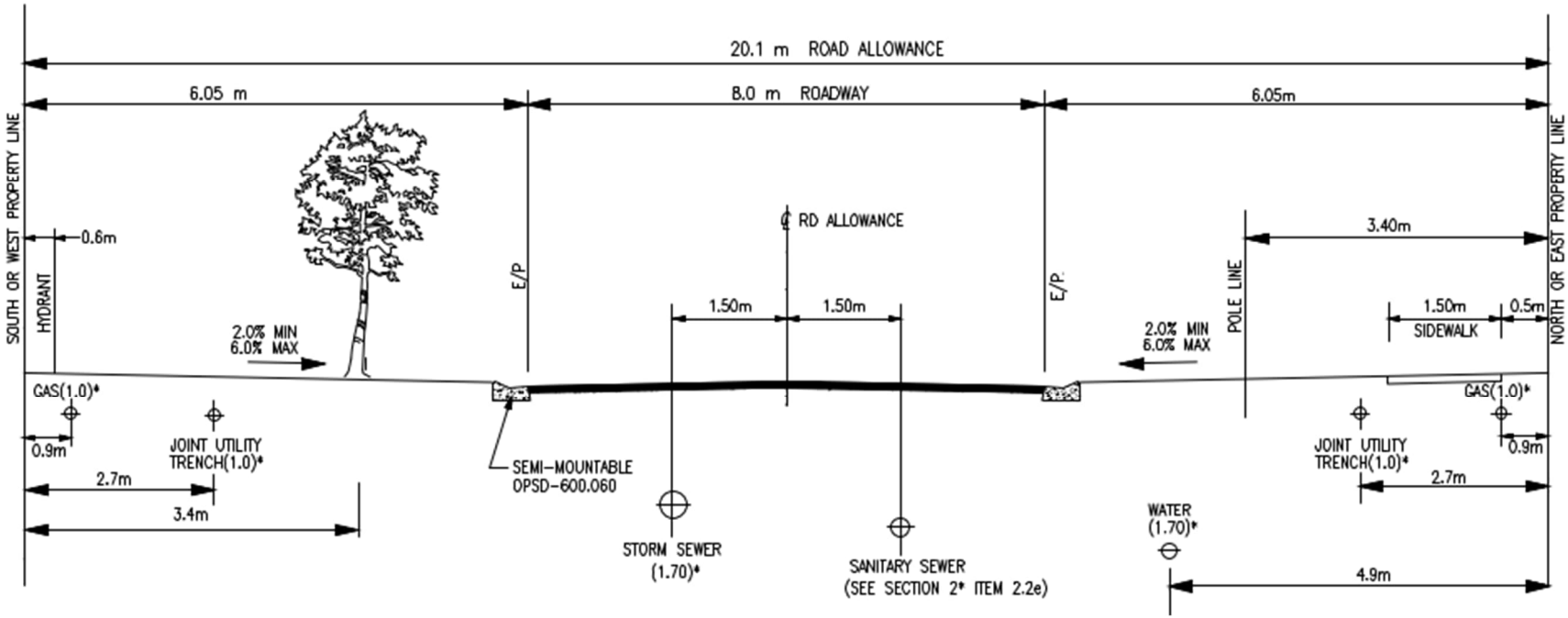


Figure 8-1- Current Strathroy-Caradoc Right of Way Standard

8.4 Capital Plan Update

8.4.1 Strathroy Water System

This Master Plan has provided the Municipality with water service-related projects that are required over the current planning horizon to address growth and to maintain the required level of service. Most of these projects involve replacement of existing watermains. The costs presented are those for the replacement of the watermains identified, water service connections and restoration of the impacted road allowance. As these replacements are generally within older areas of Strathroy, the Municipality may decide to undertake additional infrastructure renewal including storm and sanity sewer replacements as well as new surface works. Currently, the Municipality's 10-year Capital Plan has not identified these watermain replacement projects or as part of any infrastructure renewal projects. Therefore, column titled *Stand-Alone Project Cost* in Table 8-3 assumes the cost of replacement of the watermain as a stand-alone project. We would recommend that the Municipality review and evaluate the cost-benefit of undertaking these recommended projects either as watermain only projects or as part of a full infrastructure renewal projects or a combination of these. We would recommend that the Municipality undertake these projects within the next 10 to 15 years.

Additionally, the watermain upgrade projects may be combined with projects identified for other municipal infrastructure in the vicinity that the municipality may identify as needs rehabilitation or replacement. Combining the projects allows for efficient capital funding implementation and economical design practice. These projects may include replacement of aging or undersized sanitary and storm sewers, road, and curb rehabilitation etc. Therefore, the increased project cost that includes restoration of the pipelines (both storm and sanitary sewers assumed to be sharing the same locations as each of the watermains) and surface features includes roads and curbs are also provided in Table 8-3 in column titled *Combined Project Cost*. Engineering design costs for these projects are also included.

Table 8-3 –Recommended Improvements to Strathroy WDS to Address Fire Flow

#	Project Description	Alternative	MCEA Schedule	Project Cost
1	Centre Street Watermain Upgrades	1	Exempt	$840,000
2	Concord Drive Watermain Upgrades	2	Exempt	$760,000

#	Project Description	Alternative	MCEA Schedule	Project Cost
3	Riverview Drive Watermain Upgrades	1	Exempt	$760,000
4	Oak Avenue Watermain Upgrades	1	Exempt	$1,830,000
5	North Street Watermain Upgrades	1	Exempt	$1,770,000
6	Locke Heights Watermain Upgrades	1	Exempt	$1,430,000
7	Lamore Crescent Watermain Upgrades	1	Exempt	$1,210,000
8	Mill Pond Crescent Watermain Upgrades	1	Exempt	$1,430,000
9	Head Street Watermain Upgrades	1	Exempt	$2,030,000

8.4.2 Mount Brydges Waster System

8.4.2.1 Water Storage

The recommended strategy is the Above Ground Water Storage tanks per the evaluation results shown in Table 5-2. Cost of the two 800m^3 tanks is approximated at $2,575,000 (excluding HST). This cost includes tank necessities including sidewall manway and ladder, access hatches and walkway. The engineering design coordination and construction costs are also included. As seen in Table 1.3 the required storage volume will reach 85% capacity (2,000 m^3) just before year 2026. Hence, this project is recommended to be implemented within the next 5 years. The 2019 *Strathroy Caradoc Water & Wastewater Condition Assessment* completed by RVA report noted required upgrades to the Process Electrical (Pump Station Back-up Generator and corroded meter), Building Architectural (frost damage, mold removal and fence upgrades) and Building Mechanical (building heaters) to be made to the Mount Brydges Pumping Station Reservoir. These upgrades are included in the cost for this project.

8.4.2.2 Water Distribution East of Adelaide Rd and Gibson Rd

The proposed solution to low flow during fire condition at the remote areas outside of the Mount Brydges community are based on treating these areas as rural areas for fire protection. Therefore, there is no capital cost associated with this solution.

8.4.3 Hydraulic Model Updates

It would be recommended that the Municipality provide an allotment of $50,000 for the next five-year period ($250,000) to work on enhancement of the water hydraulic model. This project can also investigate the high per capita MDD demand in Mount Brydges. Additionally, we would recommend that approximately every 10-years the Municipality update the model (total $150,000).

8.5 Summary of Recommended Water Programs

Table 8-4 summarises the total costs identified for water projects from this Master Plan.

Table 8-4 – Strathroy-Caradoc Water Servicing Upgrade Recommendations

Project Type	Cost
Strathroy Watermain Upgrades	$12,060,000
Mount Brydges Storage Upgrades	$ 2,575,000
Updating of Water Hydraulic Model	$ 400,000
Total	$15,035,000

Appendix D shows the Water Master Plan Project Fact sheet that details the following:

- Project and Location;
- Anticipated MCEA Schedule;
- Total Cost;
- Anticipated Timing for Projects from 2025 to 2046; and
- Summary of Cashflow over the period 2024 to 2046.

The timing provided is based upon the perceived need to undertake work to address growth when it is expected. Additionally, those projects which address other noted deficiencies are timed such that they occur as soon as possible with the intent to undertake them when there are growth related projects underway that are relatively high cost.

It is recommended that the Municipality review the proposed projects identified in this Master Plan and consider them within the context of their current 10-year Capital Plan and Asset Management Plan and update the Capital Plan according to the Municipality's priorities and capacity and those of other stakeholders to fund the required capital works.

APPENDIX A

Municipality of Strathroy-Caradoc
Water & Wastewater
2024-2030 Capital Plan

PROJECT	DIVISION	ANNUAL BUDGET									
		2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Master Plan							1,000,000	1,000,000	1,000,000	1,000,000	1,000,000
Mt Brydges Tower Painting	Water			750,000							
Strathroy Reservoir - Electrical/generator upgrade construction	Water		100,000	1,250,000							
Water Facility Inspections 5 year	Water			25,000							
Replacement of Copper services on Darcy Dr	Water		40,000	40,000							
McKellar Ph 2 Reconstruction	Roads			3,500,000							
Adelaide St Strathroy - Reconstruction Ph 1	Roads			2,500,000							
Carroll Street East (Saxton to East Limits) - Construction	Roads		500,000								
Adelaide Road Sewer & Water Extension - Construction	Roads		3,100,000								
Extension of Thorn Dr (North Meadows Secondary Plan), West of Adair Blvd	Roads		3,500,000								
Ellor Street Reconstruction Ph 2 #325 to Caroll St	Roads		1,000,000								
New Road Street D - Wright St to Second St	Roads		2,650,000								
Extension of Adair Blvd (North Meadows Secondary Plan)	Roads		1,700,000								
Carroll Street - Sidewalk and upgrades south side West of Saxton (Existing Urban)	Roads		75,000								
High St Reconstruction & PS Elimination	Roads		4,000,000								
Beech Street Construction	Roads		1,500,000								
Head Street Reconstruction	Roads		4,000,000								
Oxford St & Richmond St Reconstruction	Roads		7,100,000								
North End Water Tower Design and land acquisition	Water		200,000								
Strathroy Reservoir Pavement and Drainage improvements/ladder/crack injection	Water		250,000								
Hydrant Painting	Water		200,000								
New Strathroy Tower Construction - North End	Water		2,000,000								
Strathroy Reserrvoir generator replacement	Water		300,000								
New Road Street B - Adair Blvd to Muni Boundary	Roads			1,600,000							
New Road Street A - Adair Blvd to Muni Boundary	Roads				475,000						
New Road Street C - Street B to Terminus	Roads				650,000						
Extension of Thorn Dr (North Meadows Secondary Plan), East of Adair Blvd	Roads				1,900,000						
Falconbridge Road Reconstruction - Rougham to Adelaide	Roads				3,000,000						
Adelaide St Strathroy - Reconstruction Ph 2	Roads				3,500,000						
Refurbishing Pumping Stations -Construction Ewart PS & Millpond PS					200,000						
York Street Servicing	Roads				3,500,000						
New Road Street E - Parallel to Adair Blvd to Adair Blvd	Roads					1,100,000					
New Road Street F - Parallel to Adair Blvd to Adair Blvd	Roads					1,100,000					
New Road Street G - Parallel to Adair Blvd to Adair Blvd	Roads					1,100,000					
Trunk Sanitary Sewer Adelaide Road (Carroll to Walkers) Construction	Roads					2,300,000					
Caradoc Street Capacity Improvement - Design - Carroll St to Metcalfe St	Roads						100,000	500,000			
Jenna Drive Extension	Roads						100,000	600,000			
Pannell Lane & Dominion Street Extension - Construction	Roads						4,000,000				
Rougham Road - Glendon to Parkhouse	Roads						200,000	3,500,000			
Saxton Road South Design	Roads					100,000					
Falconbridge Drive and Springwell Drive Design	Roads							150,000			
Falconbridge Drive and Springwell Drive Reconstruction	Roads							2,000,000			
Infrastructure Renewal Annual Design Allocation								300,000			
Infrastructure Renewal Annual Reconstruction Allocation								3,500,000			
Saulsbury Street (Drury to Victoria) Design	Roads									150,000	

APPENDIX B

Hydraulic Model Report

1.0 STRATHROY-CARADOC WATER DISTRIBUTION SYSTEM HYDRAULIC MODELLING

1.1 Objectives

The section provides the details of the analysis, summarized as follows:

- The update of water distribution models for the Strathroy and Mount Brydges water distribution systems.
- The calibration of the water distribution models based on the field test results.
- Identify existing and future system constraints and opportunities to improve the water distribution system performance; and,
- Provide recommendations for any system upgrades required to meet the 25-year servicing requirements.

Figure 1-1 and Figure 1-2 illustrate the Strathroy and Mount Brydges water distribution network respectively.

1.2 2021 Model Update

1.2.1 Overview

RVA had developed hydraulic models for both the Strathroy and Mount Brydges WDSs in 2021. The previously developed models were used as the basis for the model updates as follows:

- The latest watermain infrastructure GIS shapefile was used to verify existing infrastructure size and material or add missing watermain infrastructure that was added since the model development.
- Verification of and update connectivity within the model prior to model runs as the presence of orphan nodes may cause issues.
- Verification of and update junction elevation data using Google Earth Pro, especially new junctions that were added as part of the watermain infrastructure added based on the latest pipe dataset.
- Verification of and update pump curves for the pumps located Strathroy and Mt. Brydges water treatment plants.

- Verification of and update the demand allocated within the model to reflect the current water demands both systems are experiencing.

Figure 1-1: Strathroy Water Distribution Network

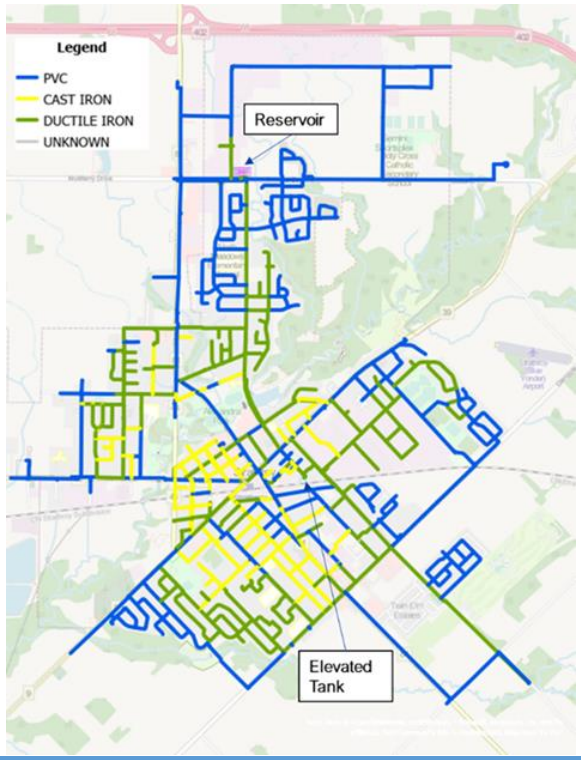
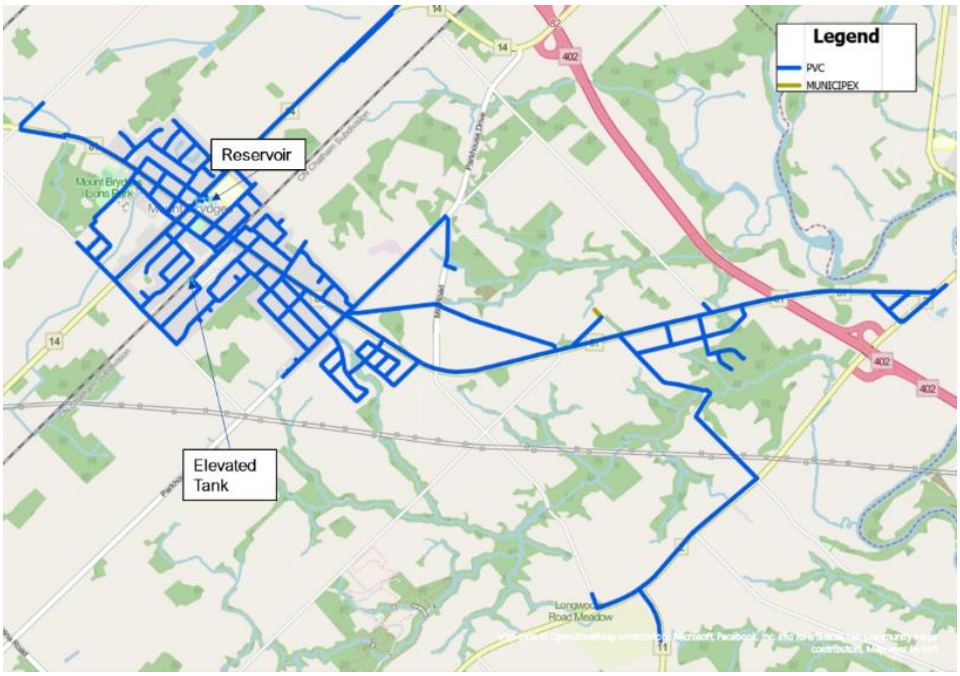


Figure 1-2: Mount Brydges Water Distribution Network



Based on the comparison with the GIS data, there were few instances where additional infrastructure data needed to be added/updated within the model. The main update made to each WDS model was the demand allocations that now reflect the current demands each system is experiencing.

1.2.2 Model Calibration

Model calibration is the process of comparing the model results with actual field measurements and using the field test results to improve the overall accuracy of the hydraulic model. The intent is to bring the modeling results as close as possible to real-world conditions by adjusting the model parameters (if necessary) to match the field test data from the hydrant flow testing. This method generally involves designating the proper C-factors per the domestic demands and comparing the simulated hydrant flow curve with the pressure and flow points gathered from the hydrant flow test results under the existing Average Day Demand (ADD) scenario.

Hydrant flow testing, based on the National Fire Protection Association (NFPA) 291 standards, was performed in July 2023 by RVA at a total of nine (9) hydrants. Six (6) were performed in Strathroy and three (3) in Mt. Brydges. The available fire flow on each test location was calculated based on the formula:

$$Q_F = 1.883\ (c)\ (d^2)\ \sqrt{p}$$

where:

Q_F = Total residual flow during the test, Litres per second (L/s)

c = Discharge coefficient;

d = Diameter of the outlet, inches

p = Pitot pressure, pounds per square inch (psi)

NFPA 291 (2010) recommends that a residual pressure of 138 kPa (20 psi) to be maintained on the fire hydrant locations and within the whole system for effective for firefighting (increased flows) and preventing contamination of public water supply from infiltration.

To extrapolate the available flow at 138 kPa (20 psi) pressure, the following formula was used:

$$Q_R = Q_F\ (h_r\ \div\ h_f)^{0.54}$$

where:

Q_R = Flow predicted at 20 psi, L/s;

Q_F = Total flow measured during the test, L/s;

h_r = Pressure drop to the desired residual pressure, psi; and

h_f = Pressure drop measured during the test, psi.

Figure 1-3 and Figure 1-4 are maps of the hydrants tested in Strathroy and Mt. Brydges respectively. The field test data gathered from the hydrant flow testing are listed in Table 1-1

Table 1-1 – Hydrant Flow Test Results Summary

Test	Flow Hydrant	Residual Hydrant	Pipe Diameter (mm)	Static (kPa) - Field	Static (kPa)- Model	Field Flow @ 138 kPa (L/s)	Model Flow @ 138 kPa (L/s)
Strathroy							
1	552 Agnes Dr.	75 Deborah Dr.	200	454	451	168	170
2	500 Head St. N	526 Head St. N	300	365	364	302	302
3*	314 Saulsbury St.	385 Saulsbury St.	150	413	415	282	160
4*	203 Burn St.	232 Burns St.	150	444	444	221	180
5*	48 McNab St	20 McNab St.	200	432	428	289	225
6	24571 Adelaide Rd.	24584 County Rd. 81	400	379	380	220	235
Mt. Brydges							
7*	8501 County Rd. 14	8562 County Rd. 14	150	394	387	168	120

Test	Flow Hydrant	Residual Hydrant	Pipe Diameter (mm)	Static (kPa) - Field	Static (kPa)- Model	Field Flow @ 138 kPa (L/s)	Model Flow @ 138 kPa (L/s)
8	Lockwood Cres.	Lockwood Cres	200	417	414	119	115
9	21809 County Rd. 81	21736 County Rd. 81	250	515	506	75	80

*Reasonable c-factor values were used during the micro calibration based on the pipe age and material of the watermains and to match the hydrant flow test data. However, tests no. 3, 4, and 5 show lower fire flow values of up to 43% (test n. This is possibly due to the demands assigned in the hydraulic model where the domestic water demand from the model is higher compared to the demand at the location and the time of testing which render conservative results from the hydraulic model.

Figure 1-3: Strathroy Fire Hydrant Locations

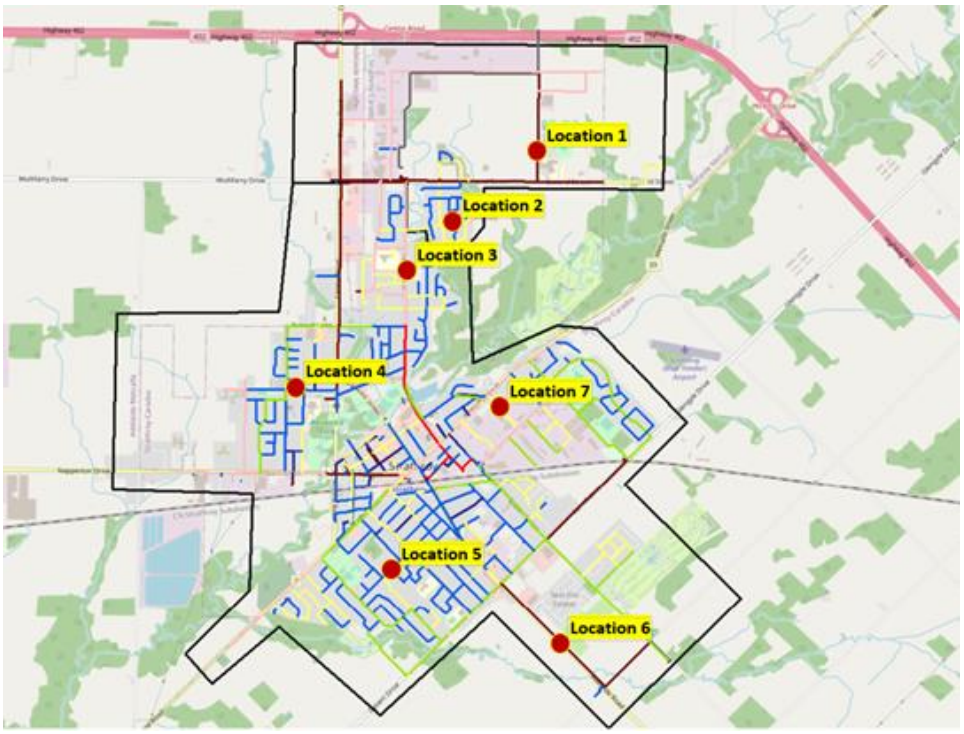
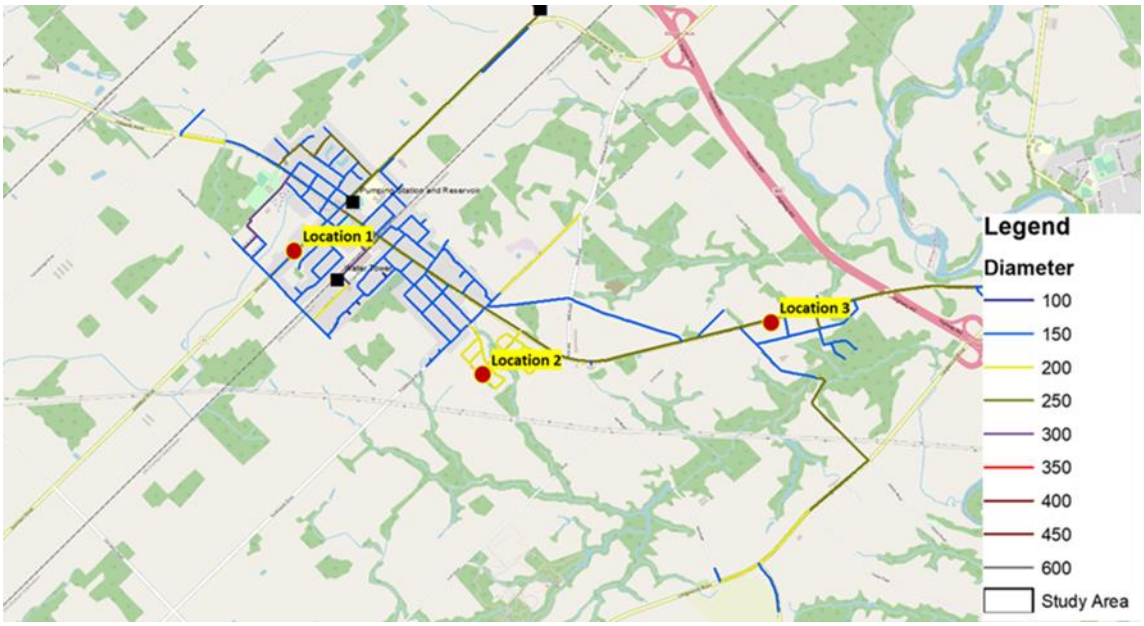


Figure 1-4: Strathroy Fire Hydrant Locations



The model parameters were adjusted by changing the C-factors of the pipes to a reasonable value to match the field test data. The step-by-step model calibration process is as follows:

1. Compare the measured static pressure from the field testing and the simulated pressure from the model. The static pressure is defined as the hydraulic grade at the test location under ADD scenario.
2. Check the ground elevation at the test location where the residual pressure was measured for each test.
3. Compare the measured residual pressure and the modeled pressure on the test location and the model junction, respectively for each test. The residual pressure is defined as the hydraulic grade at the test hydrant location when the hydrant is flowing at a specific flow rate.
4. Check the pipe connectivity at each test location.
5. Check the water demands within the area of each test location.
6. If necessary, revise the ground elevation, pipe connectivity, and/or water demands and re-run the hydrant flow curve in the hydraulic model.
7. Compare the measured head loss and the simulated head loss for each test. The head loss is the difference between the static pressure and the residual pressure at each test location.
8. If necessary, revise the roughness coefficients (C-factors) of pipe segments and re-run the simulations until the model matches the pressure and flow data gathered from the field measurements.

During flow conditions, discrepancies became obvious and were mainly caused by incorrect pipe roughness and/or incorrect pipe connectivity. In major deviations, the model overestimated the flows compared to the field conditions. This could indicate the initial C-factors used were more radical than the actual conditions.

The water distribution network model was disaggregated into separate logical calibration groups based on the known physical characteristics of the associated pipes (i.e., material, location, etc.). Then, the watermain C-factor within the critical areas were revised using trial and error until the variances within the acceptable tolerance are reached between the observed and the simulated conditions.

Table 1-2 and Table 1-3 shows the adjusted pipe roughness coefficients that satisfy the model calibration for the Strathroy and Mt. Brydges Water models.

Table 1-2 – Strathroy Adjusted Pipe Roughness Coefficients

Pipe Material	Diameters (mm)	C-Factor
Cast Iron	All	90-110
Ductile Iron	All	80-120
PVC	All	70-130

Table 1-3 – Mount Brydges Adjusted Pipe Coefficients

Pipe Material	Diameters (mm)	C-Factor
PVC	All	100-130

Detailed information about the model vs. hydrant flow test curves for each test location is contained in Appendix A-1.

1.3 Hydraulic Analysis Results

Several modeling scenarios were created to evaluate the performance of the WDS and identify potential areas that may have issues related to pipe capacity and/or water pressures. A scenario was also developed to evaluate the WDS performance during fire flow (FF) conditions and to identify areas where infrastructure upgrades may be required to ensure the minimum FF requirements are met.

The steady-state model simulations were performed to determine the hydraulic conditions of the distribution system under all demand conditions. The results were then compared under existing and future demand conditions including the system performance with the proposed upgrades which are summarized in the following subsections. Maps showing Strathroy and Mount Brydges pressure distribution for the entire network under various demand scenarios can be found in Appendix A-2 and Appendix A-3 respectively.

1.3.1 Strathroy WDS

1.3.1.1 Existing Conditions

Table 1-4 shows the results summary of the simulated pressures under the existing conditions. The existing demands utilized for the hydraulic analysis can be found in Section 4.7 of this report. Based on the results of the hydraulic analysis, the service pressures within the Municipality's water distribution network range from 313 kPa (45 psi) to 521 kPa (76 psi) under existing demand conditions. Accordingly, the resulting pressures are within the acceptable range for water distribution systems under normal operations.

Table 1-4– Strathroy Simulated Pressures Under Existing Conditions

Planning Horizon	Average Day Demand Pressures (kPa)	Maximum Day Demand Pressures (kPa)	Peak Hour Demand Pressures (kPa)
Existing (2023)	359-521	317-521	313-521

Under the existing conditions, a fire flow simulation was carried out to identify locations where the hydrant available fire flow is less than equal to the proposed minimum fire protection value of 67 L/s. The results of the hydraulic modelling showed that under existing conditions, the available fire flows on most areas within the system can achieve the minimum fire flow requirement of 67 L/s, except on areas with small diameter and/or dead-end watermains which is to be expected since the fire flow availability in these cases are normally lower compared to larger diameter watermain and/or properly looped watermain connections.

1.3.1.2 2030 Conditions

The water demand from the *committed development* scenario is added to the existing 2023 demands to generate the total water demand in 2030. Results are in Table 1-5.

Table 1-5 – Strathroy Committed Developments Water Demands, 2030

Development	ADD[1] (L/s)	MDD[2] (L/s)	PHD[3] (L/s)
100 Second Street	0.27	0.46	0.77
Darcy Drive	0.56	0.95	1.58
Strathroy Crossing	0.19	0.32	0.53
50 Carroll Street	0.31	0.53	0.88
Norbec - 990 Wright St.	1.30	2.21	3.71
Sunslab-990 Wright St.	0.38	0.65	1.09
392 Second Street	0.25	0.42	0.70
430 Head Street	0.16	0.28	0.46
Cuddy Farms - Saulsbury Development	1.17	1.98	3.32
	2.49	4.24	7.11
Fieldcrest	0.92	1.56	2.62

Development	ADD[1] (L/s)	MDD[2] (L/s)	PHD[3] (L/s)
	1.44	2.44	4.09
Southgrove Meadows	0.19	0.32	0.53

1: Average Day Demand estimated using a per capita consumption of 278 L/cap/d
2: Maximum Day Demand peaking factor used was 1.7
3: Peak Hour Demand peaking factor used was 2.85

The demands of the future developments identified in the table above were allocated to the nearest junctions connected to the existing watermains since the piping layout for these developments are not yet available for this analysis.

Table 1-6 shows the results summary of the simulated pressures under the future development conditions. Based on the results of the hydraulic analysis, the service pressures within the Municipality's water distribution network range from 310 kPa (45 psi) to 521 kPa (76 psi) under the 2030 demand scenario Accordingly, the resulting pressures are within the acceptable range for water distribution systems under normal operations.

Table 1-6 - Strathroy Simulated Pressures under Future Conditions, 2029

Planning Horizon	Average Day Demand Pressures (kPa)	Maximum Day Demand Pressures (kPa)	Peak Hour Demand Pressures (kPa)
2023 (Existing)	359-521	317-521	313-521
2030	359-521	315-520	310-521

1.3.1.3 2041 Conditions

The water demand from *all proposed developments* scenario is added to the existing 2030 demands to generate the total water demand in 2041. Results are in Table 1-7.

Table 1-7 – Strathroy Committed Developments Water Demands, 2041

Development	ADD[1] (L/s)	MDD[2] (L/s)	PHD[3] (L/s)
Site approval and Subdivision Developments	9.61	16.4	27.4
Darcy Drive	0.61	1.04	1.74
101 Hull Road	0.16	0.28	0.46
24621 Adelaide Road	0.49	0.83	1.39

Development	ADD[1] (L/s)	MDD[2] (L/s)	PHD[3] (L/s)
	0.43	0.74	1.23
	0.63	1.06	1.78
390 Second Street	1.16	1.98	3.32
	1.06	1.80	3.02
	0.00	0.00	0.00
24648 Adelaide Road	0.28	0.47	0.79
360 Carroll Road	0.57	0.97	1.63
	0.56	0.95	1.58
Buchanan Crossings	1.74	2.95	4.95
	0.89	1.51	2.53
24633 Adelaide Road	0.36	0.62	1.03
599 Albert Street	0.44	0.74	1.25
251 Burns Street	0.17	0.29	0.48
	0.02	0.03	0.04
Additional population to equal projected 2041 population number	0.52	0.88	1.48
Totals	19.7	33.5	56.1
Existing Water Demands (2023)	54.7	93.0	155.9
Total Water Demands for 2041	74.38	126.5	212.0

1: Average Day Demand estimated using a per capita consumption of 278 L/cap/d
2: Maximum Day Demand peaking factor used was 1.7
3: Peak Hour Demand peaking factor used was 2.85

The demands of the future developments are allocated to the nearest junctions connected to the existing watermains.

Table 1-8 shows the results summary of the simulated pressures under the future development conditions. Based on the results of the hydraulic analysis, the service pressures within the Municipality's water distribution network range from 310 kPa (45 psi) to 521 kPa (76 psi) under the 2041 demand scenario Accordingly, the resulting pressures are within the acceptable range for water distribution systems under normal operations.

Table 1-8 - Strathroy Simulated Pressures Under Future Conditions, 2041

Planning Horizon	Average Day Demand Pressures (kPa)	Maximum Day Demand Pressures (kPa)	Peak Hour Demand Pressures (kPa)
2023 (Existing)	359-521	317-521	313-521
2030	359-521	315-520	310-521
2041	**358-521**	**314-520**	**307-520**

1.3.1.4 2046 Conditions

The 2046 demand for a population of 23,900 people is as follows:

- ADD = 77.02 L/s
- MDD = 129.03 L/s
- PHD = 219.54 L/s

Table 1-9 shows the results summary of the simulated pressures under the future development conditions. Based on the results of the hydraulic analysis, the service pressures within the Municipality's water distribution network range from 307 kPa (45 psi) to 521 kPa (76 psi) under the 2046 demand scenario Accordingly, the resulting pressures are within the acceptable range for water distribution systems under normal operations.

Table 1-9 – Strathroy, Simulated Pressures Under Future Conditions, 2046

Planning Horizon	Average Day Demand Pressures (kPa)	Maximum Day Demand Pressures (kPa)	Peak Hour Demand Pressures (kPa)
2023 (Existing)	359-521	317-521	313-521
2030	359-521	315-520	310-521
2041	358-521	314-520	307-520
2046 (Ultimate)	**358-521**	**314-520**	**307-520**

1.3.2 Mount Brydges WDS

1.3.2.1 Existing Conditions

Table 1-10 shows the results summary of the simulated pressures under the existing demands. The hydraulic analysis shows the service pressures in Mount Brydges WDS range from 364 kPa (53 psi) to 575 kPa (83 psi) under existing demand conditions which are within the acceptable range for normal operations.

Table 1-10 – Mount Brydges, Simulated Pressures Under Existing Conditions

Planning Horizon	Average Day Demand Pressures (kPa)	Maximum Day Demand Pressures (kPa)	Peak Hour Demand Pressures (kPa)
Existing (2023)	369-575	368-567	364-558

A fire flow simulation was carried out to identify locations where the hydrant available fire flow is less than or equal to the proposed minimum fire protection value of 67 L/s. The results of the hydraulic modelling showed that under existing conditions, the available fire flows for the areas east of Adelaid Rd. and Gibson Rd., are consistently lower than the proposed minimum fire protection value of 67 L/s. The reason for the lower fire flow values is due to several reasons such as large distance from water source, going from lower elevation to a higher elevation area, small diameter, and presence of dead end watermains. It is important to note that the areas with lower fire flow availability are remote areas and only look to service a few single-family homes.

1.3.2.2 2032 Conditions

The water demand from *all proposed developments* scenario is added to the existing 2023 demands to generate the total water demand in 2032. Results are in Table 1-11.

Table 1-11– Mount Brydges Committed Developments Water Demands, 2032

Development	ADD[1] (L/s)	MDD[2] (L/s)	PHD[3] (L/s)
22182 Adelaide Road	0.25	0.60	0.74
Falconbridge	0.82	1.97	2.46
	0.86	2.06	2.58
Falconbridge West	1.58	3.79	4.74
	0.83	1.99	2.49

Development	ADD[1] (L/s)	MDD[2] (L/s)	PHD[3] (L/s)
Edgewood	0.64	1.54	1.93
Forest View	0.50	1.19	1.49
	0.81	1.93	2.42
Additional population to equal projected 2032 population number	0.28	0.68	0.85
Totals	6.6	15.8	19.7
Existing Water Demands (2023)	**10.8**	**25.9**	**32.4**
Total Water Demands for 2032	17.4	41.7	52.1

1: Average Day Demand estimated using a per capita consumption of 279 L/cap/d
2: Maximum Day Demand peaking factor used was 2.4
3: Peak Hour Demand peaking factor used was 3

The demands of future developments are allocated to the nearest junctions connected to the existing water mains.

Table 1-12 shows the results summary of the simulated pressures under the future development conditions. Based on the results of the hydraulic analysis, the service pressures within the Municipality's water distribution network range from 360 kPa (52 psi) to 573 kPa (83 psi) under the 2032 demand scenario Accordingly, the resulting pressures are within the acceptable range for water distribution systems under normal operations.

Table 1-12 – Mount Brydges Simulated Pressures Under Future Conditions, 2032

Planning Horizon	Average Day Demand Pressures (kPa)	Maximum Day Demand Pressures (kPa)	Peak Hour Demand Pressures (kPa)
2023 (Existing)	369-575	368-567	364-558
2032	**369-573**	**364-562**	**360-557**

The 2046 demand for a population of 7,500 people is as follows:

- ADD = 24.22 L/s
- MDD = 59.00 L/s
- PHD = 72.69 L/s

Table 1-13 shows the results summary of the simulated pressures under the future development conditions. Based on the results of the hydraulic analysis, the service pressures within the Municipality's water distribution network range from 347 kPa (50 psi) to

571 kPa (83 psi) under the 2046 demand scenario Accordingly, the resulting pressures are within the acceptable range for water distribution systems under normal operations.

Table 1-13 – Mount Brydges Simulated Pressures Under Future Conditions, 2046

Planning Horizon	Average Day Demand Pressures (kPa)	Maximum Day Demand Pressures (kPa)	Peak Hour Demand Pressures (kPa)
2023 (Existing)	369-575	368-567	364-558
2032	369-573	364-562	360-557
2046 (Ultimate)	**369-571**	**359-556**	**347-551**

APPENDIX B-1

Hydrant Flow Test Results

RV Anderson Associates Ltd.
2001 Sheppard Ave E, North York, ON M2J 4Z8
Tel: (416) 497-8600

TEST INFORMATION

Date: 14-Aug-23
Time: 8:25 AM
Location: 552 Agnes Drive
Municipality: Strathroy-Caradoc
Municipal Operator(s): Jeff, Dave & Dam
RVA Personnel: A. Bhutani & K. Wong
Project No:

HYDRANT & WATERMAIN INFORMATION

Flow Hydrant:
Residual Hydrant:
Hydrant Elevation Diference: 0.0 m
Pipe Diameter: 200mm
Pipe Material:

NOTES

HYDRANT FLOW TEST 01

This location is very close to the pumping station that potentially caused another pump to automatically turn on while flowing resulting in a higher residual pressure while flowing 2 ports.

RESIDUAL HYDRANT

Hydrant No.	0	
N.F.P.A. Colour Code	BLUE	
Static Pressure	65.9	psi
Residual Pressure (1 Port)	56.3	psi
Residual Pressure (2 Ports)	47.6	psi
Pressure Drop	18.2	psi
Pressure Drop Percentage	27.7	% of psi
Flow At Test Hydrant at 20 psi	2667.3	usgpm

FLOW HYDRANT(S)

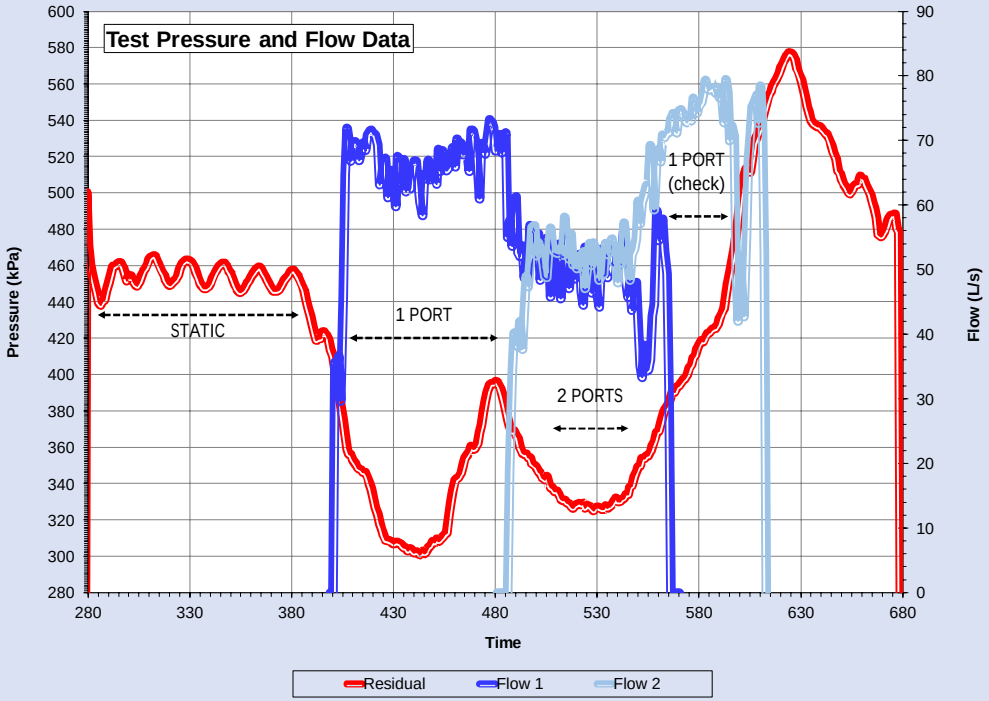
Test No.	Hydrant No.	No. of Ports Flowed	Outlet Dia (in.)	FM or Diffuser type	Nozzle Coeff.	Pitot Reading (psi)	Discharge flow (usgpm)
1st	0	1	2.5	SWIVEL BELL	0.9	38.5	1041.7
		2	2.5		0.9	23.4	1620.2
2nd							
				Total Discharge Flow (USGPM)			2661.9

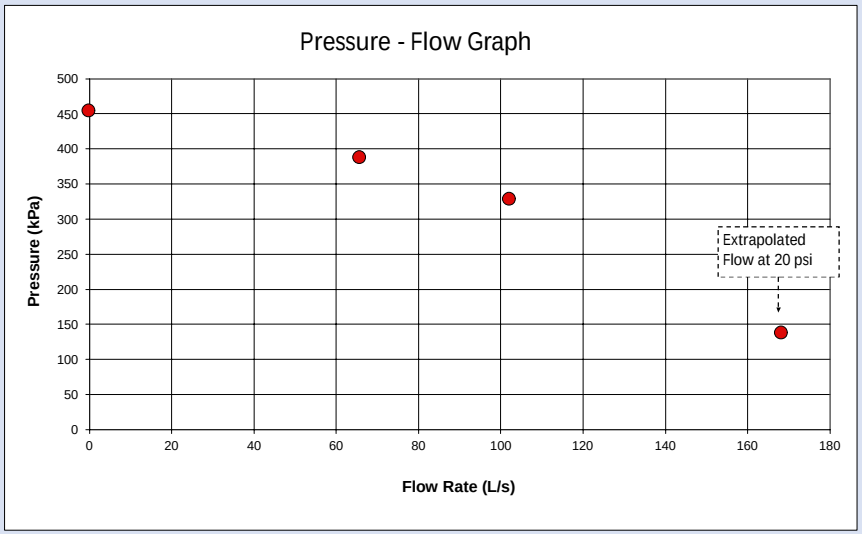
RESULTS SUMMARY

NO. OF PORTS OPEN	IMPERIAL		METRIC	
	RESIDUAL (psi)	FLOW (usgpm)	RESIDUAL (kPa)	FLOW (L/s)
STATIC	65.9	0.0	454.1	0.0
1	56.3	1041.7	388.0	65.7
2	47.6	1620.2	328.5	102.2
EXTRAPOLATED	20.0	2667.3	137.9	168.3

N.F.P.A. 291 HYDRANT CLASSIFICATION

AA	BLUE





$$Q_r = Q_t \left(\frac{P_s - P_r}{P_s - P_t} \right)^{0.54}$$

Q_r = fire flow at residual pressure P (gpm)
Q_t = hydrant discharge during test (gpm)
P_s = static pressure (psi)
P_r = desired residual pressure (psi)
P_t = residual pressure during test (psi)

Hydrant Flow Test Results

RV Anderson Associates Ltd.
2001 Sheppard Ave E, North York, ON M2J 4Z8
Tel: (416) 497-8600

TEST INFORMATION

Date: 14-Aug-23
Time: 8:45 AM
Location: 500 Head Street North
Municipality: Strathroy-Caradoc
Municipal Operator(s): Jeff, Dave & Cam
RVA Personnel: A. Bhutani & K. Wong
Project No:

HYDRANT & WATERMAIN INFORMATION

Flow Hydrant:
Residual Hydrant:
Hydrant Elevation Diference: 0.0 m
Pipe Diameter: 300mm
Pipe Material:

NOTES

HYDRANT FLOW TEST 02

RESIDUAL HYDRANT

Hydrant No.	0	
N.F.P.A. Colour Code	BLUE	
Static Pressure	53.0	psi
Residual Pressure (1 Port)	50.7	psi
Residual Pressure (2 Ports)	48.8	psi
Pressure Drop	4.1	psi
Pressure Drop Percentage	7.8	% of psi
Flow At Test Hydrant at 20 psi	4783.4	usgpm

FLOW HYDRANT(S)

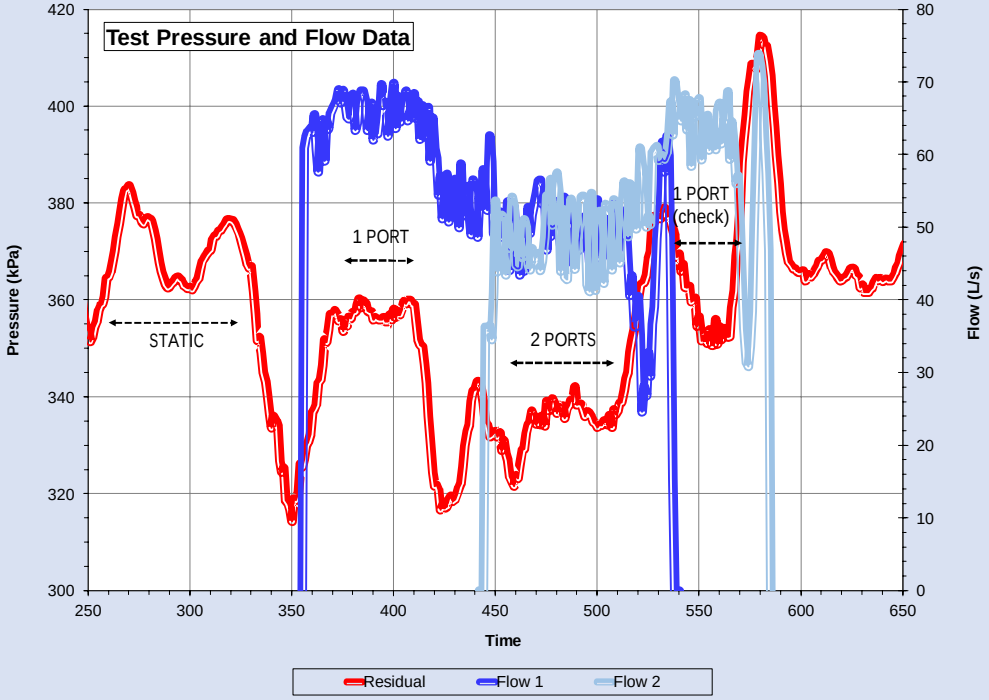
Test No.	Hydrant No.	No. of Ports Flowed	Outlet Dia (in.)	FM or Diffuser type	Nozzle Coeff.	Pitot Reading (psi)	Discharge flow (usgpm)
1st	0	1	2.5	SWIVEL BELL	0.9	38.6	1042.3
		2	2.5		0.9	21.7	1560.7
2nd							
				Total Discharge Flow (USGPM)			2603.0

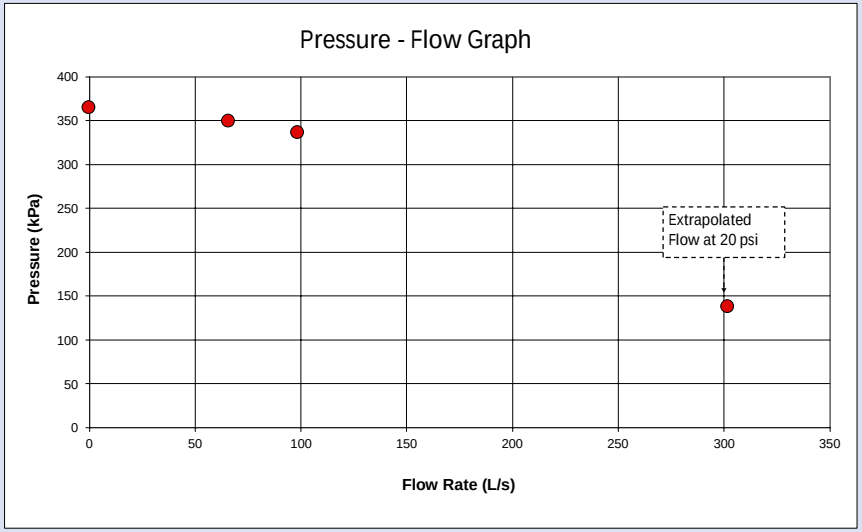
RESULTS SUMMARY

NO. OF PORTS OPEN	IMPERIAL		METRIC	
	RESIDUAL (psi)	FLOW (usgpm)	RESIDUAL (kPa)	FLOW (L/s)
STATIC	53.0	0.0	365.3	0.0
1	50.7	1042.3	349.6	65.8
2	48.8	1560.7	336.8	98.5
EXTRAPOLATED	20.0	4783.4	137.9	301.8

N.F.P.A. 291 HYDRANT CLASSIFICATION

AA	BLUE





$$Q_r = Q_t \left(\frac{P_s - P_r}{P_s - P_t} \right)^{0.54}$$

Q_r = fire flow at residual pressure P (gpm)
Q_t = hydrant discharge during test (gpm)
P_s = static pressure (psi)
P_r = desired residual pressure (psi)
P_t = residual pressure during test (psi)

Hydrant Flow Test Results

RV Anderson Associates Ltd.
2001 Sheppard Ave E, North York, ON M2J 4Z8
Tel: (416) 497-8600

TEST INFORMATION

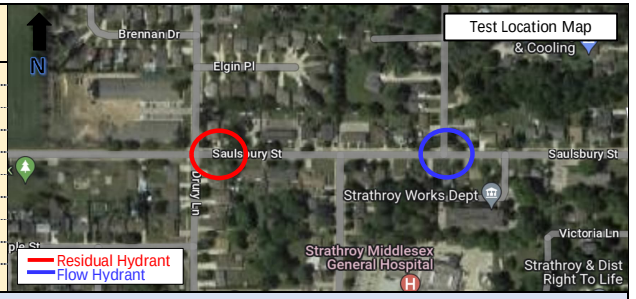
Date: 14-Aug-23
Time: 9:10 AM
Location: 314 Saulsbury Street
Municipality: Strathroy-Caradoc
Municipal Operator(s): Jeff, Dave & Cam
RVA Personnel: A. Bhutani & K. Wong
Project No:

HYDRANT & WATERMAIN INFORMATION

Flow Hydrant:
Residual Hydrant:
Hydrant Elevation Diference: 0.0 m
Pipe Diameter: 150mm
Pipe Material:

NOTES

HYDRANT FLOW TEST 03



RESIDUAL HYDRANT

Hydrant No.	0	
N.F.P.A. Colour Code	BLUE	
Static Pressure	59.9	psi
Residual Pressure (1 Port)	57.2	psi
Residual Pressure (2 Ports)	54.1	psi
Pressure Drop	5.9	psi
Pressure Drop Percentage	9.8	% of psi
Flow At Test Hydrant at 20 psi	4462.7	usgpm

FLOW HYDRANT(S)

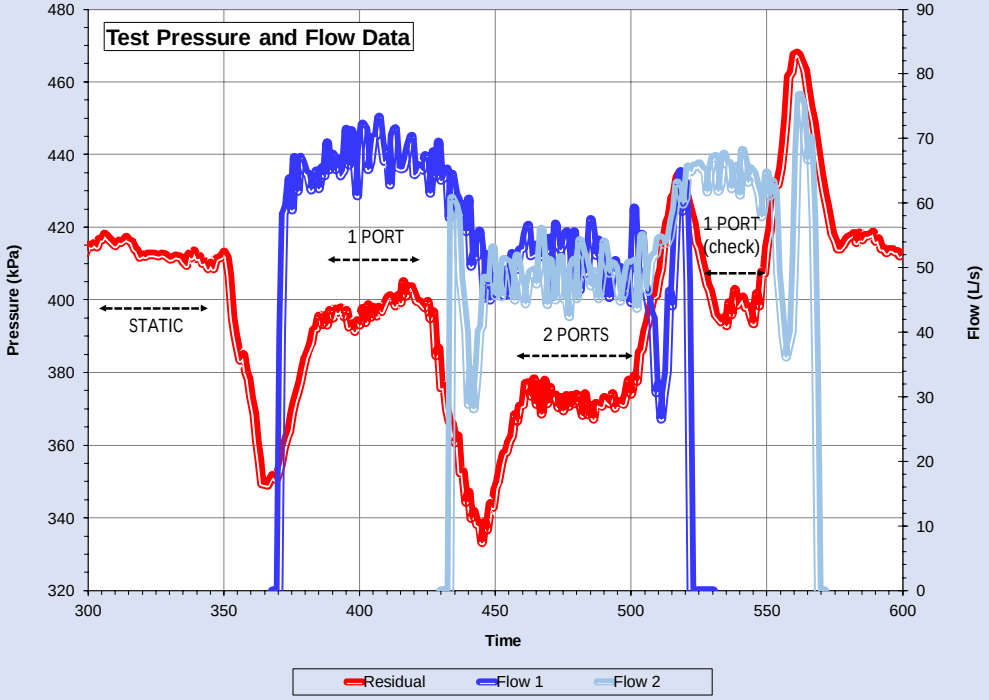
Test No.	Hydrant No.	No. of Ports Flowed	Outlet Dia (in.)	FM or Diffuser type	Nozzle Coeff.	Pitot Reading (psi)	Discharge flow (usgpm)
1st	0	1	2.5	SWIVEL BELL	0.9	39.5	1055.1
		2	2.5		0.9	22.3	1584.0
2nd							
				Total Discharge Flow (USGPM)			2639.1

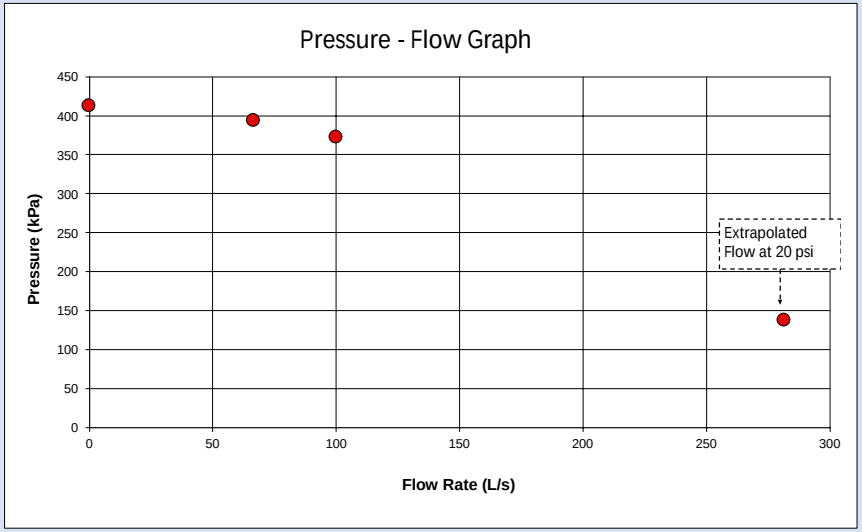
RESULTS SUMMARY

NO. OF PORTS OPEN	IMPERIAL		METRIC	
	RESIDUAL (psi)	FLOW (usgpm)	RESIDUAL (kPa)	FLOW (L/s)
STATIC	59.9	0.0	413.2	0.0
1	57.2	1055.1	394.4	66.6
2	54.1	1584.0	372.8	100.0
EXTRAPOLATED	20.0	4462.7	137.9	281.6

N.F.P.A. 291 HYDRANT CLASSIFICATION

AA | BLUE





$$Q_r = Q_t \left(\frac{P_s - P_r}{P_s - P_t} \right)^{0.54}$$

Q_r = fire flow at residual pressure P (gpm)
Q_t = hydrant discharge during test (gpm)
P_s = static pressure (psi)
P_r = desired residual pressure (psi)
P_t = residual pressure during test (psi)

Hydrant Flow Test Results

RV Anderson Associates Ltd.
2001 Sheppard Ave E, North York, ON M2J 4Z8
Tel: (416) 497-8600

TEST INFORMATION

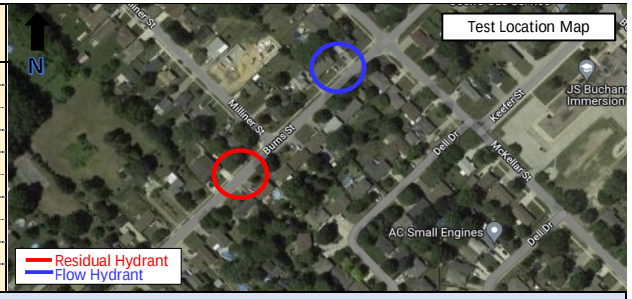
Date: 14-Aug-23
Time: 9:32 AM
Location: 203 Burns Street
Municipality: Strathroy-Caradoc
Municipal Operator(s): Jeff, Dave & Cam
RVA Personnel: A. Bhutani & K. Wong
Project No:

HYDRANT & WATERMAIN INFORMATION

Flow Hydrant:
Residual Hydrant:
Hydrant Elevation Diference: 0.0 m
Pipe Diameter: 150mm
Pipe Material:

NOTES

HYDRANT FLOW TEST 04



RESIDUAL HYDRANT

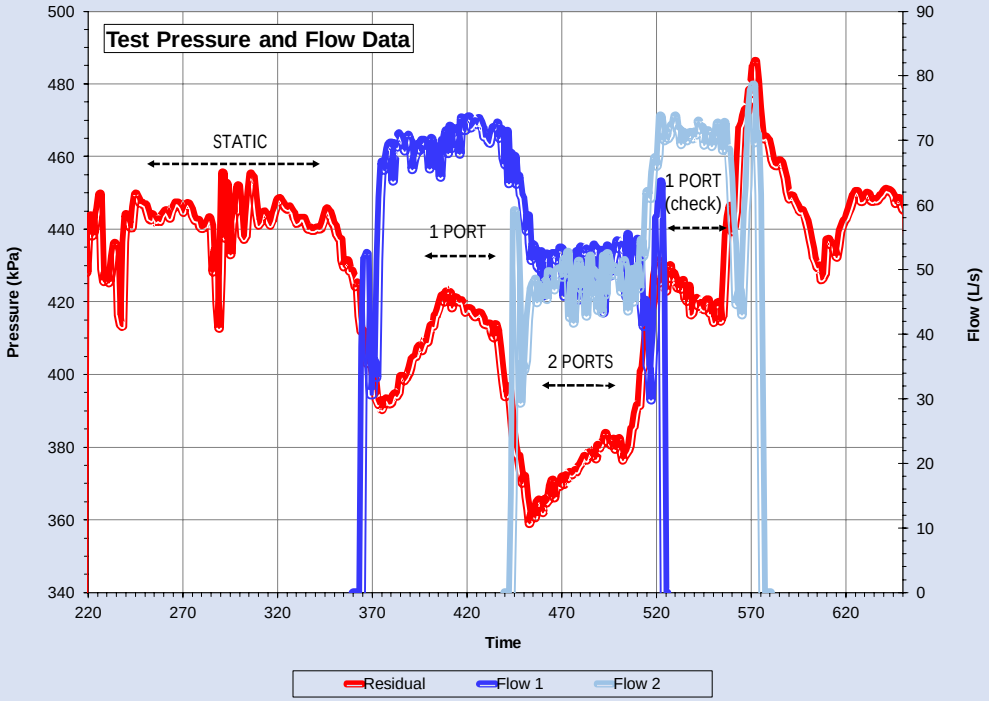
Hydrant No.	0	
N.F.P.A. Colour Code	BLUE	
Static Pressure	64.4	psi
Residual Pressure (1 Port)	58.9	psi
Residual Pressure (2 Ports)	54.3	psi
Pressure Drop	10.1	psi
Pressure Drop Percentage	15.7	% of psi
Flow At Test Hydrant at 20 psi	3503.3	usgpm

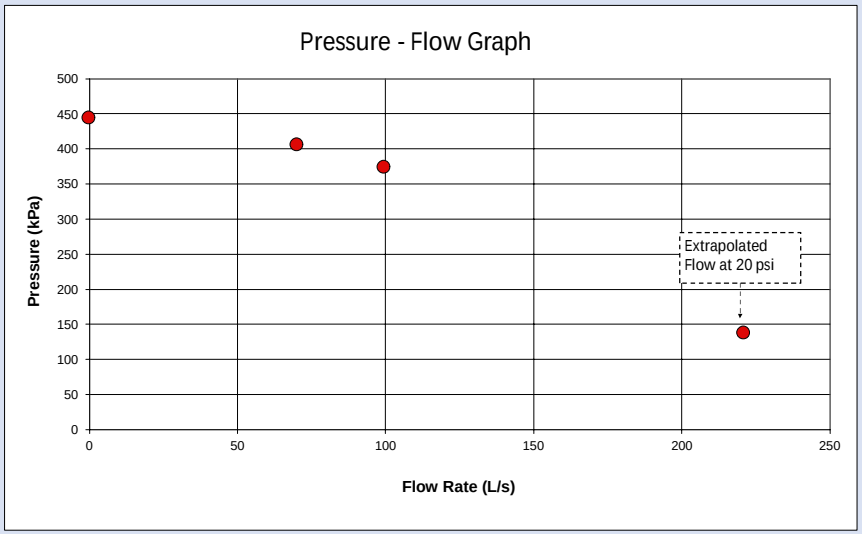
FLOW HYDRANT(S)

Test No.	Hydrant No.	No. of Ports Flowed	Outlet Dia (in.)	FM or Diffuser type	Nozzle Coeff.	Pitot Reading (psi)	Discharge flow (usgpm)
1st	0	1	2.5	SWIVEL BELL	0.9	44.0	1113.1
		2	2.5		0.9	22.1	1576.9
2nd							
				Total Discharge Flow (USGPM)			2690.0

RESULTS SUMMARY

NO. OF PORTS OPEN	IMPERIAL		METRIC	
	RESIDUAL (psi)	FLOW (usgpm)	RESIDUAL (kPa)	FLOW (L/s)
STATIC	64.4	0.0	444.2	0.0
1	58.9	1113.1	406.1	70.2
2	54.3	1576.9	374.4	99.5
EXTRAPOLATED	20.0	3503.3	137.9	221.1
N.F.P.A. 291 HYDRANT CLASSIFICATION				
AA		BLUE		





$$Q_r = Q_t \left(\frac{P_s - P_r}{P_s - P_t} \right)^{0.54}$$

Q_r = fire flow at residual pressure P (gpm)
Q_t = hydrant discharge during test (gpm)
P_s = static pressure (psi)
P_r = desired residual pressure (psi)
P_t = residual pressure during test (psi)

Hydrant Flow Test Results

RV Anderson Associates Ltd.
2001 Sheppard Ave E, North York, ON M2J 4Z8
Tel: (416) 497-8600

TEST INFORMATION

Date: 14-Aug-23
Time: 9:55 AM
Location: 48 McNab Street
Municipality: Strathroy-Caradoc

Municipal Operator(s): Jeff, Dave & Cam
RVA Personnel: A. Bhutani & K. Wong
Project No:

HYDRANT & WATERMAIN INFORMATION

Flow Hydrant:
Residual Hydrant:
Hydrant Elevation Diference: 0.0 m

Pipe Diameter: 200mm
Pipe Material:

NOTES

HYDRANT FLOW TEST 05

RESIDUAL HYDRANT

Hydrant No.	0	
N.F.P.A. Colour Code	BLUE	
Static Pressure	65.4	psi
Residual Pressure (1 Port)	64.1	psi
Residual Pressure (2 Ports)	62.8	psi
Pressure Drop	2.6	psi
Pressure Drop Percentage	3.9	% of psi
Flow At Test Hydrant at 20 psi	8461.5	usgpm

FLOW HYDRANT(S)

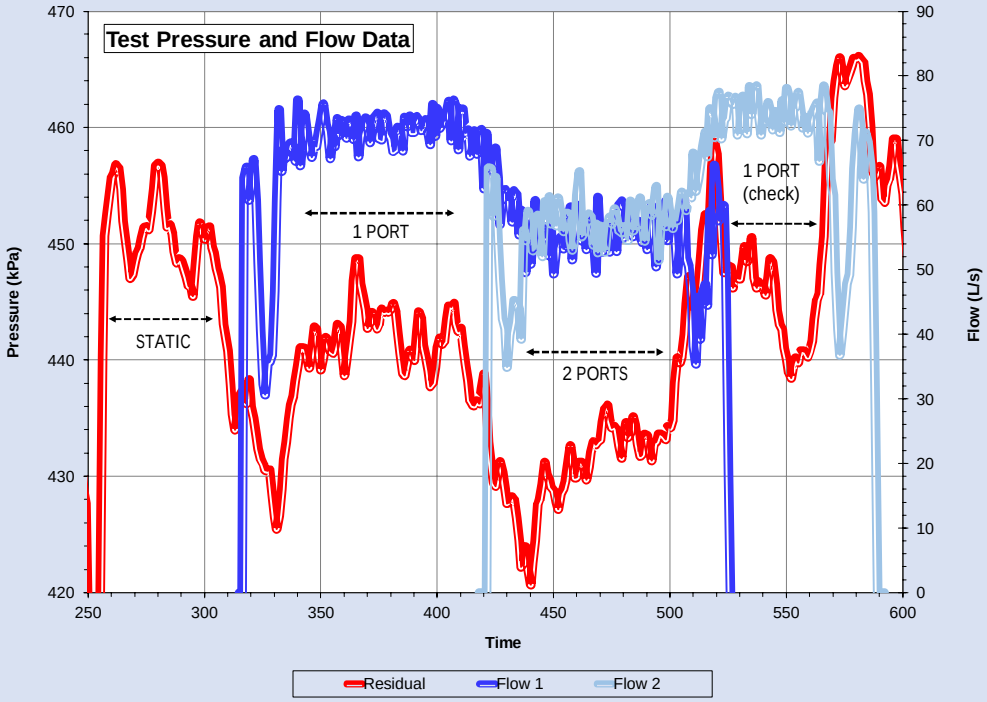
Test No.	Hydrant No.	No. of Ports Flowed	Outlet Dia (in.)	FM or Diffuser type	Nozzle Coeff.	Pitot Reading (psi)	Discharge flow (usgpm)
1st	0	1	2.5	SWIVEL BELL	0.9	45.9	1137.3
		2	2.5		0.9	28.5	1788.6
2nd							
				Total Discharge Flow (USGPM)			2925.9

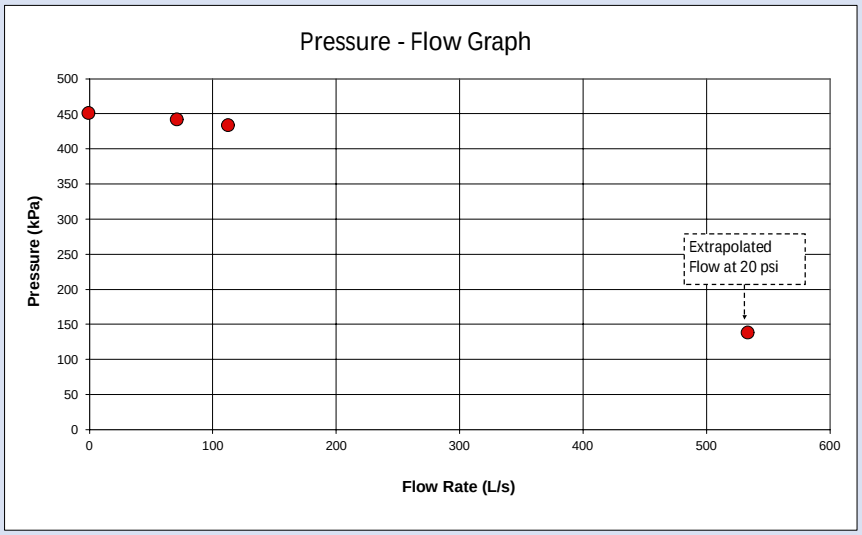
RESULTS SUMMARY

NO. OF PORTS OPEN	IMPERIAL		METRIC	
	RESIDUAL (psi)	FLOW (usgpm)	RESIDUAL (kPa)	FLOW (L/s)
STATIC	65.4	0.0	450.8	0.0
1	64.1	1137.3	441.9	71.8
2	62.8	1788.6	433.2	112.9
EXTRAPOLATED	20.0	8461.5	137.9	533.9

N.F.P.A. 291 HYDRANT CLASSIFICATION

AA	BLUE





$$Q_r = Q_t \left(\frac{P_s - P_r}{P_s - P_t} \right)^{0.54}$$

Q_r = fire flow at residual pressure P (gpm)
Q_t = hydrant discharge during test (gpm)
P_s = static pressure (psi)
P_r = desired residual pressure (psi)
P_t = residual pressure during test (psi)

Hydrant Flow Test Results

RV Anderson Associates Ltd.
2001 Sheppard Ave E, North York, ON M2J 4Z8
Tel: (416) 497-8600

TEST INFORMATION

Date: 14-Aug-23
Time: 10:20 AM
Location: 24571 Adelaide Road
Municipality: Strathroy-Caradoc

Municipal Operator(s): Jeff, Dave & Cam
RVA Personnel: A. Bhutani & K. Wong
Project No:

HYDRANT & WATERMAIN INFORMATION

Flow Hydrant:
Residual Hydrant:
Hydrant Elevation Diference: 0.0 m

Pipe Diameter: 400mm
Pipe Material:

NOTES

HYDRANT FLOW TEST 06

RESIDUAL HYDRANT

Hydrant No.	0	
N.F.P.A. Colour Code	BLUE	
Static Pressure	55.0	psi
Residual Pressure (1 Port)	51.2	psi
Residual Pressure (2 Ports)	48.2	psi
Pressure Drop	6.8	psi
Pressure Drop Percentage	12.3	% of psi
Flow At Test Hydrant at 20 psi	3477.9	usgpm

FLOW HYDRANT(S)

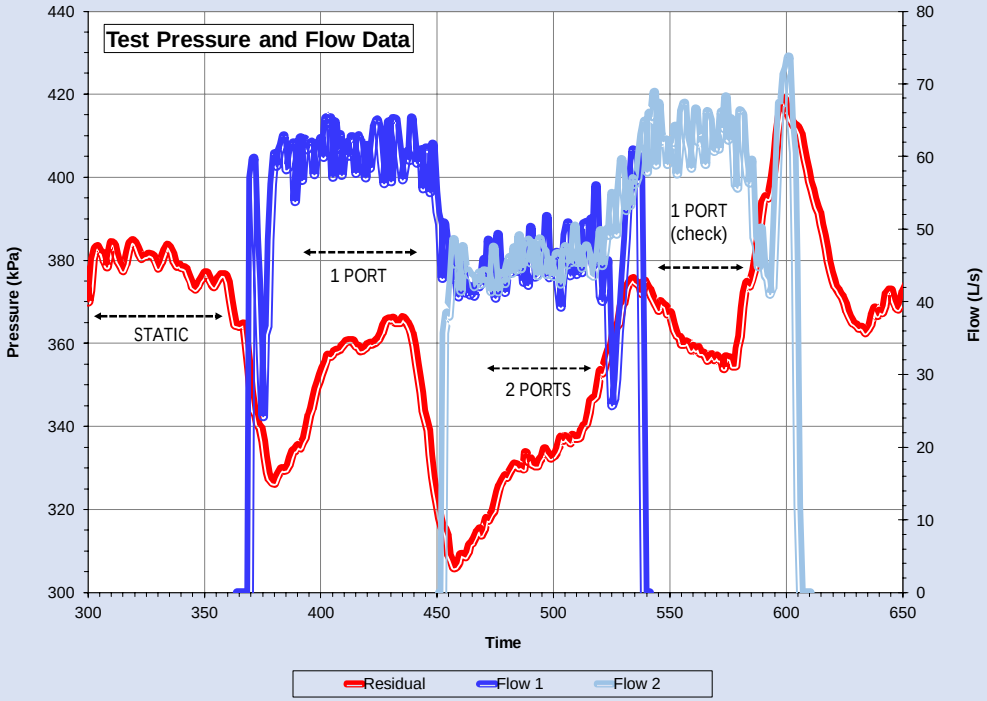
Test No.	Hydrant No.	No. of Ports Flowed	Outlet Dia (in.)	FM or Diffuser type	Nozzle Coeff.	Pitot Reading (psi)	Discharge flow (usgpm)
1st	0	1	2.5	SWIVEL BELL	0.9	33.4	969.7
		2	2.5		0.9	18.3	1434.5
2nd							
				Total Discharge Flow (USGPM)			2404.2

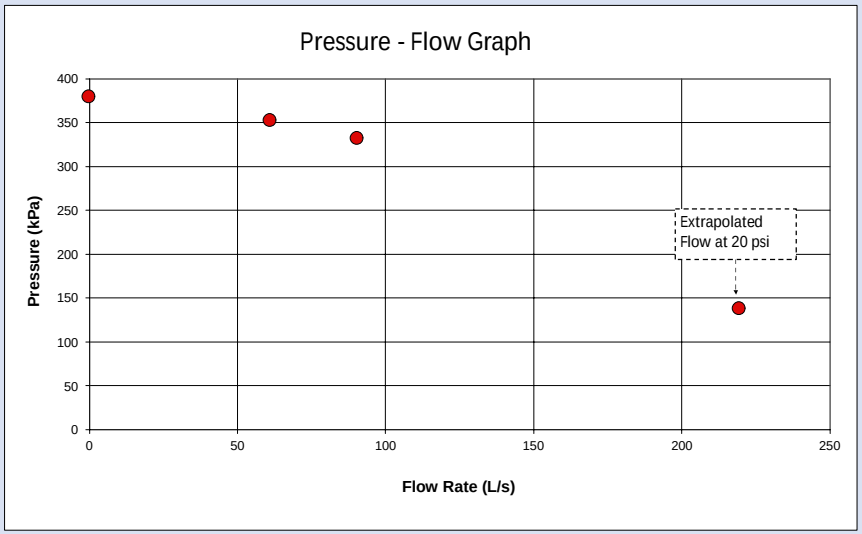
RESULTS SUMMARY

NO. OF PORTS OPEN	IMPERIAL		METRIC	
	RESIDUAL (psi)	FLOW (usgpm)	RESIDUAL (kPa)	FLOW (L/s)
STATIC	55.0	0.0	379.3	0.0
1	51.2	969.7	353.0	61.2
2	48.2	1434.5	332.5	90.5
EXTRAPOLATED	20.0	3477.9	137.9	219.5

N.F.P.A. 291 HYDRANT CLASSIFICATION

AA	BLUE





$$Q_r = Q_t \left(\frac{P_s - P_r}{P_s - P_t} \right)^{0.54}$$

Q_r = fire flow at residual pressure P (gpm)
Q_t = hydrant discharge during test (gpm)
P_s = static pressure (psi)
P_r = desired residual pressure (psi)
P_t = residual pressure during test (psi)

Hydrant Flow Test Results

RV Anderson Associates Ltd.
2001 Sheppard Ave E, North York, ON M2J 4Z8
Tel: (416) 497-8600

TEST INFORMATION

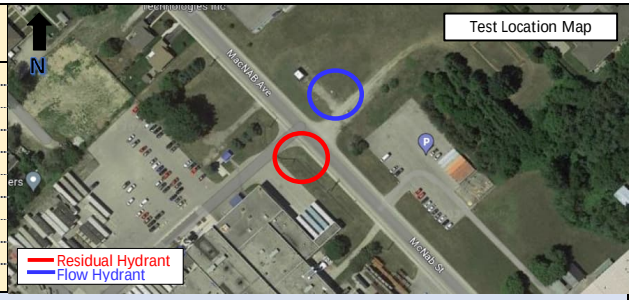
Date: 14-Aug-23
Time: 12:00 AM
Location: 120 McNab Street, Mount Brydges
Municipality: Strathroy-Caradoc
Municipal Operator(s): Jeff, Dave & Cam
RVA Personnel: A. Bhutani & K. Wong
Project No:

HYDRANT & WATERMAIN INFORMATION

Flow Hydrant:
Residual Hydrant:
Hydrant Elevation Diference: 0.0 m
Pipe Diameter: 200mm
Pipe Material:

NOTES

HYDRANT FLOW TEST 10



RESIDUAL HYDRANT

Hydrant No.	0	
N.F.P.A. Colour Code	BLUE	
Static Pressure	62.7	psi
Residual Pressure (1 Port)	58.9	psi
Residual Pressure (2 Ports)	55.3	psi
Pressure Drop	7.4	psi
Pressure Drop Percentage	11.8	% of psi
Flow At Test Hydrant at 20 psi	4266.8	usgpm

FLOW HYDRANT(S)

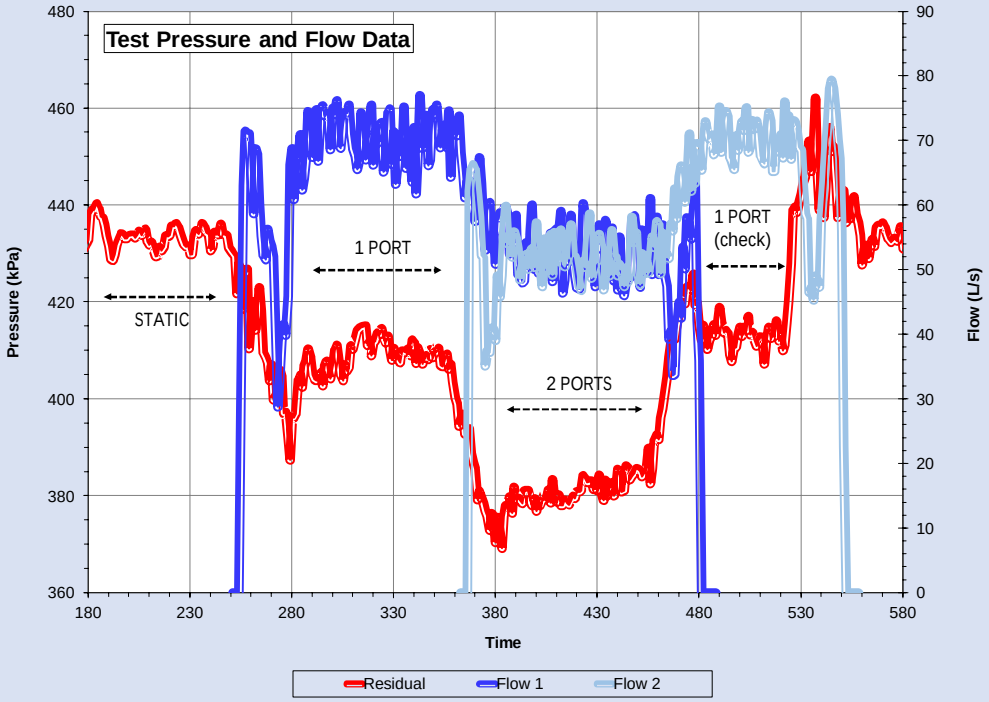
Test No.	Hydrant No.	No. of Ports Flowed	Outlet Dia (in.)	FM or Diffuser type	Nozzle Coeff.	Pitot Reading (psi)	Discharge flow (usgpm)
1st	0	1	2.5	SWIVEL BELL	0.9	44.6	1121.4
		2	2.5		0.9	24.3	1653.4
2nd							
				Total Discharge Flow (USGPM)			2774.7

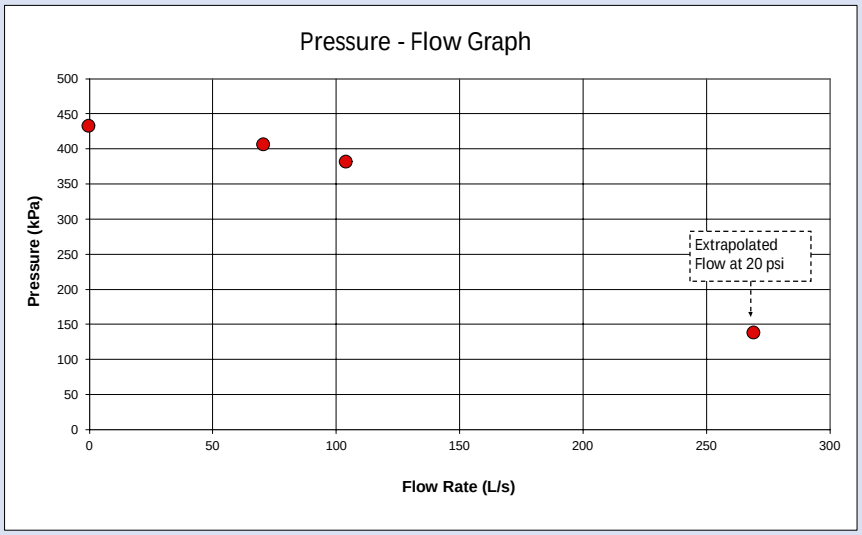
RESULTS SUMMARY

NO. OF PORTS OPEN	IMPERIAL		METRIC	
	RESIDUAL (psi)	FLOW (usgpm)	RESIDUAL (kPa)	FLOW (L/s)
STATIC	62.7	0.0	432.3	0.0
1	58.9	1121.4	406.1	70.8
2	55.3	1653.4	381.5	104.3
EXTRAPOLATED	20.0	4266.8	137.9	269.2

N.F.P.A. 291 HYDRANT CLASSIFICATION

AA	BLUE

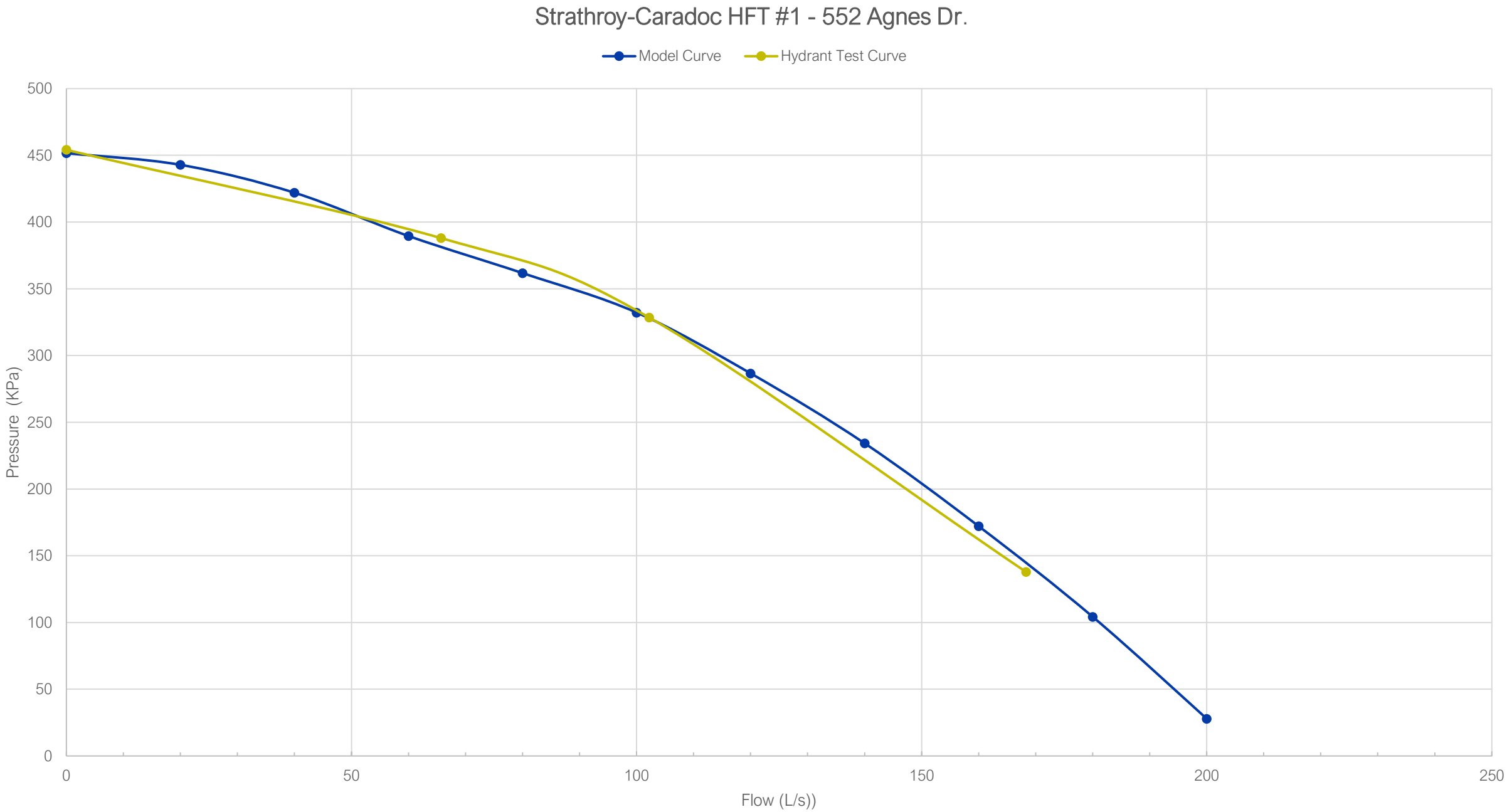


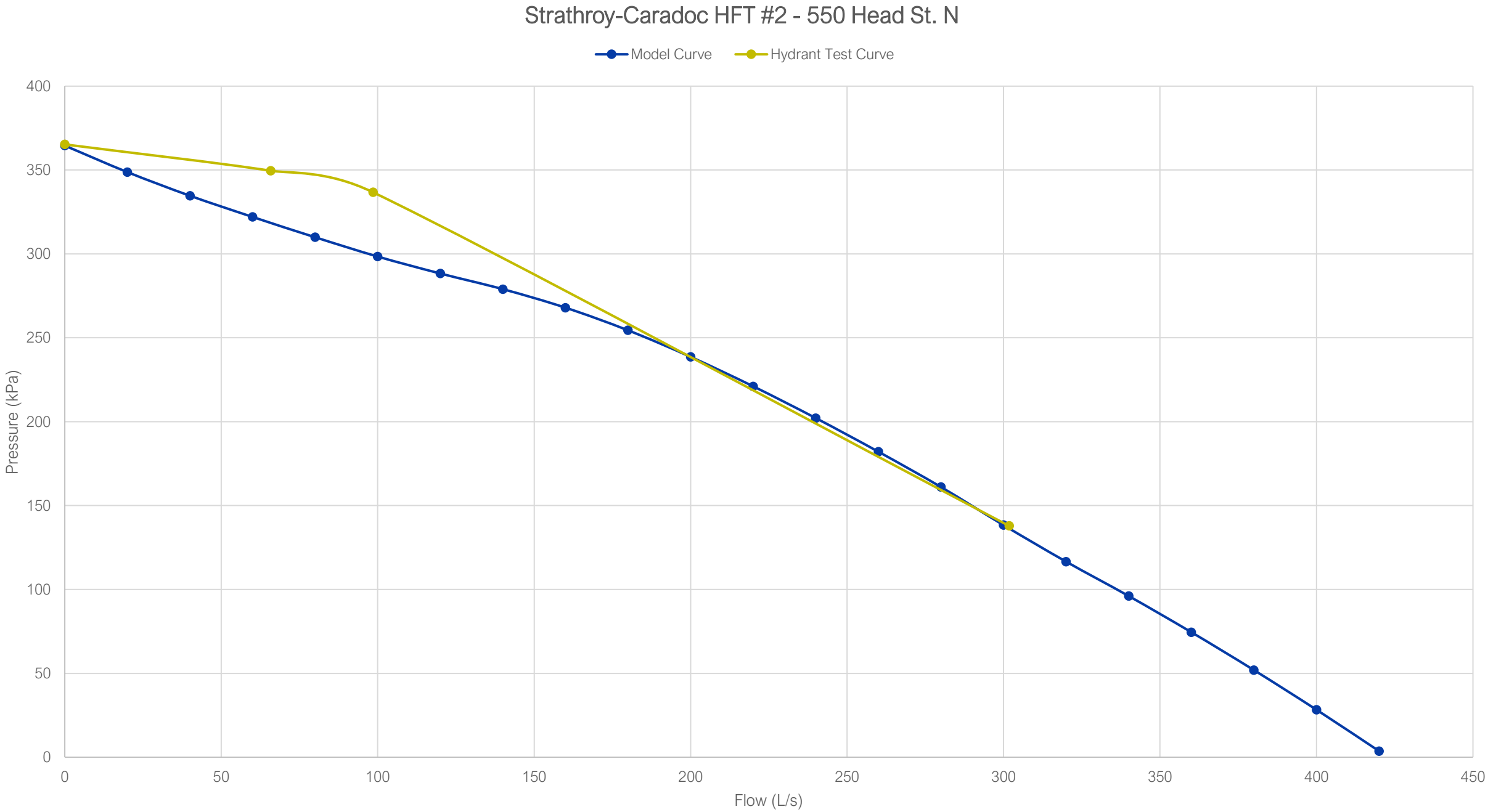


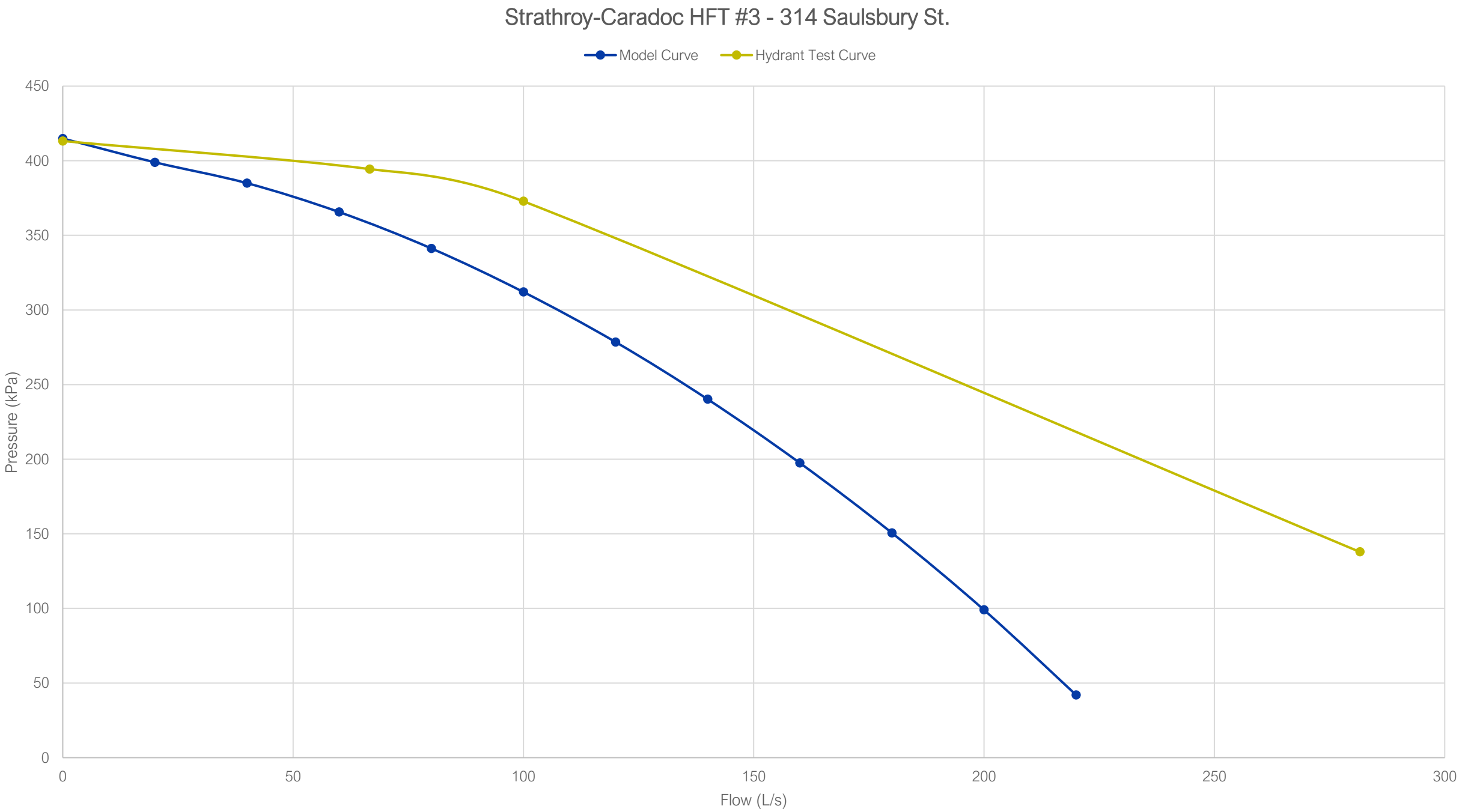
$$Q_r = Q_t \left(\frac{P_s - P_r}{P_s - P_t} \right)^{0.54}$$

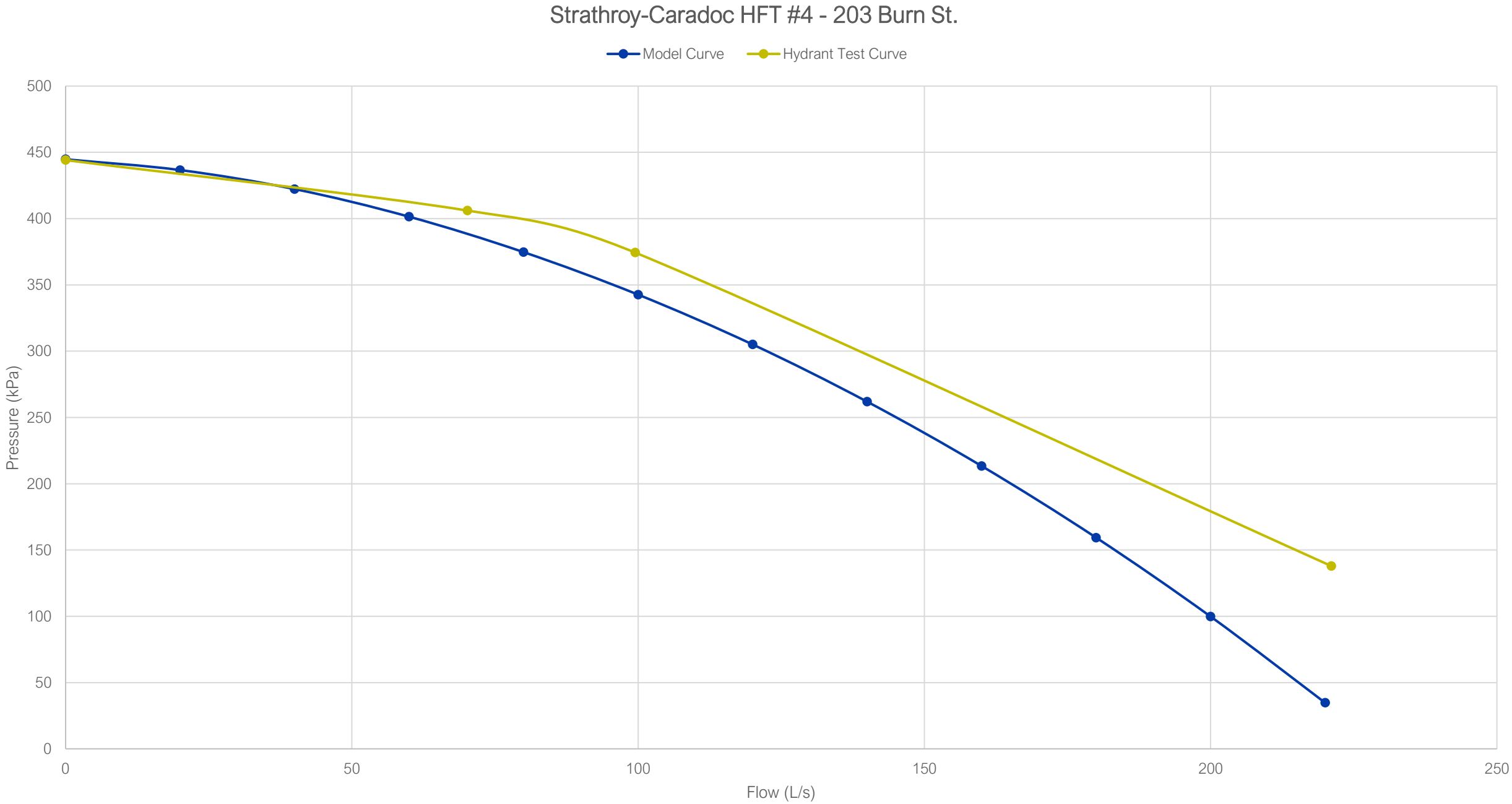
Q_r = fire flow at residual pressure P (gpm)
Q_t = hydrant discharge during test (gpm)
P_s = static pressure (psi)
P_r = desired residual pressure (psi)
P_t = residual pressure during test (psi)

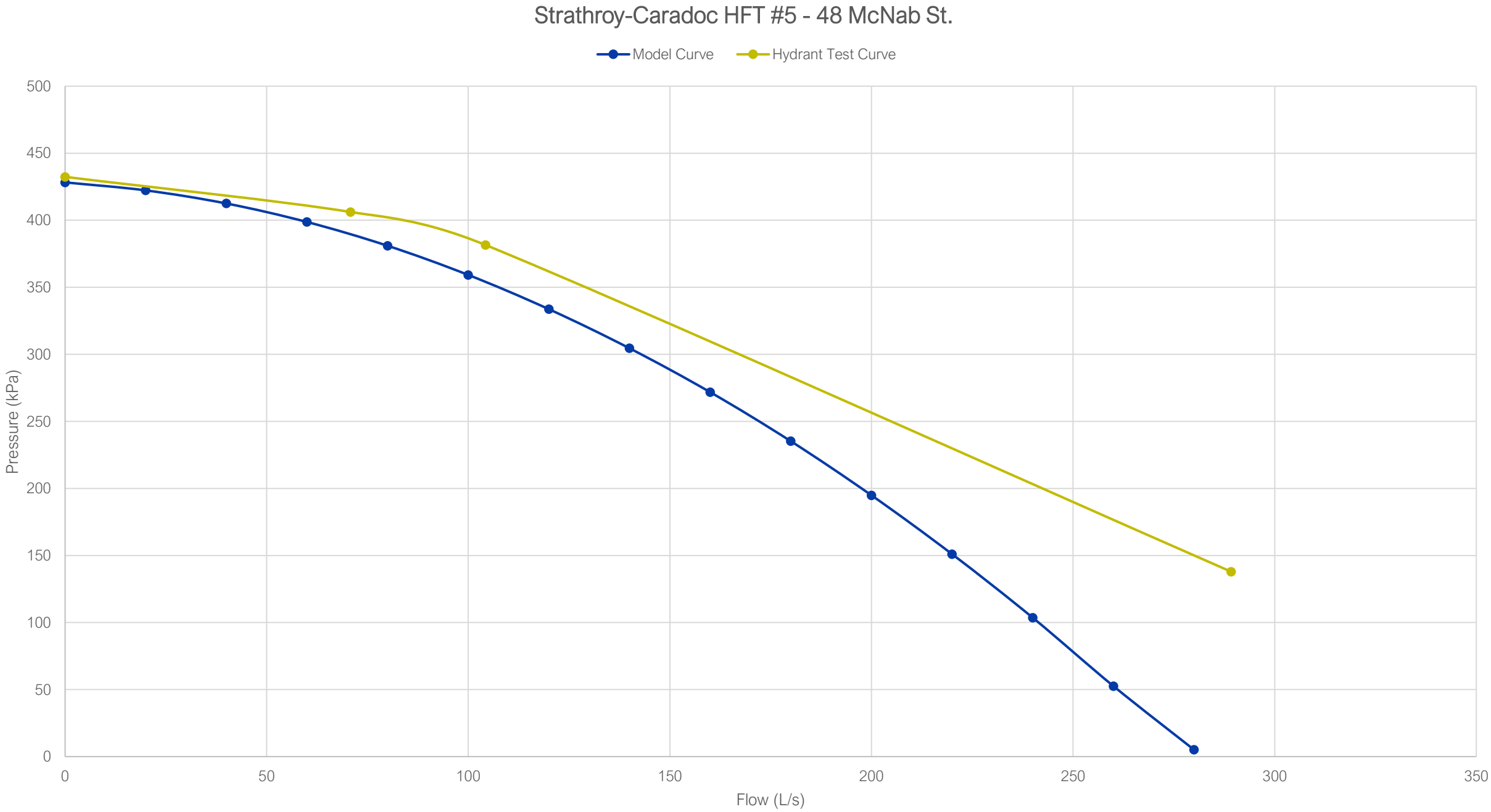
Strathroy-Caradoc HFT’s

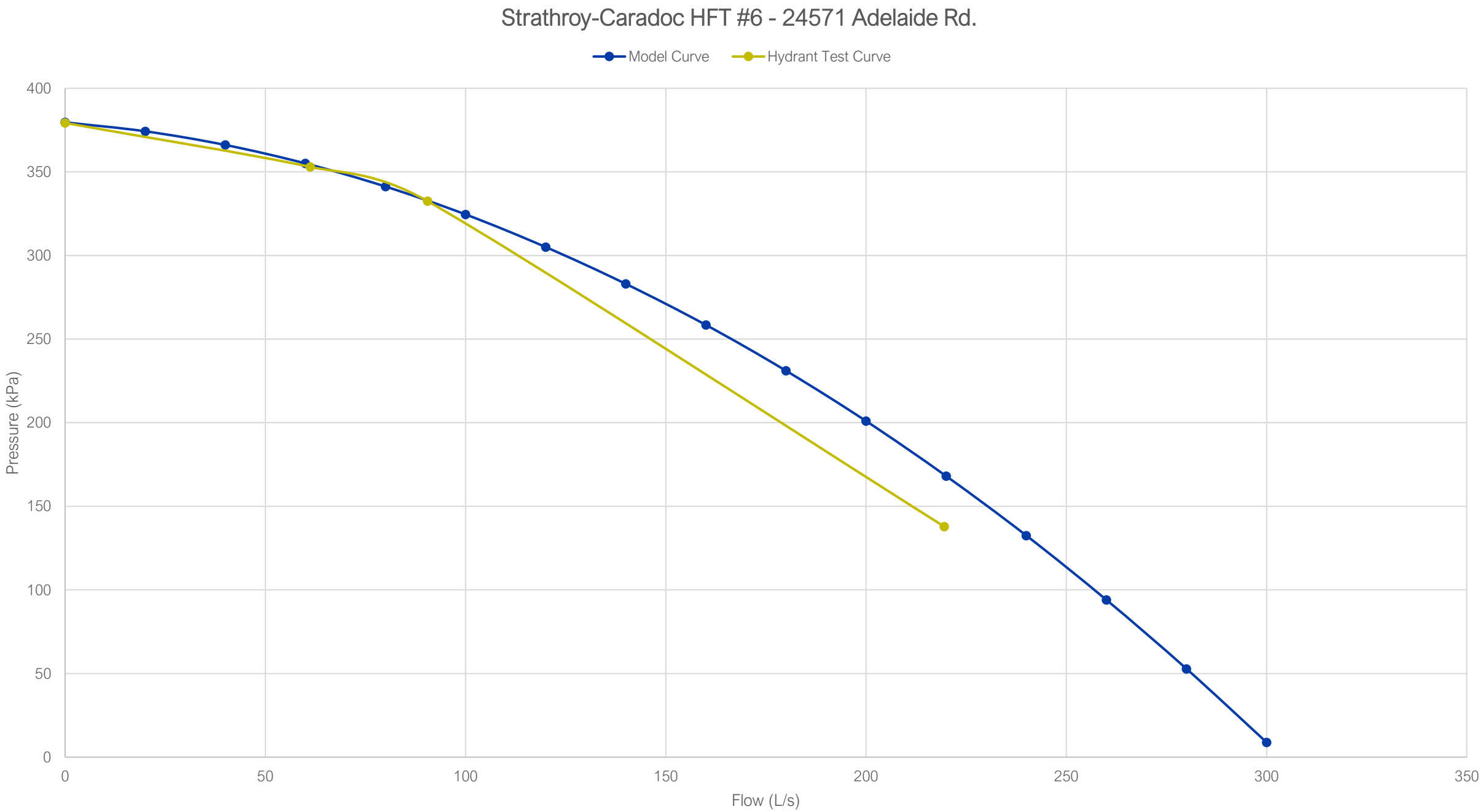

Strathroy-Caradoc HFT #1 - 552 Agnes Dr.
Model Curve
Hydrant Test Curve
Pressure (KPa)
500
450
400
350
300
250
200
150
100
50
0
0
50
100
150
200
250
Flow (L/s))


Strathroy-Caradoc HFT #2 - 550 Head St. N
Model Curve
Hydrant Test Curve
Pressure (kPa)
400
350
300
250
200
150
100
50
0
0
50
100
150
200
250
300
350
400
450
Flow (L/s)


Strathroy-Caradoc HFT #3 - 314 Saulsbury St.
Model Curve
Hydrant Test Curve
Pressure (kPa)
450
400
350
300
250
200
150
100
50
0
0
50
100
150
200
250
300
Flow (L/s)


Strathroy-Caradoc HFT #4 - 203 Burn St.
Model Curve
Hydrant Test Curve
Pressure (kPa)
500
450
400
350
300
250
200
150
100
50
0
0
50
100
150
200
250
Flow (L/s)


Strathroy-Caradoc HFT #5 - 48 McNab St.
Model Curve
Hydrant Test Curve
Pressure (kPa)
500
450
400
350
300
250
200
150
100
50
0
0
50
100
150
200
250
300
350
Flow (L/s)


Strathroy-Caradoc HFT #6 - 24571 Adelaide Rd.
Model Curve
Hydrant Test Curve
Pressure (kPa)
Flow (L/s)
400
350
300
250
200
150
100
50
0
0
50
100
150
200
250
300
350

Mt. Brydges HFT’s

Hydrant Flow Test Results

RV Anderson Associates Ltd.
2001 Sheppard Ave E, North York, ON M2J 4Z8
Tel: (416) 497-8600

TEST INFORMATION

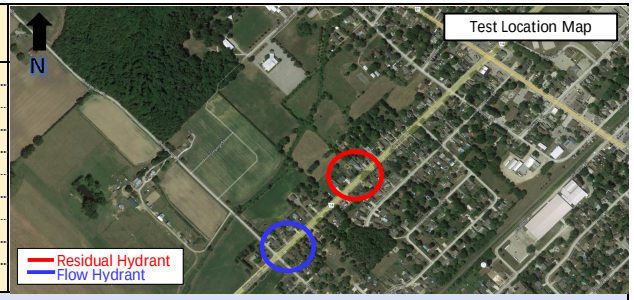
Date: 14-Aug-23
Time: 8:16 AM
Location: 8501 County Road 14, Mount Brydges
Municipality: Strathroy-Caradoc
Municipal Operator(s): Jeff, Dave and Cam
RVA Personnel: A. Bhutani & K. Wong
Project No:

HYDRANT & WATERMAIN INFORMATION

Flow Hydrant:
Residual Hydrant:
Hydrant Elevation Diference: 0.0 m
Pipe Diameter: 150mm
Pipe Material:

NOTES

HYDRANT FLOW TEST 07



RESIDUAL HYDRANT

Hydrant No.	0	
N.F.P.A. Colour Code	BLUE	
Static Pressure	57.1	psi
Residual Pressure (1 Port)	51.5	psi
Residual Pressure (2 Ports)	45.1	psi
Pressure Drop	12.0	psi
Pressure Drop Percentage	21.1	% of psi
Flow At Test Hydrant at 20 psi	2808.6	usgpm

FLOW HYDRANT(S)

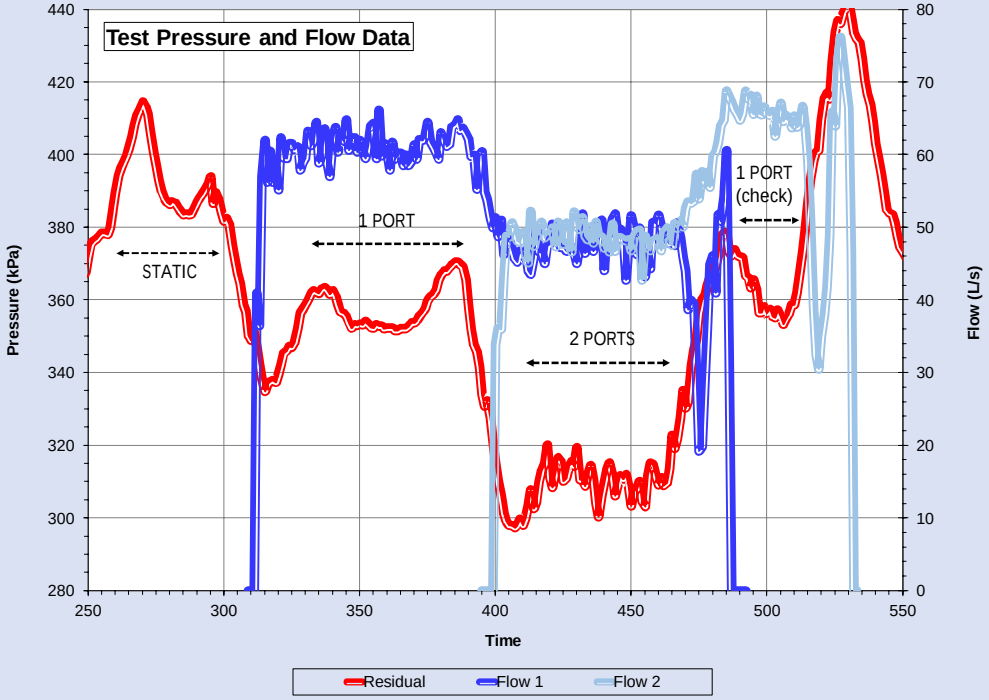
Test No.	Hydrant No.	No. of Ports Flowed	Outlet Dia (in.)	FM or Diffuser type	Nozzle Coeff.	Pitot Reading (psi)	Discharge flow (usgpm)
1st	0	1	2.5	SWIVEL BELL	0.9	33.3	968.8
		2	2.5		0.9	20.8	1529.6
2nd							
				Total Discharge Flow (USGPM)			2498.3

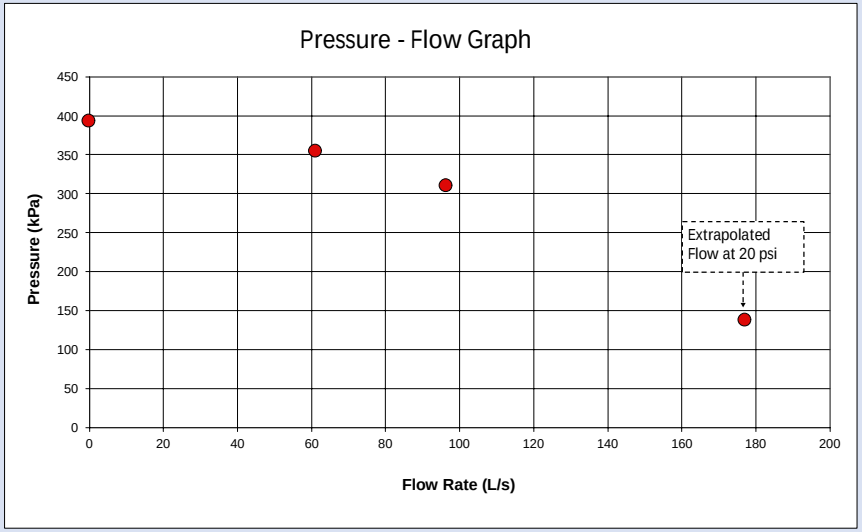
RESULTS SUMMARY

NO. OF PORTS OPEN	IMPERIAL		METRIC	
	RESIDUAL (psi)	FLOW (usgpm)	RESIDUAL (kPa)	FLOW (L/s)
STATIC	57.1	0.0	393.6	0.0
1	51.5	968.8	355.2	61.1
2	45.1	1529.6	310.6	96.5
EXTRAPOLATED	20.0	2808.6	137.9	177.2

N.F.P.A. 291 HYDRANT CLASSIFICATION

AA	BLUE





$$Q_r = Q_t \left(\frac{P_s - P_r}{P_s - P_t} \right)^{0.54}$$

Q_r = fire flow at residual pressure P (gpm)
Q_t = hydrant discharge during test (gpm)
P_s = static pressure (psi)
P_r = desired residual pressure (psi)
P_t = residual pressure during test (psi)

Hydrant Flow Test Results

RV Anderson Associates Ltd.
2001 Sheppard Ave E, North York, ON M2J 4Z8
Tel: (416) 497-8600

TEST INFORMATION

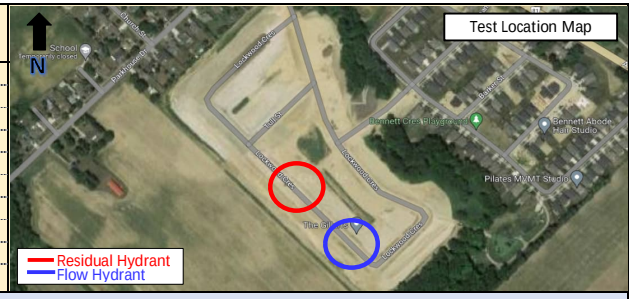
Date: 14-Aug-23
Time: 11:04 AM
Location: Lockwood Cres., Mount Brydges
Municipality: Strathroy-Caradoc
Municipal Operator(s): Jeff, Dave & Cam
RVA Personnel: A. Bhutani & K. Wong
Project No:

HYDRANT & WATERMAIN INFORMATION

Flow Hydrant:
Residual Hydrant:
Hydrant Elevation Diference: 0.0 m
Pipe Diameter: 200mm
Pipe Material:

NOTES

HYDRANT FLOW TEST 08



RESIDUAL HYDRANT

Hydrant No.	0	
N.F.P.A. Colour Code	BLUE	
Static Pressure	60.5	psi
Residual Pressure (1 Port)	49.8	psi
Residual Pressure (2 Ports)	37.9	psi
Pressure Drop	22.6	psi
Pressure Drop Percentage	37.3	% of psi
Flow At Test Hydrant at 20 psi	1889.6	usgpm

FLOW HYDRANT(S)

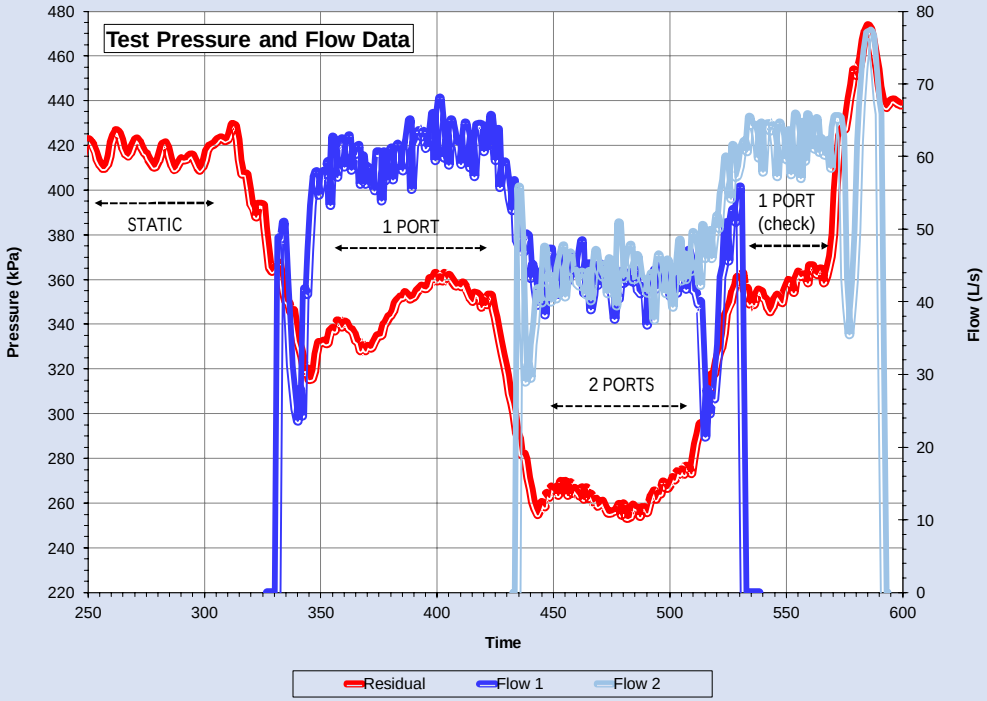
Test No.	Hydrant No.	No. of Ports Flowed	Outlet Dia (in.)	FM or Diffuser type	Nozzle Coeff.	Pitot Reading (psi)	Discharge flow (usgpm)
1st	0	1	2.5	SWIVEL BELL	0.9	33.0	964.0
		2	2.5		0.9	16.9	1379.1
2nd							
				Total Discharge Flow (USGPM)			2343.1

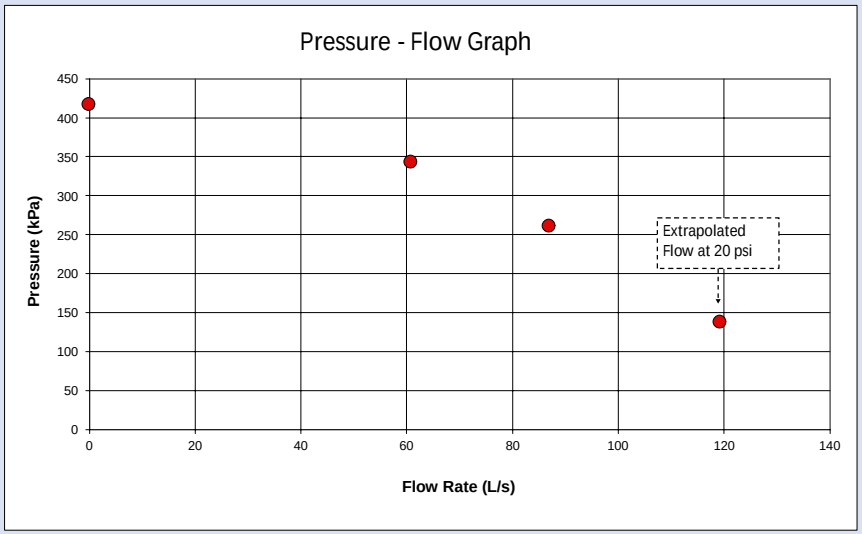
RESULTS SUMMARY

NO. OF PORTS OPEN	IMPERIAL		METRIC	
	RESIDUAL (psi)	FLOW (usgpm)	RESIDUAL (kPa)	FLOW (L/s)
STATIC	60.5	0.0	416.9	0.0
1	49.8	964.0	343.4	60.8
2	37.9	1379.1	261.2	87.0
EXTRAPOLATED	20.0	1889.6	137.9	119.2

N.F.P.A. 291 HYDRANT CLASSIFICATION

AA	BLUE





$$Q_r = Q_t \left(\frac{P_s - P_r}{P_s - P_t} \right)^{0.54}$$

Q_r = fire flow at residual pressure P (gpm)
Q_t = hydrant discharge during test (gpm)
P_s = static pressure (psi)
P_r = desired residual pressure (psi)
P_t = residual pressure during test (psi)

Hydrant Flow Test Results

RV Anderson Associates Ltd.
2001 Sheppard Ave E, North York, ON M2J 4Z8
Tel: (416) 497-8600

TEST INFORMATION

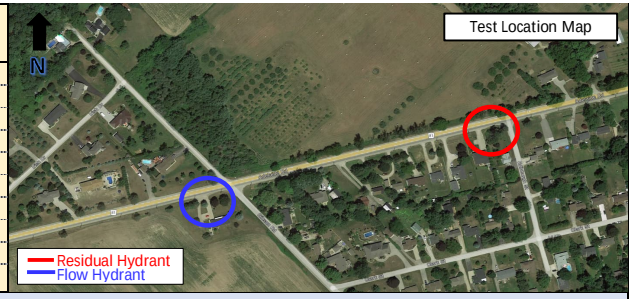
Date: 14-Aug-23
Time: 11:23 AM
Location: 21809 County Rd. 81
Municipality: Strathroy-Caradoc
Municipal Operator(s): Jeff, Dave & Cam
RVA Personnel: A. Bhutani & K. Wong
Project No:

HYDRANT & WATERMAIN INFORMATION

Flow Hydrant:
Residual Hydrant:
Hydrant Elevation Diference: 0.0 m
Pipe Diameter: 250mm
Pipe Material:

NOTES

HYDRANT FLOW TEST 09



RESIDUAL HYDRANT

Hydrant No.	0	
N.F.P.A. Colour Code	GREEN	
Static Pressure	74.7	psi
Residual Pressure (1 Port)	45.0	psi
Residual Pressure (2 Ports)	27.3	psi
Pressure Drop	47.4	psi
Pressure Drop Percentage	63.5	% of psi
Flow At Test Hydrant at 20 psi	1195.8	usgpm

FLOW HYDRANT(S)

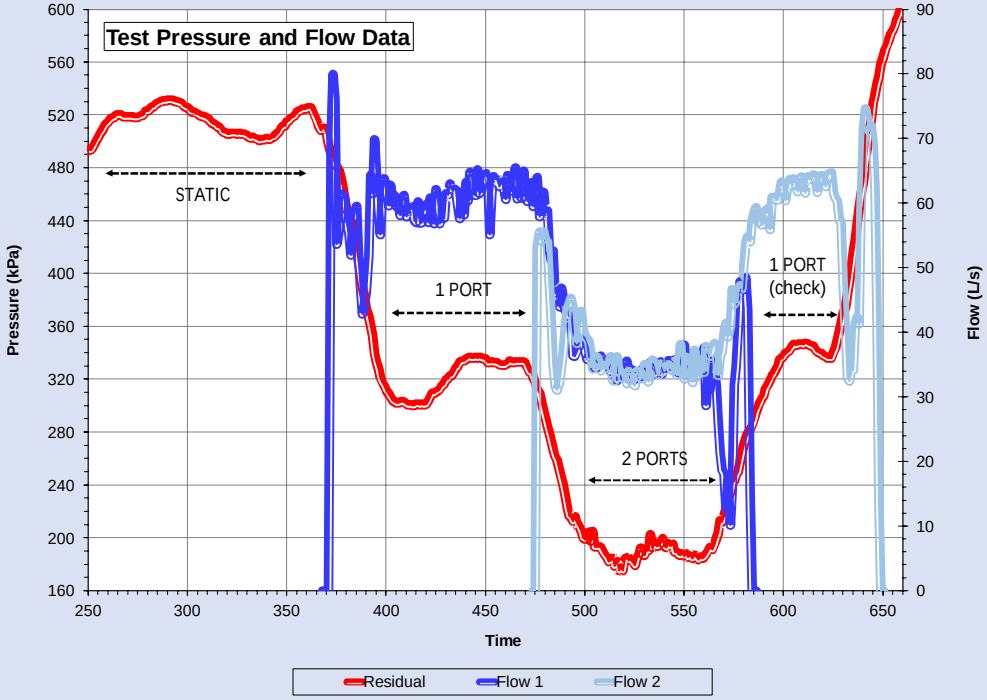
Test No.	Hydrant No.	No. of Ports Flowed	Outlet Dia (in.)	FM or Diffuser type	Nozzle Coeff.	Pitot Reading (psi)	Discharge flow (usgpm)
1st	0	1	2.5	SWIVEL BELL	0.9	28.2	891.3
		2	2.5		0.9	10.9	1106.9
2nd							
				Total Discharge Flow (USGPM)			1998.3

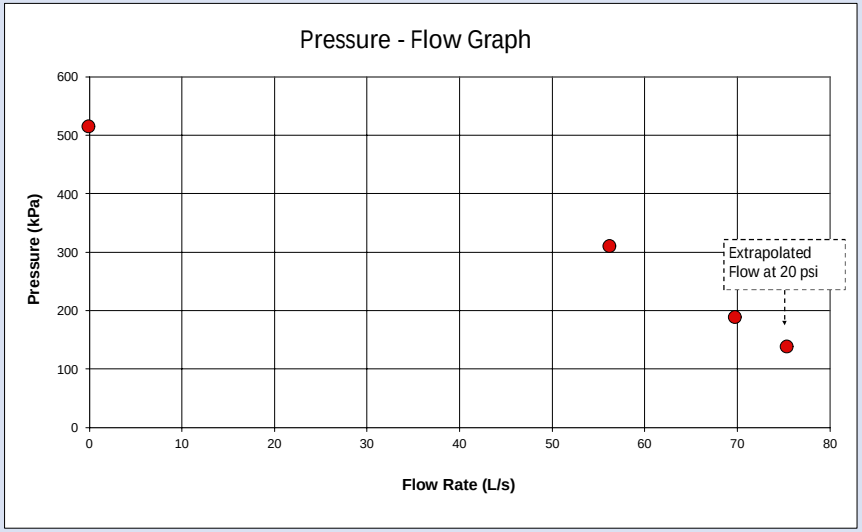
RESULTS SUMMARY

NO. OF PORTS OPEN	IMPERIAL		METRIC	
	RESIDUAL (psi)	FLOW (usgpm)	RESIDUAL (kPa)	FLOW (L/s)
STATIC	74.7	0.0	514.8	0.0
1	45.0	891.3	310.3	56.2
2	27.3	1106.9	188.1	69.8
EXTRAPOLATED	20.0	1195.8	137.9	75.5

N.F.P.A. 291 HYDRANT CLASSIFICATION

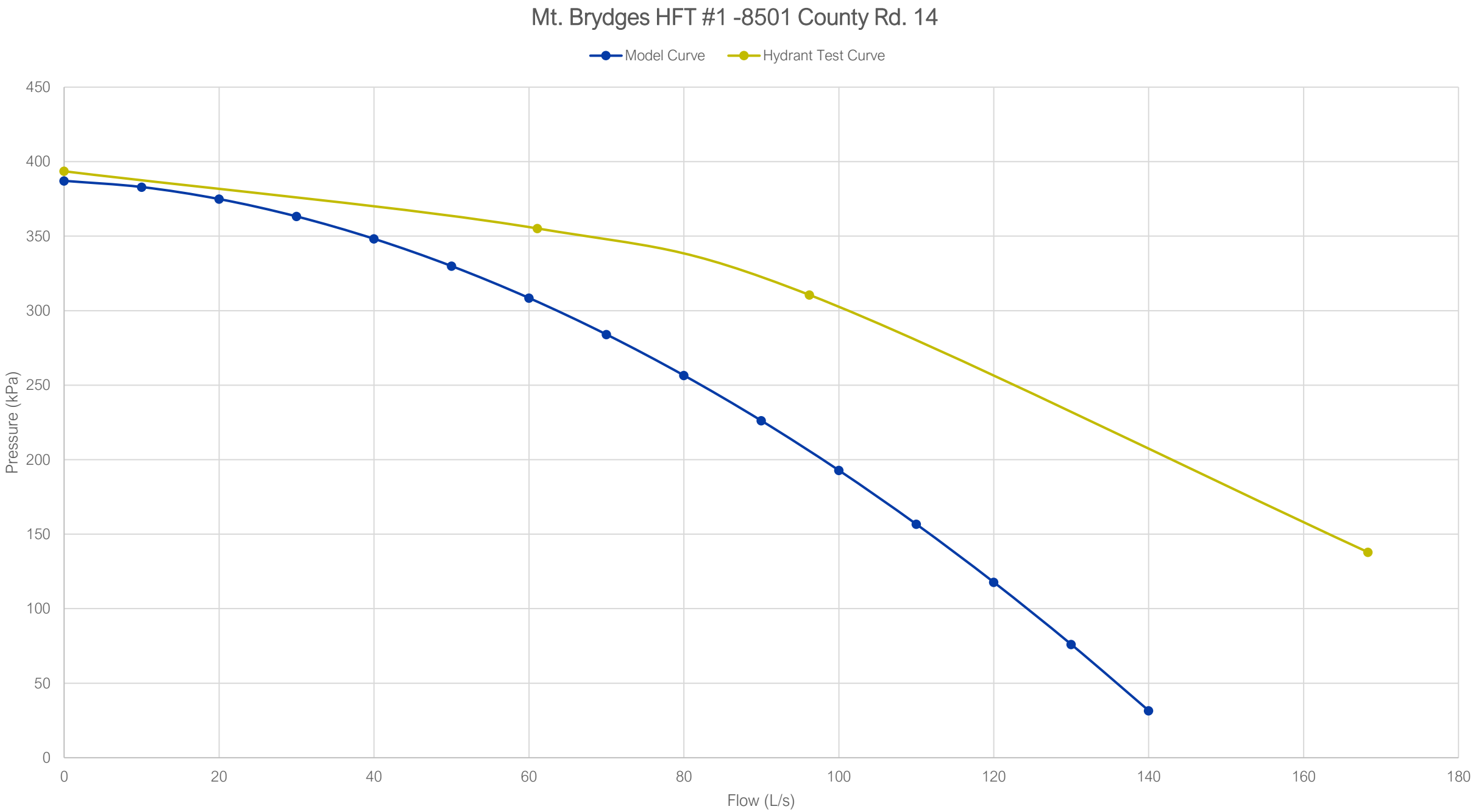
A	GREEN

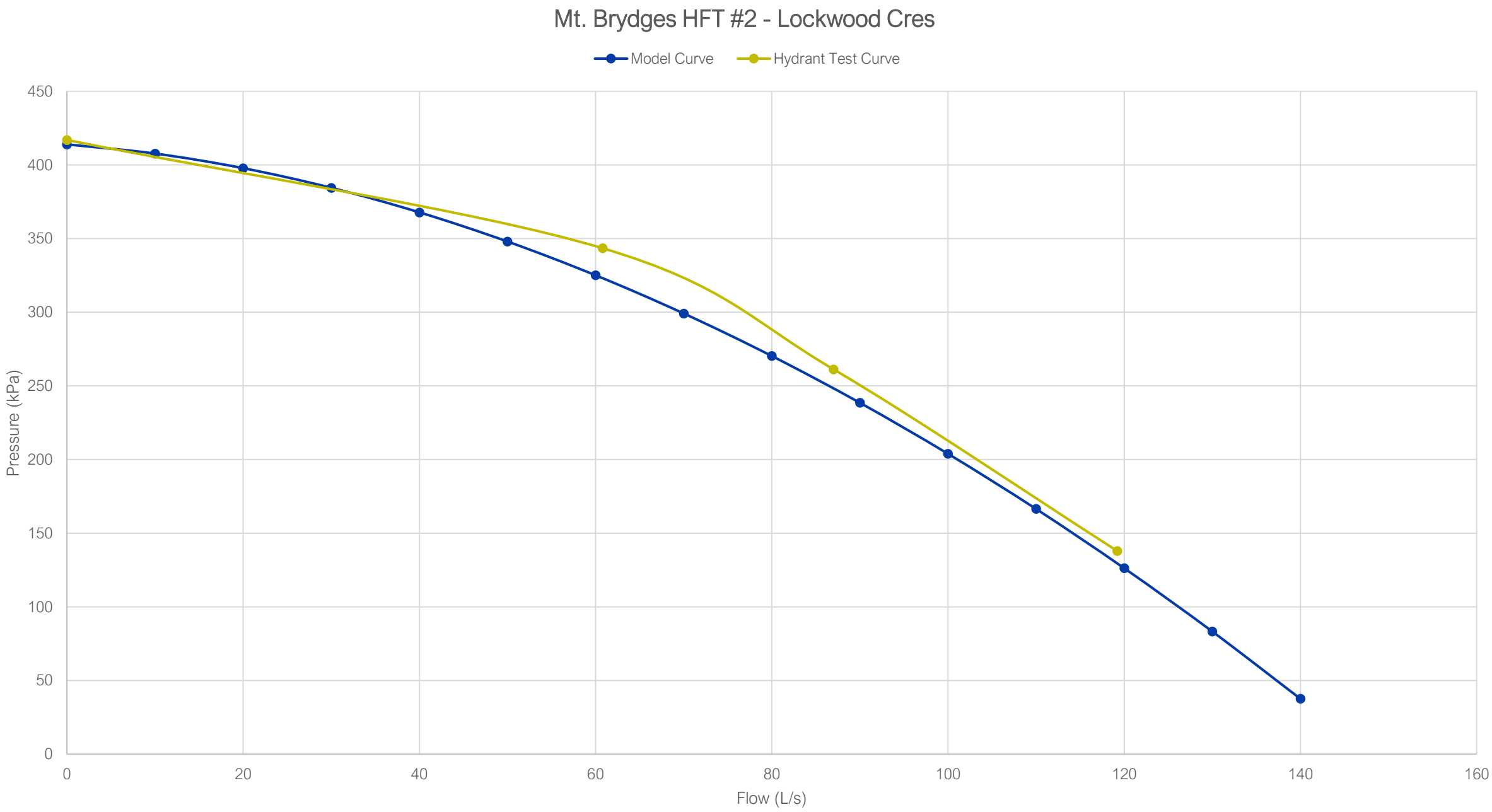


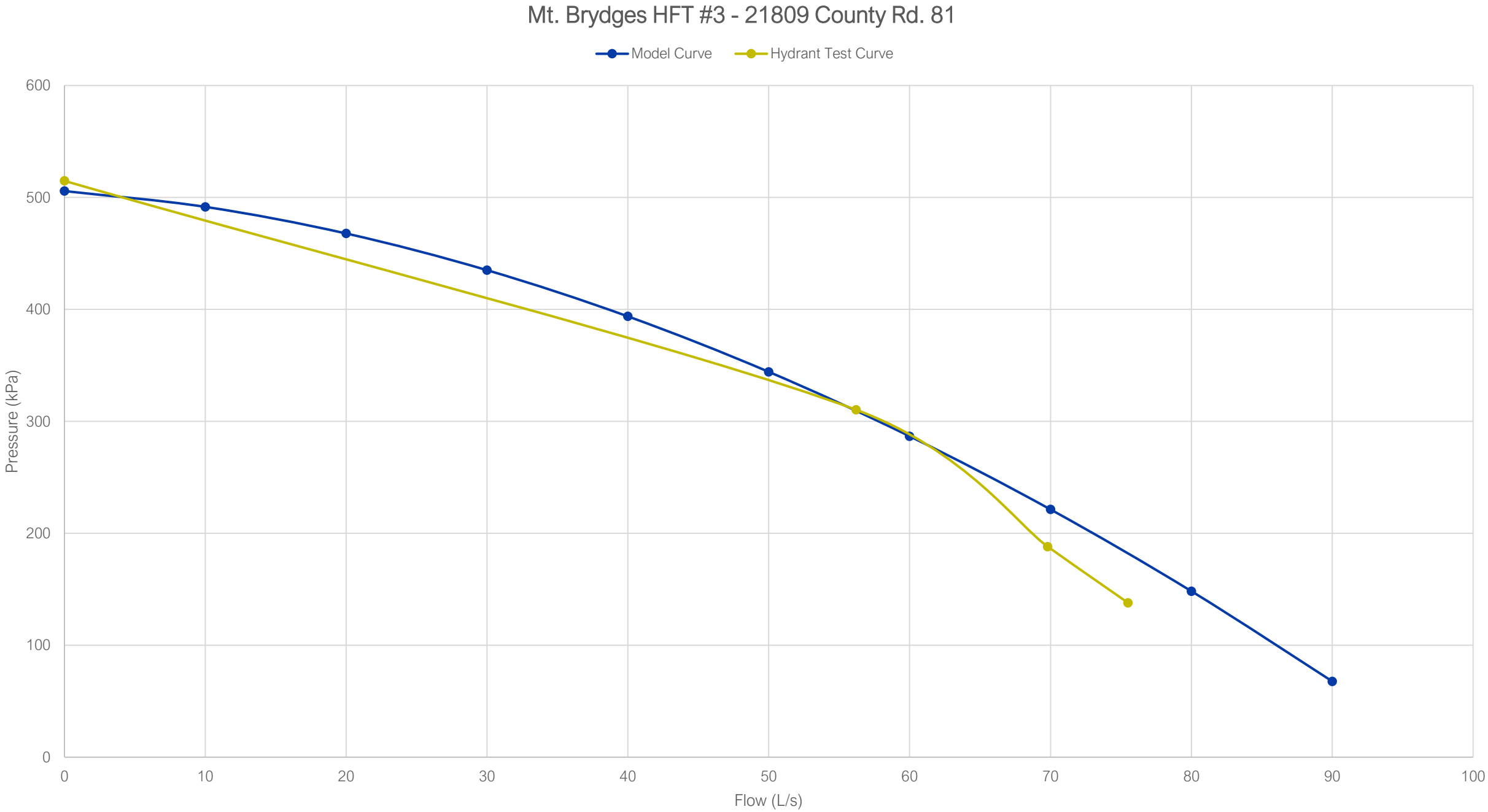


$$Q_r = Q_t \left(\frac{P_s - P_r}{P_s - P_t} \right)^{0.54}$$

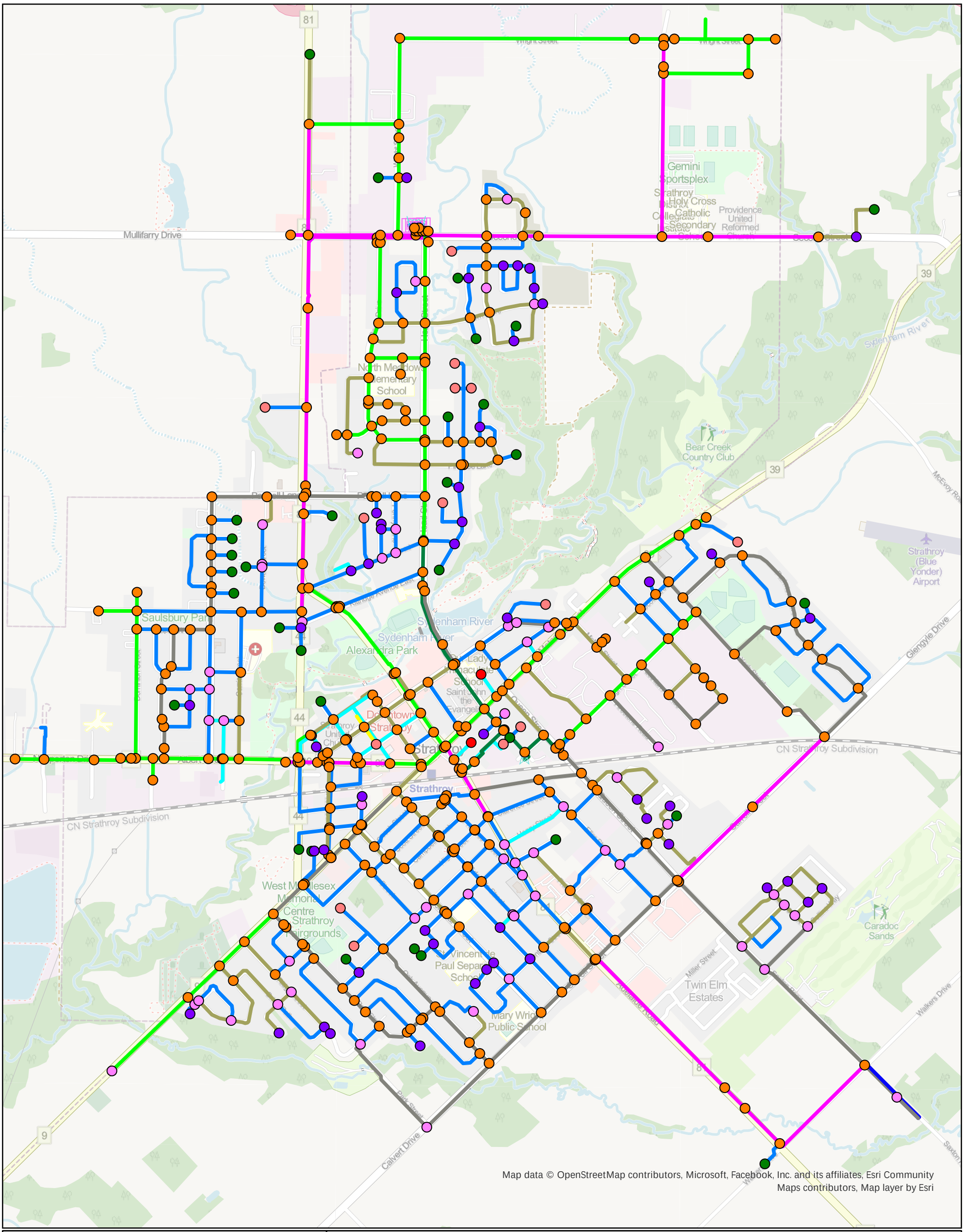
Q_r = fire flow at residual pressure P (gpm)
Q_t = hydrant discharge during test (gpm)
P_s = static pressure (psi)
P_r = desired residual pressure (psi)
P_t = residual pressure during test (psi)


Mt. Brydges HFT #1 -8501 County Rd. 14
Model Curve
Hydrant Test Curve
Pressure (kPa)
450
400
350
300
250
200
150
100
50
0
0
20
40
60
80
100
120
140
160
180
Flow (L/s)


Mt. Brydges HFT #2 - Lockwood Cres
Model Curve
Hydrant Test Curve
Pressure (kPa)
450
400
350
300
250
200
150
100
50
0
0
20
40
60
80
100
120
140
160
Flow (L/s)


Mt. Brydges HFT #3 - 21809 County Rd. 81
Model Curve
Hydrant Test Curve
Pressure (kPa)
600
500
400
300
200
100
0
0
10
20
30
40
50
60
70
80
90
100
Flow (L/s)

APPENDIX B-2



Legend

Junction

Hydrant Available Flow (L/s)

- <= 40 Lps
- <= 70 Lps
- <= 100 Lps
- <= 150 Lps
- <= 200 Lps
- > 200 Lps

Pipe

DIAMETER

- 50 mm
- 100 mm
- 150 mm
- 200 mm
- 250 mm
- 300 mm
- 350 mm
- 400 mm
- 600 mm

2025 Water, Wastewater and Stormwater Master Plan and Pollution Control Plan

Water System Master Plan

Maximum Day Demand + Fire Flow - 2023 Scenario

N

0 325 650 1,300 1,950 Meters

Scale: 1:18,000

Date: 2024-04-11

RVA

Legend

Junction

Pressure (kPa)

- <= 138 kPa (20 psi)
- <= 276 kPa (40 psi)
- <= 414 kPa (60 psi)
- <= 552 kPa (80 psi)
- <= 689 kPa (100 psi)
- > 689 kPa (100 psi)

Pipe

Diameter (mm)

- 50 mm
- 100 mm
- 150 mm
- 200 mm
- 250 mm
- 300 mm
- 350 mm
- 400 mm
- 600 mm

2025 Water, Wastewater and Stormwater Master Plan and Pollution Control Plan

Water System Master Plan

Peak Hour Demand - 2023 Scenario

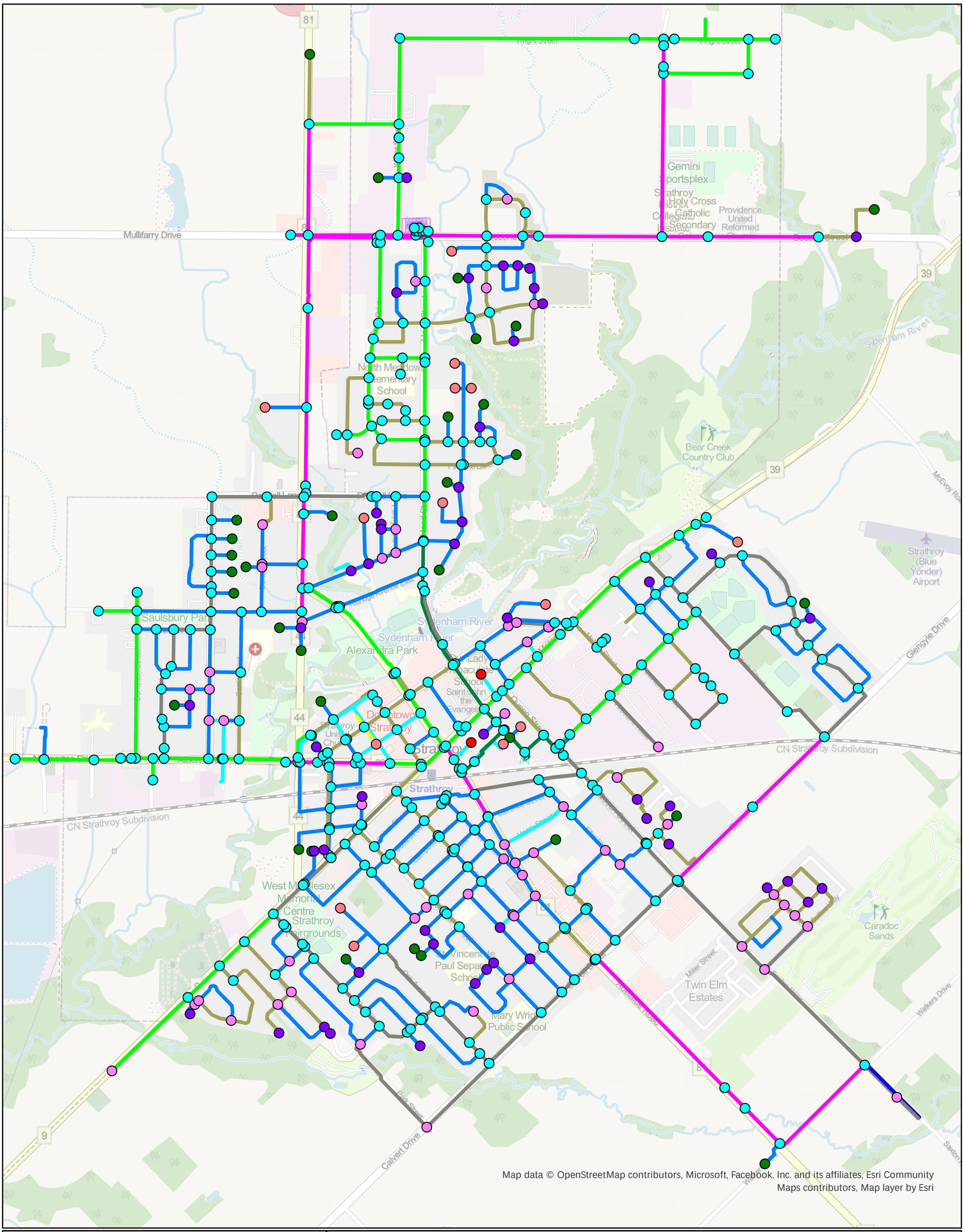
N

0 325 650 1,300 1,950 Meters

Scale: 1:18,000

Date: 2024-04-11

RVA



Legend

Junction

Hydrant Available Flow (L/s)

- <= 40 Lps
- <= 70 Lps
- <= 100 Lps
- <= 150 Lps
- <= 200 Lps
- > 200 Lps

Pipe

DIAMETER

- 50 mm
- 100 mm
- 150 mm
- 200 mm
- 250 mm
- 300 mm
- 350 mm
- 400 mm
- 600 mm

2025 Water, Wastewater and Stormwater Master Plan and Pollution Control Plan

Water System Master Plan

Maximum Day Demand + Fire Flow - 2030 Scenario

N

0 325 650 1,300 1,950 Meters

Scale: 1:18,000

Date: 2024-04-11

RVA

Legend

Junction

Pressure (kPa)

- <= 138 kPa (20 psi)
- <= 276 kPa (40 psi)
- <= 414 kPa (60 psi)
- <= 552 kPa (80 psi)
- <= 689 kPa (100 psi)
- > 689 kPa (100 psi)

Pipe

Diameter (mm)

- 50 mm
- 100 mm
- 150 mm
- 200 mm
- 250 mm
- 300 mm
- 350 mm
- 400 mm
- 600 mm

2025 Water, Wastewater and Stormwater Master Plan and Pollution Control Plan

Water System Master Plan

Peak Hour Demand - 2030 Scenario

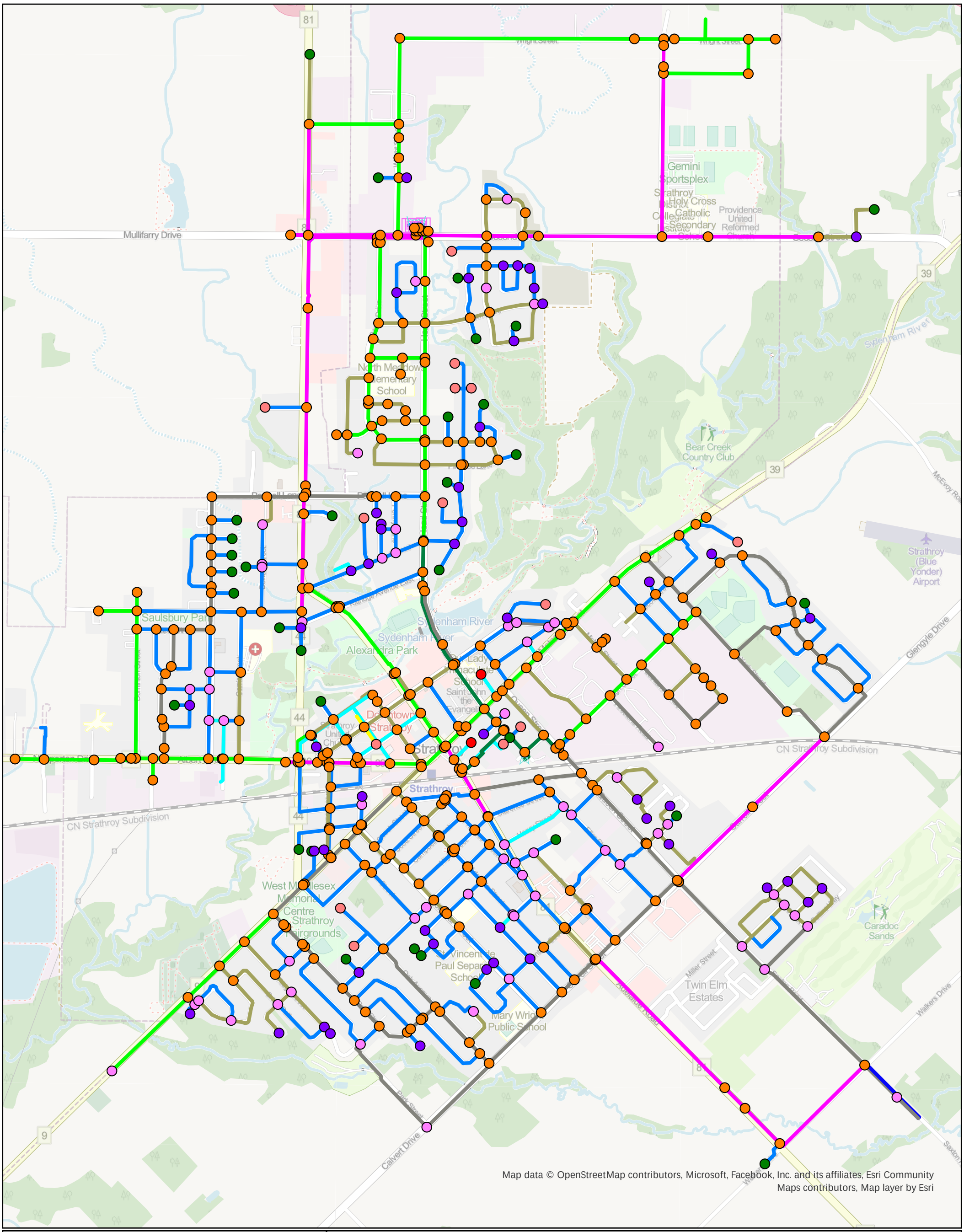
N

0 325 650 1,300 1,950 Meters

Scale: 1:18,000

Date: 2024-04-11

RVA



Legend

Junction

Hydrant Available Flow (L/s)

- <= 40 Lps
- <= 70 Lps
- <= 100 Lps
- <= 150 Lps
- <= 200 Lps
- > 200 Lps

Pipe

DIAMETER

- 50 mm
- 100 mm
- 150 mm
- 200 mm
- 250 mm
- 300 mm
- 350 mm
- 400 mm
- 600 mm

2025 Water, Wastewater and Stormwater Master Plan and Pollution Control Plan

Water System Master Plan

Maximum Day Demand + Fire Flow - 2041 Scenario

N

0 325 650 1,300 1,950 Meters

Scale: 1:18,000

Date: 2024-04-11

RVA

Map data © OpenStreetMap contributors, Microsoft, Facebook, Inc. and its affiliates, Esri Community Maps contributors, Map layer by Esri

Legend

Junction

Pressure (kPa)

- <= 138 kPa (20 psi)
- <= 276 kPa (40 psi)
- <= 414 kPa (60 psi)
- <= 552 kPa (80 psi)
- <= 689 kPa (100 psi)
- > 689 kPa (100 psi)

Pipe

Diameter (mm)

- 50 mm
- 100 mm
- 150 mm
- 200 mm
- 250 mm
- 300 mm
- 350 mm
- 400 mm
- 600 mm

2025 Water, Wastewater and Stormwater Master Plan and Pollution Control Plan

Water System Master Plan

Peak Hour Demand - 2041 Scenario

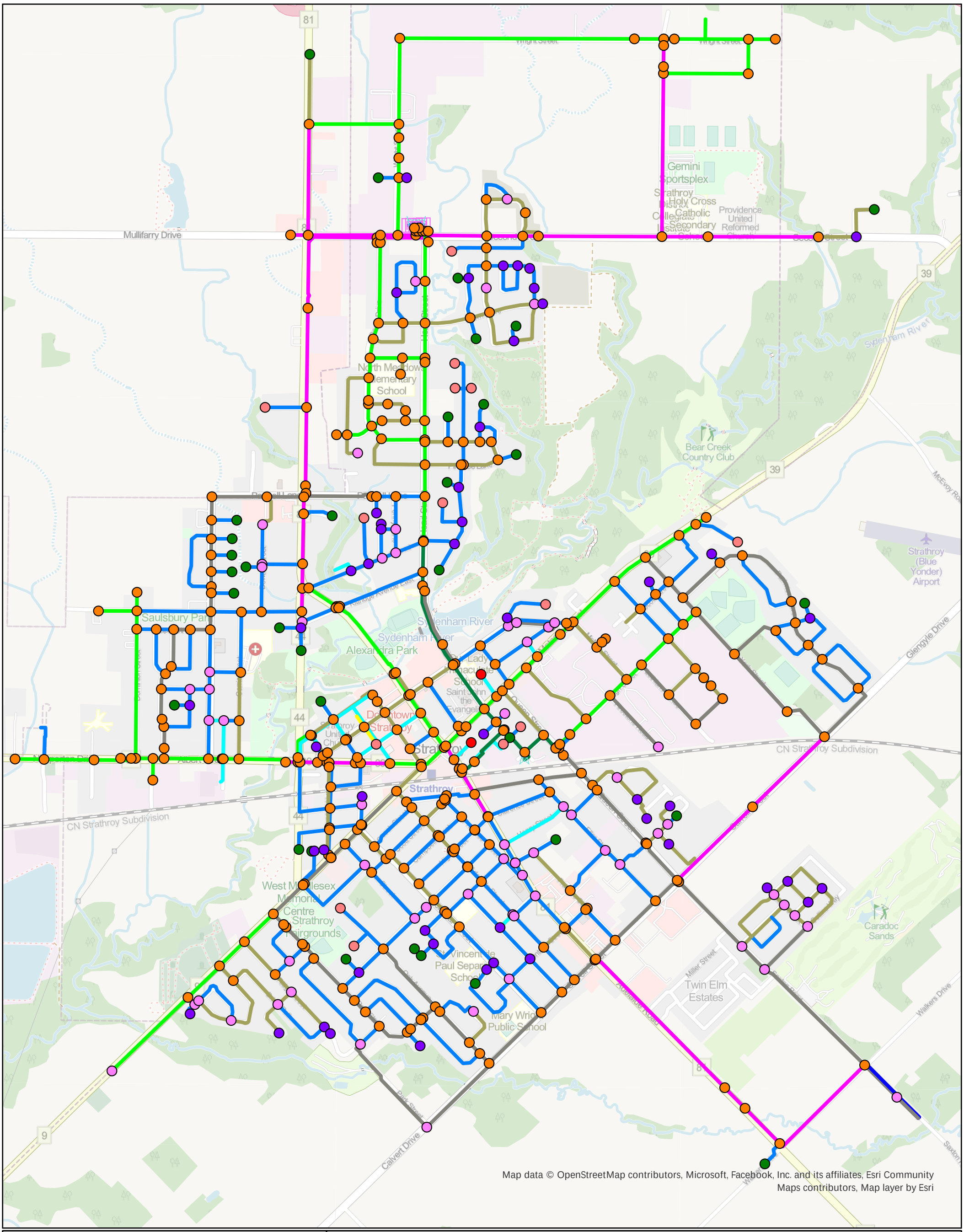
N

0 325 650 1,300 1,950 Meters

Scale: 1:18,000

Date: 2024-04-11

RVA



Legend

Junction

Hydrant Available Flow (L/s)

- <= 40 Lps
- <= 70 Lps
- <= 100 Lps
- <= 150 Lps
- <= 200 Lps
- > 200 Lps

Pipe

DIAMETER

- 50 mm
- 100 mm
- 150 mm
- 200 mm
- 250 mm
- 300 mm
- 350 mm
- 400 mm
- 600 mm

2025 Water, Wastewater and Stormwater Master Plan and Pollution Control Plan

Water System Master Plan

Maximum Day Demand + Fire Flow - 2046 Scenario

N

0 325 650 1,300 1,950 Meters

Scale: 1:18,000

Date: 2024-04-11

RVA

Legend

Junction

Pressure (kPa)

- <= 138 kPa (20 psi)
- <= 276 kPa (40 psi)
- <= 414 kPa (60 psi)
- <= 552 kPa (80 psi)
- <= 689 kPa (100 psi)
- > 689 kPa (100 psi)

Pipe

Diameter (mm)

- 50 mm
- 100 mm
- 150 mm
- 200 mm
- 250 mm
- 300 mm
- 350 mm
- 400 mm
- 600 mm

2025 Water, Wastewater and Stormwater Master Plan and Pollution Control Plan

Water System Master Plan

Peak Hour Demand - 2046 Scenario

N

0 325 650 1,300 1,950 Meters

Scale: 1:18,000

Date: 2024-04-11

APPENDIX B-3

2025 Water, Wastewater and Stormwater Master Plan and Pollution Control Plan

Water System Master Plan

Maximum Day Demand + Fire Flow
2023 Scenario

Legend

Junction

Hydrant Available Flow (L/s)

- <= 40 Lps
- <= 70 Lps
- <= 100 Lps
- <= 150 Lps
- <= 200 Lps
- > 200 Lps

Pipe

Diameter (mm)

- 50 mm
- 100 mm
- 150 mm
- 200 mm
- 250 mm
- 300 mm

Scale: 1:20,000

Date: 2024-04-11

0 180 360 540 720 900 Meters

N

RVA

2025 Water, Wastewater and Stormwater Master Plan and Pollution Control Plan

Water System Master Plan

Peak Hour Demand 2023 Scenario

Legend

Junction

Pressure (kPa)

- <= 138 kPa (20 psi)
- <= 276 kPa (40 psi)
- <= 414 kPa (60 psi)
- <= 552 kPa (80 psi)
- <= 689 kPa (100 psi)
- > 689 kPa (100 psi)

Pipe

Diameter (mm)

- 50 mm
- 100 mm
- 150 mm
- 200 mm
- 250 mm
- 300 mm

Scale: 1:20,000

Date: 2024-04-11

0 180 360 540 720 900 Meters

N

RVA

2025 Water, Wastewater and Stormwater Master Plan and Pollution Control Plan

Water System Master Plan

Maximum Day Demand + Fire Flow
2032 Scenario

Legend

Junction

Hydrant Available Flow (L/s)

- <= 40 Lps
- <= 70 Lps
- <= 100 Lps
- <= 150 Lps
- <= 200 Lps
- > 200 Lps

Pipe

Diameter (mm)

- 50 mm
- 100 mm
- 150 mm
- 200 mm
- 250 mm
- 300 mm

Scale: 1:20,000

Date: 2024-04-11

0 180 360 540 720 900 Meters

N

RVA

2025 Water, Wastewater and Stormwater Master Plan and Pollution Control Plan

Water System Master Plan

Peak Hour Demand
2032 Scenario

Legend

Junction

Pressure (kPa)

- <= 138 kPa (20 psi)
- <= 276 kPa (40 psi)
- <= 414 kPa (60 psi)
- <= 552 kPa (80 psi)
- <= 689 kPa (100 psi)
- > 689 kPa (100 psi)

Pipe

Diameter (mm)

- 50 mm
- 100 mm
- 150 mm
- 200 mm
- 250 mm
- 300 mm

Scale: 1:20,000

Date: 2024-04-11

0 180 360 540 720 900 Meters

N

RVA

2025 Water, Wastewater and Stormwater Master Plan and Pollution Control Plan

Water System Master Plan

Maximum Day Demand + Fire Flow
2046 Scenario

Legend

Junction

Hydrant Available Flow (L/s)

- <= 40 Lps
- <= 70 Lps
- <= 100 Lps
- <= 150 Lps
- <= 200 Lps
- > 200 Lps

Pipe

Diameter (mm)

- 50 mm
- 100 mm
- 150 mm
- 200 mm
- 250 mm
- 300 mm

Scale: 1:20,000

Date: 2024-04-11

0 180 360 540 720 900 Meters

N

RVA

2025 Water, Wastewater and Stormwater Master Plan and Pollution Control Plan

Water System Master Plan

Peak Hour Demand
2046 Scenario

Legend

Junction

Pressure (kPa)

- <= 138 kPa (20 psi)
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- <= 414 kPa (60 psi)
- <= 552 kPa (80 psi)
- <= 689 kPa (100 psi)
- > 689 kPa (100 psi)

Pipe

Diameter (mm)

- 50 mm
- 100 mm
- 150 mm
- 200 mm
- 250 mm
- 300 mm

Scale: 1:20,000

Date: 2024-04-11

0 180 360 540 720 900 Meters

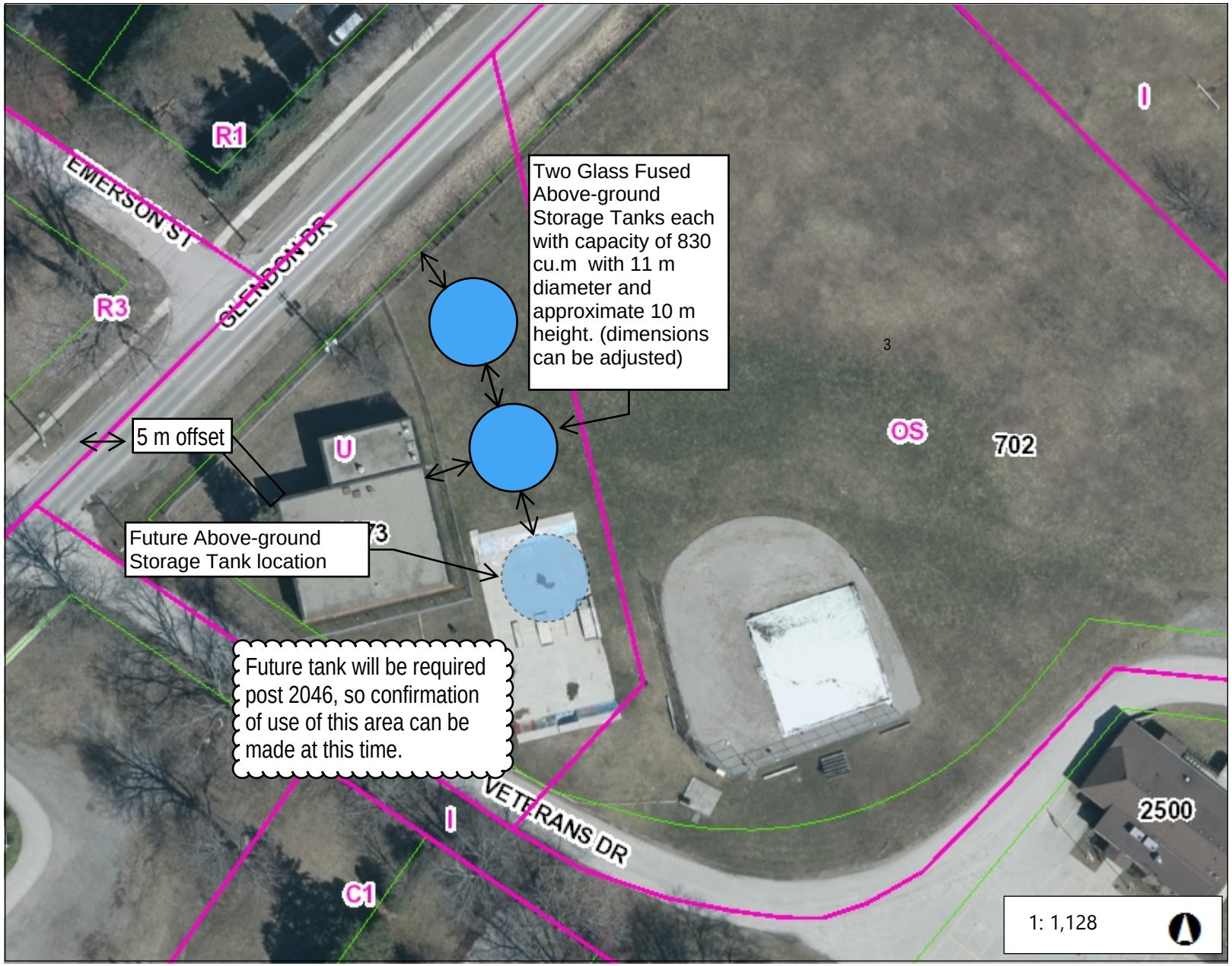
N

RVA

APPENDIX C

Mount Brydges
Water Storage Options

Mount Brydges Water Supply Additional Storage
Above-ground Storage Option



Legend

- Strathroy-Caradoc Zoning
- Parcels

Notes

6/05/2024

0.1 0 0.03 0.1 Kilometers

WGS_1984_Web_Mercator_Auxiliary_Sphere

Mount Brydges Water Supply Additional Storage
In-ground Storage Option

Legend

- Strathroy-Caradoc Zoning
- Parcels

Notes

6/05/2024

0.1 0 0.03 0.1 Kilometers

WGS_1984_Web_Mercator_Auxiliary_Sphere

APPENDIX D

Water Master Plan
Fact Sheet

Strathroy-Caradoc Water, Wastewater, and Stormwater Master Plan
Project Fact Sheet - Water Projects

	PROJECT	LOCATION	MCEA SCHEDULE	TOTAL COST	ANTICIPATED YEAR OF IMPLEMENTATION																			
					2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046
WATER MASTER PLAN	**WATER MASTER PLAN**																									
	Strathroy Water System																									
	Centre Street Watermain Upgrades	Strathroy	Approved	$840,000							$84,000	$756,000														
	Concord Drive Watermain Upgrades	Strathroy	Approved	$760,000							$76,000	$684,000														
	Riverview Drive Watermain Upgrades	Strathroy	Approved	$760,000							$76,000	$684,000														
	Oak Avenue Watermain Upgrades	Strathroy	Approved	$1,830,000							$183,000	$1,647,000														
	North Street Watermain Upgrades	Strathroy	Approved	$1,770,000								$177,000	$1,593,000													
	Locke Heights Watermain Upgrades	Strathroy	Approved	$1,430,000								$143,000	$1,287,000													
	Lamore Crescent Watermain Upgrades	Strathroy	Approved	$1,210,000									$121,000	$1,089,000												
	Mill Pond Crescent Watermain Upgrades	Strathroy	Approved	$1,430,000									$143,000	$1,287,000												
	Head Street Watermain Upgrades	Strathroy	Approved	$2,030,000										$203,000	$1,827,000											
	Mount Brydges Water System																									
	Storage Upgrades	Mount Brydges	B	$2,575,000	$175,000	$2,400,000																				
	Hydraulic Modeling																									
	Annual Updating of Hydraulic Model	Municipality	Approved	$400,000	$50,000	$50,000	$50,000	$50,000	$50,000						$50,000	$25,000					$50,000	$25,000				
	WATER TOTAL:			**$15,035,000**	**$225,000**	**$2,450,000**	**$50,000**	**$50,000**	**$50,000**	**$0**	**$419,000**	**$4,091,000**	**$3,144,000**	**$2,579,000**	**$1,877,000**	**$25,000**	**$0**	**$0**	**$0**	**$0**	**$50,000**	**$25,000**	**$0**	**$0**	**$0**	**$0**

MUNCIPALITY OF STRATHROY - CARADOC

Water, Wastewater and Stormwater Master Plan

Appendix 3 - Wastewater System Master Plan

October 31, 2024

R.V. Anderson Associates Limited
557 Southdale Road East, Suite 200
London, ON N6E 1A2

TECHNICAL MEMORANDUM

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GLOSSARY OF WASTEWATER SYSTEM DESIGN PARAMETERS

Guidelines

The criteria used to obtain and analyse the parameters in wastewater analysis is compiled from the following standards and guidelines:

- Ontario Design Guidelines for Sewage Works (Wastewater Guidelines) as amended in 1984 and 2008;
- Wastewater Treatment Fundamentals published by Water Environment Federation (WEF); and
- Strathroy-Caradoc Servicing Standards (SCSS).

Wastewater Guidelines directs that existing sewers and sewage treatment plants, flow rates, and sewage strengths are to be determined in both wet and dry weather conditions, and the wastewater treatment systems to be designed using the resulting parameters which consist of:

- Average Daily Flow (ADF) is the cumulative total sewage flow to the treatment system during a calendar year, divided by the number of during which sewage was flowing to the sewage treatment works that year.
- Maximum Daily Flow (MDF) is the largest volume of flow to be received during a one-day period expressed as a volume per unit time.
- Peaking Factor (PF) is the ratio of the MDF to the ADF is termed Peaking Factor (PF). The Water Environment Federation (WEF) guidelines provides ranges of PF for historical average ADF values. This allows determining the system's exposure to extraneous flows and allows identifying atypical conditions that may need rectification.

Extraneous Flows

Inflow from rainfall and infiltration from groundwater (I&I) regularly enter sanitary sewers to various degrees. Excessive I&I can increase operation and maintenance costs and can consume the collection system and the wastewater treatment plant's hydraulic capacity. As such, the Wastewater Guidelines requires that all sewer construction should exclude inflow and infiltration to the greatest extent possible. Although sanitary sewer systems are not designed to receive the bulk of stormwater flows, exposure to inflows and infiltrations may occur at vulnerable locations including pipe joints and indirect sources such as service connections.

Extraneous flows to the WWTF is estimated by subtracting peak wet weather flow from dry weather flow. This is done for both plants, and the resulting I&I flow is divided by the existing developed land (that is serviced by sanitary sewers) to obtain the I&I per hectare (L/ha/s) in the system. Then, to determine if the WWTS has higher than typical I&I entering the system, the I&I per hectare can be compared to the values provided in the Revision 1984 of Wastewater Guidelines as follows:

- 0.043 - 0.107 L/ha/s (average to peak); and
- 90 L/cap/day – 227 L/cap/day (average to peak).

The SCSS standards directs for an infiltration allowance of 0.08 L/ha/s for sizing sanitary sewers. The sizing of the collection system will be based on SCSS standards and be verified by modelling of the collection system.

Wastewater flows are expressed as follows:

- Wastewater Collection (Gravity Collection Systems, Siphons) flows are expressed in litres per second (l/s);
- Sewage Pumping Station flows are expressed in l/s at a specified total dynamic head (TDH) in m; and
- Wastewater Treatment Capacity is generally expressed as cubic metres (m^3) per day – m^3/day.

1.0 INTRODUCTION

Note: RVA projections of servicing are based on the projected settlement populations calculated in the 2022 Residential Lands Needs Assessment (RLNA) was prepared by Watson & Associates Economists Ltd. as part of the review and update of the Municipality's Official Plan. study. Our analysis of committed and/or anticipated development is intended to provide a picture of the anticipated progress of growth as of mid-2024 and use this as a tool to consider the expected rate and extent of growth in our analysis. The reader should consult current Municipality and County Planning reports and Council minutes to confirm the status of development.

As a part of the 2025 Water, Wastewater and Stormwater Master Plan (WWSMP) and Pollution Prevention and Control Plan (PPCP), the Municipality of Strathroy-Caradoc (Municipality) has undertaken a review of the existing wastewater collection systems via the use of a hydraulic model to:

- Provide the Municipality with an assessment of its existing wastewater collection systems in terms of its current capacity, and ability to convey future flows;
- Provide the Municipality with an appropriate design criteria and wastewater flow projections over the master planning period for each system;
- Determine future wastewater infrastructure requirements by assessing alternatives (upgrades/diversion/expansion), potential to decommission certain assets, issues, and opportunities;
- Evaluate and recommend preferred alternative and servicing strategy.

The hydraulic models developed for the Strathroy and Mount Brydges wastewater collection systems (WWCS) were simulated for various scenarios and time horizons. The model can be used:

- As an analytical tool to identify hydraulic bottlenecks in the collection system and;
- As a planning tool to identify upgrades of the wastewater collection system needed to maintain level of service for existing and future developments.

The models were assessed for impacts due to changes in wastewater flows and/or infrastructure conditions over specific study periods as detailed in this report. The relative severity of this impact provided the necessary information to develop a list of recommendations necessary to continue maintaining the Municipality's level of service.

2.0 REVIEW OF STRATHROY'S EXISTING WASTEWATER COLLECTION AND TREATMENT FACILITIES

2.1 System Components

2.1.1 Collection and Pumping

The Strathroy wastewater collection system comprises of approximately 90 km of gravity sewers, 6 km of forcemains, 1,236 manholes. The Strathroy wastewater collection system consists of nine (9) sewage pumping stations (SPS). Out of nine, two pumping stations service the majority of the sanitary drainage areas. Albert Street SPS and Metcalfe Street SPS convey all of the wastewater from the Strathroy collection system to the Strathroy Sewage Treatment Plant. The remaining seven (7) sewage pumping stations are secondary, discharging to the existing sanitary sewers.

2.1.2 Treatment

The Strathroy Wastewater Treatment Facility (WWTF) comprises of a mechanical treatment plant with a design rated capacity of 10,000 m^3/day. The WWTF's liquid train comprises of mechanical screens, one aeration basin, chemical phosphorus removal, two secondary clarifiers, tertiary filtration, and UV disinfection. Sludge storage is provided by an onsite lagoon.

2.2 System Assessment

A field review of the Municipality's wastewater treatment facilities (WWTFs) and sewage pumping stations (SPSs) was conducted on September 8, 2023. It was noted that the High Street SPS which services a small cul-de-sac requires operators to manually remove the pumps for servicing as part of regular maintenance. It would be recommended that when this SPS is replaced at the end of its life that an appropriate pump lifting system be included as part of the upgrade.

2.3 WWTF Flow Projections

Table 2-1 provides the forecasted sanitary flow to the Strathroy WWTF for the associated population projected to the year 2046. Strathroy's historical per capita flows used to project the future flows is 294 L/cap/day, based on 2019 – 2022 rolling wastewater flow data. The current WWTF rated capacity is 10,000 m^3/day and, therefore, the system has ample capacity to continue supporting growth to the study horizon of 2046.

Additionally, the 2022 Residential Lands Needs Assessment (RLNA) provided the remaining available residential lots in Strathroy (within existing boundary) as of 2023. The scenario where these remaining lots are all developed and are all populated is labeled *Built Out Scenario*. The resulting total ADF (from the current connected population as of 2023 and from the additional population from the remaining available lots) is 7,092 m^3/day. Per the RLNA population forecast, this built out scenario is not expected until after the study horizon of 2046.

Table 2-1 - Strathroy WWTS Projected Wastewater Flows

Parameter	Units	2026	2031	2036	2041	2046
Population	-	18,200	20,300	21,800	22,900	23,900
ADF	m^3/day	5,357	5,975	6,416	6,740	7,034
Built Out Scenario Population	-	24,096				
Built Out Scenario ADF	m^3/day	7,092				

With the current rated capacity of 10,000 m^3/d, the Strathroy WWTF has capacity to support growth beyond 2046.

2.4 WWTF

2.4.1 WWTF Description

The existing WWTF is located at 27886 Pike Road in the Township of Adelaide Metcalfe just west of the Strathroy settlement area. The Strathroy WWTF comprises of a mechanical treatment plant with a design rated capacity of 10,000 m^3/day. The WWTF's liquid train comprises of mechanical screens, one aeration basin, chemical phosphorus removal, two secondary clarifiers, tertiary filtration, and UV disinfection. Sludge storage is provided by an onsite lagoon.

At present the process comprises a single cell with no means to isolate or drain any section of the aeration tank (which is a lagoon cell) to allow for maintenance and cleaning. Inability to properly perform maintenance has led to the accumulation of solids on the lagoon slopes and bottom. To allow for better operation and long-term maintenance and cleaning, an upgrade project is underway to improve system redundancy.

The WWTF upgrades currently in design phase and to be implemented include the addition of new aeration cell (an existing lagoon on site), a new headworks building, replacement of the existing UV banks (which are at the end of their service life) and other plant modifications. These upgrades will not change the treatment capacity of the WWTF and are included within the current Capital Plan.

2.4.2 Committed Capacity

The list of approved developments provided by the Municipality and the wastewater generated by them based on 294 L/cap/day is provided in Table 2-1. As of 2023, about 6,749 m^3/day or 67% of the WWTF's total capacity is committed to existing and approved developments, leaving about 33% of the plant's capacity as available capacity.

Table 2-2 - Strathroy WWTS Committed Capacity

Locations	Allocated Flow (m^3/day)
2023 ADF (existing connected lots)	5,009
Approved Proposed Developments	
430 Head Street	15
Cuddy Farms - Saulsbury Development	334
Fieldcrest	229

Locations	Allocated Flow (m^3/day)
Southgrove Meadows	17
390 Second Street	203
24648 Adelaide Road	25
360 Carroll Road	212
Buchanan Crossings	253
24633 Adelaide Road	33
599 Albert Street	40
251 Burns Street	18
100 Second Street	25
Darcy Drive	51
Strathroy Crossing	17
50 Carroll Street	28
392 Second Street	23
Darcy Drive	56
101 Hull Road	18
24621 Adelaide Road	141
Total Flow Generated from Developments	1,740
Total Flow to the WWTF	6,749
Plant Capacity	10,000
Remaining Capacity	3,251

3.0 REVIEW OF MOUNT BRYDGES' EXISTING WASTEWATER COLLECTION AND TREATMENT FACILITIES

3.1 System Components

3.1.1 Collection and Pumping

The Mount Brydges Wastewater Collection System comprises of approximately 11 km of gravity sewers, 2 km of forcemains, 145 manholes and two (2) sanitary pump stations.

3.1.2 Treatment

Mount Brydges is currently services by the Moun Brydges WWTF which is located approximately 2 km southeast of Mount Brydges, at 22416 Mill Road. The WWTF was constructed in 2011 and has a design capacity of 825 m^3/day. Since 2019, the Municipality has had operational issues with the WWTF and have been actively engaged with MECP District Office and Approvals Branch to mitigate these issues. In 2019, the WWTF was operating at approximately 15-20% of its rated capacity and these low loadings led to the treatment system having trouble treating Total Ammonia Nitrogen (TAN) to its required limit. As flows to the WWTF continued to rise from 2020 to present, the WWTF has experienced equipment breakdown and treatment challenges in meeting the treatment requirements for other parameters including total suspended solids, organic matter and TAN. This has demonstrated that the capacity and reliability of the current WWTF technology cannot provide the level of treatment required to its capacity is 825 m^3/day. The Municipality has undertaken a phased approach to reduce the environmental impacts. These phases are detailed below.

Immediate Action - Modifications at the Main PS to replace existing discharge valve with a throttle valve to better control flows coming into the WWTF. This included piping and SCADA changes and was completed in early 2021.

Interim Action - Modifications to the existing spare tank to work as an equalization tank are being considered by the Municipality.

Permanent Approach (restoration of WWTF ECA Capacity to 825 m^3/day) - This involves construction of headworks and moving to an extended air process which has several advantages and is much better suited to future expansion of the WWTF. The ECA approval has been received from the MECP for the changes to the WWTF. Preparation and submission of an ECA – Air and Noise, and a Permit to Take Water (PTTW) both from MECP is underway. Once the Air and Noise ECA and PTTW are obtained and the project is approved by Council, the tender/construction of the Capacity Restoration project can be started in early 2025 with completion of works anticipated sometime in 2026.

3.2 Collection System Assessment

No notable findings related to operations and maintenance were found in the collection system from the field visit.

3.3 Connection of Existing Unserviced Properties within Mount Brydges

Based on direction from Strathroy-Caradoc Council, the future serviced population is to be based on the additional growth from 2023 onwards are connected to the WWTS as will be the existing unconnected population.

3.4 WWTF Flow Projections

Municipal addresses connected to the sewer system was provided by the Municipality for the year 2024 and showed 598 connections. Using a PPU of 2.58 (from the GMS report) gave a connected population of 1,549 as of 2024.

It is assumed that there will be a phasing of connecting the existing unconnected population will be connected in a phased approach such that, by year 2046, the entire un-serviced population is fully connected.

The baseline year is taken as 2023 instead of 2024 because this Master Plan was prepared mid-year 2024 and only the 2023 wastewater flow data was available. To estimate the connected population in 2023, the RLNA report is used. The report provided an annual housing growth rate of 70 units from 2021 – 2046. Using this and the PPU from the SC Design Standards, the estimated connected population in 2023 is 1,368 ([598 units – 70 units] x 2.59 = 1,368). The total population in Mount Brydges is also calculated likewise and is 3,631. As such, as of 2023, the remaining unconnected population is 2,264.

The connection of the existing unconnected population will be approximately 9% of this population, or about 206 people every 2 years to the WWTS. With this frequency, the entire existing unconnected population will be connected to the WWTS by 2046.

The historical average per capita ADF is provided in Table 3-1. Two different timelines are used for the historical average to obtain a realistic ADF per capita.

Table 3-1 - Mount Brydges WWTF Historical Per Capital Flows

Units	2019	2020	2021	2022	2023	2024	Average
ADF (m^3/day)	201	207	273	315	331	419	-
Population	642	824	1,005	1,186	1,369	1,549	-
2019 – 2024, L/cap/day							269
2022 – 2024, L/cap/day							259

The historical per capita ADFs shown above are very low numbers for the size of Mount Brydges and may lead to underestimating the future flows. They may be a result of overestimating and not having an accurate representation of the connected population. Late 2023 and early 2024 monthly averages appeared to be trending higher without a significant change in connected units. To address this variability, an assumed per Capita flow of 313 L/cap/day is used for flow forecasting. This aligns with the per capita ADF of 300 L/cap/day provided in the SC Design Standards. Table 3-2 provides the projected ADF up to the year 2046.

Table 3-2 - Mount Brydges WWTF Projected Wastewater Flows

Parameter	Years				
	2026	2031	2036	2041	2046
Total Population	4,200	5,500	6,300	6,900	7,500
Future Development Population	0	1050	2100	3150	4200
Existing Unconnected Population	1,456	1092	728	364	0
Total Connected Population Growth	2,744	4,408	5,572	6,536	7,500
WWTF Capacity Requirement (m^3/day)	718	1,287	1,703	2,064	2,348

With the current rated capacity of Mount Brydges WWTF of 825 m^3/d, a wastewater servicing Schedule C Municipal Class Environmental Assessment (MCEA) will need to be completed to determine the preferred approach to increase wastewater treatment capacity to service growth. Based on population projections the WWTF ADF will reach 85% of the capacity by 2028. This is illustrated graphically in Figure 1-1.

3.5 WWTF

3.5.1 WWTF Description

The Mount Brydges WWTF is located approximately 2 km southeast of Mount Brydges, at 22416 Mill Road. The WWTF was constructed in 2011 and has a design capacity of 825 m^3/day. The WWTF consists of:

- Two (2) “Rotating Biological Contactors” (RBC’s);
- Two (2) “Final Settling Tanks” (FST’s);
- Tertiary Filter System: Three (3) continuous backwash filters; and
- UV Disinfection System.

3.5.2 Issues with the WWTF

Since 2019, the Municipality has had operational issues with the WWTF and have been actively engaged with MECP District Office and Approvals Branch to mitigate these issues.

Per the current ECA for the WWTF, its capacity is 825 m^3/day. In 2019, the WWTF was operating at approximately 15-20% of its rated capacity and these low loadings led to the treatment system having trouble treating Total Ammonia Nitrogen (TAN) to its required limit. As flows to the WWTF continued to rise from 2020 to present, the WWTF has experienced equipment breakdown and treatment challenges in meeting the treatment requirements for other parameters including total suspended solids and organic matter. This has demonstrated that the capacity and reliability of the current WWTF technology cannot provide the level of treatment required to its capacity is 825 m^3/day.

Specific issues related to the current WWTF are as follows:

- There is no proper headworks to remove rags, solids and grit which impact the ability of the current treatment system to provide adequate treatment;

- The RBC systems lack redundancy as one motor/gearbox/bearing/media failure results in 50% loss of capacity;
- Lack of buffering for variations in flows;
- Long recovery time from process upsets; and
- RBC technology, while used in the past by municipalities is proven not to be reliable and expandible.

As this situation placed the Municipality both legal and financial risk, the Municipality has undertaken a phased approach to reduce the environmental impacts. These phases are detailed below.

- Immediate Action - Modifications at the Main SPS to replace existing discharge valve with a throttle valve to better control flows coming into the WWTF. This included piping and SCADA changes and was completed in early 2021.
- Interim Action - Modifications to the existing spare tank to work as an equalization tank are being considered by the Municipality.
- Restoration of WWTF ECA Capacity (825 m^3/day) - This involves construction of headworks and moving to an extended air process which has several advantages and is much better suited to future expansion of the WWTF. The ECA approval has been received from the MECP for the changes to the WWTF. Preparation and submission of an ECA – Air and Noise, and a Permit to Take Water (PTTW) both from MECP is underway. Once the Air and Noise ECA and PTTW are obtained and the project is approved by Council, the tender/construction of the Capacity Restoration project can be started in early 2025 with completion of works anticipated sometime in 2026. This proposed solution will:
    - Provide a headworks facility to provide proper influent screening;
    - Treatment process is switched to extended aeration provides the following advantages:
        - More robust system;
        - Superior handling of uneven plant flows;
        - Recovers much quicker to process upsets;
        - Staff familiarity with process; and
        - This system will be more readily expandible in the future.
    - These modifications include:
        - Addition of a headworks building for the removal of sand/grit/rags;
        - Conversion of RBC tanks into aeration tanks with fine bubble diffusers;
        - Addition of blowers and controls needed to support the aeration system;
        - The addition of skimmers to remove floatables from the clarifiers;
        - Installation of a new sludge holding tank;
        - Provision of location office space and area for staff to clean up;
        - Reusing the mixers and pumps purchased for the interim solution;
        - Refurbishment of the chemical system; and
        - Updating the WWTF controls.

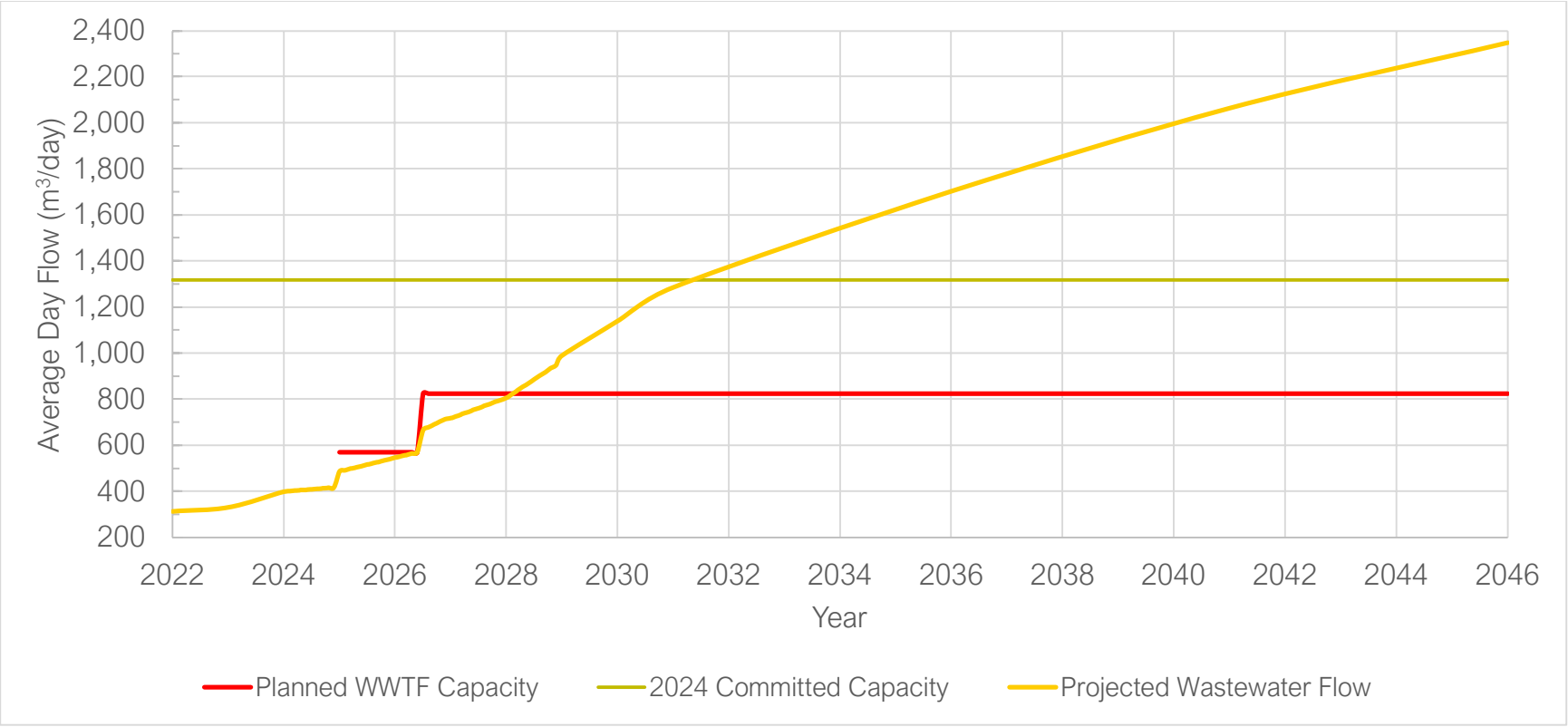


Figure 3-1 - Mount Brydges Wastewater Flow Projection

The current estimated budget for Construction and Contract Administration is approximately $11.5 million.

3.5.3 Committed Capacity

Table 3-3 provides the current committed capacity and the remaining available capacity of the Mount Brydges WWTS as of mid-2024.

Table 3-3 - Mount Brydges WWTF Committed Capacity

Locations	Allocated Flow (m^3/day)
2023 ADF (existing connected lots)	419
Approved Proposed Developments	
22182 Adelaide Road	23
Falconbridge	154
Falconbridge West	202
Edgewood	100
Forest View	122
22226 Adelaide Road	20
22696 Adelaide Road	163
2585 Queen Street	60
8535 Glendon Drive	33
22268 Adelaide Road	22
Total Flow Generated from Developments	899
Total Flow to the WWTF	1,318
Plant Capacity	825
Remaining Capacity	-493

4.0 ASSET MANAGEMENT

4.1 Levels of Service Requirement

Per the 2021 Asset Management Plan for the Municipality of SC, the Engineering and Public Works department is responsible for the WWTFs, pumping stations, and the sewer collection system in both Strathroy and Mount Brydges. The wastewater system in both communities are funded by the user rater and has an average remaining service life of 43 years.

The current strategies for ensuring service level from the Municipality's WWTS are met is via an establishment of a detailed maintenance and rehabilitation schedule. Overall, the average condition of the WWTS is rated good. The recommendations that will be developed for the Master Plan will incorporate the strategies determined in the AMP.

4.2 Capital Forecast

The Municipality has previously provided the planned 10-year capital forecast from 2024 to 2033 for wastewater projects. This list is provided in Appendix A for reference. The Total Capital Budget from 2024 to 2033 is $49.8 million of this:

- $1.9 million is identified for sanitary pumping station renewal projects;
- $1.3 million is identified for renewal projects for the Strathroy WWTF;
- $18.6 million is identified for extensions of the sanitary collection system for the Mount Brydges WWTF.

Table 4-1 provides a summary of the wastewater projects identified for renewal and upgrades during this period. This forecast is updated annually by the Municipality.

Table 4-1 – Identified Wastewater Projects

Year	Project	WW Portion of the Budget
2024	DC Municipal BTE Share Allowance	$183,000
2024	Downtown Streetscaping Improvements Construction	$2,196,000
2024	Ellor Street Reconstruction Ph 2 #325 to Caroll St	$183,000
2024	Extension of Thorn Dr (North Meadows Secondary Plan), West of Adair Blvd	$640,500
2024	Instrumentation Upgrades	$25,000
2024	Manhole Refurbishment/Repairs	$10,000
2024	MB Sewer Expansion- Design	$500,000
2024	McKellar Ph 2 Reconstruction	$640,500
2024	NFPA Upgrades - Main and Lions Park	$1,500,000
2024	Pump Station Pump Spares	$30,000
2024	Queen Street Reconstruction Ph 2 including Arthur St Stm Outlet	$1,281,000
2024	Refurbishing Pumping Stations -Construction McNab	$1,250,000
2024	Refurbishing Pumping Stations -Design - Arnella and Bella	$100,000
2024	Rougham Road Design - Glendon to Falconbridge	$54,900
2024	Saxton Road Redesign and Reconstruction	$274,500
2024	Sludge Hauling Strathroy WWTF	$300,000
2024	Valve Repairs	$15,000

Year	Project	WW Portion of the Budget
2025	Adelaide St Strathroy -Design	$36,600
2025	Carroll Street - Sidewalk and upgrades S side/W of Saxton (Exist. Urban)	$13,725
2025	DC Municipal BTE Share Allowance	$183,000
2025	Extension of Adair Blvd (North Meadows Secondary Plan)	$311,100
2025	Head Street Reconstruction	$732,000
2025	High St Reconstruction & PS Elimination	$732,000
2025	Instrumentation Upgrades	$25,000
2025	Instrumentation Upgrades	$150,000
2025	Manhole Refurbishment/Repairs	$10,000
2025	MB Sewer Expansion	$3,000,000
2025	MB Sewer Expansion	$3,000,000
2025	New Road Street D - Wright St to Second St	$484,950
2025	Pump Station Pump Spares	$50,000
2025	Refurbishing Pumping Stations -Construction Arnella and Bella	$250,000
2025	Refurbishing Pumping Stations -Design Ewart	$25,000
2025	Refurbishing Pumping Stations -Design Millpond	$50,000
2025	Rougham Road Reconstruction - North of Glendon	$640,500
2025	Valve Repairs	$15,000
2026	Adelaide St Strathroy -Reconstruction Ph 1	$457,500
2026	DC Municipal BTE Share Allowance	$183,000
2026	Glengyle Drive Design	$27,450
2026	Instrumentation Upgrades	$9,150
2026	Manhole Refurbishment/Repairs	$10,000
2026	MB Sewer Expansion	$3,000,000
2026	New Road Street B - Adair Blvd to Muni Boundary	$292,800
2026	Oxford St & Richmond St Reconstruction	$1,299,300
2026	Pannell Lane Design - Head to Centre	$27,450
2026	Sludge Hauling Strathroy WWTF	$300,000
2026	Strathroy WWTF Sludge Handling Design	$200,000
2027	Adelaide St Strathroy - Reconstruction Ph 2	$640,500
2027	DC Municipal BTE Share Allowance	$183,000
2027	Extension of Thorn Dr (North Meadows Secondary Plan), East of Adair Blvd	$347,700
2027	Falconbridge Road Reconstruction - Rougham to Adelaide	$549,000
2027	Instrumentation Upgrades	$25,000
2027	Manhole Refurbishment/Repairs	$20,000
2027	MB Sewer Expansion	$3,000,000
2027	New Road Street A - Adair Blvd to Muni Boundary	$86,925
2027	New Road Street C - Street B to Terminus	$118,950
2027	Refurbishing Pumping Stations -Construction Ewart	$9,150
2027	Refurbishing Pumping Stations -Construction Millpond	$150,000
2027	Saxton Road South Design	$18,300
2027	Sludge Hauling Strathroy WWTF	$300,000
2027	Strathroy WWTF Sludge handling facility	$2,000,000

Year	Project	WW Portion of the Budget
2027	Strathroy WWTF Lagoon Rehabilitation Study	$150,000
2027	Trunk Sanitary Sewer Adelaide Road (Carroll to Walkers) Design	$100,000
2027	York Street Servicing	$640,500
2028	Albert St PS Forcemain Replacement	$1,250,000
2028	DC Municipal BTE Share Allowance	$183,000
2028	MB Sewer Expansion	$3,000,000
2028	New Road Street E - Parallel to Adair Blvd to Adair Blvd	$201,300
2028	New Road Street F - Parallel to Adair Blvd to Adair Blvd	$201,300
2028	New Road Street G - Parallel to Adair Blvd to Adair Blvd	$201,300
2028	Pannell Lane & Dominion Street Extension - Design	$54,900
2028	Strathroy WWTF Lagoon Rehabilitation	$3,000,000
2028	Trunk Sanitary Sewer Adelaide Road (Carroll to Walkers) Construction	$2,300,000
2029	Caradoc Street Capacity Improvement - Design - Carroll St to Metcalfe St	$18,300
2029	DC Municipal BTE Share Allowance	$183,000
2029	Jenna Drive Extension - Design	$18,300
2029	MB Sewer Expansion	$3,000,000
2029	Metcalfe PS incoming main assessment	$36,600
2029	Pannell Lane & Dominion Street Extension - Construction	$732,000
2029	Rougham Road Design - Glendon to Parkhouse	$36,600
2030	Caradoc Street Capacity Improvement - Design	$91,500
2030	Falconbridge Drive and Springwell Drive Design	$27,450
2030	Infrastructure Renewal Annual Design Allocation	$54,900
2030	Jenna Drive Extension -Construction	$109,800
2030	Rougham Road Construction - Glendon to Parkhouse	$640,500
2031	Infrastructure Renewal Annual Design Allocation	$54,900
2031	Infrastructure Renewal Annual Reconstruction Allocation	$640,500
2032	Infrastructure Renewal Annual Design Allocation	$54,900
2032	Infrastructure Renewal Annual Reconstruction Allocation	$640,500
2032	Saulsbury Street (Drury to Victoria) Design	$27,450
	Total	$49,796,950

Notes:
1 - For linear and BTE projects, sanitary portion is assumed to be 18.3 % of the total
2- For instrumentation upgrades, maintenance hole and valve repair, sanitary portion is assumed to be 50.0 % of the total

The recommended projects from in this Master Plan should be reviewed and considered within the context of the current 10-year capital plan should they be needed within this timeframe.

5.0 WASTEWATER SERVICING EVALUATION STRATEGY

5.1 Strathroy-Caradoc Wastewater System Alternative Solutions

The MCEA process requires that a reasonable range of alternative management techniques be developed for issues identified in Strathroy's and Mount Brydges' wastewater treatment collection systems. The first strategy is the Do-Nothing scenario which is a compulsory check per the MCEA process. The remaining strategies are taken from the 2021 AMP which identifies preventative maintenance, rehabilitation and/or replacement as the best practice strategies for watermains. Therefore, the problems or opportunities identified in the hydraulic model will be categorized into these 4 strategies to ensure they meet the Municipality's asset management goals.

The following subsections provides details on the type of projects that will be identified for the Strathroy and Mount Brydges WDSs and which category they fall under.

5.1.1 Do Nothing

This alternative solution is required baseline condition that considers the anticipated impacts if no remedial or mitigation measures are taken to address the identified issues. Under this scenario, no improvements or changes would be undertaken to address the current and future water supply and storage requirements.

5.1.2 Preventative Maintenance

This alternative solution will address the identified constraints by proposing operational strategies that will reduce risks to wastewater servicing, including periodic inspections, flushing and cleaning, and flow monitoring to identify significant extraneous inputs into the collection system that can impact the treatment plant's capacity.

5.1.3 Rehabilitation

This alternative solution will target optimization of the wastewater conveyance infrastructure to increase capacity, including:

- Improvements to existing sewage pumping stations; and
- Trenchless re-lining of aging or sewer mains identified as reaching capacity limits in the hydraulic model.

5.1.4 Replacement/Expansion

This alternative solution will be recommended when the previous 3 alternative prove incapable of meeting growing system demands. Strategies that will be explored include:

- Replacement of existing sewage pumping stations;
- Replacement of aging or sewer mains identified as reaching capacity limits in the hydraulic model; and
- Expansion of the existing system or its replacement.

5.2 Evaluation Criteria

The preliminary evaluation of each recommendation included an assessment to identify any cultural heritage resources to be impacted by the proposed changes. In these

5.2.1 MCEA Evaluation Criteria Description

An evaluation criterion to evaluate the alternative solutions is developed based on the MCEA requirements. It comprises of four categories with specific criteria that must be met to satisfy them as listed in Table 5-1.

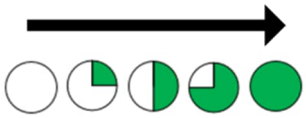
Table 5-1 – MCEA Evaluation Criteria

Category	General Criteria to Assess Impact
Technical	• Constructability • Improvements to operation • Infrastructure Required • Approval Requirements
Social and Cultural	• Public Requirements • Impact to built heritage resources and cultural heritage landscapes
Environmental	• Impact to aquatic and terrestrial species and habitat • Impact to surface water quantity and quality • Climate Change resiliency
Economic	• Capital Costs • Operational and Maintenance Costs • User Value

5.2.2 Criteria Measurement

The evaluation criteria is applied to each alternative solution to rate their ability of meeting the Master Plan's Problem and Opportunity Statement and narrow down to the preferred solution. Table 5-2 illustrates the rating scale used.

Table 5-2 – Evaluation Criteria Measurement

Evaluation Rating Scale		
Highest Impact (Most Negative Solution)		Lowest Impact (Most Positive Solution)

5.3 Project Implementation Strategy

The project recommended timelines are established using the projected population as detailed in TM#1. Initially, the time horizons selected for the simulation were 2025 – 2029, 2030 – 2034 and 2035 – 2044. However, these have since been revised to reflect the most current development applications the Municipality is planning for. The approach is detailed in Section 1. In addition to the above, the recommended timelines will also be based on the following:

- Improvements required to maintain level of service for the projected population;
- Projects identified in the Municipality's 2023 – 2030 capital plan with an effort to collaborate the projects; and
- Collaborating the projects with those planned in areas undergoing development or have development proposals submitted.

The evaluation of servicing strategies to address growth related issues in the Strathroy's and Mount Brydges wastewater treatment collection systems, with the project types as follows:

- Do Nothing Alternative, comprising of the baseline condition with no improvements to the wastewater treatment system;
- Preventative Maintenance Alternative will include periodic inspections, flushing and cleaning, and flow monitoring to identify significant extraneous inputs into the collection system that can impact the treatment plant's capacity;
- Rehabilitation Alternative will include improvements to SPSs and trenchless re-lining of aging or sewer mains identified as reaching capacity limits in the hydraulic model
- Replacement Alternative will be recommended when the previous three alternatives prove incapable of meeting growing system demands.

5.4 Project Implementation Strategy

Initially, the time horizons selected for the simulation were 2025 – 2029, 2030 – 2034 and 2035 – 2044. However, these have since been revised to reflect the most current development applications the Municipality is planning for. The approach is detailed in *Appendix 2 – Water Master Plan Technical Memorandum* of the Master Plan Report. In addition to the above, the recommended timelines will also be based on the following:

- Improvements required to maintain level of service for the projected population;
- Projects identified in the Municipality's 2023 – 2030 capital plan with an effort to collaborate the projects; and
- Collaborating the projects with those planned in areas undergoing development or have development proposals submitted.

6.0 WASTEWATER TREATMENT SYSTEM HYDRAULIC ANALYSIS

6.1 Wastewater Flow Allocation Strategy

6.1.1 Hydraulic Model Used

PCSWMM (version 7.6) software for the hydraulic modeling and analysis of Strathroy's and Mount Brydges wastewater collection system (WWCS). The model base/current conditions was taken as conditions in year 2023. The 2023 population for both communities is:

- Strathroy: Approximately 17,304 people in 2023; and
- Mount Brydges: Approximately 3,631 people in 2023.

6.1.2 Existing Conditions

Since this report is developed in April of 2024, the 'existing conditions' is taken as year 2023. Therefore, to update the 2021 model to existing conditions (as of 2023), the 2023 population and corresponding Average Day Demand (ADD), Maximum Day Demand (MDD), and Peak Hour Demand (PHD) for both WDSs was computed. The methodology used is the following:

1. The RLNA provided the forecasted populations for 2021, 2026, 2031, 2036, 2041, and 2046. For estimating the population between those years, RLNA gave two methods - Method 1 was to use an annual growth rate of 28 low density homes, 33 medium density homes, and 95 high density lots, and Method 2 was to use an annual growth rate of 1.5%. Method 1 uses the Strathroy Caradoc PPU factor to compute the corresponding population. Both methods were tested to check which provided a closer value to the 2026 population. This is illustrated in Table 4-1.

Table 6-1 - Population Projection using RLNA Methods

Year / Method	2021[1]	2022[2]	2023[2]	2024[2]	2025[2]	2026[2]	2026[1]
Strathroy							
Method 1	16,600	16,952	17,304	17,656	18,008	18,360	18,200
Method 2	16,600	16,849	17,102	17,358	17,619	17,883	18,200
Mount Brydges							
Method 1	3,300	3,466	3,631	3,797	3,962	4,128	4,200
Method 2	3,300	3,409	3,521	3,638	3,758	3,882	4,200

1: Provided verbatim in RLNA study
2: Estimated using the projection factors provided in RLNA study

For both communities, the population calculated using Method 1 is closer to the 2026 population provided verbatim in RLNA (red boxed in table above). Therefore, year 2023 population of 17,304 for Strathroy and 3,631 for Mount Brydges is used for the hydraulic model.

6.1.3 Strathroy

Hydraulic modeling of the WWCS follows the same allocation strategy of projected population and committed development as explained in the *Appendix 2 – Water Master Plan Technical Memorandum* of the Master Plan Report.

6.1.4 Mount Brydges

Built Out Scenario is expected by the year 2039. As such, the additional 840 people (7,500 – 6,660) were allocated outside the current delineated settlement boundary of Mount Brydges. The 840 people and their resultant wastewater demands were assigned on the edge of the existing growth boundary and the flows allocated to the nearest sanitary sewer (hydraulic node).

6.2 Hydraulic Model

The calibrated hydraulic models were used to determine the wastewater collection system performance under the following conditions:

- 2024 (existing), 2029, 2041 and 2046 (ultimate) for Strathroy; and;
- 2024 (existing), 2032 and 2046 (ultimate) for Mount Brydges.

For each of the time horizons stated above, modeling scenarios were created to evaluate the performance of the WWCS and identify potential constraint areas that may have issues related to pipe capacity. The system analysis has considered sanitary system only and it was assumed that if any combined sewers exist within the system, the Municipality will consider sewer separation to direct all surface flows to the new storm sewer. The calibrated hydraulic models were then utilized to evaluate system's capacity under 2024 (existing), 2029, 2041 and 2046 (ultimate) for Strathroy and 2024 (existing), 2032 and 2046 (ultimate) for Mount Brydges.

A summary of the hydraulic analysis results are:

- The Strathroy's existing WWCS is capable of conveying future estimated wet weather flows under the 2046 conditions;
- The Mount Brydges WWCS has sufficient capacity to convey future estimated wet weather flows under the 2046 conditions; and
- All the SPS's in Strathroy and Mount Brydges have capacity to handle ultimate scenario flows for the year 2046 while maintaining the existing configuration.

The system analysis has considered the sanitary system only and it is noted that there were no significant wet weather impacts noted as part of the hydraulic analysis.

The Hydraulic Analysis report is attached to Appendix A.

7.0 WWTS RECOMMENDATIONS

7.1 Recommended Strategy for Review of Undersized Sewers

Should an undersized sewer be found in the future, Table 7-1 summarizes the options review and the recommendation for the replacement of this section of sewer. The evaluation results show that upsizing the sewers is the only option that can address the capacity deficit. However, since the portion of pipe causing the issue is preceded and succeeded by pipes more than double its size, it is possible that the pipe size information is incorrect. Therefore, a field investigation to confirm the sewer sizes along Head Street North is recommended before undertaking the upgrades.

7.2 Strathroy Wastewater System

As collection system capacity and the existing SPS are capable of handling anticipated flows to 2046, there no recommendations associated as a result of the Master Plan review.

7.3 Mount Brydges Wastewater System

7.3.1 Alternative Strategies

Mount Brydges' existing sewage collection system does not pose any servicing constraints as determined in the hydraulic model. Expansion of wastewater treatment capacity from 825 to 2,348 m^3/day is required to meet anticipated demand. At present, the MCEA Schedule C process will be required to confirm the required type of project to be undertaken for the provision of increased wastewater treatment capacity. Since Mount Brydges' existing sewage collection system does not pose any servicing constraints as determined in the hydraulic model, only the WWTF expansion is analyzed further for alternative servicing strategies. The intent will be to plan for a wastewater treatment capacity expansion to 2,348 m^3/day. For each of the Scenarios, the common alternative strategies evaluated in Table 7-2 are:

1. Do Nothing Alternative;
2. Limit growth to prevent requirement of expanding the Mount Brydges municipal servicing capacity;
3. Reducing sewage flows by incorporating water conservation measures and by reducing I&I capture in the sanitary system via control of permitted connections to the collection system; and
4. Expanding the capacity of the treatment capacity to accommodate growth and the connection of the existing population that is not serviced by the WWTF.

Both Preventative Maintenance and Rehabilitation are unable to address the capacity deficit issue and were, therefore, not explored further.

Table 7-1 - Alternative Solutions Evaluation for Sewers Requiring Upsizing

Criteria	Do Nothing	Preventative Maintenance	Rehabilitation	Replacement
Description	Implement no solution	Flow monitoring and/ swabbing of sewer main	Trenchless re-lining (injection grouting) of the sewer main	Replace pipes with upsized pipes
Technical	This Alternative does not meet the requirements for a solution to the identified servicing issue.	Following completion of this maintenance exercise, flow monitoring will be needed to confirm the actual flow being conveyed by this pipe and the hydraulic model updated to confirm if the capacity issue has been resolved.	This can reduce I&I exposure which can assist in regaining some capacity. However, the model already incorporated a low I&I allowance and still resulted in a capacity deficit in the pipe. Therefore, this may not address the issue.	• Considered an Approved project under MCEA Class EA • Other municipal, utility and conservation permitting may be required. • Will address the issue of the pipe size decreasing significantly over a small portion of its length which impacts headloss and capacity.
Social and Cultural	Insufficient sewer pipe capacity can lead to backing up at the SPS which may cause adverse social impacts (odors, overflows, etc.) and damage surrounding cultural areas.	Insufficient sewer pipe capacity can lead to backing up at the SPS which may cause adverse social impacts (odors, overflows, etc.) and damage surrounding cultural areas.	Trenchless re-lining has minimum social and cultural impacts as it is requiring no significant construction activities and is less time consuming.	• General impact due to construction activity which may involve road closure. This can be mitigated by effective communication with the public.
Environment	Insufficient sewer pipe capacity can lead to backing up of the SPS which can cause overflows or bypasses that will directly impact the environment	Insufficient sewer pipe capacity can lead to backing up of the SPS which can cause overflows or bypasses that will directly impact the environment	Trenchless re-lining has minimum environmental impacts as it is requiring no significant construction activities.	• Projects are confined to existing public right- of-ways and/or Municipality properties where impacts to natural environment is minimal. • General construction impacts only.

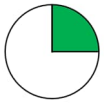
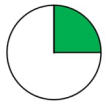
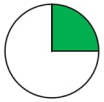
Criteria	Do Nothing	Preventative Maintenance	Rehabilitation	Replacement
Economic	Issues identified may cause additional issues that will have cost impacts in the future.	Lower cost than Rehabilitation and Replacement alternatives. However, since it does not address the issues identified, it can cause additional issues in the future that will have cost impacts.	• Lower cost than replacement but may not provide the increased capacity required to accommodate future flows. • Additionally, it does not solve the issue of the pipe size changing over the course of its length (from 600 to 250 and then to 750). This may cause future issues which will have cost impacts.	• Capital investments required may not justify the project unless costs are shared. High cost implementation to occur over time • Infrastructure-related risks are mitigated with new pipes
Overall Strategy	This does not meet the service level of the sewage collection system infrastructure and is, therefore, not a viable solution.	The implementation of this strategy will require testing the pipe capacity against the values used for the hydraulic model and re-confirming if the capacity deficit has been covered. However, the probability of this alternative addressing the solution is low because the deficit is occuring within the next 5 years. As such, the issue will continue to increase with time.	Since relining of these pipes will further reduce their diameters, this is not a viable solution.	This strategy will require some capital investment; however, it will ensure that all of Strathroy community meets its servicing goals as established for its public assets.
Score				

Table 7-2 - Mount Brydges WWTS Alternative Solutions Evaluation

Criteria	Do Nothing	Limit Growth	Reduce Sewage Flows	Expand WW Treatment Capacity
Description	Implement No Solution	Limit Community Growth to maintain the current capacity of the WWTF	Reduce sewage and I&I flows to maintain current capacity of the WWTF	Upsize the capacity of the WWTF to accommodate growth
Technical	This alternative does not address the problem and opportunity statement	This alternative does not address the problem and opportunity statement and the overall goals of the Municipality	Per the hydraulic model, current I&I flows into the system are not significant. Therefore, this alternative will not cover the WWTF's capacity deficit expected within the next five years	• This will address the capacity deficit expected within the next five years. • A Schedule C Class EA will have to be undertaken, including an Assimilative Capacity study. • The capacity expansion can be undertaken as part of the ongoing Mount Brydges upgrades project.
Social and Cultural	This alternative will result in infrastructure that is incapable of supporting its existing and future serviced population	This alternative may have some social and cultural impacts, such as being unable to benefit from a growing and developing community	This alternative is typically publicized as an environmentally - supportive approach and has, therefore, public and water consumer support.	This alternative will prevent any constraints to Mount Brydges to grow and develop as an urban community. It will also ensure that municipal service level is maintained.
Environment	Undersized wastewater treatment infrastructure will result in overflows and bypassing treatment which causes environmental harm to the downstream natural resource.	This alternative does not impact the environment.	Practicing water conservation and limiting I&I flows into the sanitary collection system are environmentally sustainable and conservational approaches	Ensuring that wastewater treatment systems are sized to prevent overflows and bypasses protect the environment from exposure to untreated sewage

Criteria	Do Nothing	Limit Growth	Reduce Sewage Flows	Expand WW Treatment Capacity
Economic	Cost impacts to recovering environmental and other damages due to undersized infrastructure	Economic opportunities that can be gained from system expansion are not realized	This alternative can require significant reconstruction activities including in-situ repairs or replacement of sewers, thereby having large costs with minimum probability of addressing the capacity deficit	This option can reuse existing infrastructure where capacity is available which allows for some cost savings. Additionally,
Overall Strategy	This alternative does not meet the Municipality's needs	This alternative does not meet the Municipality's needs	Although this alternative can be combined with the recommended alternative as part of the Municipality's environmental goals, it alone cannot meet the Municipality's needs.	This alternative meets the problem and opportunity statements and is recommended
Score				

7.3.2 Alternatives Solutions for Expansion of Wastewater Capacity for Mount Brydges

The recommended strategy based on the evaluation in Table 7-2 is to expand the wastewater treatment capacity to meet the anticipated . The following are the Options for the expansion of Wastewater Capacity for Mount Brydges to provide a capacity of 2,348 m^3/day as anticipated to be required by 2046:

1. Upgrade Existing Mount Brydges WWTF;
2. Upgrade Mill Road Main Sewage Pumping Station and Send Flows to Strathroy WWTF
   2.1. Send all flows to Strathroy WWTF and decommission the existing WWTF,
   2.2. Split flows between current WWTF rated at 825 m^3/day and send additional flows to Strathroy; and
3. Build a New WWTF and Divert Part or all of Flows from Mill Road Main Sewage Pumping Station
   3.1. Send all flows and decommission the existing WWTF,
   3.2. Split flows between current WWTF rated at 825 m^3/day and send additional flows to a new WWTF.

At present, the MCEA Schedule C process will be required to confirm the required type of project to be undertaken for the provision of increased wastewater treatment capacity. This is shown in Figure 7-1.

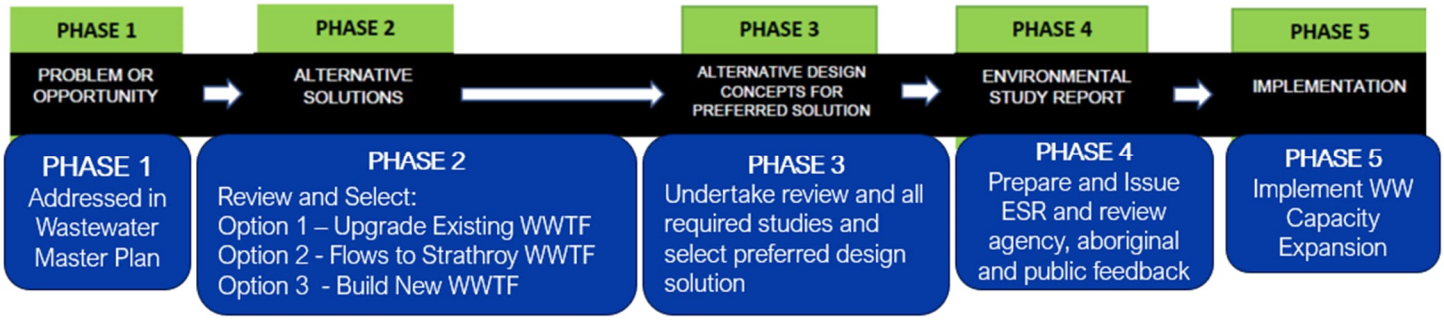


Figure 7-1: MCEA Flow Chart for Wastewater Treatment Capacity Solution in Mount Brydges

Figure 7-2 shows the Options and their general location within the Municipality. Table 7-3 highlights some major considerations that should be addressed as part of Phase 2 of the MCEA Schedule C.

7.4 Expansion of Collection System

In addition to the expansion of the treatment capacity to accommodate growth and the connection of the existing population, the collection system will have to be expanded. The portion of the collection system that is to be expanded to accommodate growth will be paid by the proponents of this growth through Development Charges. The connection of the current unconnected population of 2,264 will have to be funded by the Municipality. There is approximately 11.6 km of new sanitary sewer that will be required to service the existing development areas in Mount Brydges. As part of the sanitary sewer placement to ensure conservative costing, it would be assumed that the Municipality will look to reconstruct the roadways as fully urbanized sections to the current local road standard which would include storm sewers and curbs. The standard road allowance is shown in Figure 7-3.

7.5 Recommendations to Enhance Hydraulic Model

As part of this Master Plan, the Municipality has invested in the development of a sanitary collection hydraulic model. It is recommended that the Municipality consider following updates to the wastewater hydraulic models:

1. Switching from a steady state to an EPS hydraulic model which are valuable for long-term planning, system optimization, and capacity analysis, due to their ability to capture dynamic system behaviour;
2. Using the enhanced RTK Hydrograph method as the RTK hydrograph method offers a more advanced and supports more detailed decision making for infrastructure design and capacity analysis;
3. The Municipality commission a program of manhole and pumping station surveys to gather the missing, incomplete or inaccurate data;
4. Pump stations performance couldn't be verified and it is recommended that flow data be collected through the SCADA system to assist in system management; and
5. Pump performance testing is recommended for all the sewage pumping stations to replace reliance on manufacturer provided pump curves which overestimate pumps performance as it does not consider impact of wear and tear on pumps efficiency.

This could be implemented through an annual investment in model development, field investigation and improvements in data collection through the SCADA system.

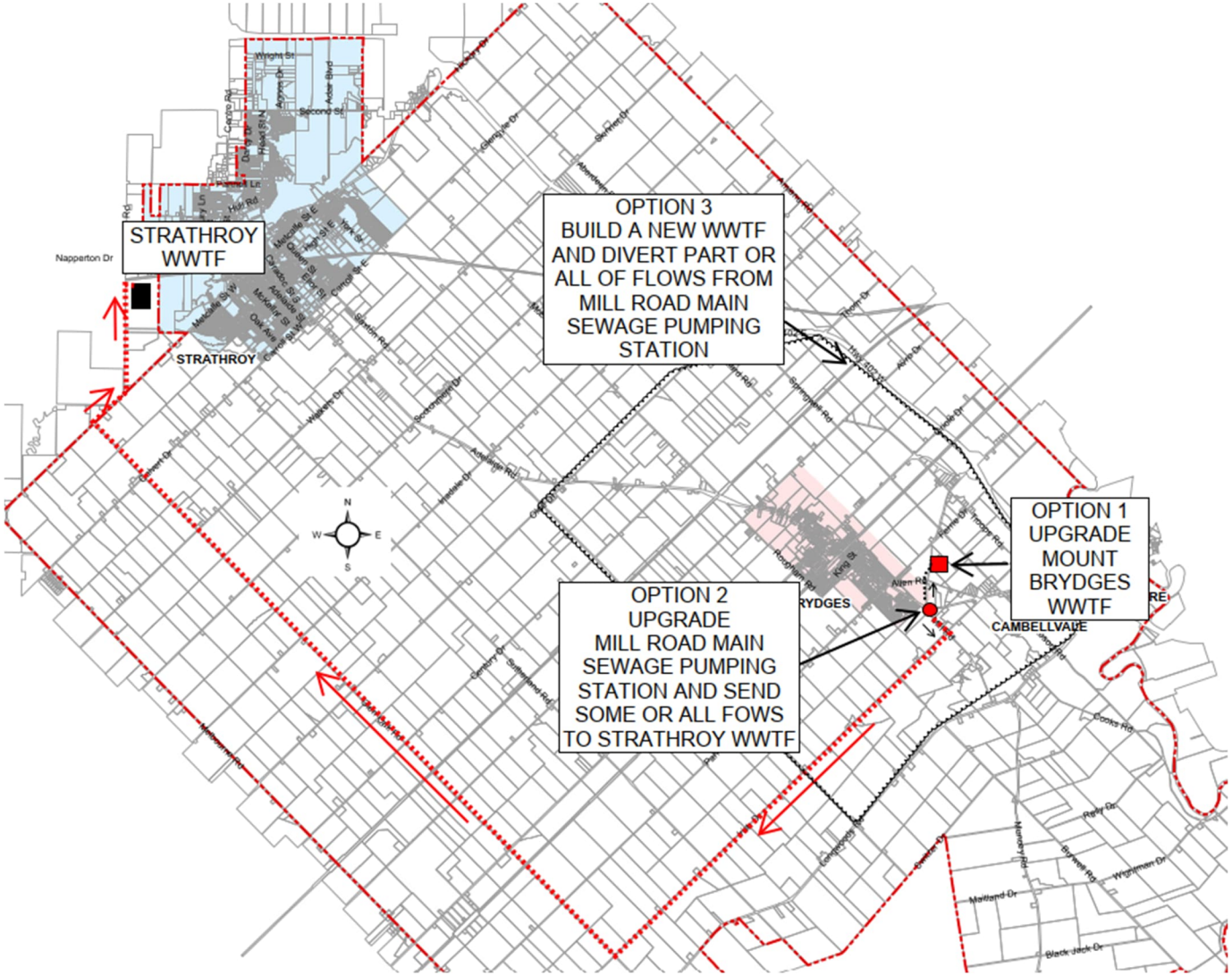


Figure 7-2 - Alternatives Solutions for Expansion of Wastewater Capacity for Mount Brydges

Table 7-3 - MCEA Schedule C Phase 2 Considerations

Option / Criteria	Upgrade Existing Mount Brydges WWTF	Upgrade Mill Road Main Sewage Pumping Station and Send Flows to Strathroy WWTF		Build a New WWTF	
	1 - Upgrade WWTF to 2,348 m^3/day	2a - All flow to Strathroy WWTF	2b - Flow > 825 m^3/day to Strathroy WWTF	3a - All flow to New WWTF	3b - Flow > 825 m^3/day to New WWTF
Technical	No significant increase in complexity of operations from current WWTF (when fix to restore 825 m^3/day is completed).		Higher complexity in operating two outlets for wastewater from community.	No significant increase in complexity of operations from current WWTF (when fix to restore 825 m^3/day is completed).	Highest complexity in operating two WWTF for relatively small community. Initial flows to new WWTF to be small.
Social and Cultural	No significant impact from current WWTF. Site is located on former landfill which has minimum social/cultural value.	No significant impact as it is assumed routing of forcemain will be along existing municipal roads. Only issue may be approval from Adelaide Metcalfe if routing is through this municipality.		Will impact current use of lands and require cultural heritage, and archaeological review. New WWTF may not be popular with stakeholders.	
Environment	Will require ACS for additional flows to existing outfall.	Mitigation required during construction. Potential odour issues along forcemain due to residency time of sewage.		Will require detailed natural studies, ACS for new outfall.	Will require detailed natural studies, ACS for new outfall. Agencies may not want two outfalls.
Economic	Use this as the base costing option to compare capital and O&M costs for other Options.	Will use up capacity of Strathroy WWTF and will increase O&M costs. Impacts for earlier expansion of Strathroy WWTF expected to be post 2046. If routed through Strathroy, there may be costs to upgrades to gravity sewers, forcemains and pumping stations.		Value of existing WWTF is a “throw away cost” and new WWTF more costly than expansion of existing.	Significant operational costs to running two WWTF for relatively small community.

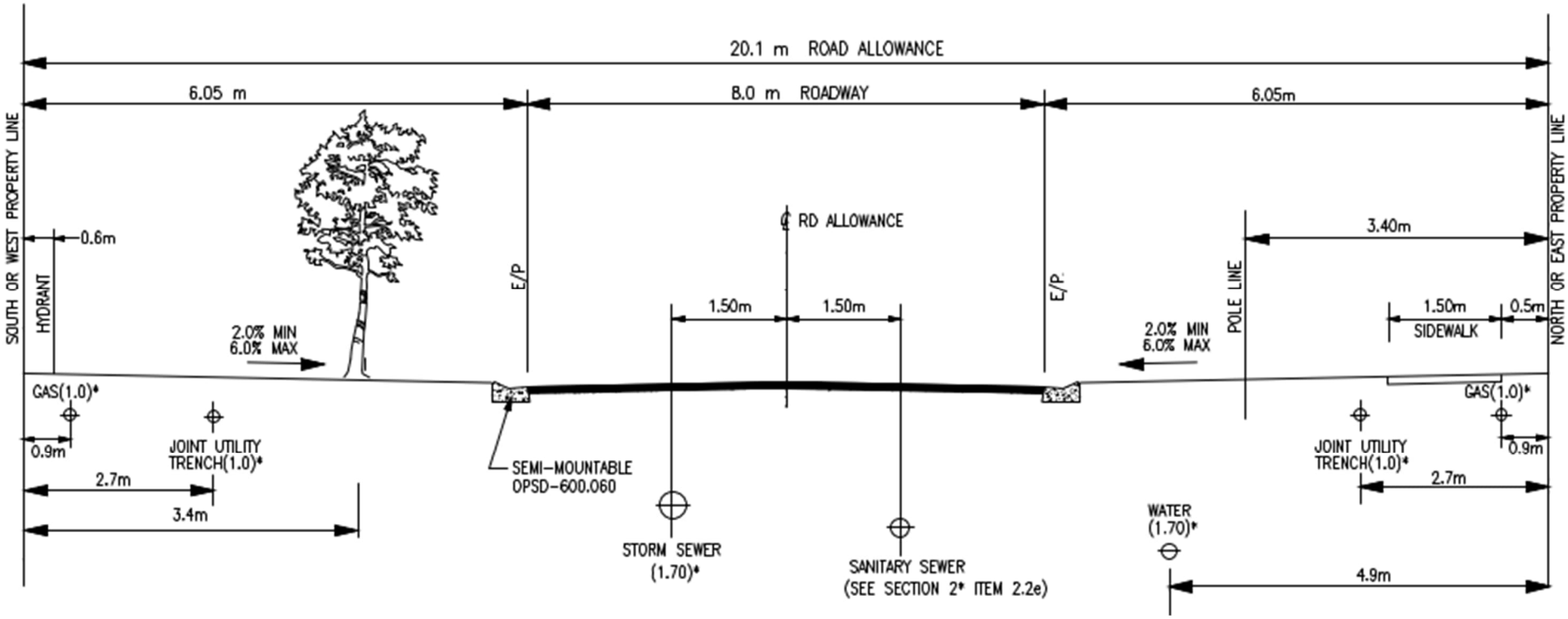


Figure 7-3 - Standard Municipal Utility Layout for 20.1 m Road Allowance per SCSS

8.0 CAPITAL IMPLEMENTATION PLAN

8.1 Development of Multi-year Capital Implementation Plan

ASTM E 2516 (Standard Classification for Cost Estimate Classification System) provides a five-level classification system based on several characteristics, with the primary characteristic being the level of project definition (i.e., percentage of design completion). The ASTM standard, shown in Table 8-1, illustrates the typical accuracy ranges that may be associated with the general building industries.

Table 8-1 – ASTM E2516 Accuracy Range of Cost Opinions for General Building Industries

Cost Estimate Class	Expressed as % of Design Completion	Anticipated Accuracy Range as % of Actual Cost
5	0-2	-30 to +50
4	1-15	-20 to +30
3	10-40	-15 to +20
2	30-70	-10 to +15
1	50-100	-5 to +10

The cost opinions developed in this report would be best described as a **Class 5 Cost Estimate** which is typically used for high level study project.

8.2 Project Fact Sheets

Appendix B contains a Project Fact Sheet detailing the following for each recommended project:

- Project description including general scope of work;
- Project justification including model scenario used;
- Project timeline including identification of the trigger points;
- Project cost opinion including details for permit requirements and hydrogeological/geotechnical studies (if required); and
- Class EA requirements per MCEA process.

The timing provided is based upon the perceived need to undertake work to address growth when it is expected. Additionally, those projects which address other noted deficiencies are timed such that they occur as soon as possible with the intent to undertake them when there are growth related projects underway that are relatively high cost.

It is recommended that the Municipality review the proposed projects identified in this Master Plan and consider them within the context of their current 10-year Capital Plan and Asset Management Plan and update the Capital Plan according to the Municipality's priorities and capacity and those of other stakeholders to fund the required capital works.

8.3 Linear Construction Costs

Based upon data from 2023 linear urban infrastructure renewal projects in Strathroy-Caradoc, Table 8-2 summarizes the costs for infrastructure reconstruction which assumes that a full reconstruction of the roadway will be undertaken and that the existing watermain, sanitary and storm sewer will also be replaced (or added) at the time of this work to ensure that the roadway is up to the current municipal standard. This is shown in Figure 7-3. The Municipality should determine the extent of construction on a case-by-case basis to determine the extent of work required for growth, lifecycle improvement and service level.

Table 8-2 – Estimated 2024 Linear Construction Costs (per m)

Component	Construction	+15% Engineering	% of Total Costs
Total General Tax Base (Storm sewer, road, curb)	$3,108	$3,575	60.4%
Sanitary Sewers (funded through Sewer Rate)	$939	$1,080	18.3%
Watermain (funded through Water Rate)	$1,097	$1,262	21.3%
Total	**$5,145**	**$5,917**	**100.0%**

8.4 Capital Plan Update

8.4.1 Strathroy Wastewater System

The Wastewater Master Plan did not note any wastewater costs to the existing system required to provide for service to 2046.

8.4.2 Mount Brydges WWTS

8.4.2.1 Wastewater Treatment Options

To address the requirement to increase the treatment capacity for Mount Brydges to 2,348 m^3/day as anticipated to be required by 2046, we have provided as the basis for the capital cost projection based on the three options detailed in Section 7. The Cost Opinion for the three options is as follows:

- Option 1 Upgrade Mount Brydges WWTF - $25,768,000;
- Option 2 Send Mount Brydges Flows to Strathroy- $29,067,000; and
- Option 3 New WWTF in Vicinity of Mount Brydges - $45,350,000.

Details are provided in Table 8-3. Option 2 may require upsizing or twinning forcemain from Metcalfe SPS to Strathroy WWTF which will add cost to project. The cost to Mount Brydges consumers related to joining the Strathroy WWTF is not included. In taking Mount Brydges wastewater flows, the Strathroy WWTF's future ADF capacity is projected to be reduced from 2,966 m^3/day to approximately 566 m^3/day in 2046. Option 3 costs will depend on where property is located (length of forcemain) and its value.

For the purpose of high-level Master Plan, Option 1 Upgrade Mount Brydges WWTF is included for budgetary analysis. This is shown in Figure 1.

Table 8-3: Mount Brydges Wastewater Treatment Capacity Options

Item No.	Option 1 Upgrade Mount Brydges WWTF		Option 2 Send Mount Brydges Flows to Strathroy		Option 3 New WWTF in Vicinity of Mount Brydges	
	Item Description	Cost Opinion	Item Description	Cost Opinion	Item Description	Cost Opinion
1	Schedule C MCEA to determine wastewater treatment system	$350,000	Schedule C MCEA to determine wastewater treatment system	$350,000	Schedule C MCEA to determine wastewater treatment system	$350,000
2	Upgrade of Existing WWTF from 825 m^3/day to 2,348 m^3/day	$23,075,000	Main Sewage Pumping Station Upgrades for longer forcemain	$750,000	Main Sewage Pumping Station Upgrades for longer forcemain	$500,000
3			19.57 km Forcemain (300mm) from SPS to Park St	$17,613,000	2 km Forcemain (250mm)	$1,550,000
4			0.34 km Forcemain (300mm) from Clavert Dr to easement along Park St	$823,000	Wastewater Treatment Plant (2,348 m^3/day)	$36,000,000
5			Twinning 600 mm sewer (2500 m)	$3,138,000	Administration Building & Garage	$1,500,000
6			Metcalfe Sewage Pumping Station (from 75 L/s to 186 L/s for pumps) Upgrades	$2,500,000	Decommissioning and Disposal of Existing WWTF	$1,250,000
7			Decommissioning and Disposal of Existing WWTF	$1,250,000		
	Subtotal	$23,425,000	**Subtotal**	$26,424,000	**Subtotal**	**$41,150,000**
	Engineering and Testing	$2,343,000	**Engineering and Testing**	$2,643,000	**Engineering and Testing**	$3,200,000
	Property Acquisition	$0	**Property Acquisition**	$0	**Property Acquisition**	$1,000,000
	Total (Base Estimate)	**$25,768,000**	**Total (Base Estimate)**	**$29,067,000**	**Total (Base Estimate)**	**$45,350,000**

Item No.	Option 1 Upgrade Mount Brydges WWTF		Option 2 Send Mount Brydges Flows to Strathroy		Option 3 New WWTF in Vicinity of Mount Brydges	
	Item Description	Cost Opinion	Item Description	Cost Opinion	Item Description	Cost Opinion
	Total (Low Range)	$18,038,000	Total (Low Range)	$20,347,000	Total (Low Range)	$31,745,000
	Total (High Range)	$38,652,000	Total (High Range)	$43,601,000	Total (High Range)	$68,025,000

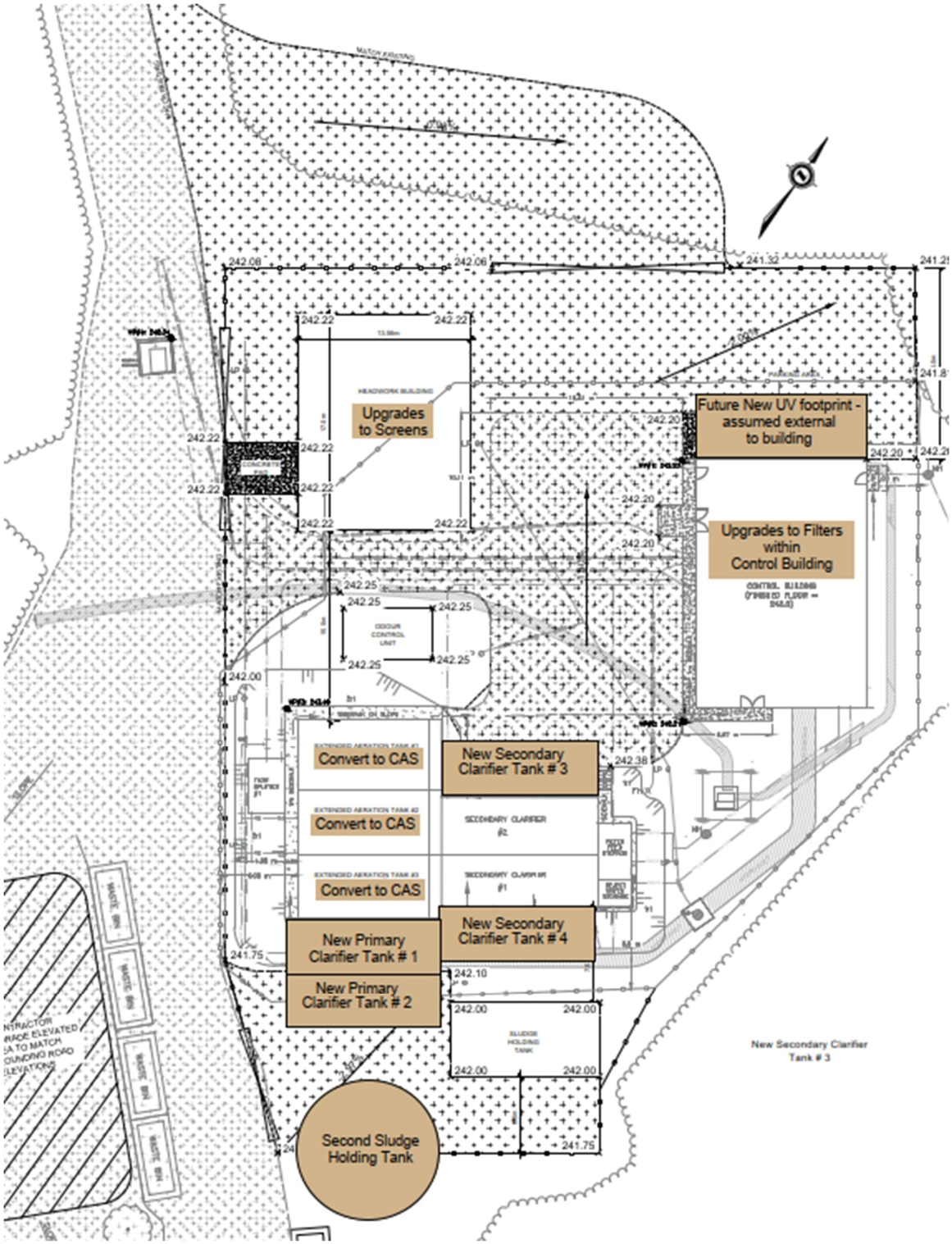


Figure 8-1 - Mount Brydges Treatment Capacity Option 1 Conceptual WWTF Site Layout

8.4.2.2 Expansion of the WWCS

There are three general options with regard to the provision of a collection system to the 11,600 m of existing streets in Mount Brydges. These are as follows:

- Option 1 – Provide all utilities and full urban road/right of way reconstruction per SCSS;
- Option 2 – Retain existing water main but provide all other utilities and full urban road reconstruction per SCSS; and
- Option 3 - Retain existing water main, do not install storm sewer and do a partial road/right of way reconstruction.

Based on the linear costs established in Section 8.2, it would be assumed that the servicing would be undertaken over the period from 2026 to 2046. To provide a cost opinion, it is assumed that the WWCS expansion will include storm sewers and road improvements only. This is detailed in Table 8-4.

Table 8-4: Mount Brydges WWCS Options Costing

Component	Per m Cost	Length (m)	Cost	% of Total Costs
Option 1 All Utilities and Full Urban Road Reconstruction				
Road and Drainage (storm sewer, road, curb)	$3,574	11600	$41,470,000	60.42%
Sanitary Sewers	$1,080	11600	$12,530,000	18.25%
Watermain	$1,262	11600	$14,640,000	21.33%
Total Option 1	**$5,916**		**$68,640,000**	**100.00%**
Option 2 Retain Existing Watermain and Full Urban Road Reconstruction				
Road and Drainage (storm sewer, road, curb)	$3,574	11600	$41,470,000	76.80%
Sanitary Sewers	$1,080	11600	$12,530,000	23.20%
Watermain	$0	11600	$0	0.00%
Total	**$4,654**		**$54,000,000**	**100.00%**
Option 3 Retain Existing Watermain, No Storm Sewer and Partial Road Reconstruction				
Component	Per m Cost	Length		% of Total Costs
Road and Drainage (storm sewer, road, curb)	$2,145	11600	$24,880,000	46.08%
Sanitary Sewers	$1,080	11600	$12,527,000	23.20%
Watermain	$0	11600	$0	0.00%
Total	**$4,654**		**$37,407,000**	100.00%

For the purpose of high-level Master Plan, Option 2 Retain Existing Watermain and Full Urban Road is included for budgetary analysis.

8.4.3 Hydraulic Modeling

It would be recommended that the Municipality provide an allotment of $50,000 annually for the next five-year period ($250,000) to work on enhancement of the wastewater hydraulic model. Additionally, we would recommend that approximately every 10-years the Municipality update the model (total $150,000).

APPENDIX A

Wastewater Hydraulic Model Report

TECHNICAL MEMORANDUM

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APPENDICES

1.0 INTRODUCTION

As a part of the 2025 Water, Wastewater and Stormwater Master Plan (WWSMP) and Pollution Prevention and Control Plan (PPCP), the Municipality of Strathroy-Caradoc (Municipality) has undertaken a review of the existing wastewater collection systems via the use of a hydraulic model to:

- Provide the Municipality with an assessment of its existing wastewater collection systems in terms of its current capacity, and ability to convey future flows;
- Provide the Municipality with an appropriate design criteria and wastewater flow projections over the master planning period for each system;
- Determine future wastewater infrastructure requirements by assessing alternatives (upgrades/diversion/expansion), potential to decommission certain assets, issues, and opportunities;
- Evaluate and recommend preferred alternative and servicing strategy.

The hydraulic models developed for the Strathroy and Mount Brydges wastewater collection systems (WCS) were simulated for various scenarios and time horizons. The model can be used:

- As an analytical tool to identify hydraulic bottlenecks in the collection system and;
- As a planning tool to identify upgrades of the wastewater collection system needed to maintain level of service for existing and future developments.

The models were assessed for impacts due to changes in wastewater flows and/or infrastructure conditions over specific study periods as detailed in this report. The relative severity of this impact provided the necessary information to develop a list of recommendations necessary to continue maintaining the Municipality's level of service.

2.0 HYDRAULIC MODEL DEVELOPMENT

This section presents the development of the hydraulic models used to evaluate the Strathroy and Mount Brydges collection systems. In order to evaluate collection system hydraulics, computerized modeling platform PCSWMM is used to build hydraulic models. Two separate hydraulic models were developed for the Strathroy and Mount Brydges collection systems using steady state method.

2.1 Model Input Parameters

Review of the existing collection system infrastructure (such as pipes, manholes, and pumps) was performed based on the information presented in the GIS database as provided by the Municipality. The background data review included the following items:

- Sewer infrastructure inventory (GIS database including pipes and manholes);
- General GIS data including land parcels;
- Pump station drawings and operation manuals;
- Wastewater treatment plant historical flows;
- Planned subdivisions; and
- Existing and future population projections

The following section will summarize the information collected and reviewed to develop the wastewater hydraulic model for the Strathroy wastewater collection system (SWWCS) and Mount Brydges wastewater collection system (MBWWCS).

2.1.1 Sewer GIS Data

The sewer GIS data provided by the Municipality included the following key information:

- Pipe ID (GIS ID);
- To and From Manhole ID;
- Pipe length;
- Pipe diameter;
- Pipe material;
- Invert information;
- Pipe slope; and
- Installation year

As per the GIS data, there is a total of 89.8 km and 10.9 km of gravity sewer network exists in the Strathroy and Mount Brydges, respectively. These sewers were imported into the PCSWMM hydraulic modeling platform as a first step in the development of Strathroy and

Mount Brydges wastewater models. The sewer data fields in PCSWMM were populated based on the information available in the GIS data. Figure 1 and Figure 2 in Appendix A represents the Strathroy and Mount Brydges Collection System, respectively.

One of the key information for sewers is roughness coefficient. Review of sewer material shows that majority of sewers are PVC, 61% in SWWCS and 83% in MBWWCS. A global Manning's n value of 0.013 was used for both the wastewater systems. Figure 3 and Figure 4 represents the various sewer materials in Strathroy and Mount Brydges Collection System, respectively.

Another key information which is missing from the GIS data is invert elevations. In PCSWMM, each sewer is assigned with two inverts representing flow from upstream to downstream direction. The GIS data for sewers contain only one invert elevation and it has been assumed that it is the invert elevation of the manhole that starts the flow direction (upstream end).

2.1.2 Manhole GIS Data

The manhole GIS data provided by the Municipality included the following key information:

- Manhole ID (GIS ID);
- X and Y Coordinates;
- Location;
- Installation year.

There are 1,236 manholes in SWWCS and 145 manholes in MBWWCS as per the GIS data. These manholes were imported into the PCSWMM for the Strathroy and Mount Brydges wastewater models.

2.1.3 Sewage Pumping Station Data

The Strathroy wastewater collection system consists of ten (10) sewage pumping stations (SPS). Out of ten, two pumping stations service the majority of the sanitary drainage areas. Albert Street SPS and Metcalfe Street SPS convey all of the wastewater from the Strathroy collection system to the Strathroy Sewage Treatment Plant. The remaining eight (8) sewage pumping stations are secondary, discharging to the existing sanitary sewers.

The Mount Brydges wastewater collection system contain two (2) sewage pumping stations. The Northwest SPS is located on Lions Park Drive. This SPS receives flows from the north and west of the Canadian National Railway (CNR) which then discharges to an existing sanitary sewer, south of CNR which flows to the Main SPS. The main SPS is located

at the intersection of Adelaide Road and Mill Road. The Main SPS receives sewage from the south area in addition to the flows transferred by the Northwest SPS. The main SPS then conveys the entire wastewater to the Mount Brydges sewage treatment plant.

All the sewage pumping stations were presented in the model. The crucial information required to model pumping stations included wet well dimension, pump curve, pump set points, invert elevations, forcemain size etc. This information was extracted from the SPS operations and maintenance manuals and design drawings. For the secondary pumping stations, some of this information was not available and hence it was assumed. RVA contacted pump supplier to obtain some of the missing pump curve information.

Out of nine (9) sewage pumping stations in Strathroy:

- Pump curve was provided by the Municipality for three (3) pumping stations: Albert St SPS, Ewart St SPS, and Park St SPS;
- Pump curve was obtained from supplier for three (3) pumping stations: Metcalfe St SPS, McNab St SPS, and High St SPS;
- Pump curve was not available and assumed for three (3) pumping stations: Arnella St SPS, Bella St SPS, and Mill Pond SPS.

Pump curve information for both sewage pumping stations in Mount Brydges were provided by the Municipality and used in the model.

2.1.4 Model Data Discrepancy and Rectification Strategy

The initial wastewater model for the Strathroy and Mount Brydges consists of gravity sewers, manholes, SPS, and forcemains imported from the GIS data. RVA performed data quality reviews on both the models and identified following data discrepancies.

- Rim Elevations:
  - Rim/ground elevation is one of the crucial information in presenting manholes in the model and this information was not provided in the GIS data. The ground elevation for all the manholes in SWWCS and MBWWCS were established from the Digital Elevation Model (DEM). The Southwestern Ontario Orthophotography Project (SWOOP) 2015 Digital Elevation Model (DEM) is a 2m raster elevation product that represents a generalized surface and ground features. This DEM was used to extract ground elevations at each manhole in both the wastewater systems.
- Missing Invert Elevations:
  - There were about 50 sewers in the models with missing invert elevations. The invert elevations are crucial in determining the sanitary flow directions within the model. The missing invert elevations were estimated by using following approaches:
    - Using Pipe Slope – The sewer GIS data received includes slope for each sewer segment. The missing inverts were calculated based on the sewer slope from GIS data, if available.
    - Using Design Standards – In case when invert elevations and slope, both were missing from the GIS data, design standards were used. As per the servicing standards (October 2021), a slope of 0.35% was assumed to calculate the missing invert elevations.
- Incorrect Invert Elevations:
  - The wastewater collection is a gravity system where sewage flows by gravity to the pumping station. The sanitary sewers are designed to facilitate the gravity flow. PCSWMM's in-built data validation tool was used to identify incorrect invert elevations resulting in negative slopes for the sewers. In SWWCS, around 105 locations were identified with negative sewer slopes. The inverts of these sewers were updated based on the slope in GIS, if available. In absence of slope, inverts were estimated based on available upstream and downstream inverts or by using interpolation to facilitate the gravity flow.

Figure 5 represents the sewers with invert discrepancy identified in the Strathroy wastewater collection system.

2.2 Subcatchment Delineation

In a wastewater hydraulic model, subcatchment is used to represent the sanitary population-based flows, groundwater infiltration, and rainfall-derived inflow and infiltration. The contributing area of the subcatchment includes land use areas and roads.

Sanitary subcatchments were delineated on a manhole-to-manhole basis in a GIS software. A total of 790 subcatchments for Strathroy and 118 subcatchments for Mount Brydges were delineated based on the received parcel layer to allocate the flows to the appropriate sewer segments. The subcatchment boundaries are generally aligned with the parcel lot boundaries. The gross area of the subcatchment included the area of the residential/ non-residential parcel, green areas, and roads.

The inflow and infiltration are calculated from the contributing area of each subcatchment. The contributing area was estimated by subtracting approximate green areas from the gross area of each subcatchment. Green areas in each subcatchment were assessed based on the aerial base map for the study area. The contributing area of the subcatchment included the area of the residential/ non-residential parcel, and the roads if any.

2.3 Wastewater Flow Estimation and Allocation

2.3.1 Baseline Wastewater Flows

The base wastewater flow generated by population was estimated using the historical average daily flows (ADF) provided in the Annual Wastewater Reports and using the billing records. Billing records provided by the Municipality comprised of water usage data of individual customers for Strathroy and Mount Brydges water distribution systems. The data covered the last six (6) months in 2022 and first six (6) months in 2023. To obtain the average daily billed usage, water usage for each customer account was added to obtain the total billed water consumption and then divided by the total number of usage days.

Table 2-1 provides the results.

Table 2-1: Total and Average Annual Water Consumption

Year	Month	Annual Billed Consumption (m^3)	Average Daily Billed Consumption (m^3/day)	Average Annual Billed Consumption (L/s)
Strathroy				
2022	Jul - Dec	898,462	4,883	57
2023	Jan - Jun	677,257	3,742	43
Mount Brydges				
2022	Jul - Dec	173,883	945	11
2023	Jan - Jun	145,213	789	9

The average daily billed consumption for each customer account was used to estimate the average wastewater flow. It was assumed that 80% of the average daily billed consumption of each customer converts to wastewater. This wastewater represents the dry weather flow (DWF) in the model.

The billing records provided by the Municipality were in excel format with no spatial information. In order to estimate wastewater flow generated by each subcatchment, RVA geocoded each customer account. By using ArcGIS software, an analysis was conducted to spatially join each customer to their corresponding subcatchment. Furthermore, contributing area of each subcatchment was used to calculate inflow and infiltration generated by the subcatchment. The DWF and inflow and infiltration together represent the wet weather flow (WWF) for each subcatchment in the model.

2.3.2 Infiltration Allowance

Two separate model networks representing DWF and WWF for Strathroy and Mount Brydges were prepared. The estimated DWF and WWF was allocated to the most upstream manhole in each subcatchment.

The SC Design Standards mentions infiltration allowance of 0.08 L/s/ha. RVA performed a comparison of infiltration allowances of various municipalities/regions in the surrounding areas and noticed that the municipalities current infiltration allowance is on lower side. **Table 4-1** summarizes infiltration allowances for some of the surrounding municipalities and 0.26 L/s/ha was a common value used for infiltration allowance. Based on this analysis, a conservative approach was considered, and an infiltration allowance of 0.26 L/s/ha has been used to calculate the inflow and infiltration from the existing as well as planned developments to evaluate the performance of the existing collection systems.

Table 2-2: Infiltration Allowance Summary

	City of London	City of Markham	City of Toronto	Durham Region	MECP	Peel Region
Infiltration Allowance* (L/s/ha)	0.1	0.26	0.26	0.26	0.28	0.26

*Values are based on design standards from respective municipalities/regions

The evaluation of the performance of WWCS for each of the scenarios established was conducted by performing steady-state model simulations. The hydraulic conditions of the collection system under all scenarios were analyzed and summarized in the following subsections.

3.0 WASTEWATER MODEL CALIBRATION

The hydraulic model is an analytical tool to identify capacity constraints within the system. The calibration of the hydraulic model is integral to increase the ability of the model to accurately mimic actual field conditions and allow for reliable hydraulic analysis results. This section presents the flow monitoring data analysis and calibration methodology.

3.1 Flow Monitoring Data Analysis

A sanitary flow monitoring program was conducted consisting of the installation and maintenance of 7 flow monitors at strategic locations in the wastewater collection system of Strathroy and Mount Brydges. The flow monitoring period was from September to early January 2024. Over the course of the monitoring period, flow, depth and velocity measurements were recorded at 5-minute interval at each location.

The purpose of this monitoring program was to collect data for use in calibration of the newly developed wastewater hydraulic model. Figure 6 and Figure 7 presents the locations of each flow monitor installed in Strathroy and Mount Brydges, respectively. Table 3-1 and

Table 3-2 presents information of three largest rain events in terms of peak RDII captured during the monitoring period for each flow monitor in Strathroy and Mount Brydges, respectively.

A rain event occurred on September 17, 2023 shows a huge RDII value for flow monitors 1, 2, and 5 as highlighted in Table 3-1. This event is compared with the other rain events of similar duration, cumulative rainfall, and intensity shows that the RDII value is at least 2 to 5 times higher than the corresponding RDII value. Furthermore, an Intensity Duration Frequency (IDF) curve analysis was performed on the September 17, 2023 storm event and was ranked as less than 2-year return frequency as per the open data available (climatedata.ca) for a neighboring rain gauge station. For a rain event with return frequency less than 2-year, the observed RDII value of 49.4 L/s is very high. The Inflow and Infiltration rate is calculated based on the peak RDII and net contributing area for the September 17, 2023 event is 0.66 L/s/ha for flow monitoring location 1 which is significantly higher than the Municipality's standard infiltration allowance of 0.08 L/s/ha. Based on this analysis, the rainfall event recorded on September 17, 2023 is excluded from the further analysis.

Table 3-1: Flow Monitoring Data Analysis - Strathroy

Monitor ID	Event Start	Event End	Duration (hr)	Total Rainfall (mm)	Intensity (mm/hr)	Maximum Peak RDII (L/s)	Net Area (ha)	I & I (L/s/ha)
SC_FM_1	9/17/2023 13:20	9/17/2023 14:35	1.3	9.1	7.0	49.49	75.43	0.66
	11/8/2023 12:05	11/8/2023 23:55	11.8	13.7	1.2	10.49		0.14
	11/2/2023 9:35	11/2/2023 16:05	6.5	13.3	2.0	7.39		0.10
	10/25/2023 17:40	10/25/2023 19:35	1.9	10.9	5.7	10.40		0.14
SC_FM_2	9/17/2023 13:20	9/17/2023 14:35	1.3	9.1	7.3	54.48	125.65	0.43
	11/8/2023 12:05	11/8/2023 23:55	11.8	13.7	1.2	25.56		0.20
	11/2/2023 9:35	11/2/2023 16:05	6.5	13.3	2.0	8.81		0.07
	10/25/2023 17:40	10/25/2023 19:35	1.9	10.9	5.7	24.88		0.20
SC_FM_3	10/25/2023 17:40	10/25/2023 19:35	1.9	10.9	5.7	11.11	105.29	0.11
	11/8/2023 12:05	11/8/2023 23:55	11.8	13.7	1.2	7.99		0.08
	11/21/2023 6:45	11/21/2023 20:55	14.2	10.0	0.7	6.52		0.06
SC_FM_4	11/8/2023 12:05	11/8/2023 23:55	11.8	13.7	1.2	3.69	53.33	0.07
	11/2/2023 9:35	11/2/2023 16:05	6.5	13.3	2.0	3.54		0.07
	10/25/2023 17:40	10/25/2023 19:35	1.9	10.9	5.7	3.07		0.06
SC_FM_5	9/17/2023 13:20	9/17/2023 14:35	1.3	9.1	7.3	23.02	149.68	0.15
	11/8/2023 12:05	11/8/2023 23:55	11.8	13.7	1.2	9.36		0.06
	11/2/2023 9:35	11/2/2023 16:05	6.5	13.3	2.0	9.47		0.06
	10/25/2023 17:40	10/25/2023 19:35	1.9	10.9	5.7	7.40		0.05

Highlighted rain event was excluded from average I & I calculation as explained in Section 3.1.

Table 3-2: Flow Monitoring Data Analysis – Mount Brydges

Monitor ID	Event Start	Event End	Duration (hr)	Total Rainfall (mm)	Intensity (mm/hr)	Maximum Peak RDII (L/s)	Net Area (ha)	I & I (L/s/ha)
SC_FM_3	10/25/2023 17:40	10/25/2023 19:35	1.9	10.9	5.7	11.11	105.29	0.11
	11/8/2023 12:05	11/8/2023 23:55	11.8	13.7	1.2	7.99		0.08
	11/21/2023 6:45	11/21/2023 20:55	14.2	10.0	0.7	6.52		0.06
SC_FM_4	11/8/2023 12:05	11/8/2023 23:55	11.8	13.7	1.2	3.69	53.33	0.07
	11/2/2023 9:35	11/2/2023 16:05	6.5	13.3	2.0	3.54		0.07
	10/25/2023 17:40	10/25/2023 19:35	1.9	10.9	5.7	3.07		0.06

3.2 Dry Weather Flow Calibration

The goal of the dry weather flow calibration was to best represent the wastewater flows generated by the existing population. Various data sources were available to estimate the dry weather flows for the Strathroy. To identify correct source of information to perform dry weather calibration, a comparison analysis was performed among all the data sources as follows:

1. Source 1: Pumping station discharge records for the Albert St SPS and Metcalfe St SPS were available for a period of one week from April 17-23, 2023. These two SPS serves the entire population of Strathroy and the average flow from these two pumping stations was calculated to be 63.6 L/s.
2. Source 2: Monthly effluent data for the Strathroy wastewater treatment plant was available for the year 2022. The average monthly flow for the year 2022 was 4496 m^3/day so the average daily flow was calculated to be 52 L/s.
3. Source 3: The flow monitoring data collected as part of this study was analysed to estimate the average flows from all the five (5) flow monitoring locations. The average flow based on flow monitoring data was calculated to be 79.5 L/s.
4. Source 4: Municipality provided billing records for the last six (6) months of 2022 and the first six (6) months of 2023. Average daily billed water usage for each customer was calculated using the billing records. For the purpose of estimating the wastewater generated by each customer, it was assumed that 80% of the average daily billed consumption will convert into wastewater. This average wastewater flow was calculated to be 35.8 L/s.

On comparing all the sources, it was concluded that, the average daily flow obtained from the flow monitoring data was more reliable as it was collected during the field investigation for this study. For the dry weather calibration purposes, average daily flow estimated using flow monitoring data was used for the Strathroy and Mount Brydges.

As part of the dry weather calibration, wastewater calculated from billing records assuming 80% return rate was upscaled to match the average DWF estimated from the flow monitoring data for each flow monitoring location. As shown in Table 3-3, total dry weather flow for the Strathroy is 79.5 L/s. Flow monitor MB_FM_2 is downstream of MB_FM_1 so the total dry weather flow for the Mount Brydges is 6.67 L/s.

Table 3-3: Flow Summary for the Dry Weather Calibration

Monitor ID	DWF from Billing Records*	Average DWF from Flow Monitoring Data(L/s)
Strathroy		
SC_FM_1	4.51	9.65
SC_FM_2	8.24	14.35
SC_FM_3	6.39	12.87
SC_FM_4	2.98	7.47
SC_FM_5	13.53	35.15
Total	**35.83**	**79.5**
Mount Brydges		
MB_FM_1	2.08	2.53
MB_FM_2	3.44	6.67

*Assuming 80% of average daily billed usage will convert to wastewater

3.3 Wet Weather Flow Calibration

Wet weather flow in the sanitary system is the combination of the typical dry weather flow and the rainfall derived inflow and infiltration (RDII). The peak RDII rate is a measure of the peak flow response based on the maximum flow during a 5-minute time interval in the event. The three rain events recorded at each flow monitor in terms of highest RDII values for the Strathroy and Mount Brydges are summarized in Table 3-4.

The peak RDII was used to calculate inflow and infiltration rate for each flow monitoring area by dividing with net contributing area. The net contributing area for each flow monitor was estimated by subtracting approximate green areas from the gross area. Furthermore, an average rate of inflow and infiltration from three rain events was calculated for each flow monitor in Strathroy and Mount Brydges. As part of the wet weather calibration, infiltration allowance based on the calculated average inflow and infiltration rate and net contributing area of each subcatchment was calculated and allocated to the most upstream manhole in the corresponding subcatchment.

Table 3-4: Average Inflow and Infiltration Rate Summary

Flow Monitor ID	Event Start	Event End	Maximum Peak RDII (L/s)	Net Area (ha)	I & I (L/s/ha)	Average I & I (L/s/ha)
Strathroy						
SC_FM_1	11/8/2023 12:05	11/8/2023 23:55	10.49	75.43	0.14	0.13
	11/2/2023 9:35	11/2/2023 16:05	7.39		0.10	
	10/25/2023 17:40	10/25/2023 19:35	10.40		0.14	
SC_FM_2	11/8/2023 12:05	11/8/2023 23:55	25.56	125.65	0.20	0.16
	11/2/2023 9:35	11/2/2023 16:05	8.81		0.07	
	10/25/2023 17:40	10/25/2023 19:35	24.88		0.20	
SC_FM_3	10/25/2023 17:40	10/25/2023 19:35	11.11	105.29	0.11	0.08
	11/8/2023 12:05	11/8/2023 23:55	7.99		0.08	
	11/21/2023 6:45	11/21/2023 20:55	6.52		0.06	
SC_FM_4	11/8/2023 12:05	11/8/2023 23:55	3.69	53.33	0.07	0.06
	11/2/2023 9:35	11/2/2023 16:05	3.54		0.07	
	10/25/2023 17:40	10/25/2023 19:35	3.07		0.06	
SC_FM_5	11/8/2023 12:05	11/8/2023 23:55	9.36	149.68	0.06	0.06
	11/2/2023 9:35	11/2/2023 16:05	9.47		0.06	
	10/25/2023 17:40	10/25/2023 19:35	7.40		0.05	
Mount Brydges						
MB_FM_1	12/1/2023 6:35	12/1/2023 15:50	2.96	34.37	0.09	0.06
	10/25/2023 18:15	10/26/2023 9:15	1.83		0.05	
	10/19/2023 19:05	10/19/2023 23:10	1.51		0.04	
MB_FM_2	10/25/2023 18:15	10/26/2023 9:15	4.37	63.78	0.07	0.05
	12/1/2023 6:35	12/1/2023 15:50	2.96		0.05	
	10/19/2023 19:05	10/19/2023 23:10	2.94		0.05	

4.0 WASTEWATER COLLECTION SYSTEM ANALYSIS

4.1 Overview

The calibrated hydraulic models were used to determine the wastewater collection system performance under the following conditions:

- 2024 (existing), 2029, 2041 and 2046 (ultimate) for Strathroy-Caradoc and;
- 2024 (existing), 2032 and 2046 (ultimate) for Mt. Brydges.

For each of the time horizons stated above, modeling scenarios were created to evaluate the performance of the WWCS and identify potential constraint areas that may have issues related to pipe capacity. It may be noted that the system analysis has considered sanitary system only. It was assumed that any combined sewers exists within the system, Municipality would consider sewer separation to direct all surface flows to the new storm sewer.

The Strathroy-Caradoc Servicing Standards (October 2021) mentions infiltration allowance of 0.08 L/s/ha. RVA performed a comparison of infiltration allowances of various municipalities/regions in the surrounding areas and noticed that the municipalities current infiltration allowance is on lower side. Table 4-1 summarizes infiltration allowances for some of the surrounding municipalities and 0.26 L/s/ha was a common value used for infiltration allowance. Based on this analysis, a conservative approach was considered, and an infiltration allowance of 0.26 L/s/ha has been used to calculate the inflow and infiltration from the existing as well as planned developments to evaluate the performance of the existing collection systems.

Table 4-1: Infiltration Allowance Summary

	City of London	City of Markham	City of Toronto	Durham Region	MECP	Peel Region
Infiltration Allowance* (L/s/ha)	0.1	0.26	0.26	0.26	0.28	0.26

*Values are based on design standards from respective municipalities/regions

The evaluation of the performance of WWCS for each of the scenarios established was conducted by performing steady-state model simulations. The hydraulic conditions of the collection system under all scenarios were analyzed and summarized in the following subsections.

4.2 Strathroy Wastewater Collection System

4.2.1 Existing Condition

The existing condition scenario for the Strathroy WWCS was developed using the water billing records assuming 80% of the average water usage will turn to wastewater. As explained in Section 3.2, these flows were upscaled as part of dry weather flow calibration based on the flow monitoring data analysis. A total dry weather flow allocated in the existing condition scenario was 79.7 L/s. Existing condition wet weather flow was added by estimating the inflow and infiltration based on 0.26 L/s/ha for all the existing land uses within the study area. A total wet weather flow allocated in the existing condition scenario was 213.2 L/s.

Based on the model simulation results and hydraulic analysis, the Municipality's collection system for Strathroy has sufficient capacity to convey wet weather flows under the existing conditions. **Figure 8** represents the capacities of the WWCS under existing conditions.

4.2.2 Future Condition

A list of residential and industrial development proposals as of 2023 was provided by the municipality. The proposals were categorized based on their application phase as follows:

- Proposed Developments (No applications submitted)
- Site Plan Approval Stage
- Zoning by-law Amendments Stage
- Subdivision (Permitting Stage)

These committed developments will impact the wastewater flows and reduces the uncommitted or remaining available capacity of the WWCS; therefore, these were incorporated as future condition scenarios in the hydraulic model.

Based on the above categorization, RVA developed the following future scenarios:

Table 4-2: Flow Estimation for Future Scenarios

Time Horizon	Flow Projection
2030	2023 Flows + Flows from Site Plan Approval + Subdivision Stage
2041	2030 Flows + Flows from Proposed Developments + Zoning by-law Amendments Stage
2046	2041 Flows + Flows generated by the projected increase in population until 2046

4.2.2.1 2030 Scenario

Future scenario for 2030 was developed by adding calculated wastewater flows for the proposed developments under category *Site Plan Approval* and *Subdivision* to the existing 2023 flows. The flow calculations are presented in **Table 4-3**.

Table 4-3: Wastewater Flow Estimation for SWWCS – 2030 Scenario

Development	Average Wastewater Flow[1] (L/s)	Peak Wastewater Flow[2] (L/s)	Inflow and Infiltration[3] (L/s)	Total Wastewater Flow (L/s)
100 Second Street	0.29	0.34	0.29	0.63
Darcy Drive	0.59	0.71	0.00	0.71
Strathroy Crossing	0.20	0.24	1.08	1.32
50 Carroll Street	0.33	0.39	0.32	0.71
392 Second Street	0.26	0.31	0.00	0.31
430 Head Street	0.17	0.21	0.20	0.41
Cuddy Farms - Saulsbury Development	3.87	4.65	6.25	10.90
Fieldcrest	2.49	2.99	2.94	5.93
Southgrove Meadows	0.20	0.24	0.00	0.24
Norbec - 990 Wright St.	0.65	2.47	0.65	3.12
Sunslab-990 Wright St.	0.19	0.76	0.19	0.95
Subtotal	9.24	13.31	11.92	25.23
Existing Flows (2023)	-	79.74	133.48	213.22
Total Flows (2030)	**-**	**93.05**	145.4	**238.45**

[1] Average Wastewater Flow calculated using a per capita flow rate of 294 L/cap/day

[2] Harmon Peaking Factor calculated and used was 1.2

[3] Infiltration allowance used was 0.26 L/s/ha

The estimated flows for the future developments identified in the table above were allocated to the nearest manholes connected to the existing sewers since the sewer layout for these developments are not yet available for this analysis.

Based on the results of the hydraulic analysis, the Strathroy's existing collection system is capable of conveying future estimated wet weather flows under the 2030 conditions, except at one location. Model simulation result shows that sewer ST-WW0204 along Head Street

North will exceed 100% of its capacity and needs to be upsized to meet Municipality's level of service criteria.

Figure 9 in Appendix A represents the wastewater collection system performance under 2030 scenario.

4.2.2.2 2041 Scenario

2041 future scenario was developed by adding calculated wastewater flows for all the proposed developments to the existing condition flows. The RLNA study shows a population of 22,900 for the year 2041 which is 161 people more than what all the developments can accommodate. Therefore, the wastewater flow for these additional 161 people have been allocated to the south area of Strathroy since that area has more room for development per the 2023 Strathroy Caradoc Official Plan. The flow calculations are presented in Table 4-4.

Table 4-4: Wastewater Flow Estimation for SWWCS – 2041 Scenario

Development	Average Wastewater Flow[1] (L/s)	Peak Wastewater Flow[2] (L/s)	Inflow and Infiltration[3] (L/s)	Total Wastewater Flow (L/s)
Site plan approval and Subdivision	9.23	13.31	11.92	25.23
Darcy Drive	0.65	0.77	0.00	0.77
101 Hull Road	0.17	0.21	0.24	0.44
24621 Adelaide Road	1.64	1.96	2.21	4.17
390 Second Street	2.35	2.82	4.22	7.04
24648 Adelaide Road	0.29	0.35	0.00	0.35
360 Carroll Road	1.19	1.43	1.46	2.89
Buchanan Crossings	2.78	3.33	0.00	3.33
24633 Adelaide Road	0.38	0.46	0.49	0.95
599 Albert Street	0.46	0.56	0.00	0.56
251 Burns Street	0.20	0.24	0.18	0.42
Additional 161 people to match 2041 projection	0.55	0.66	-	0.66
Subtotal	19.89	26.10	20.72	46.82
Existing Flows (2023)	-	79.74	133.48	213.22
Total Flows (2041)	**-**	**105.84**	154.20	**260.04**

[1] Average Wastewater Flow calculated using a per capita flow rate of 294 L/cap/day

[2] Harmon Peaking Factor calculated and used was 1.2

[3] Infiltration allowance used was 0.26 L/s/ha

The estimated wastewater flows from the above table were allocated to the nearest manholes connected to the existing collection system.

Based on the results of the hydraulic analysis, the Strathroy's existing collection system is capable of conveying future estimated wet weather flows under the 2041 conditions, except at one location. Model simulation result shows that sewers ST-WW0203 and ST-WW0204 along Head Street North will exceed 100% of their capacities and needs to be upsized to meet Municipality's level of service criteria.

Figure 10 in Appendix A represents the wastewater collection system performance under 2041 scenario.

4.2.2.3 2046 Scenario (Ultimate Condition)

The RLNA study provides a 2046 population of 23,900 for Strathroy which is 1161 people more than what all the developments can accommodate. Therefore, the wastewater flow for these additional 1161 people have been allocated to the south area of Strathroy. The calculated wastewater flows for this population are presented in Table 4-5.

Table 4-5: Wastewater Flow Estimation for SWWCS – 2046 Scenario

Development	Average Wastewater Flow[1] (L/s)	Peak Wastewater Flow[2] (L/s)	Inflow and Infiltration[3] (L/s)	Total Wastewater Flow (L/s)
Flows from committed developments	19.89	26.10	20.72	46.82
Additional 1161 people to match 2046 projection	3.95	4.74	-	4.74
Subtotal	23.84	30.84	20.72	51.56
Existing Flows (2023)	-	79.74	133.48	213.22
Total Flows (2046)	**-**	**110.58**	154.20	**264.78**

[1] Average Wastewater Flow calculated using a per capita flow rate of 294 L/cap/day

[2] Harmon Peaking Factor calculated and used was 1.2

[3] Infiltration allowance used was 0.26 L/s/ha

Based on the results of the hydraulic analysis, the Strathroy's existing collection system is capable of conveying future estimated wet weather flows under the 2046 conditions, except

at one location. Model simulation result shows that sewers ST-WW0203 and ST-WW0204 along Head Street North will exceed 100% of their capacities and needs to be upsized to meet Municipality's level of service criteria.

Figure 11 in Appendix A represents the wastewater collection system performance under 2046 scenario.

4.3 Mount Brydges Wastewater Collection System

4.3.1 Existing Condition

The existing condition scenario for the Mount Brydges WWCS was developed using the water billing records assuming 80% of the average water usage will turn to wastewater. As explained in Section 3.2, these flows were upscaled as part of dry weather flow calibration based on the flow monitoring data analysis. A total dry weather flow allocated in the existing condition scenario was 6.67 L/s. Existing condition wet weather flow was added by estimating the inflow and infiltration based on 0.26 L/s/ha for all the existing land uses within the study area. A total wet weather flow allocated in the existing condition scenario was 23.25 L/s.

Based on the model simulation results and hydraulic analysis, the Municipality's collection system for Mount Brydges has sufficient capacity to convey wet weather flows under existing conditions. Figure 12 in Appendix A represents the capacities of the WWCS under existing conditions.

4.3.2 Future Condition

A list of residential development proposals in Mount Brydges as of 2023 was provided by the municipality. These committed developments will impact the wastewater flows and reduces the uncommitted or remaining available capacity of the WWCS; therefore, these were incorporated as future condition scenarios in the hydraulic model.

4.3.2.1 2032 Scenario

Future scenario for 2032 was developed by adding calculated wastewater flows for all the proposed developments to the existing 2023 flows. The RLNA study shows a population of 5,666 for the year 2032 which is 88 people more than what all the developments can accommodate. Therefore, the wastewater flow as apportioned to an area on the boundary of the current settlement area.

The flow calculations are presented in Table 4-6.

Table 4-6: Wastewater Flow Estimation for MBWWCS – 2032 Scenario

Development	Average Wastewater Flow[1] (L/s)	Peak Wastewater Flow[2] (L/s)	Inflow and Infiltration[3] (L/s)	Total Wastewater Flow (L/s)
22182 Adelaide Road	0.27	0.35	0.32	0.67
Falconbridge	1.85	2.41	2.27	4.67
Falconbridge West	2.65	3.45	3.48	6.93
Edgewood	0.71	0.92	3.67	4.59
Forest View	1.43	1.86	3.93	5.79
Additional 88 people to match 2032 projection	0.31	0.41	-	0.41
Subtotal	7.22	9.40	13.67	23.06
Existing Flows (2023)	-	6.67	16.58	23.25
Total Flows (2032)	**-**	**16.07**	30.25	**46.31**

[1] Average Wastewater Flow calculated using a per capita flow rate of 307 L/cap/day

[2] Harmon Peaking Factor calculated and used was 1.3

[3] Infiltration allowance used was 0.26 L/s/ha

The estimated wastewater flows from the above table were allocated to the nearest manholes connected to the existing collection system.

Based on the model simulation results and hydraulic analysis, the Municipality's collection system for Mount Brydges has sufficient capacity for conveying future estimated wet weather flows under the 2032 conditions.

Figure 13 in Appendix A represents the wastewater collection system performance under 2032 scenario.

4.3.2.2 2046 Scenario (Ultimate Condition)

The RLNA study provides a 2046 population of 7,500 for Mount Brydges which is 1483 people more than what all the developments can accommodate. Therefore, the wastewater flow for these additional 1,483 people have been allocated to the wastewater flow as to an areas on the boundary of the current settlement area. The calculated wastewater flows for this population are presented in Table 4-7.

Table 4-7: Wastewater Flow Estimation for MBWWCS – 2046 Scenario

Development	Average Wastewater Flow[1] (L/s)	Peak Wastewater Flow[2] (L/s)	Inflow and Infiltration[3] (L/s)	Total Wastewater Flow (L/s)
Flows from committed developments	7.22	9.40	13.67	23.06
Additional 1483 people to match 2046 projection	5.27	6.85	-	6.85
Subtotal	12.49	16.25	13.67	29.91
Existing Flows (2023)	-	6.67	16.58	23.25
Total Flows (2046)	**-**	**22.92**	30.25	**53.16**

[1] Average Wastewater Flow calculated using a per capita flow rate of 294 L/cap/day

[2] Harmon Peaking Factor calculated and used was 1.2

[3] Infiltration allowance used was 0.26 L/s/ha

The model simulation results, and hydraulic analysis shows that the Mount Brydges collection system has sufficient capacity to convey future estimated wet weather flows under the 2046 conditions.

Figure 14 in Appendix A represents the wastewater collection system performance under 2046 scenario.

5.0 SUMMARY AND RECOMMENDATIONS

5.1 Summary

As part of the Master Plan Study,

- A background review of the existing collection system infrastructure information provided by the Municipality was performed. The background data review included sewer and manhole inventory, other GIS data including land parcels, pumping station drawings and operations manual, treatment plant historical flows, and future developments for the planning horizons.
- Separate wastewater collection system models were developed for the Strathroy and Mount Brydges by importing GIS data.
- A quality review was performed on the imported sewers and manholes and some data discrepancies were identified. A rectification strategy was developed for each of the identified discrepancy.
- Sanitary subcatchments were delineated on a manhole-to-manhole basis in a GIS software. A total of 790 subcatchments for Strathroy and 118 subcatchments for Mount Brydges were delineated based on the received parcel layer to allocate the flows to the appropriate sewer segments.
- Dry weather flows for both the collection systems were estimated by using billing records provided by the Municipality. It was assumed that 80% of the average daily billed consumption of each customer converts to wastewater.
- Contributing area of each subcatchment was used to calculate inflow and infiltration generated by the subcatchment. The dry weather flow and inflow and infiltration together represented the wet weather flow for each subcatchment in the models.
- A sanitary flow monitoring program was implemented, which comprised of the installation of seven (7) flow monitors in the wastewater collection system of Strathroy and Mount Brydges. The flow monitoring period was from September to early January 2024.
- Dry weather flow calibration was preformed to best represent the wastewater flows generated by the existing population. A comparison analysis was performed on various sources of information of flows and concluded that the flow monitoring data is more reliable. As part of the dry weather calibration, wastewater calculated from billing records assuming 80% return rate was upscaled to match the average dry weather flow estimated from the flow monitoring data for each flow monitoring location in the Strathroy and Mount Brydges.

- A flow monitoring data analysis was performed to estimate average rate of inflow and infiltration for each flow monitor in Strathroy and Mount Brydges. As part of the wet weather calibration, infiltration allowance based on the calculated average inflow and infiltration rate and net contributing area of each subcatchment was calculated and allocated to the most upstream manhole in the corresponding subcatchment.
- The Strathroy-Caradoc Servicing Standards (October 2021) mentions infiltration allowance of 0.08 L/s/ha. RVA performed a comparison of infiltration allowances of various municipalities/regions in the surrounding areas and noticed that the municipalities current infiltration allowance is on lower side.
- Based on this analysis, a conservative approach was considered, and an infiltration allowance of 0.26 L/s/ha has been used to calculate the inflow and infiltration from the existing as well as planned developments to evaluate the performance of the existing collection systems.
- Future flows were estimated based on the list of residential and industrial development proposals as of 2023 provided by the municipality.
- The calibrated hydraulic models were then utilized to evaluate system's capacity under 2024 (existing), 2029, 2041 and 2046 (ultimate) for Strathroy and 2024 (existing), 2032 and 2046 (ultimate) for Mt. Brydges.
- Based on the results of the hydraulic analysis, the Strathroy's existing collection system is capable of conveying future estimated wet weather flows under the 2046 conditions, except at one location.
- The model simulation results, and hydraulic analysis shows that the Mount Brydges collection system has sufficient capacity to convey future estimated wet weather flows under the 2046 conditions.
- The hydraulic modeling results shows that, all the sewage pumping stations in Strathroy and Mount Brydges are adequate to handle ultimate scenario flows for the 2046 while maintaining the existing configuration.

5.2 Recommendations for System Upgrade

The model simulation results showed that the existing Strathroy WWCS meets the level of service requirements with the exception in one area. Following are the recommendations to improve the level of service for Strathroy WWCS to meet the 2046 planning horizon flows:

1. Sewers ST-WW0203 and ST-WW0204 along the Head Street North consistently exceeding 100% of the pipe capacities. This can be resolved by upsizing these

sewers. The existing sewer size is 250 mm which is recommended to be upsized to 300 mm. Note on September 4, 2024, the Municipality confirmed that this pipe section is in fact 600 mm

2. It was further observed that the sewer sizes along Head Street North are not consistent as presented in the GIS database. South of Pannell Lane along the Head Street North, sanitary sewer size reduced from 600 mm to 250 mm which then became 750 mm south of Kittridge Avenue East. RVA recommends a field investigation to confirm the sewer sizes along Head Street North before undertaking the upgrades. Note on September 4, 2024, the Municipality confirmed that this pipe section is in fact 600 mm
3. The system analysis has considered sanitary system only. There are about 7 km of combined sewers within the Strathroy WWCS. All the combined sewers are in the drainage areas of Albert Street and Metcalfe Street pumping stations. In combined sewer areas where no storm sewer exists, RVA recommends constructing a storm sewer (sewer separation) and directing all surface flows to the new storm sewer.

5.3 Recommendations for Model Improvement

The hydraulic simulations and result analysis performed in this study were based on the steady-state analysis. RVA recommends Municipality to consider following updates to the wastewater hydraulic models developed as part of this Master Plan studies:

1. Switching from a steady-state to an EPS hydraulic model.
    - EPS models simulate hydraulic systems over extended periods, considering variations in flow generation and other factors over time.
    - EPS models account for dynamic changes in system behavior such as varying flow patterns, pump cycling etc.
    - For long-term planning, system optimization, and capacity analysis, EPS models are typically preferred due to their ability to capture dynamic system behaviour.
2. Switching from a static method to RTK Hydrograph method.
    - Unlike static methods, the RTK hydrograph method dynamically defines the proportion of the rainfall falling on the subcatchment that enters the system as RDII and the time at which this rainfall enters the system.
    - This method allows for adjustment in calculations based on observed data inputs during a rainfall event.
    - The method accounts for various hydrological processes such as infiltration, runoff generation, routing through sewer network, and potential overflow or surcharging.

- Overall, RTK hydrograph method offers a more advanced and responsive approach to hydrologic and hydraulic modeling and supports decision making for infrastructure design and capacity analysis.

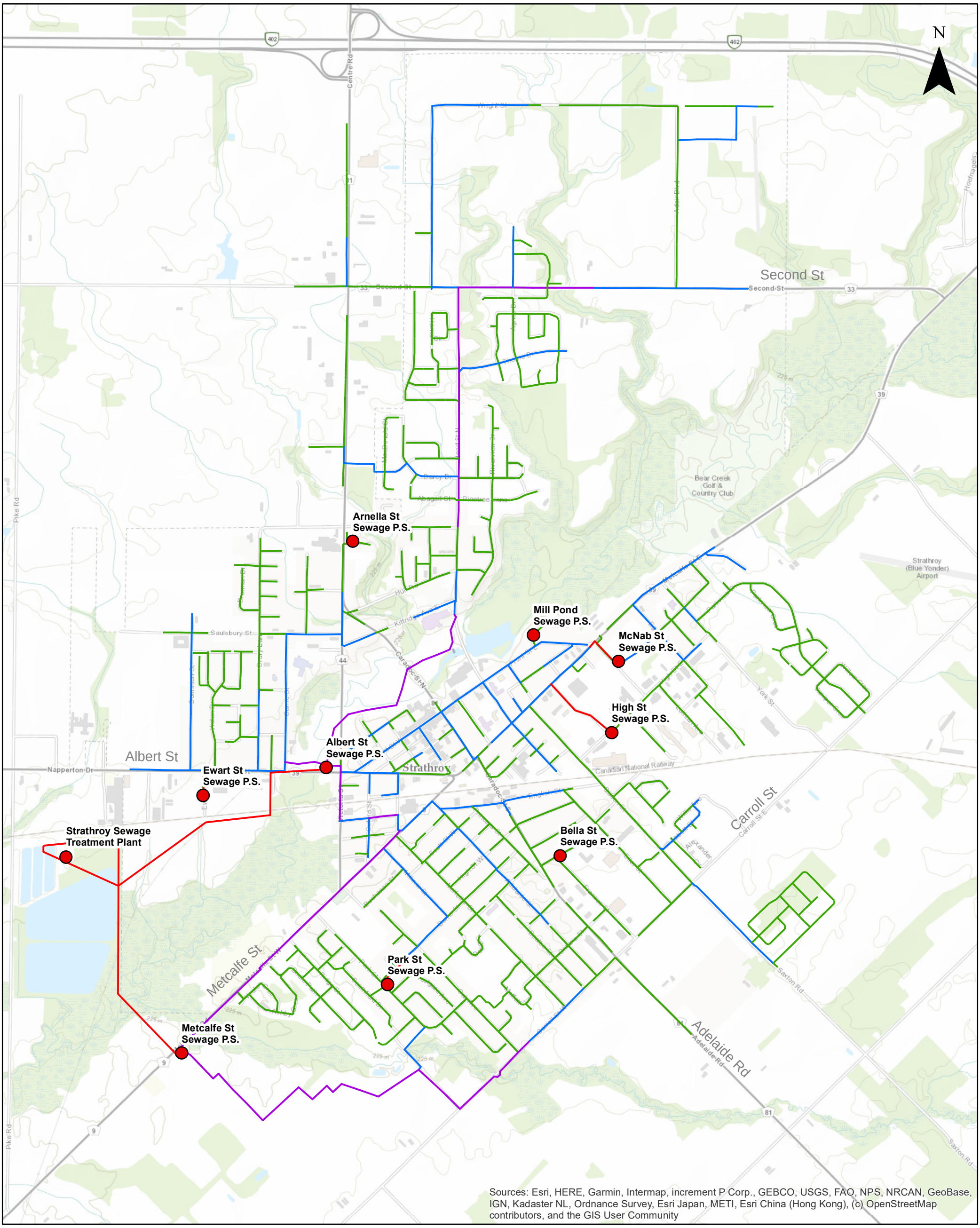
3. In order to further improve the accuracy of the models, it is recommended that the Municipality commission a program of manhole and pumping station surveys to gather the missing, incomplete or inaccurate data.
4. Pump stations performance couldn't be verified because of unavailability of SCADA flow data for the pumping stations. Accurate and reliable SCADA data is necessary for pumping capacity evaluations.
5. Pump performance tests for all the sewage pumping stations are crucial. Using manufacturer provided pump curves in the models may overestimate pumps performance as it does not consider impact of wear and tear on pumps efficiency. Performance test will help determine actual performance of the pumps as it deteriorates over time.

Appendix A

Figures

Appendix A

Figures



Legend

- Wastewater Infrastructure
- Forcemain

Sanitary Sewer Size (mm)

- Less than 300
- 300 - 450
- More than 450

Water, Wastewater and Stormwater Master Plan and Pollution Prevention Control Plan
Wastewater System Master Plan

Figure 1 Strathroy Collection System Overview

0 500 1,000 1,500 Meters

RVA - 236786

May 2024

N

Lions Park P.S.

Mount Brydges

MB Sewage Treatment Plan

Mill Main P.S.

Glendon Dr

Adelaide Rd

Parkhouse Dr

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Legend

- Wastewater Infrastructure
- Forcemain

Sanitary Sewer Size (mm)

- Less than 300
- 300 - 450
- More than 450

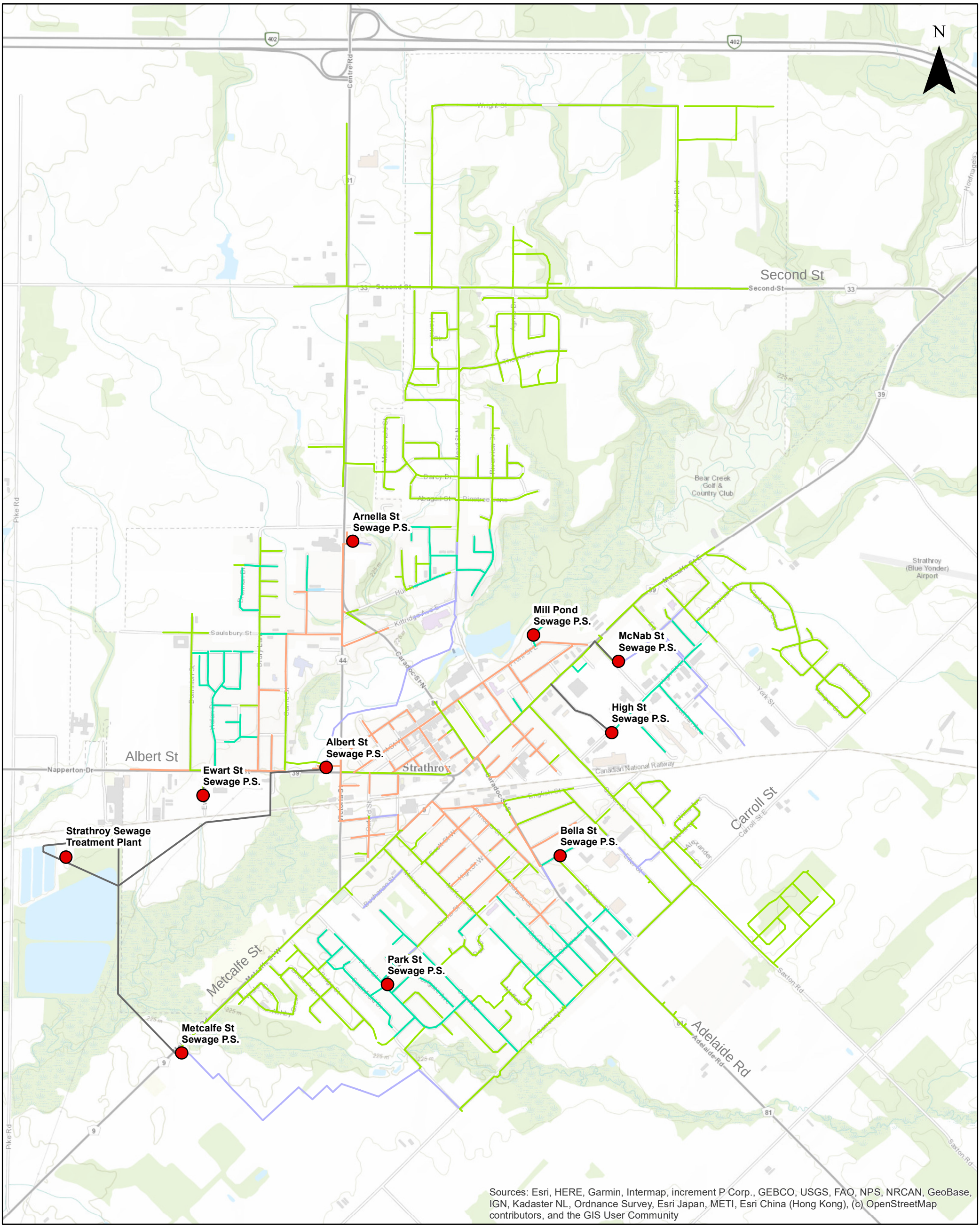
Water, Wastewater and Stormwater Master Plan and Pollution Prevention Control Plan Wastewater System Master Plan

Figure 2 Mount Brydges Collection System Overview

0 250 500 750 1,000 Meters

RVA - 236786

May 2024



Legend

- Wastewater Infrastructure
- Forcemain

Sanitary Sewer Material

- ASB-CEMENT (15.9%)
- CLAY (15.7%)
- CONCRETE (7.6%)
- PVC (60.7%)
- TRANSITE (0.1%)

Water, Wastewater and Stormwater Master Plan and Pollution Prevention Control Plan Wastewater System Master Plan

Figure 3 Strathroy Collection System - Sewer Material

0 500 1,000 1,500 Meters

RVA - 236786

May 2024

N

Lions Park P.S.

MB Sewage Treatment Plan

Mill Main P.S.

Glendon Dr

Adelaide Rd

Parkhouse Dr

Mount Brydges

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Legend

- Wastewater Infrastructure
- Forcemain

Sanitary Sewer Material

- CONCRETE (17.3%)
- PVC (82.7%)

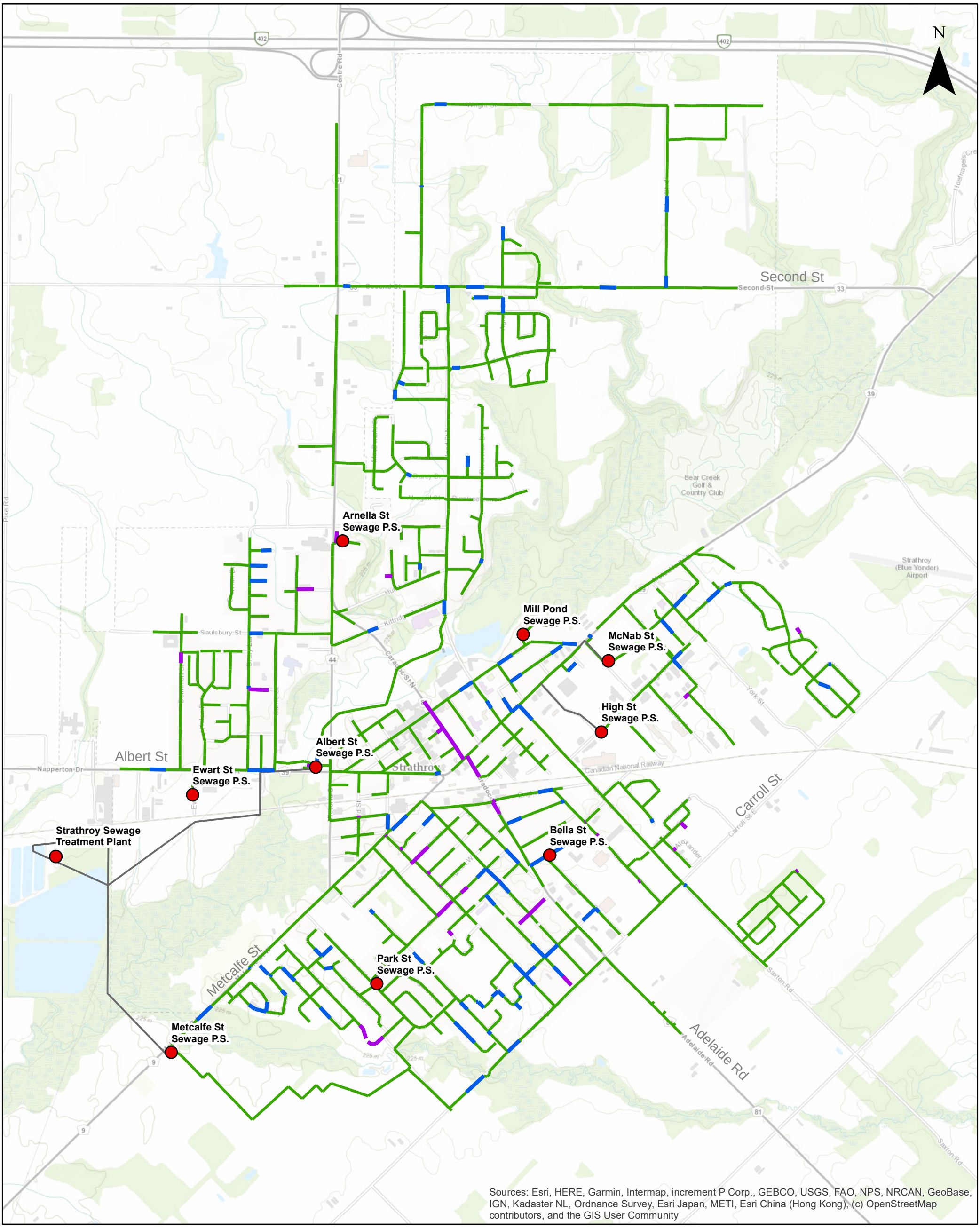
Water, Wastewater and Stormwater Master Plan and Pollution Prevention Control Plan Wastewater System Master Plan

Figure 4 Mount Brydges Collection System - Sewer Material

0 250 500 750 1,000 Meters

RVA - 236786

May 2024



Legend

- Wastewater Infrastrucutre
- Forcemain
- Sanitary Sewer
- Sewer with Missing Inverts
- Sewer with Incorrect Inverts

Water, Wastewater and Stormwater Master Plan and Pollution Prevention Control Plan Wastewater System Master Plan

Figure 5 Strathroy Collection System - Data Discrepancy

0 500 1,000 1,500 Meters

RVA - 236786

May 2024

N

Second St

Arnella St Sewage P.S.

Mill Pond Sewage P.S.

McNab St Sewage P.S.

High St Sewage P.S.

SC_FM_2

SC_FM_1

SC_FM_5

Albert St

Ewart St Sewage P.S.

Albert St Sewage P.S.

Strathroy Sewage Treatment Plant

Bella St Sewage P.S.

Park St Sewage P.S.

SC_FM_3

SC_FM_4

Metcalfe St Sewage P.S.

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Legend

- Wastewater Infrastrucutre
- Forcemain
- Sanitary Sewer
- Flow Monitoring Location

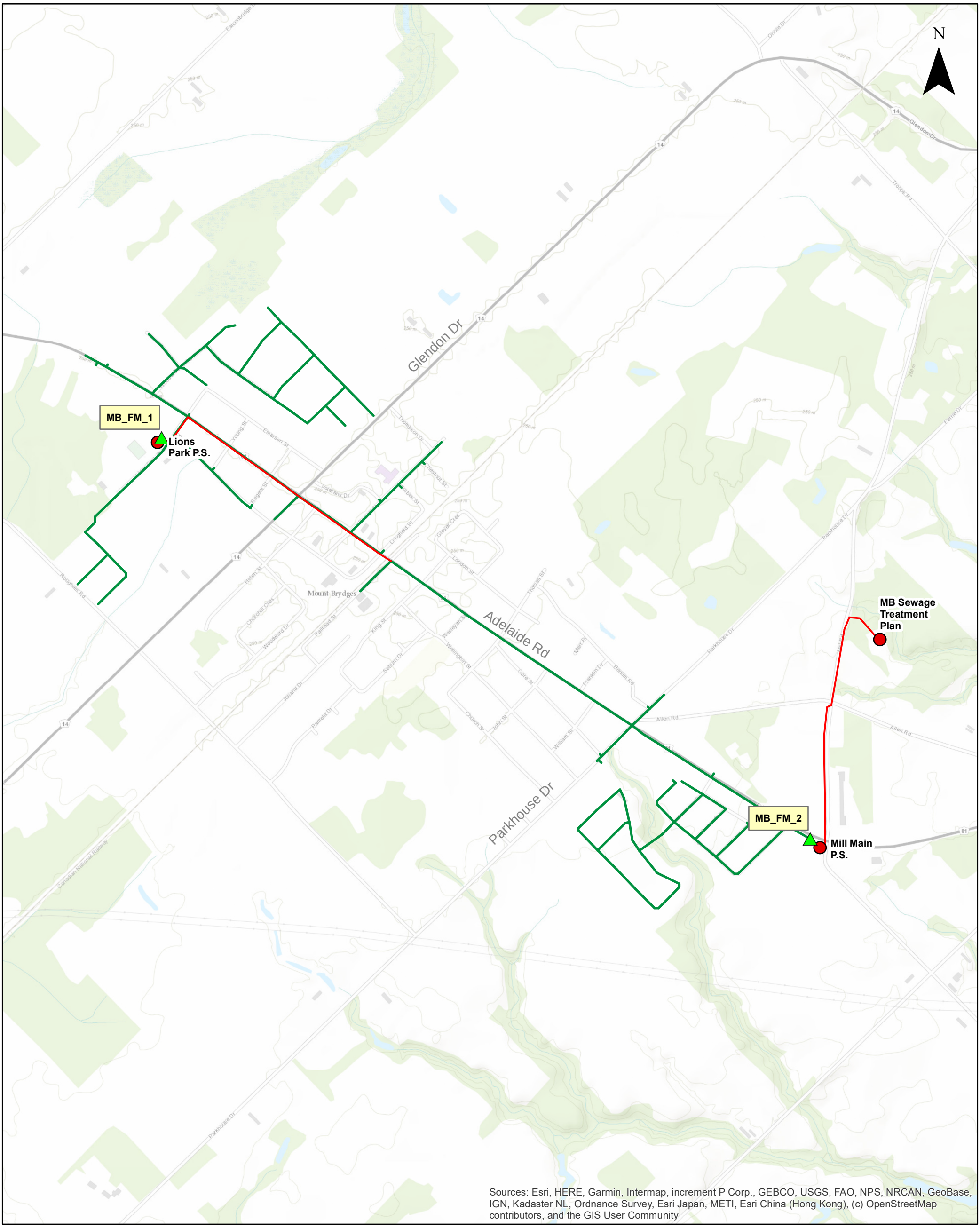
Water, Wastewater and Stormwater Master Plan and Pollution Prevention Control Plan Wastewater System Master Plan

Figure 6 Flow Monitoring Locations - Strathroy

0 500 1,000 1,500 Meters

RVA - 236786

May 2024



Legend

- Wastewater Infrastructure
- Forcemain
- Sanitary Sewer
- Flow Monitoring Location

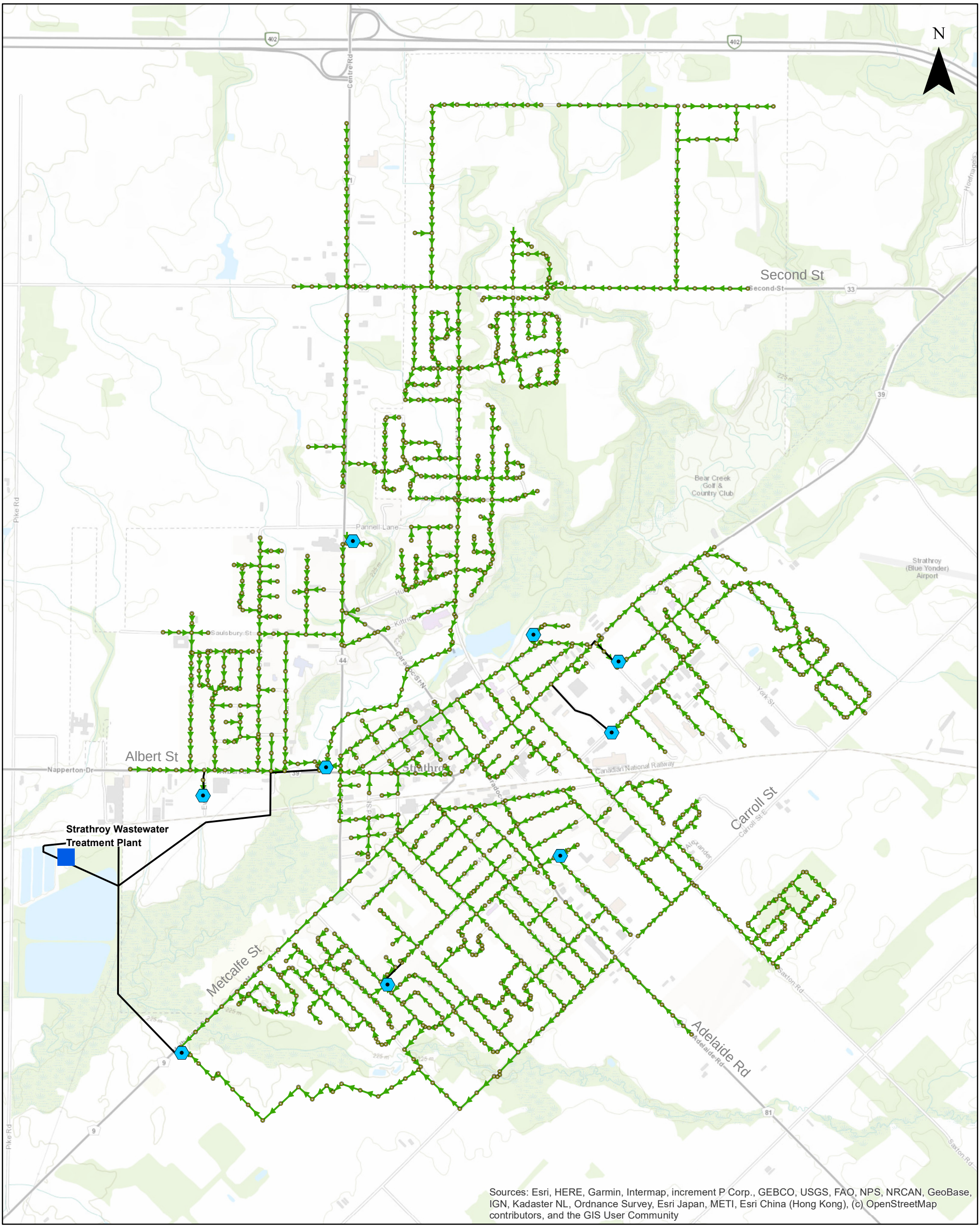
Water, Wastewater and Stormwater Master Plan and Pollution Prevention Control Plan Wastewater System Master Plan

Figure 7 Flow Monitoring Locations - Mount Brydges

0 250 500 750 1,000 Meters

RVA - 236786

May 2024



Legend

- Wastewater Treatment Plant
- Sewage Pumping Station
- Sanitary Manhole
- Forcemain

Peak Conduit Depth Ratio (d/D)

- Less than 1 (Less than 100% of Pipe Full Capacity)
- More than 1 (More than 100% of Pipe Full Capacity)

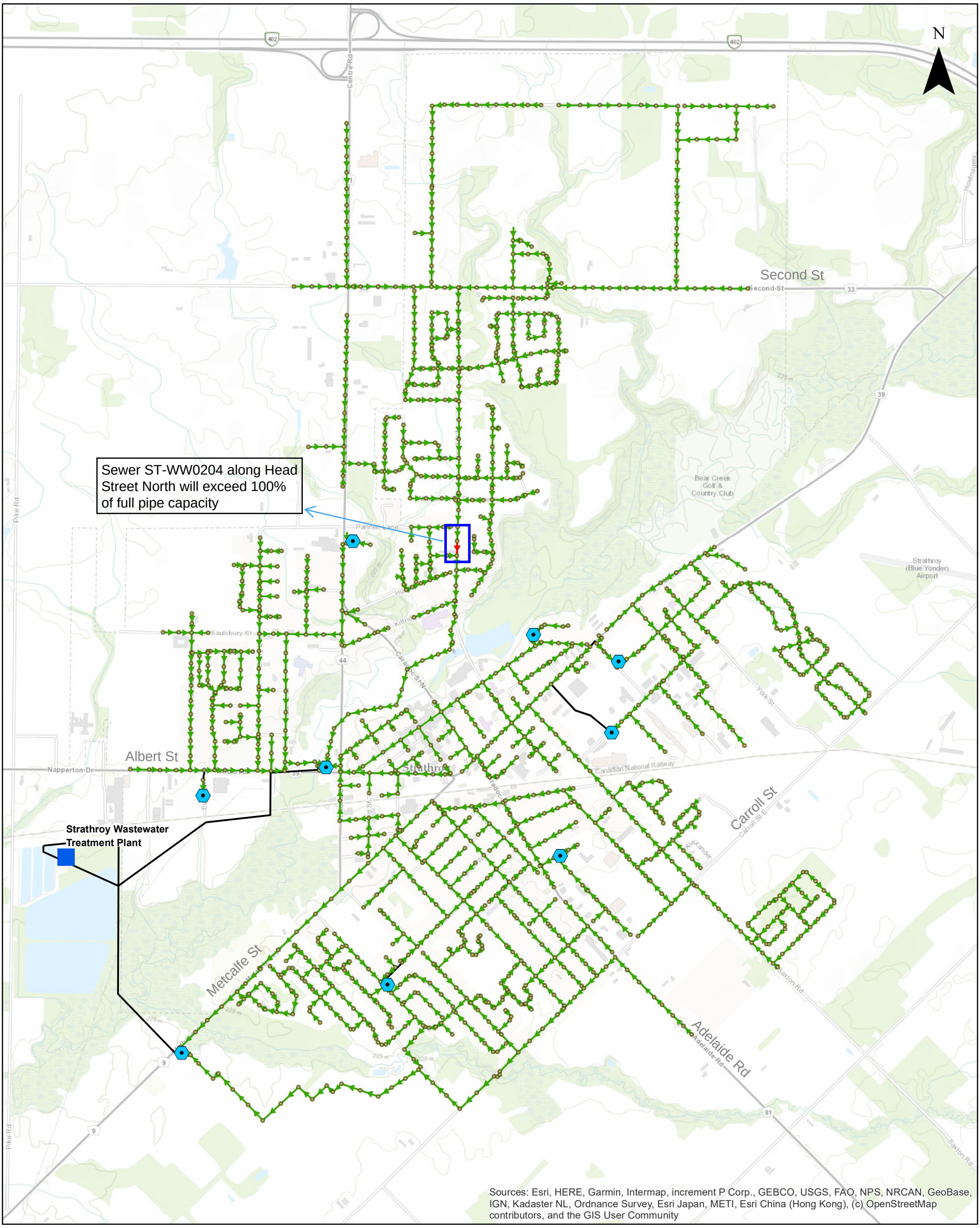
Water, Wastewater and Stormwater Master Plan and Pollution Prevention Control Plan Wastewater System Master Plan

Figure 8 Strathroy Wastewater Collection System Performance - Existing Condition

0 500 1,000 1,500 Meters

RVA - 236786

May 2024



Legend

- Wastewater Treatment Plant
- Sewage Pumping Station
- Sanitary Manhole
- Forcemain

Peak Conduit Depth Ratio (d/D)

- Less than 1 (Less than 100% of Pipe Full Capacity)
- More than 1 (More than 100% of Pipe Full Capacity)

Water, Wastewater and Stormwater Master Plan and Pollution Prevention Control Plan Wastewater System Master Plan

Figure 9 Strathroy Wastewater Collection System Performance - 2030 Scenario

0 500 1,000 1,500 Meters

RVA - 236786

May 2024

Sewers ST-WW0203 and ST-WW0204 along Head Street North will exceed 100% of full pipe capacity

Strathroy Wastewater Treatment Plant

Second St

Albert St

Metcalfe St

Carroll St

Adelaide Rd

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Legend

- Wastewater Treatment Plant
- Sewage Pumping Station
- Sanitary Manhole
- Forcemain

Peak Conduit Depth Ratio (d/D)

- Less than 1 (Less than 100% of Pipe Full Capacity)
- More than 1 (More than 100% of Pipe Full Capacity)

Water, Wastewater and Stormwater Master Plan and Pollution Prevention Control Plan Wastewater System Master Plan

Figure 10 Strathroy Wastewater Collection System Performance - 2041 Scenario

0 500 1,000 1,500 Meters

RVA - 236786

May 2024

Sewers ST-WW0203 and ST-WW0204 along Head Street North will exceed 100% of full pipe capacity

Strathroy Wastewater Treatment Plant

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Legend

- Wastewater Treatment Plant
- Sewage Pumping Station
- Sanitary Manhole
- Forcemain

Peak Conduit Depth Ratio (d/D)

- Less than 1 (Less than 100% of Pipe Full Capacity)
- More than 1 (More than 100% of Pipe Full Capacity)

Water, Wastewater and Stormwater Master Plan and Pollution Prevention Control Plan Wastewater System Master Plan

Figure 11 Strathroy Wastewater Collection System Performance - 2046 Scenario

0 500 1,000 1,500 Meters

RVA - 236786

May 2024

N

Glendon Dr

Adelaide Rd

Parkhouse Dr

Mount Brydges

Mount Brydges Wastewater Treatment Plan

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Legend

- Wastewater Treatment Plant
- Sewage Pumping Station
- Sanitary Manhole
- Forcemain

Peak Conduit Depth Ratio (d/D)

- Less than 1 (Less than 100% of Pipe Full Capacity)
- More than 1 (More than 100% of Pipe Full Capacity)

Water, Wastewater and Stormwater Master Plan and Pollution Prevention Control Plan Wastewater System Master Plan

Figure 12 Mount Brydges Wastewater Collection System Performance - Existing Condition

0 250 500 750 1,000 Meters

RVA - 236786

May 2024

RVA

N

Glendon Dr

Adelaide Rd

Parkhouse Dr

Mount Brydges

Mount Brydges Wastewater Treatment Plan

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Legend

- Wastewater Treatment Plant
- Sewage Pumping Station
- Sanitary Manhole
- Forcemain

Peak Conduit Depth Ratio (d/D)

- Less than 1 (Less than 100% of Pipe Full Capacity)
- More than 1 (More than 100% of Pipe Full Capacity)

Water, Wastewater and Stormwater Master Plan and Pollution Prevention Control Plan Wastewater System Master Plan

Figure 13 Mount Brydges Wastewater Collection System Performance - 2032 Scenario

0 250 500 750 1,000 Meters

RVA - 236786

May 2024

N

Glendon Dr

Adelaide Rd

Parkhouse Dr

Mount Brydges

Mount Brydges Wastewater Treatment Plan

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Legend

- Wastewater Treatment Plant
- Sewage Pumping Station
- Sanitary Manhole
- Forcemain

Peak Conduit Depth Ratio (d/D)

- Less than 1 (Less than 100% of Pipe Full Capacity)
- More than 1 (More than 100% of Pipe Full Capacity)

Water, Wastewater and Stormwater Master Plan and Pollution Prevention Control Plan Wastewater System Master Plan

Figure 14 Mount Brydges Wastewater Collection System Performance - 2046 Scenario

0 250 500 750 1,000 Meters

RVA - 236786

May 2024

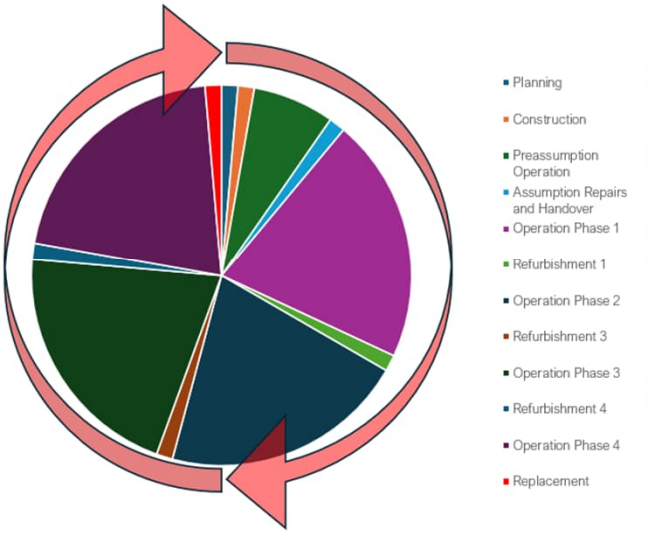
APPENDIX B

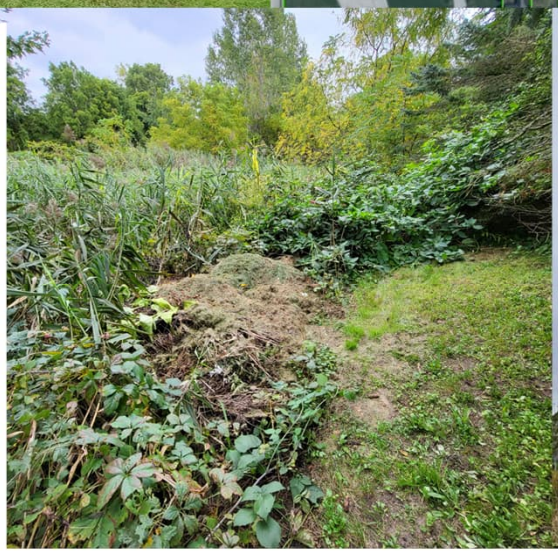
Project Fact Sheet - Wastewater Projects

Strathroy-Caradoc Water, Wastewater, and Stormwater Master Plan

Project Fact Sheet - Wastewater Projects

PROJECT	LOCATION	MCEA SCHEDULE	TOTAL COST	ANTICIPATED YEAR OF IMPLEMENTATION																			
				2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046
WASTEWATER MASTER PLAN																							
Mount Brydges Wastewater System																							
WWTF Expansion Schedule C Class	Mount Brydges	C	$350,000	$200,000	$150,000																		
WWTF Expansion Design and	Mount Brydges	C	$25,768,000		$500,000	$500,000	$8,100,000	$8,274,560	$8,393,440														
Existing Servicing Phase 1	Mount Brydges	Approved	$5,400,000			$540,000	$4,860,000																
Existing Servicing Phase 2	Mount Brydges	Approved	$5,400,000					$540,000	$4,860,000														
Existing Servicing Phase 3	Mount Brydges	Approved	$5,400,000							$540,000	$4,860,000												
Existing Servicing Phase 4	Mount Brydges	Approved	$5,400,000									$540,000	$4,860,000										
Existing Servicing Phase 5	Mount Brydges	Approved	$5,400,000											$540,000	$4,860,000								
Existing Servicing Phase 6	Mount Brydges	Approved	$5,400,000													$540,000	$4,860,000						
Existing Servicing Phase 7	Mount Brydges	Approved	$5,400,000															$540,000	$4,860,000				
Existing Servicing Phase 8	Mount Brydges	Approved	$5,400,000																	$540,000	$4,860,000		
Existing Servicing Phase 9	Mount Brydges	Approved	$5,400,000																			$540,000	$4,860,000
Existing Servicing Phase 10	Mount Brydges	Approved	$5,400,000																				$540,000	$4,860,000
Hydraulic Modeling																							
Updating of Wastewater	Municipality	Approved	$600,000	$50,000	$50,000	$50,000	$50,000	$50,000						$50,000	$50,000	$50,000	$50,000	$50,000					$50,000	$50,000
WASTEWATER TOTAL:			**$80,718,000**	**$250,000**	**$700,000**	**$1,090,000**	**$13,010,000**	**$8,864,560**	**$13,253,440**	**$540,000**	**$4,860,000**	**$540,000**	**$4,860,000**	**$590,000**	**$4,910,000**	**$590,000**	**$4,910,000**	**$590,000**	**$4,860,000**	**$540,000**	**$4,860,000**	**$540,000**	**$4,860,000**	**$590,000**	**$4,910,000**





MUNCIPALITY OF STRATHROY - CARADOC

Water, Wastewater and Stormwater Master Plan

Appendix 4 - Stormwater Planning and Implementation

October 21, 2024

R.V. Anderson Associates Limited
557 Southdale Road East, Suite 200
London, ON N6E 1A2

TECHNICAL MEMORANDUM

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APPENDICES

1.0 INTRODUCTION

1.1 Background

As a part of the 2025 Water, Wastewater and Stormwater Master Plan (WWSMP) and Pollution Prevention and Control Plan (PPCP), the Municipality of Strathroy-Caradoc (Municipality) has undertaken a review of the existing stormwater management (SWM) systems that are utilized by the Municipality to plan, approve, operate and maintain the current facilities.

This review will include a review of the current condition of the existing facilities and review the current SWM standards, the approval requirements for new facilities, and the operations and maintenance of the current SWM Facilities. The intent is to provide the Municipality with recommendations to improve the current SWM approval and management process to balance meeting regulatory requirements, safety, environmental protection/enhancement, lifecycle cost, liability, and an equitable apportionment between new and existing development.

1.2 Requirement for SWM

In Ontario, SWM is required when a rural area is urbanized and its intent is to mitigate impacts on the environment. Therefore, three aspects of SWM that need to be addressed in development and these are:

- Quantity Control, which is the name given to managing the amount of runoff generated by a drainage area and generally includes attempts to limit the maximum run off flow of the developed area to the rate of flow that occurred prior to development;
- Quality Control, which is the name given to managing the quality of the runoff generated from a drainage area and generally includes attempts to allow for an extended period of detention of storm water in order to encourage the settling out of pollutants within a facility for most frequent rainfall events; and
- Enhanced Protection, which is to provide for the protection of receiving streams from excessive erosion or to changes in stream morphology (structure of the channel).

Quantity impacts result from an increase of runoff as the urban development will have more impervious surface. This increase includes the total volume, flow rate and duration of run off from a rainfall event. This can cause serious erosion problems in creeks, rivers and outfalls into the water bodies. Quality impacts are the result of “non-point” sources of pollution, which can discharge from the result of human activity. Both rural and urban areas can contribute to non- point source pollution. Stormwater contaminants may include suspended solids, microbiological contamination, organic matter, petroleum hydrocarbons, salts, nutrients, and pesticides.

Enhanced protection is typically mandated by agencies having jurisdiction over the receiving stream which in the case of Strathroy-Caradoc, this is taken to be the Conservation Authority in whose area the SWM facility and outlet is located.

1.3 SWM Facility Lifecycle

The lifecycle of a SWM facility generally consists of the following stages:

1. Planning and Approvals;
2. Construction;
3. Pre-Municipal Assumption Operation;
4. Municipal Assumption;
5. Operation;
6. Facility Renewal (often multiple times); and
7. Facility Replacement.

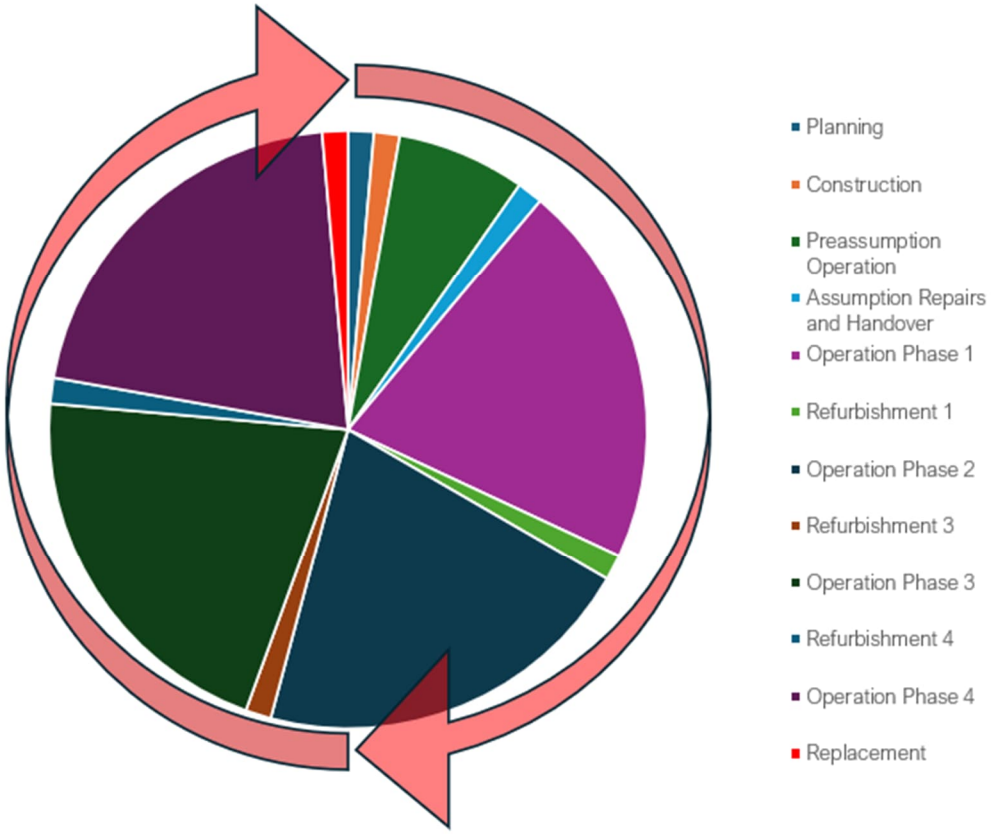


Figure 1-1: SWM Facility Lifecycle

1.4 Requirement for SWM Policy

SWM facilities are intended to be in operation permanently once installed prior to but this will require periodic maintenance activities and eventual substantial rebuilding or replacement. In all likelihood, the Municipality will be operating the facility in excess of 90% of its lifespan. Therefore, the Municipality has an interest with regard to SWM to:

1. Ensure that a Proponent who wishes to urbanize an area provides an acceptable level of protection to the public with regard to stormwater runoff based on current accepted practices and the requirements of agencies having jurisdiction;
2. Ensure that a Proponent who wishes to urbanize an area provides an acceptable level of protection to the environment with regard to stormwater runoff based on current accepted practices and the requirements of agencies having jurisdiction;
3. Ensure that the risk to the Municipality in operating these facilities is reasonable;
4. Ensure that the cost to the Municipality to operate these facilities is reasonable and is borne by the Proponent and/or the benefiting users;
5. Ensure that these facilities are planned, constructed and operated in a manner consistent with the Municipality's Master Servicing Plan Principles; and
6. Ensure that there is a policy in place so that all parties (municipal council, municipal staff, Proponents, regulators, members of the public, etc.) understand the roles and responsibilities that the Municipality has in this regard as well as that of the Proponent.

1.5 SWM Design Criteria

1.5.1 Design Standards

The Strathroy-Caradoc Servicing Standards (SCSS), October 2021 are the basis for SWM design criteria and include references to provincial standard designs. The SCSS states the "engineering design package [submitted by a proponent] should adhere and comply with the current version of the following Acts and references..." which detail the following standards:

- Provincial Acts
    - Clean Water Act (2006),
    - Conservation Authorities Act (1990) ,
    - Drainage Act (1990),
    - Environmental Bill of Rights (1993),
    - Municipal Act (2001),
    - Ontario Water Resources Act (1990),

  - Ontario Endangered Species Act (2007),
  - Ontario Environmental Protection Act (1990),
  - Ontario Provincial Policy Statemen,
  - Environmental Assessment Act (1990);
- Federal Acts
  - Species at Risk Act (2002) ,
  - Fisheries Act (1985),
  - Canadian Environmental Assessment Act (1999); and
- General Stormwater Management Design References
  - Stormwater Management Practices Planning and Design Manual (MOE, 2003) Ministry of the Environment, 2003,
  - Low Impact Development Stormwater Management Planning and Design Guide Sustainable Technologies Evaluation Program, Living Website,
  - Low Impact Development Stormwater Planning and Design Guide Credit Valley Conservation and Toronto Region Conservation, 2011."

The last two references could be superseded by the Low Impact Development Stormwater Management Planning and Design Guide, MECP January 2022. This document references the "Quality "storm of being a rainfall event of 30 mm for Strathroy-Caradoc area.

1.5.2 Design Criteria

1.5.2.1 Quantity Control

Quantity control requirements are detailed in SCSS Section 10.4.1 and generally are as follows:

- Sites (commercial, industrial) and smaller subdivisions are to control post development flows to the predevelopment rates for 5,10, 25, 100 and 250-year storm events;
- For larger subdivisions (greater than 50 lots) or large sites (greater than 5 Hectares), control post development flows to the predevelopment rates is required for 5,10, 25, 100 and 250-year storm events; and
- General requirement to route all 10-year storm events through the storm sewer collection system but it is not clear if pipe surcharging is permitted.

1.5.2.2 Quality Control

Quality control requirements are detailed in SCSS Section 10.4.2 and generally are as follows:

- All proposed developments should receive a minimum level of treatment for enhanced quality protection (80% T.S.S. Removal) unless otherwise approved in advance by the Conservation Authority (copy of approval to be supplied to Municipality);
- The application of Oil and Grit Separators (OGS) or comparable system is limited to developments of 4 Hectares or less;
- When an OGS must be located on private lands with consideration for how the owner will access the OGS for regular maintenance; and
- All Stormwater Management Facilities require extended detention.

1.5.2.3 Erosion Control

Erosion control requirements are detailed in SCSS Section 10.4.3 and for developments with a receiving outlet that is sensitive to erosion will be required to provide adequate erosion control in addition to the quality control extended detention. All large developments, or developments with a receiving outlet that is sensitive to erosion, must design additional storage at reduced release rates for common rain events (less than 2 year) in accordance with the current design guidelines from the MECP.

1.5.2.4 Water Balance

Water balance measures are detailed in SCSS Section 10.4.4 and "shall be considered by the proponent within the predesign submission. The proponent shall be responsible to determine if the MECP will require water balance as part of an Environmental Compliance Approval (ECA). Where the MECP does not require water balance as part of an ECA approval, the Municipality promotes water balance methods through infiltration or exfiltration but does not require water balance calculations. If water balance is required by the MECP, the calculations shall also be submitted to the Municipality."

1.5.2.5 Other Design Requirements

Section 10.4.5 provides direction on end of pipe SWM facilities. Section 10.4.6 provides information on Low Impact Development Systems (LIDS). Section 10.4. 6 appears to state that LID is not mandatory if the proponent intends to implement LIDS, then these facilities must have a pipe outlet to the stormwater quality treatment system. Section 10.5 provides the details necessary for a proponent to undertake the required modeling based on approved parameters and software.

1.6 Subdivision and Site Plan Agreements

1.6.1 Subdivision Agreements

Under the current *MUNICIPALITY OF STRATHROY-CARADOC SUBDIVISION AGREEMENT* template there is a section devoted to the requirements for SWM. This requires that the Subdivider provide the Municipality the following:

- A Stormwater Management Plan;
- A Sediment and Erosion Control Plan; and
- A Final Detailed Servicing and Grading Plan.

These plans must be approved by the Municipality, its Engineer, the MECP and any other agencies having jurisdiction.

Additionally, the Subdivider has to provide the Municipality with a Functional Servicing Report satisfactory which shall include projected development population based on the Municipality's standards, and calculations determining the stormwater demand based on the Municipality's design guidelines. The Municipality maintains approval over who the Subdivider can retain to undertake the required SWM modeling. The agreement requires that the SWM Plan address infiltration of roof top runoff and ensure that water quality, including temperature.

Upon completion of the subdivision being 85% build out the Subdivider is to undertake steps to allow for the Municipality to assume the SWM facility and take over its ownership. Prior to assumption the Subdivider has to deliver the following:

- A fully constructed and operational SWM facility, to the satisfaction of the Municipality;
- SWM facility (forebay and ponds) fully cleaned out and clear of any sediment, to the satisfaction of the Municipality;
- An Operational SWM Report completed by a Professional Engineer that includes:
    - Hydraulic operation of the facility (detention time, evidence or occurrence of overflows), condition of vegetation in and around facility, occurrence of obstructions at the inlet and outlet, evidence of spills and oil/grease contamination; and frequency of trash build-up,
    - Measured sediment depths (where appropriate) and clean out of sediment where necessary, results of flow and quality monitoring – including temperature,
    - Additional conditions relevant to the long and short-term operation of the pond,
    - Recommendations for immediate maintenance, repair actions; and,

    - Recommendations for a future annual inspection and maintenance program and an annual cost estimate for such;
- Completion of immediate maintenance and repairs identified in the Operational SWM Report shall be completed to the satisfaction of the Municipality; and
- Cost sharing agreement or contribution where significant costs of future annual inspection and maintenance programs have been identified.

1.6.2 Site Plan Agreements

Under the current *MUNICIPALITY OF STRATHROY-CARADOC SITE PLAN AGREEMENT* template there is no specific section devoted to the requirements for SWM as each site plan is unique and may be both either a greenfield or an infill development. Under the *General Conditions* clause, subclause *Construction in Accordance with the Plans*, under the *Grading and Drainage* sub-subclause, there is the requirement that the proponent provide the Municipality with a *Stormwater Management Plan*.

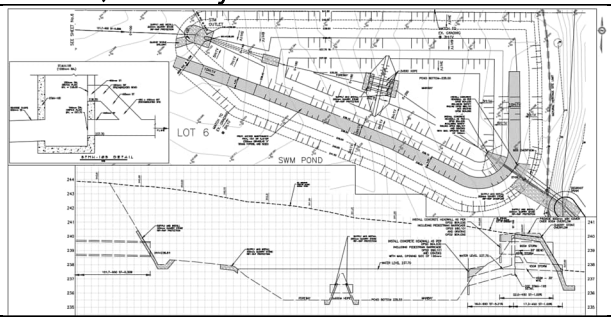
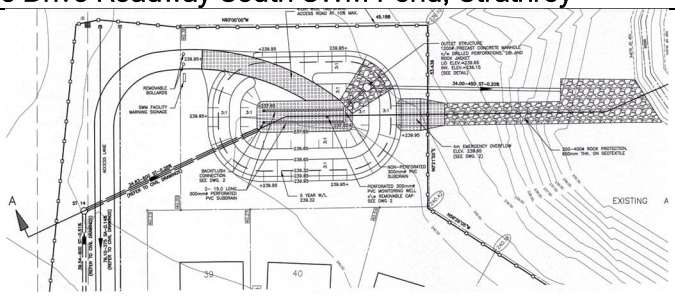
2.0 EXISTING FACILITIES

The Municipality owns and manages an urban stormwater management system (SWM) with ten (10) stormwater ponds and a large collection system encompassing the Sydenham River, Thames River and watersheds. Based on a review of the MECP's Environmental Compliance Approval for a Municipal Stormwater Management System ECA Number: 058- S701, Issue Number: 1 dated February 8, 2023, Schedule B, these numbered SWMP 01 to 09 are described in Appendix A and summarized in Table 2-1. Included in the table is the Agnes Drive Roadway Extension SWM Pond in Strathroy which is a Future SWMP-10 currently under review and a SWM Pond which is given the designation SWMP-11 which was built but is not accounted for in the current SWM ECA.

Table 2-1 – Current and Planned SWM Facilities

General Information	Picture
SWMP-01- Pinetree Ln/Riverview Dr, Strathroy	
Watershed: East Sydenham **Facility Type:** Wet Pond **Type of Controls:** Quantity **Drainage Area (ha):** 26.5 **In-Service Date:** 1992 **ECA (prior to CLI)):** not known	
SWMP-02 - Parkview Dr/Parkview Cres (north)	
Watershed: East Sydenham **Facility Type:** Infiltration/Wet Pond? **Type of Controls:** Quantity **Drainage Area (ha):** 20.5 **In-Service Date:** 1992 **ECA (prior to CLI)):** not known	
SWMP-03 - Parkview Dr/Parkview Cres (south)	
Watershed: East Sydenham **Facility Type:** Dry Pond **Type of Controls:** Quantity **Drainage Area (ha):** 6.3 **In-Service Date:** 1994 **ECA (prior to CLI)):** not known	

General Information	Picture
SWMP-04 - Second Str. & Adair Blvd., Strathroy	
Watershed: East Sydenham **Facility Type:** Extended Detention Pond **Type of Controls:** Quantity/Quality **Drainage Area (ha):** 70.1 **In-Service Date:** 2001 **ECA (prior to CLI)):** 6561-4M6N6Q, 2000	
SWMP-05 - Head St N/ Thorne Dr, Strathroy	
Watershed: East Sydenham **Facility Type:** Dry Pond **Type of Controls:** Quantity **Drainage Area (ha):** 25.6 **In-Service Date:** 1994 **ECA (prior to CLI):** not known	
SWMP-06 - Molnar Industrial Park	
Watershed: East Sydenham **Facility Type:** Wet Pond **Type of Controls:** Quantity **Drainage Area (ha):** 26.5 **In-Service Date:** 2010 **ECA (prior to CLI):** not known	
SWMP-07 - Bennett Cres, Mt. Brydges	
Watershed: Thames River **Facility Type:** Wet Pond **Type of Controls:** Quantity/Quality **Drainage Area (ha):** 33.9 **In-Service Date:** 2013 **ECA (prior to CLI):** not known	

General Information	Picture
SWMP-08 and 09 - Lucas St/Pondhaven Ln, Mt. Brydges	
Watershed: East Sydenham **Facility Type:** Wetland **Type of Controls:** Quantity/Quality **Drainage Area (ha):** 34.5 **In-Service Date:** 2014 **ECA (prior to CLI):** 4605-9D6N3K	
SWMP-010 - Agnes Drive Extension SWM Pond, Strathroy	
Watershed: East Sydenham **Facility Type:** Wet Pond **Type of Controls:** Quantity/Quality **Drainage Area (ha):** 12.5 **In-Service Date:** TBD **ECA (prior to CLI):** N/A	
SWMP-011 - (not noted in CLI) Agnes Drive Roadway South SWM Pond, Strathroy	
Watershed: East Sydenham **Facility Type:** Infiltration Pond **Type of Controls:** Quantity/Quality **Drainage Area (ha):** 4.8 **In-Service Date:** circa 2015-20 **ECA (prior to CLI):** N/A	

3.0 ASSET MANAGEMENT, LEVEL OF SERVICE, AND CAPITAL PLAN

3.1 2021 Strathroy Caradoc Asset Management Plan

The 2021 Asset Management Plan (AMP) for the Municipality prepared by PSD Research Consulting establishes the approach for the management of the Municipality's assets. The recommendations and capital project lists in the Water Master Plan will be based on the following AMP strategies:

- Lifecycle management strategies including identifying project type under categories of preventative and/or general maintenance, rehabilitation and/or renewal, replacement, and upgrades; and
- Risk management strategies which states that precedence of asset prioritization is (1) condition of the asset; (2) its importance to service delivery; and (3) impact of its failure or disrepair.

Section 4.7.1, *Storm Water System Asset Inventory & Replacement Cost* stated that the total replacement cost for 9 active SWM ponds at the time had total replacement cost of $288,212. This is not a realistic estimate of the costs for the replacement let alone the periodic rehabilitation costs for a SWM facility.

Section 4.7.2 *Asset Condition* states that the Municipality's "current approach:

- There are no formal condition assessment programs in place for the storm water system.
- The Municipality should consider establishing an industry best practice assessment cycle for the storm water system."

Section 4.7.3 *Estimated Useful Life & Average Age* states that SWM facilities have an average useful life of 50 years with an average age of age of approximately 16 years.

Section 4.7.7 *Recommendations* made the following recommendations:

- Asset Inventory
    - Continue to refine and consolidate asset data from various data sources into the primary asset inventory to ensure that all relevant asset types are included.
    - Review and revise replacement costs and critical attribute data on a regular basis.
- Condition Assessment Strategies

    - Consider formalizing the internal condition assessment program that have been developed for linear storm assets as part of the Roadmap project and expanding it to include other relevant stormwater assets.

- Risk Management Strategies
    - Implement risk-based decision-making as part of asset management planning and budgeting processes. This should include the regular review of high-risk assets to determine appropriate risk mitigation strategies.
    - Review risk models on a regular basis and adjust according to an evolving understanding of the probability and consequences of asset failure.
- Lifecycle Management Strategies
    - Document and review lifecycle management strategies for the Storm Water System on a regular basis to achieve the lowest total cost of ownership while maintaining adequate service levels.
- Levels of Service
    - Continue to measure current levels of service in accordance with the metrics that Strathroy-Caradoc has established in this AMP. Additional metrics can be established as they are determined to provide meaningful and reliable inputs into asset management planning.
    - Work towards identifying proposed levels of service as per O. Reg. 588/17 and identify the strategies that are required to close any gaps between current and proposed levels of service.

These are valid recommendations and should be reviewed and implemented by the Municipality.

3.2 Municipality of Strathroy-Caradoc Stormwater Utility Feasibility Study

The Municipality of Strathroy-Caradoc Stormwater Utility Feasibility Study (Watson and Associates Economist Ltd) was undertaken and the recommendations were presented to Council in February 2024. The study goals were to:

- Review current stormwater management activities and stormwater infrastructure needs;
- Establish levels of service for maintenance programs, operational resource needs, and infrastructure lifecycle needs;
- Establish funding levels required to support proposed stormwater program to ensure sustainability of the Stormwater Utility; and

- Make informed recommendations about user fee rate structures to provide fair and equitable recovery of costs from landowners.

The report made the following recommendations to Council:

- That Council endorse separating the stormwater funding from the tax levy and moving towards a new funding model and rate structure specific to stormwater services, using the "Runoff Coefficient by Actual Land Area per Property" approach;
- That Council endorse the stormwater program proposed level of service and associated financial forecast as presented in the Watson report; and
- That the Municipality proceeds with the implementation phase.

This study was reviewed in the context of the review of this technical memorandum and the goals and findings of this study are separate and distinct as they are to do with how SWM services are paid for as opposed to how the facilities are brought on line, assumed by the Municipality and then maintained.

3.3 Levels of Service Requirements

The original ECAs for each of the SWM facility should provide detail as to the required level of quantity, quality, erosion control and thermal protection required. Additionally the original design reports for the SWM facilities should provide the rationale for their sizing, design criteria and the treatment provided. Over time, within a SWM facility increased vegetation and sediment deposition will reduce storage volume available to provide quantity control for large run-off events. Sediment resuspension and poor water quality due to eutrophication may impact the ability of a SWM facility to provide quality control during warm weather months.

Operation of the SWM facility after the Municipality's assumption of ownership will be carried out by the Municipality and should include periodic review to determine:

- That the facility is functioning as intended with no short circuiting of flows, excessive standing water or dumping of materials by residents;
- When dredging of silt deposits from the sediment forebay is required;
- When access roads, fencing, berms, outlet structures, headwalls, etc. need to be repaired;
- When storage in the main bays need to be restored through the removal of vegetation and sediment; and
- The vegetation in the facility is thriving and free of invasive species.

Efforts by the Municipality to restore the required storage volumes would typically require the SWM facility to be drained and partially reconstructed following the removal of excess vegetation and sediment. The extent of this work may vary depending on the type and robustness of the design of the SWM facility and the previous maintenance work undertaken which can mitigate the extent of restoration work.

3.4 Capital Forecast

The municipality has provided the planned 10-year capital forecast to the year 2033. The list includes water, wastewater, stormwater and transportation projects which were separated to facilitate the development of an updated capital forecast plan. The separated list is provided in Appendix B for reference only. The Municipality has budgeted $100,000 per year for a total of $1,000,0000 over this 10-year period. Based on recently publicly tendered SWM Facility cleanout/restoration projects, costs to rehabilitate a facility typically are in the range of $200,000 to $500,000.

4.0 GAP REVIEW OF CURRENT SWM GUIDANCE DOCUMENTS

4.1 Introduction

Appendix B reviews the applicable sections of Current Subdivision Agreement, Site Plan Agreement and the current Strathroy-Caradoc Servicing Standards and details noticeable gaps within each document and also gaps in coordination between them.

4.2 Subdivision Agreement

The following gaps and coordination issues were noted in Table 4-1.

Table 4-1 – Gaps Noted in Subdivision Agreement

Reference Section	Comment
1. DEFINITIONS Agreement Wording "Storm Water System"	Commentary: Subdivision agreements should have a prohibition on lots having depressed driveways and below grade garages. If these are allowed, they should be prohibited on properties adjacent to overland flow routes within the subdivision.
8.*STORMWATER MANAGEMENT*	Commentary: Requirements in Strathroy-Caradoc Servicing Standards. Note on Section (e): Permission from the Applicable Conservation Authority Note that all individual Conservation Authority regulations have been replaced with *O. Reg. 41/24: PROHIBITED ACTIVITIES, EXEMPTIONS AND PERMITS* under the *Conservation Authorities Act.* For information on how this regulation is to be implemented, refer to: • *O. Reg. 41/24: PROHIBITED ACTIVITIES, EXEMPTIONS AND PERMITS (ontario.ca)* • *UTRCA Transitional Procedures for the Implementation of O.Reg. 41-24 (thamesriver.on.ca)* • *Policies and Guidelines – St. Clair Region Conservation Authority (scrca.on.ca)* • *Interim GL Conservation Ontario*
15. SPECIAL CONDITIONS	Assumption by Municipality of Stormwater Facilities Commentary: SWM requirements in should be coordinated with current SWM requirements in Strathroy-Caradoc Servicing Standards. Wording and terminology should be the same between the agreements and the servicing standards whenever possible. Assumption requirements should include: • *Preparation and submission of an Operations and Maintenance Manual which reflects:* o *Conditions of Approvals*

Reference Section	Comment
	▪ *ECA* ▪ *Other approvals/conditions* ▪ *Servicing Standards* o *Requirements for ongoing monitoring* o *Lifecycle costing for sediment removal, replanting, repairs, etc.* o *Standard Forms/Checklists* ▪ *Assumption inspection form* ▪ *End of Warranty form* ▪ *Monitoring forms* ▪ *Maintenance forms* ▪ *Annual inspection form* • *Completion of the following forms:* o *Assumption inspection form* o *Maintenance form showing remedial work undertaken* Commentary: Fencing Due to inherent risk of having standing water, suggest fence height around SWM facility of 1.8 m. Current Ontario SWM GL does provide the option of the strategic planting of thorn bearing trees and shrubs such as hawthorn and raspberry in conjunction with or in lieu of fencing depending on the risk management approach of a municipality.
26. ACCEPTANCE, MAINTENANCE AND ASSUMPTION OF THE SERVICES	Warranty Period Commentary: End of Warranty period requirements should include completion of the following forms: • *End of Warranty form* • *Maintenance form showing remedial work undertaken*

4.3 Site Plan Agreement

The following gaps and coordination issues were noted in Table 4-2.

Table 4-2 – Gaps Noted in Site Plan Agreement

Reference Section	Comment
Overall Comment	SWM requirements in should be coordinated with current SWM requirements in Strathroy-Caradoc Servicing Standards. Wording and terminology should be the same between the agreements and the servicing standards whenever possible.
Overall Comment	As site plans typically involve catchment areas < 5 ha, it is important that the type of SWM facility chosen is both technically effective and has a manageable life cycle cost.
Overall Comment	If SWM Facility to be publicly owned, assumption requirements should include: • *Preparation and submission of an Operations and Maintenance Manual which reflects:*

Reference Section	Comment
	o *Conditions of Approvals* ▪ *ECA* ▪ *Other approvals/conditions* ▪ *Servicing Standards* o *Requirements for ongoing monitoring* o *Lifecycle costing for sediment removal, replanting, repairs, etc.* o *Standard Forms/Checklists* ▪ *Assumption inspection form* ▪ *End of Warranty form* ▪ *Monitoring forms* ▪ *Maintenance forms* ▪ *Annual inspection form* • *Completion of the following forms:* o *Assumption inspection form* o *Maintenance form showing remedial work undertaken*
Overall Comment	If to be privately owned approval requirements should include: • *Preparation and submission for review of an Operations and Maintenance Manual which reflects:* o *Conditions of Approvals* ▪ *ECA* ▪ *Other approvals/conditions* ▪ *Servicing Standards* o *Requirements for ongoing monitoring* o *Lifecycle costing for sediment removal, replanting, repairs, etc.* o *Standard Forms/Checklists* ▪ *Assumption inspection form* ▪ *End of Warranty form* ▪ *Monitoring forms* ▪ *Maintenance forms* ▪ *Annual inspection form* • *Completion of the following forms:* o *Assumption inspection form* o *Maintenance form showing remedial work undertaken* • *Sufficient surety for maintenance over life span of facility.*

4.4 Strathroy-Caradoc Servicing Standards, October 2021

The following gaps and coordination issues were noted in Table 4-3.

Table 4-3 – Gaps Noted in Strathroy-Caradoc Servicing Standards Section 10 – Stormwater Management

Reference Section	Comment
10.1 INTRODUCTION	Commentary: Standards should:

Reference Section	Comment
	• Prohibit End of Pipe Infiltration Facilities • Require some sort of surety on Private SWM facilities • State that use of LID measures are for environmental enhancement and cannot be counted on as part of the mandated quantity or quality treatment.
10.2 SUBMISSION / APPROVAL PROCEDURES	**Commentary:** Submission/Approval Procedures should be coordinated between Subdivision/Site Plan Agreement requirements and those required in Strathroy-Caradoc Servicing Standards. Wording and terminology should be the same between the agreements and the servicing standards whenever possible.
10.3 REFERENCES	**Commentary:** Preamble to this section should note that proponents are required • *to ensure compliance with all relevant acts regardless of the list provided* • *to ensure compliance to regulations from the required provincial and federal acts* **Note:** All individual Conservation Authority regulations have been replaced with *O. Reg. 41/24: PROHIBITED ACTIVITIES, EXEMPTIONS AND PERMITS* under the *Conservation Authorities Act.* For information on how this regulation is to be implemented, refer to: • *O. Reg. 41/24: PROHIBITED ACTIVITIES, EXEMPTIONS AND PERMITS (ontario.ca)* • *UTRCA Transitional Procedures for the Implementation of O.Reg. 41-24 (thamesriver.on.ca)* • *Policies and Guidelines – St. Clair Region Conservation Authority (scrca.on.ca)* • *Interim GL Conservation Ontario*
10.4 DESIGN REQUIREMENTS 10.4.5 End of Pipe Facility Requirements	**Recommended Modification:** Change "Stormwater Management Facilities (i.e., ponds, wetlands, etc.) are required to have the following design criteria:" To "In addition to adhering to the Ontario Stormwater Management Planning and Design Manual (2003), Stormwater Management Facilities (i.e., ponds, wetlands, etc.) are required to have the following design criteria:"
10.4 DESIGN REQUIREMENTS	10.4.5.6 Stormwater Management Facility Storage Volumes

Reference Section	Comment
Recommended Additional Sections to 10.4.5	The working volumes of the sediment forebay and the detention pond (s) should allow for an average depth of sediment of 0.3 m in the forebay and the pond (s). To lengthen the service life, individual SWM facilities should be oversized by 10% with regard to treatment volume for the design storms selected. 10.4.5.7 Stormwater Management Safety SWM Pond design features to reduce the risk of injury to children (aged1 to 8 years) or adults with physical or mental impairments, while maintaining facility function. In addition to these the Proponent must consider safety features to restrain access to deep standing water through a series of spatial, physical, natural and aesthetic barriers or through alternatives to direct access. Specific guidance includes but is not limited to: 1. Stormwater from the forebay shall be held in a permanent wet retention pond and should be located in the facilities lower cell (assuming the general main cell design reflects an overall safety criteria of gentle slopes and aquatic safety benches or suitable barriers); 2. Within open space and park areas in lieu of fencing, unmowed vegetated buffers will be required around the perimeter. This buffer should be comprised of tall grasses and wild flowers, followed by trees and densely planted shrubs. A densely vegetated margin on the aquatic safety bench is to serve as an aesthetic amenity and an additional natural barrier; 3. This dense unfriendly vegetation should act as a natural barrier to all but the most determined individuals. Openings can be provided if warnings are posted advising those who approach the facility of its purpose, operation and potential safety hazards; 4. Posted warning signs should be visible at emergency access points in the event that the barrier is penetrated. An aquatic safety bench must be constructed around the forebay and the main treatment cells with the lower edge to be located 0.9 m above the pond bottom with a minimum 2 m width and incorporate a slope of 10:1 or flatter; 5. Pedestrian and cycle paths must always be located no lower than the 10 year storm event water elevation with at least 0.9 m freeboard from the permanent pool of water and are only permitted where the safety bench is present and have adequate signage to warn the public of potential safety hazards during pond operation; and *6.* Access roads below the 10 year storm event water elevation are to be posted with hazard signage Paths below this point and

Reference Section	Comment
	leading to the lower portions of a facility to warn the public of potential safety hazards during pond operation.
10.4.6 Low Impact Development Systems	**Commentary:** The Municipality should support efforts to incorporate LID measures into development to enhance the environment as part of sustainability goals of Strathroy-Caradoc. These can contribute to buildings getting LEED Certification or developments achieving Envision Certification which are laudable goals. However, practical experience in the past 10-years in Southwestern Ontario has found that LIDS are not necessarily effective low costs solutions for SWM or drainage, have issues with community acceptance (create wet areas, require resident maintenance of boulevard), and require frequent maintenance as they are mostly infiltration-based systems. Therefore, it is recommended that LID systems not be considered as part of the mandated quantity or quality treatment.
10.5 HYDROLOGY 10.5.2 Overland Flow Routes	**Commentary:** The Standards, similar to what is recommended in subdivision agreements should have a prohibition on lots having depressed driveways and below grade garages. If these are allowed, they should be prohibited on properties adjacent to overland flow routes within the subdivision.
10.6 MONITORING AND MAINTENANCE 10.6.3 Post-Assumption Operation and Maintenance	**Commentary:** This section should be revised to coordinate with proposed revisions to Section 15. SPECIAL CONDITIONS, Assumption by Municipality of Stormwater Facilities in t Subdivision Agreements and in any similar section in Site Plan Agreements.
10.8 INTERIM / PHASING CONSIDERATIONS	**Commentary:** This should be coordinated so that there are standard conditions between the Standards and applicable Subdivision Agreements.
10.9 MONITORING OF PRIVATE SITE	**Commentary:** This should be coordinated so that there are standard conditions between the Standards and applicable Site Plan Agreements.

5.0 RECOMMENDATIONS

5.1 Summary of Recommendations

To improve the current SWM approval and management process to balance meeting regulatory requirements, safety, environmental protection/enhancement, lifecycle cost, liability, and an equitable apportionment between new and existing development.

- Stage 1: Develop Overall SWM Policy for Council Endorsement;
- Stage 2: Update Procedures Facility Assessment and Assumption; and
- Stage 3: Implement SWM Lifecycle Management Program.

This is illustrated in Figure 5-1.

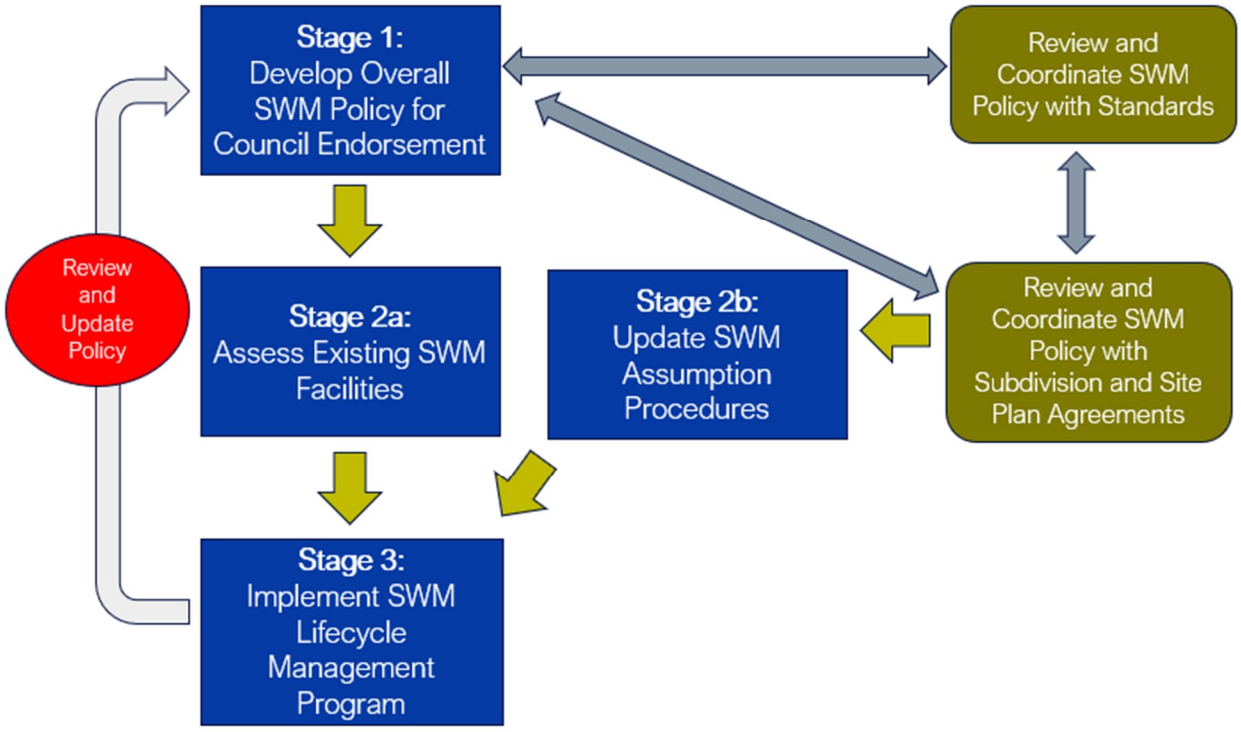


Figure 5-1: SWM Policy Implementation Flow Chart

5.2 Stage 1: Develop Overall SWM Policy for Council Endorsement

A Municipality SWM Policy is recommended to be created which will form the basis for the lifecycle management of the current and future SWM facilities in Strathroy Caradoc. This policy would include:

1. Introduction to the Policy;

2. Reference Section to review statutes, regulations and design standards including policy background, roles and responsibilities of various levels of government, and risk management;
3. Requirements including planning requirements, proponent responsibility, facility sizing and cost apportionment, approval requirements;
4. SWM Facility Lifecycle requirements, including operations manual requirement, construction, assumption, operational practices, monitoring, and renewal; and
5. Errata and Revision Section to keep track of changes to policy over time.

The development of the policy would involve review and coordinate with the Municipality's current municipal design standards and harmonizing the policy with the requirements detailed in Subdivision and Site Plan Agreements. Appendix C provides a Stormwater Management Policy Manual Draft Table of Contents.

5.3 Stage 2: Assessment of Existing Facilities and Adoption of Assumption Procedures

Based on the SWM Facility Lifecycle requirements established in the SWM Policy, the current SWM facilities should be assessed as follows:

1. That an inspection be performed of each facility to confirm its current condition;
2. That the performance of each facility be reviewed during a 25 mm or greater rainfall event to confirm its current level of performance;
3. Review of the SWM facility's performance to confirm if it matches the requirements stated in their original or most current Environmental Compliance Certificate (prior to issuance of CLI) and their current Operations and Maintenance Manual (if available);
4. If there is no record of the performance of a SWM Facility, then a study of the SWM facility be conducted to establish its required performance based on the type of facility and the current treatment standards for this type of treatment (i.e. quantity and/or quality); and
5. Based on the above activities, develop a maintenance/restoration plan be established for each SWM facility including scope of work, anticipated cost and timing.

Update assumption and end of warranty procedures for the acceptance of new SWM facilities to match the approved SWM policy.

5.4 Stage 3: Implement SWM Lifecycle Management Program

Based on the work undertaken in Stages 1 and 2, the Municipality will be able to assess development fees related to the planning, implementation and lifecycle costs for planned SWM facilities. The Municipality should also look to establish a maintenance and capital works budget to:

1. Establish the timing and cost to address condition and performance issues in the current SWM facilities;
2. Periodically Monitor current SWM Facilities; and
3. Periodically renew the function of the current SWM Facilities.

6.0 COSTS ASSOCIATED WITH IMPLEMENTATION OF SWM POLICY

6.1 Levels of Cost Estimation

ASTM E 2516 (Standard Classification for Cost Estimate Classification System) provides a five-level classification system based on several characteristics, with the primary characteristic being the level of project definition (i.e., percentage of design completion). The ASTM standard, shown in Table 6-1, illustrates the typical accuracy ranges that may be associated with the general building industries.

Table 6-1 – ASTM E2516 Accuracy Range of Cost Opinions for General Building Industries

Cost Estimate Class	Expressed as % of Design Completion	Anticipated Accuracy Range as % of Actual Cost
5	0-2	-30 to +50
4	1-15	-20 to +30
3	10-40	-15 to +20
2	30-70	-10 to +15
1	50-100	-5 to +10

The cost estimates developed in this report would be best described as a **Class 5 Cost Estimate** which is typically used for high level study project.

Any costs stated in this report should be considered to reported in 2024 Canadian dollars.

6.2 Stage 1: Develop Overall SWM Policy for Council Endorsement

Developing an overall SWM Policy could be undertaken internally by the Municipality but it may be better to have a consultant undertake this work. The Scope of Work for the development of a SWM Policy would be as follows:

1. Background Review
    a. Review and confirm Gaps noted in this report,
    b. Confirm with Muncipaity staff scope of external consultation,
    c. Review and confirm SWM policy best practices of municipalities of similar size and development demands to Strathroy-Caradoc,
    d. Undertake consultation with Muncipaity staff, County Planning Staff, and stakeholders,
    e. Summarize review of review and report to Muncipaity staff;

2. Develop Draft Policy
    a. Develop draft policy and harmonize with municipal standards and subdivision/site plan terms and conditions,

b. Review draft policy with Muncipaity staff,
c. Undertake external review for comment if requested by Muncipaity staff,
d. Finalize draft SWM policy document; and

3. Present Policy to Council and Finalize
    a. Assist Staff in the presentation of the draft SWM policy to council,
    b. Finalize policy based on staff/council direction.

The cost for getting an external consultant to assist with the development of a SWM Policy would be approximately $100,000.

6.3 Stage 2: Stage 2: Assessment of Existing Facilities and Adoption of Assumption Procedures

Based upon the development of a SWM Policy for Strathroy-Caradoc, Table 6-2 summaries the anticipated costs for assessing existing SWM facilities and implementing assumption procedures. The total costs for completing Stage 2 is estimated at $279,000.

Table 6-2 – Costs for Assessment of Existing Facilities and Implementing Assumption Procedures

SWM Facility	Facility Inspection to Confirm Condition	Performance Review (25 mm storm event)	Facility Assessment	Establish Facility Performance Criteria	Facility Maintenance Plan
SWMP-01- Pinetree Ln/ Riverview Dr, Strathroy	$3,000	$3,000	$15,000	$10,000	$5,000
SWMP-02 - Parkview Dr/ Parkview Cres (north)	$3,000	$3,000	$15,000	$10,000	$5,000
SWMP-03 - Parkview Dr/ Parkview Cres (south)	$3,000	$3,000	$10,000	$10,000	$5,000
SWMP-04 - Second Str. & Adair Blvd., Strathroy	$3,000	$3,000	$15,000	$10,000	$5,000
SWMP-05 - Head St N/ Thorne Dr, Strathroy	$3,000	$3,000	$15,000	$10,000	$5,000
SWMP-06 - Molnar Industrial Park	$3,000	$3,000	$15,000	$10,000	$5,000

SWM Facility	Facility Inspection to Confirm Condition	Performance Review (25 mm storm event)	Facility Assessment	Establish Facility Performance Criteria	Facility Maintenance Plan
SWMP-07 - Bennett Cres, Mt. Brydges	$3,000	$3,000	$15,000	$10,000	$5,000
SWMP-08 and 09 - Lucas St/Pondhaven Ln, Mt. Brydges [1]	$0	$0	$0	$0	$3,000
SWMP-010 - Agnes Drive Extension, Strathroy [1]	$0	$0	$0	$0	$0
SWMP-011 - Agnes Drive South, Strathroy	$3,000	$3,000	$10,000	$10,000	$3,000
TOTAL	**$24,000**	**$24,000**	**$110,000**	**$80,000**	**$40,500**

Note 1 - Recent SWM Facility, Municipality should be able to get information from Developer or Engineer

6.4 Stage 3: Implement SWM Lifecycle Management Program

Table 6-3 summaries the anticipated costs for the rehabilitation of existing SWM facilities and includes an allowance for 10% engineering fees. The specific costs for the rehabilitation of each facility should be updated based on the findings of Stage 2 of the proposed work program.

Table 6-3 – High Level SWM Rehabilitation Costs for SWM Facilities

SWM Facility	Cost
SWMP-01- Pinetree Ln/Riverview Dr, Strathroy	$550,000
SWMP-02 - Parkview Dr/Parkview Cres (north)	$385,000
SWMP-03 - Parkview Dr/Parkview Cres (south)	$220,000
SWMP-04 - Second Str. & Adair Blvd., Strathroy	$550,000
SWMP-05 - Head St N/ Thorne Dr, Strathroy	$550,000
SWMP-06 - Molnar Industrial Park	$385,000
SWMP-07 - Bennett Cres, Mt. Brydges	$550,000
SWMP-08 and 09 - Lucas St/Pondhaven Ln, Mt. Brydges	$760,000
SWMP-010 - Agnes Drive Extension SWM Pond, Strathroy	$385,000
SWMP-011 - (not noted in CLI) Agnes Drive South, Strathroy	$440,000

6.5 SWM Lifecycle Management Implementation

Assuming that the Municipality commences the proposed SWM Lifecyle program, in 2025, the following would be the projected costs over the following 20-years:

- Stage 1: Develop Overall SWM Policy for Council Endorsement
    - Initial policy developed in 2025 and 2026,
    - 10-year policy review and updates,
    - Total 10-year cost $100,000,
    - Total (cumulative) 20-year cost $200,000;
- Stage 2: Update Procedures Facility Assessment and Assumption
    - SWM assessments undertaken between 2027 and 2029,
    - Total 10-year cost $279,000,
    - Stage 2 is a one-time cost; and
- Stage 3: Implement SWM Lifecycle Management Program
    - Once Stage 2 is complete, the order of the rehabilitation will be established based on the needs identified,
    - SWM Facility rehabilitation commences in 2029 with the engineering phase of the rehabilitation of the first SWM facility and it is assumed that rehabilitation is undertaken at the rate of one facility per year with the following year's facility in design.
    - Total 10-year cost $2,290,000,
    - Total (cumulative) 20-year cost $5,325,000.

Appendix D shows the Stormwater Master Plan Project Fact sheet that details the following:

- Project and Location;
- Anticipated MCEA Schedule;
- Total Cost;
- Anticipated Timing for Projects from 2025 to 2046; and
- Summary of Cashflow over the period 2024 to 2046.

The timing provided is based upon the perceived need to undertake work to address growth when it is expected. Additionally, those projects which address other noted deficiencies are timed such that they occur as soon as possible with the intent to undertake them when there are growth related projects underway that are relatively high cost.

It is recommended that the Municipality review the proposed projects identified in this Master Plan and consider them within the context of their current 10-year Capital Plan and Asset Management Plan and update the Capital Plan according to the Municipality's priorities and capacity and those of other stakeholders to fund the required capital works.

APPENDIX A

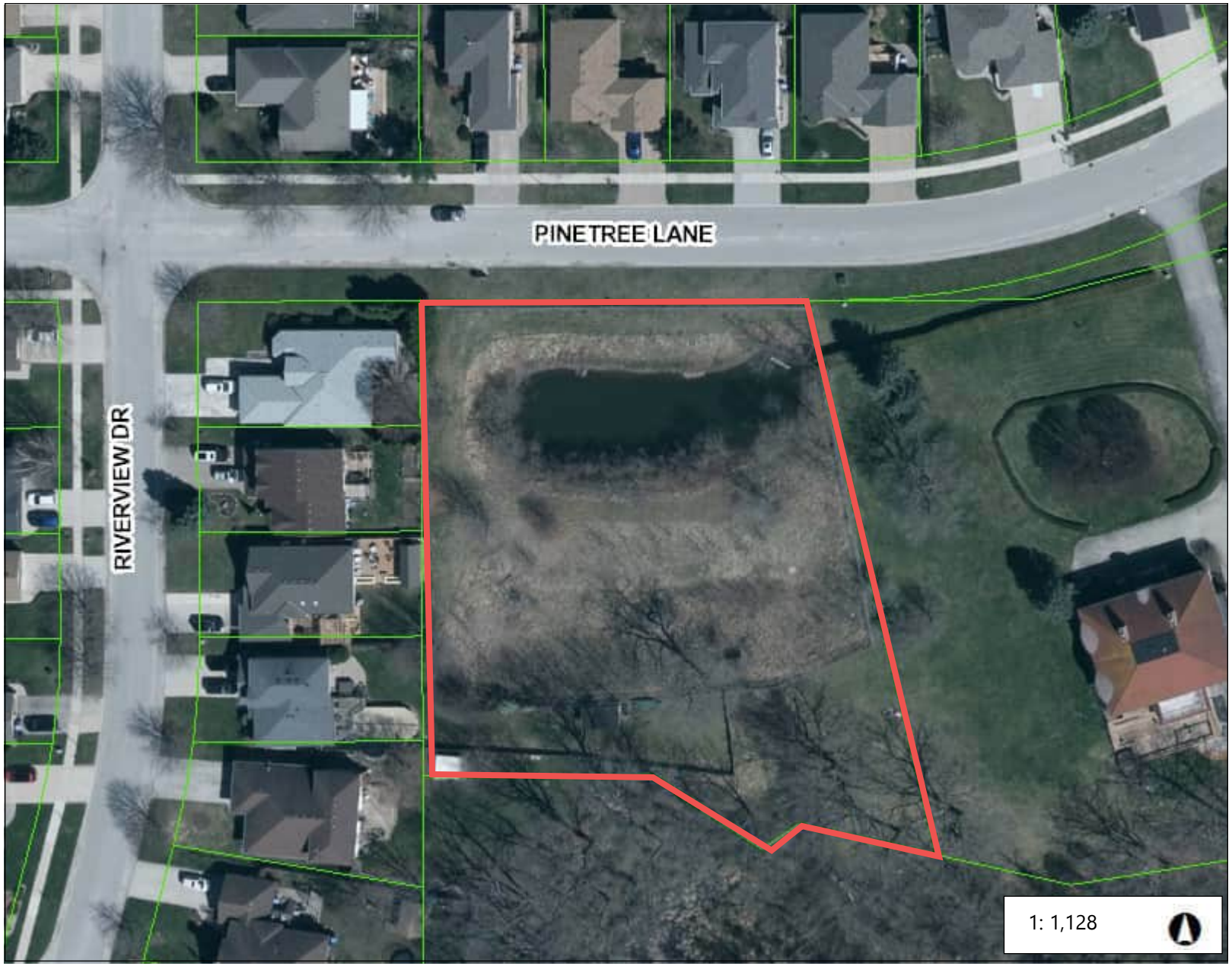
Details of Existing and Planned SWM Facilities

APPENDIX A-1

SWMP-01- Pinetree Ln/Riverview Dr, Strathroy

Watershed: East Sydenham
Facility Type: Wet Pond
Type of Controls: Quantity
Drainage Area (ha): 26.5
In-Service Date: 1992
ECA (prior to CLI)): not known

Pinetree SWM



Legend

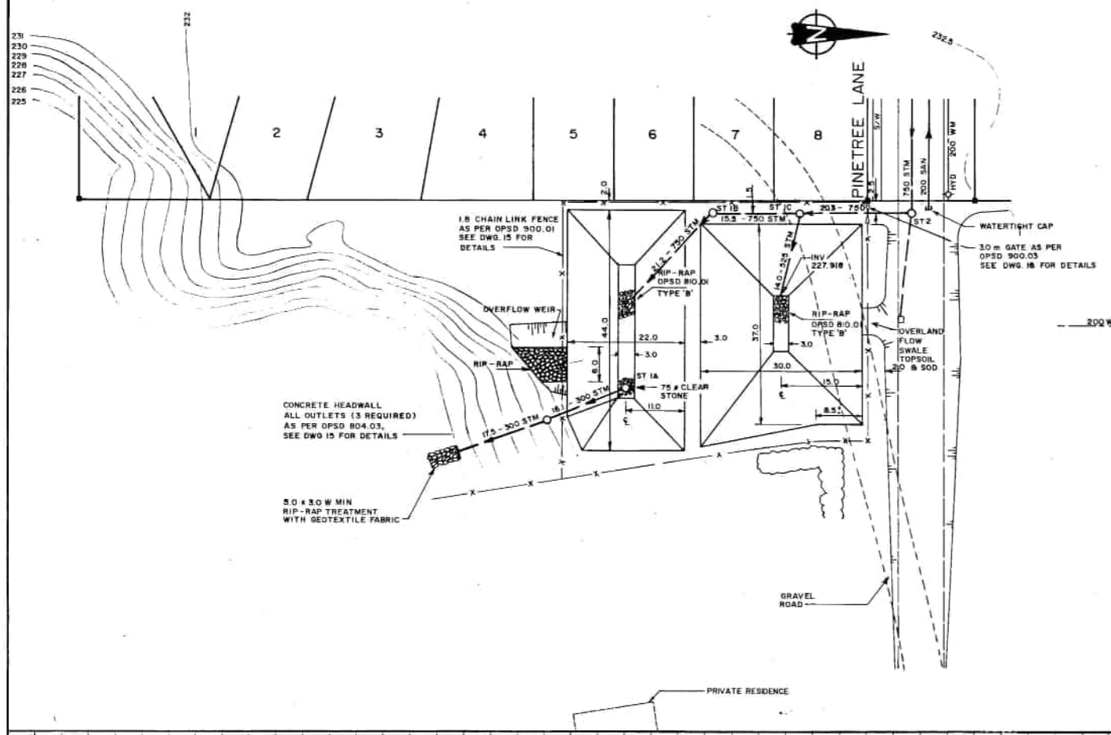
Parcels

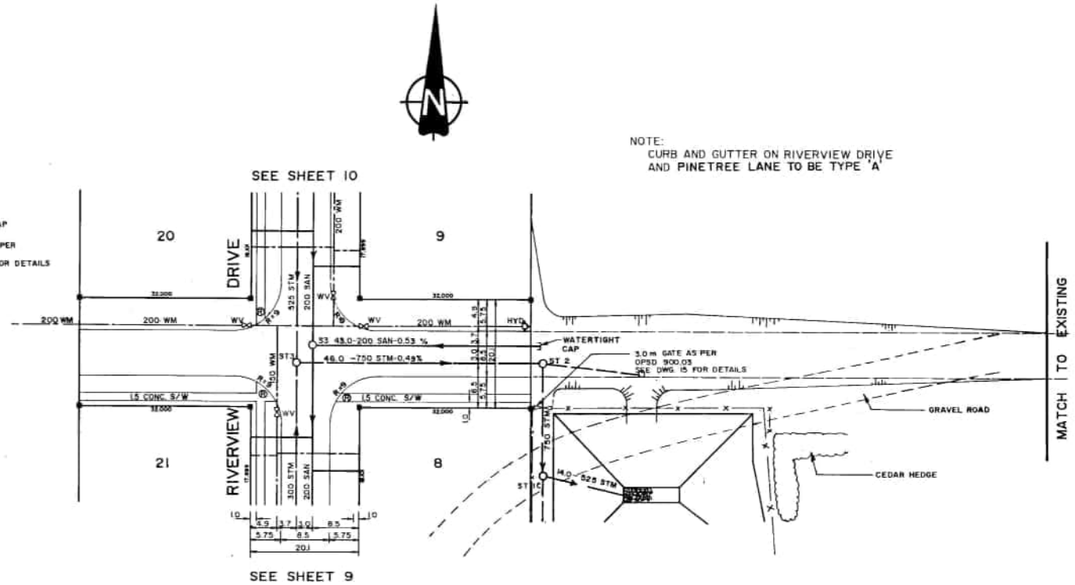
Notes

6/06/2024

0.1 0 0.03 0.1 Kilometers

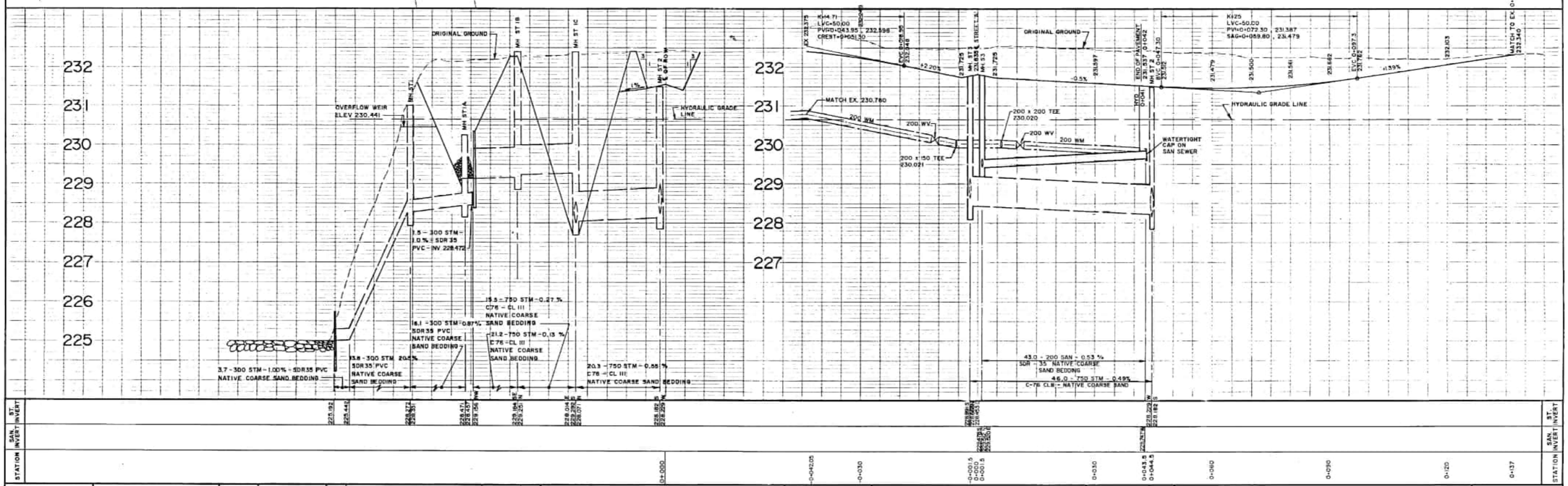
WGS_1984_Web_Mercator_Auxiliary_Sphere





NOTE:
CURB AND GUTTER ON RIVERVIEW DRIVE AND PINETREE LANE TO BE TYPE 'A'

PINETREE LANE



AS CONSTRUCTED NOTES	AS CONSTRUCTED SERVICES	COMPLETION
1. SEE DRAWING FOR FURTHER DETAILS.	SANITARY SEWERS, P.D.C.'s & M.H.'s	APRIL/93
2. SEWER DESIGN: TRANSITION WIDTH OR AS NOTED.	STORM SEWERS, C.B.'s & M.H.'s	APRIL/93
3. REFERENCE B.M. No.S ELEVATION:	WATERMAINS & W.S.C.'s	APRIL/93
4. PDC'S SIZE SANITARY 100 UNLESS OTHERWISE NOTED.	GRANULAR BASE	MAY/93
	CURB & GUTTER	MAY/93
	SIDEWALKS	MAY/93
	PAVING i) BASE	MAY/93
	ii) SURFACE	NOV/93

DESIGN: TAC/RKD
DRAWN: DTJ
CHECKED: RAL
APPR'D: DJW
DATE: APR. 1992

No.	REVISIONS	DATE	BY
1	AS CONSTRUCTED	JAN/94	JK

UMA Engineering Ltd.
Engineers & Planners
PROJECT ENGINEER

ENGR'S STAMP
REGISTERED PROFESSIONAL ENGINEER
14/04/94
D. J. WHITNEY
PROVINCE OF ONTARIO

NMB INVESTMENTS
71 ROSEDALE AVE, WEST
BUILDING 'G' UNIT 6
BRAMPTON, ONT.

SCALE
HOR. 1 : 500
VERT. 1 : 50
5 m 0 10 m Horizontal
0.5 m 0 1.0 m Vertical

TITLE
NORTH STRATHROY MEADOWS
PHASE I
TOWN OF STRATHROY
RETENTION PONDS
PINETREE LANE FROM 42 WEST OF STREET 'A' TO 42 EAST OF STREET 'A'

PROJECT No. 6310-001
SHEET No. 14 of 17
PLAN FILE No.

No Additional Information

APPENDIX A-2

SWMP-02 - Parkview Dr/Parkview Cres (north), Strathroy

Watershed: East Sydenham
Facility Type: Infiltration/Wet Pond?
Type of Controls: Quantity
Drainage Area (ha): 20.5
In-Service Date: 1992
ECA (prior to CLI)): not known

Parkview North SWM

Legend

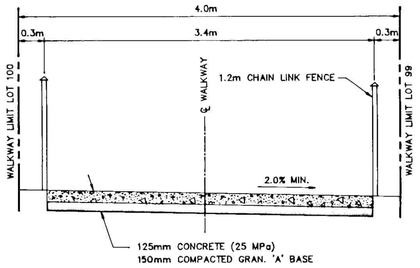
- Parcels

Notes

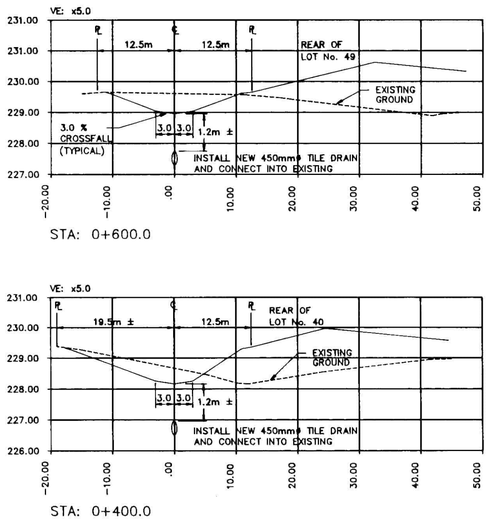
6/06/2024

0.1 0 0.03 0.1 Kilometers

WGS_1984_Web_Mercator_Auxiliary_Sphere



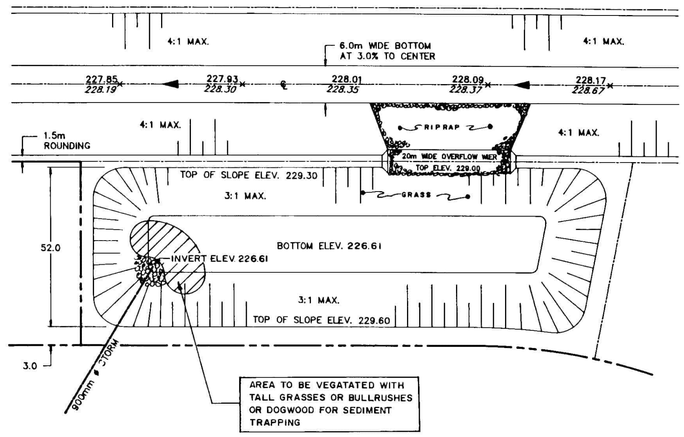
WALKWAY TYPICAL CROSS-SECTION



STA: 0+600.0

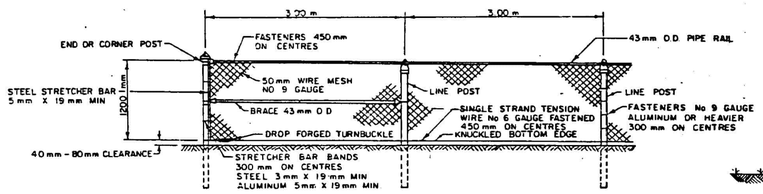
STA: 0+400.0

TYPICAL CRAWFORD DRAIN X-SECTIONS

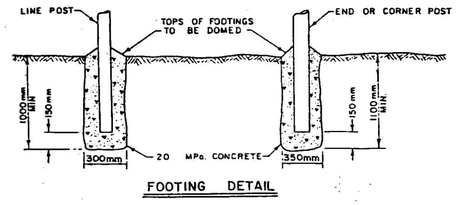


STORM WATER MANAGEMENT POND

SCALE 1:500

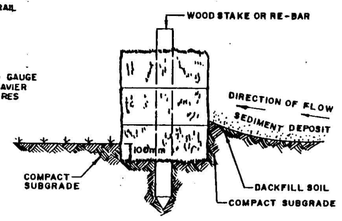


CHAIN LINK FENCE DETAIL



FOOTING DETAIL

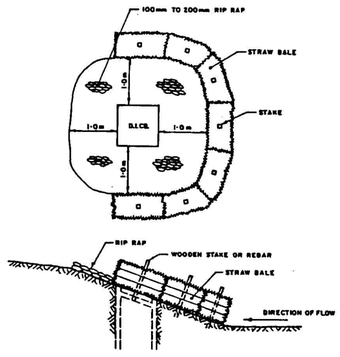
POST DETAIL							
DESCRIPTION	O.D	LENGTH					
		FABRIC WIDTH 1.8m		FABRIC WIDTH 1.5m		FABRIC WIDTH 1.2m	
		STANDARD	RETAINING WALLS	STANDARD	RETAINING WALLS	STANDARD	RETAINING WALLS
LINE POST	60mm	2.65m	2.15m	2.35m	1.85m	2.05m	1.55m
END, CORNER, STRAINING AND GATE POST WITH OPENINGS 8.5m MAX.	90mm	2.90m	2.35m	2.60m	2.05m	2.30m	1.70m
GATE POST OPENINGS 8.8m MAX.	115mm	2.90m	—	2.60m	—	2.30m	—



TYPICAL SECTION OF STRAW BALE USED TO FILTER OVERLAND FLOW

STRAW BALE FILTER

N.T.S.

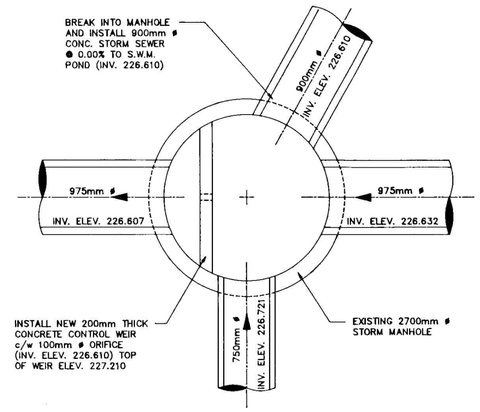


STRAW BALE AND RIP RAP FILTER

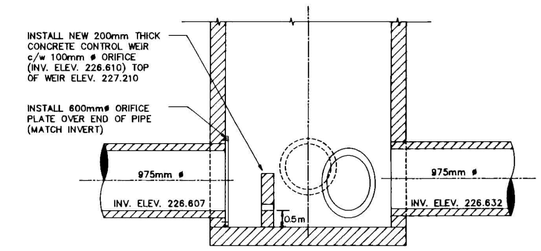
N.T.S.

SEDIMENTATION AND EROSION CONTROL MEASURES

1. PROTECT ALL EXPOSED SURFACES AND CONTROL ALL RUNOFF DURING CONSTRUCTION.
2. ALL EROSION CONTROL MEASURES TO BE IN PLACE BEFORE STARTING CONSTRUCTION AND ARE TO BE MAINTAINED IN PLACE UNTIL RESTORATIVE VEGETATION HAS BEEN FULLY ESTABLISHED.
3. MAINTAIN EROSION CONTROL MEASURES DURING CONSTRUCTION.
4. ALL COLLECTED SEDIMENT TO BE DISPOSED OF AT AN APPROVED LOCATION.
5. MINIMIZE AREA DISTURBED DURING CONSTRUCTION.
6. ALL DEWATERING TO BE DISPOSED OF IN AN APPROVED SEDIMENTATION BASIN.
7. PROTECT ALL CATCHBASINS, MANHOLES AND PIPE ENDS FROM SEDIMENT INTRUSION. ALL INLETS TO CATCHBASINS SHALL BE SEALED OR WRAPPED WITH GEOTEXTILE UNTIL THE DRAINAGE AREA HAS BEEN SODDED.
8. KEEP ALL SUMPS CLEAN DURING CONSTRUCTION.
9. PREVENT WIND-BLOWN DUST.
10. STRAW BALES AND SILT FENCES TO BE USED IN LOCALIZED AREAS AS SHOWN AND AS DIRECTED BY THE ENGINEER DURING CONSTRUCTION.
11. TOPSOIL STOCKPILES TO BE PROTECTED BY SEED AND MULCH APPLICATION.
12. CHANNEL IMPROVEMENTS TO BE CARRIED OUT DURING DRY WEATHER SEASON (MAY-AUGUST).



PLAN BELOW ELEV. 227.000



SECTION A-A

SCALE 1:50

STORM MANHOLE No. 10 DETAILS

AS CONSTRUCTED NOTES	AS CONSTRUCTED SERVICES	COMPLETION
1 SEE DRAWING No. FOR FURTHER DETAIL		
2 SEWER DESIGN; TRANSITION WIDTH OR AS NOTED		
3 REFERENCE B.M. No ELEVATION m		
4		
5		

DESIGN	G.D.C.
DRAWN	G.D.C.
CHECKED	J.A.H.
APPROVED	R.C.S.
DATE	JULY 1992

No	REVISIONS	DATE	BY
1	ADD DETAILS TO SWM POND	3 SEPT '92	R.C.S.

CONSULTANT OR DIVISION

Cumming Cockburn Limited
Consulting Engineers and Planners
Hull, Ottawa, Toronto, Waterloo, London
350 OXFORD ST. WEST, SUITE 203, LONDON
PHONE (519) 472-7328
PROJECT ENGINEER

ENGINEERS STAMP

REGISTERED PROFESSIONAL ENGINEER R. C. Smith PROVINCE OF ONTARIO

THE Hampton GROUP INC.

SCALE: N.T.S.

TITLE: PARKVIEW ESTATES - PHASE II
STRATHROY, ONTARIO
DETAILS

PROJECT No 2102.02
SHEET No 10 of 11
PLAN FILE No

No Additional Information

APPENDIX A-3

SWMP-03 - Parkview Dr/Parkview Cres (south), Strathroy

Watershed: East Sydenham
Facility Type: Dry Pond
Type of Controls: Quantity
Drainage Area (ha): 6.3
In-Service Date: 1994
ECA (prior to CLI)): not known

Parkview South SWM

Legend

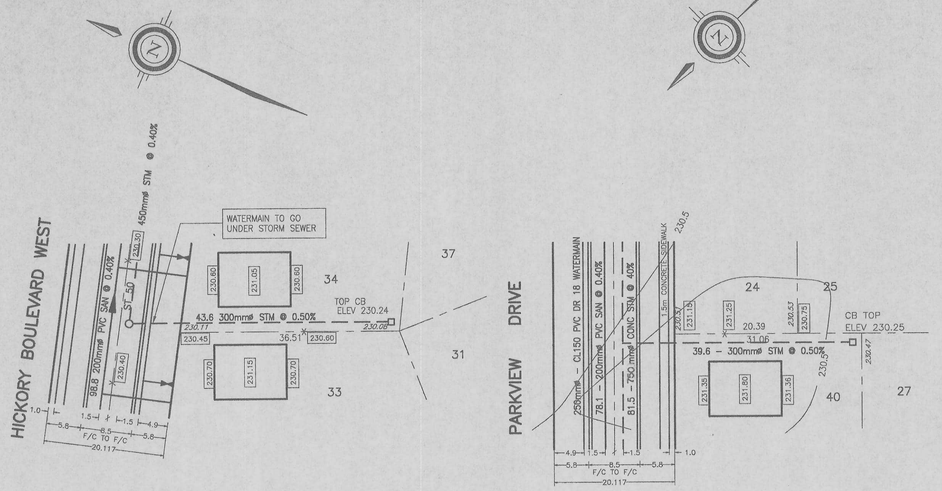
Parcels

Notes

6/06/2024

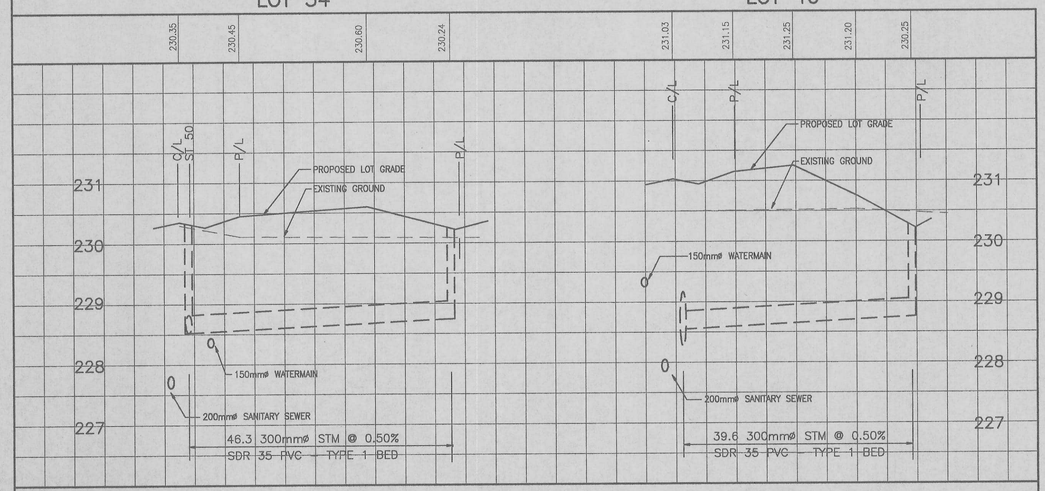
0.1 0 0.03 0.1 Kilometers

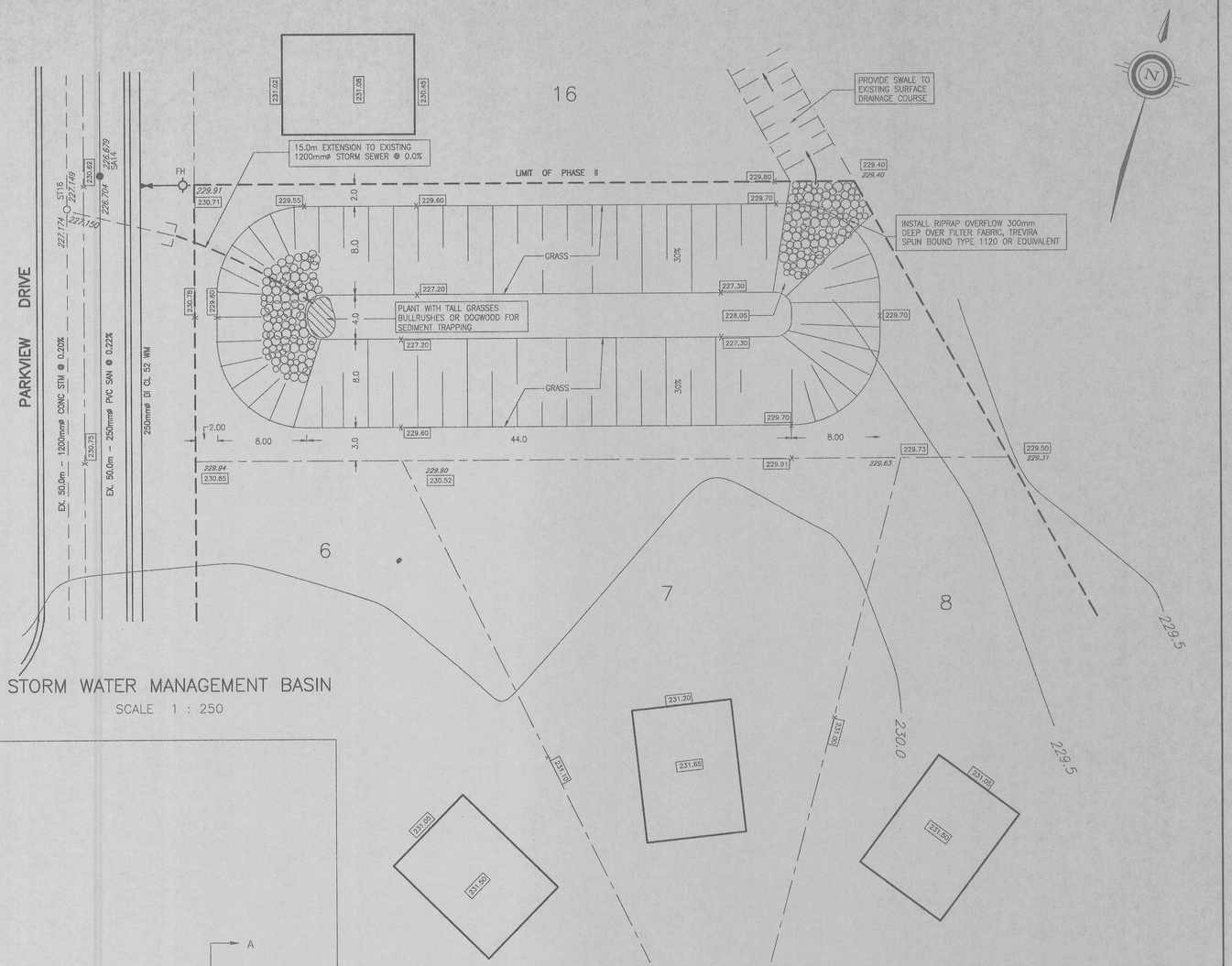
WGS_1984_Web_Mercator_Auxiliary_Sphere



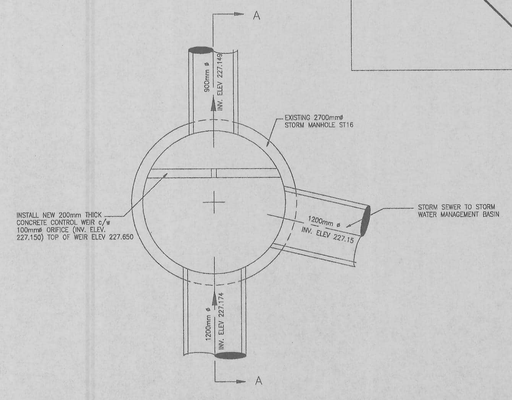
STORM SEWER RESERVE
LOT 34

STORM SEWER RESERVE
LOT 40

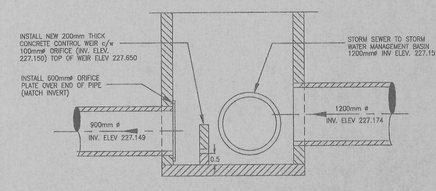




STORM WATER MANAGEMENT BASIN
SCALE 1 : 250



PLAN VIEW



SECTION A-A

STORM MANHOLE No. 16 DETAIL

AS CONSTRUCTED NOTES

AS CONSTRUCTED SERVICES

COMPLETION

DESIGN	RCS
DRAWN	RJM
CHECKED	RCS
FIELD BOOK	
DATE	MARCH 29, 1994
CAD REF. No.	

No.	REVISIONS	DATE	BY

CONSULTANT

STEVENSON ENGINEERING LIMITED

361 Dundas Street London Ontario N6B 1V5 (519) 439-6091

ENGINEER'S STAMP

REGISTERED PROFESSIONAL ENGINEER R. C. STEVENSON PROVINCE OF ONTARIO

CLIENT

STRATHNET DEVELOPMENTS INC.

SCALE

HORIZONTAL 1:500
5 0 10m

VERTICAL 1:50
0.5 0 1m

TITLE

PARKVIEW ESTATES - PHASE III - PART A

PART OF LOT 15 CONCESSION 10
TOWN OF STRATHROY

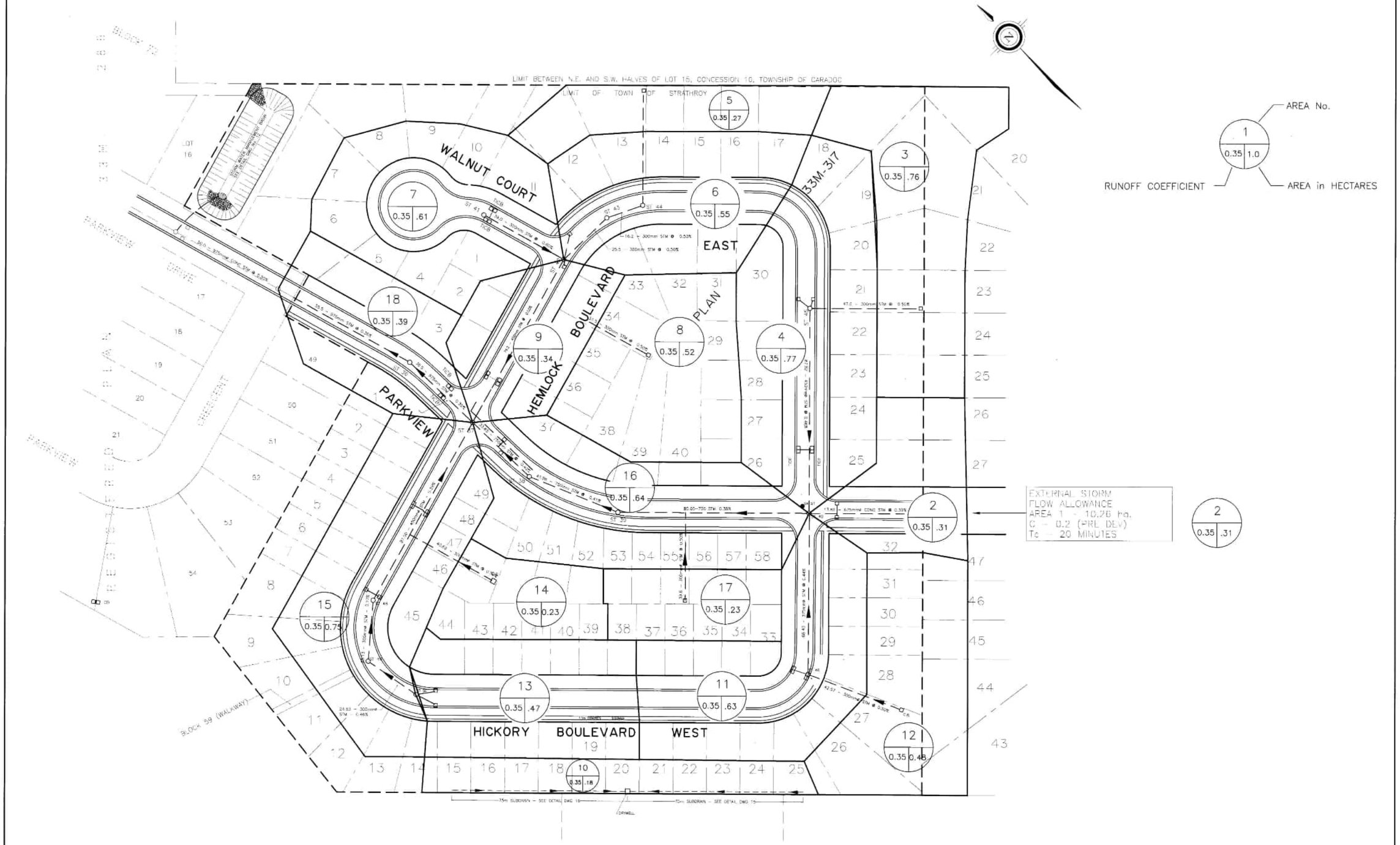
LATERAL STORM SEWERS
PLAN AND PROFILE

PROJECT No. 93022

SHEET No. 12

PLAN FILE No.

APR 21 1994



AS CONSTRUCTED NOTES	AS CONSTRUCTED SERVICES	COMPLETION

DESIGN R.C.S.
DRAWN R.J.M
CHECKED R.C.S.
FIELD BOOK
DATE: MARCH 29, 1994
CAD REF. No.

No.	REVISIONS	DATE	BY
1	REVISED TO TOWN OF STRATHROY REQUIREMENTS	MAY, 1994	RJM
2	REVISED LOT LAYOUT AND SIZE	DEC. 1995	RCS
3	AS CONSTRUCTED	DEC., 1997	RCS

CONSULTANT
STEVENSON ENGINEERING LIMITED
238 Olympic Crescent London Ontario N6G 3P7
TEL (519) 474-0410 FAX (519) 474-0283

ENGINEER'S STAMP
R. C. STEVENSON
PROFESSIONAL ENGINEER PROVINCE OF ONTARIO

CLIENT
STRATHNET DEVELOPMENTS INC.

SCALE
HORIZONTAL 1 : 750
0 5 10 20
METRIC

TITLE
PARKVIEW ESTATES - PHASE III
PART OF LOT 15 CONCESSION 10 RP 33M-317
TOWN OF STRATHROY
STORM DRAINAGE AREA PLAN

PROJECT No. 93022
SHEET No. 3
PLAN FILE No.

No Additional Information

APPENDIX A-4

SWMP-04 - Second Str. & Adair Blvd., Strathroy

Watershed: East Sydenham
Facility Type: Extended Detention Pond
Type of Controls: Quantity/Quality
Drainage Area (ha): 70.1
In-Service Date: 2001
ECA (prior to CLI)): 6561-4M6N6Q, 2000

Second Street and Adair Blvd SWM

Legend

- Adelaide Metcalfe Address
- North Middlesex Address Unit
- Thames Centre Address
- Parcels

0.4 0 0.20 0.4 Kilometers

WGS_1984_Web_Mercator_Auxiliary_Sphere

This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.

THIS MAP IS NOT TO BE USED FOR NAVIGATION

Notes

6/04/2024

Ontario

Ministry of the Environment **Ministère de l'Environnement**

CERTIFICATE OF APPROVAL
MUNICIPAL AND PRIVATE SEWAGE WORKS
NUMBER 6561-4M6N6Q

Corporation of the Town of Strathroy
52 Frank St.
Strathroy, Ontario
N7G 2R4

Site Location: Strathroy Multi-Use Site
Lot 25, Concession 2
Strathroy Town, County Of Middlesex

You have applied in accordance with Section 53 of the Ontario Water Resources Act for approval of:

the construction of a stormwater management facility and associated appurtenances as part of the Strathroy Multi-Use Facility, in the Town of Strathroy, as follows:

Stormwater Management Pond

a stormwater management pond located onsite consisting of a stormwater extended detention wet pond with quality and quantity control functions. The stormwater management facility has a combined available storage volume of approx. 9,599 m^3 consisting of 7,649 m^3 of detention storage (including 780 m^3 of extended detention storage) and 1,950 m^3 of permanent pool storage. The quality portion of the pond is provided with inlet forebay, berm and vegetative lining to enhance sediment removal. Discharge control is provided via an perforated riser pipe structure and two orifice plates designed to provide quality control by detaining the runoff from all design storm events prior to discharge over a minimum 24 hr period to an existing watercourse. Quantity control is provided by overcontrolling the catchment area post-development flows to the pre-development rates of 0.248 m^3/s, 0.546 m^3/s, 0.718 m^3/s and 0.977 m^3/s prior to discharge to an existing watercourse during the 2, 10, 25 and 100 year design storm events respectively, together with inlet and outlet piping and structures, overflow weir, spillway, low flow channel and fencing and including temporary erosion/sedimentation stormwater management facilities during construction, all in accordance with the stormwater management report and final drawings prepared by Stantec Consulting Ltd., Consulting Engineers.

For the purpose of this Certificate of Approval and the terms and conditions specified below, the following definitions apply:

(1) "Owner" means The Corporation of the Town of Strathroy;

You are hereby notified that this approval is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1. The Owner shall make all necessary investigations, take all necessary steps and obtain all necessary approvals so as to ensure that the physical structure, siting and operations of the stormwater works do not constitute a safety or health hazard to the general public.

2. The Owner shall ensure that sediment and excessive decaying vegetation are removed from the above noted stormwater management system at such a frequency as to prevent the excessive buildup and potential overflow of sediment and/or decaying vegetation into the receiving watercourse.

The reasons for the imposition of these terms and conditions are as follows:

1. Condition 1 is imposed because it is not in the public interest for the Director to approve facilities which, by reason of

potential health and safety hazards do not generally comply with legal standards or approval requirements falling outside the purview of this Ministry.

2. Condition 2 is included as regular removal of sediment and excessive decaying vegetation from this approved stormwater management system are required to mitigate the impact of sediment and/or decaying vegetation on the downstream receiving watercourse. It is also required to ensure that adequate storage is maintained in the stormwater management facilities at all times as required by the design.

In accordance with Section 100 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, as amended, you may by written notice served upon me and the Environmental Appeal Board within 15 days after receipt of this Notice, require a hearing by the Board. Section 101 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, provides that the Notice requiring the hearing shall state:

1. The portions of the approval or each term or condition in the approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The Certificate of Approval number;
6. The date of the Certificate of Approval;
7. The name of the Director;
8. The municipality within which the works are located;

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Appeal Board
2300 Yonge St., 12th Floor
P.O. Box 2382
Toronto, Ontario
M4P 1E4

AND

The Director
Section 53, *Ontario Water Resources Act*
Ministry of the Environment
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

*** Further information on the Environmental Appeal Board's requirements for an appeal can be obtained directly from the Board at: Tel: (416) 314-4600, Fax: (416) 314-4506 or www.ert.gov.on.ca**

The above noted sewage works are approved under Section 53 of the Ontario Water Resources Act.

DATED AT TORONTO this 16th day of August, 2000

Mohamed Dhalla, P.Eng.
Director
Section 53, *Ontario Water Resources Act*

JC/
c: District Manager, MOE London - District
John Tyrell, Stantec Consulting Ltd.

No Additional Information

APPENDIX A-5

SWMP-05 - Head St N/ Thorne Dr, Strathroy

Watershed: East Sydenham
Facility Type: Dry Pond
Type of Controls: Quantity
Drainage Area (ha): 25.6
In-Service Date: 1994 **ECA (prior to CLI):** not known

Head and Thorne SWM

Legend

Parcels

Notes

6/06/2024

0.1 0 0.05 0.1 Kilometers

WGS_1984_Web_Mercator_Auxiliary_Sphere

THORNE DRIVE

x 33.160

R1

3.0m ACCESS ROAD PAVED FROM CURB TO PROPERTY LINE, CONSISTING OF 50mm HL4, 300mm NATIVE SAND COMPACTED AS PER ROAD.

HEAVY DUTY CONC.

1.5 m SIDEWALK

30.650

63.828

33.46

233.000

33.68

INTERNAL ACCESS ROAD TO CONSIST OF UPPER 1.0m NATIVE SAND COMPACTED TO 98% SPMDD, TOPSOIL AND SOD.

232.500
232.000
231.500
231.000
230.500
230.300
230.000

3:1

232.5

HIGH WATER LEVEL
231.80

29.810
℄ CREEK

WETLAND

RIP RAP
(SEE TYPICAL DETAIL)

OVERFLOW WIER WITH TURFSTONE SURFACE, OPENINGS IN BLOCKS TO BE FILLED WITH TOPSOIL, SEED AND MULCH. PROVIDE BASE AS PER MANUFACTURERS RECOMMENDATIONS. PROVIDE FILTER CLOTH BETWEEN BEDDING SAND AND BASE MATERIAL.

QUALITY OUTLET STRUCTURE
(SEE TYPICAL DETAIL)

4:1

A

A

R2

7:1

BERM

FOREBAY

230.150

229.500

230.500

231.000
231.500
232.000
232.300
232.000
231.500
231.000
230.500

26.454

37.759

30.943

33.99

33.92

34.04

34.11

34.41

34.30

34.96

35.26

34.97

34.86

6

5

FOR SILT FENCE
SEE SHEET LG-

℄ CREEK

℄ CREEK

6.0
2.0 2.0 2.0
EL. 233.00
232.50
EL. 232.00
1
3
EL. 231.00
232.50
EL. 232.30
EL. 231.80
TURFSTONE SURFACE TREATMENT OR APPROVED EQUIVALENT

OVERFLOW WIER DETAIL N.T.S.

LEGEND

- WETPOND CONTOURS
- 232.000 WETPOND CONTOUR ELEVATIONS
- GABION BASKETS
- 150 mm RIP RAP
- 1.8 m CHAIN LINK FENCE
- 1800 mm DIAMETER MANHOLE
- STORM FLOW ARROWS
- x 34.86 PROPOSED FINISHED GRADES
- STORM SEWER
- TURFSTONE

AS CONSTRUCTED NOTES	AS CONSTRUCTED SERVICES	COMPLETION

DESIGN	HF
DRAWN	GER
CHECKED	RAL
APPROVED	DJW
DATE	DEC 93
FB	

No.	REVISIONS	DATE	BY
1	SUBMITTED FOR APPROVAL	DEC 93	RAL
2	REVISED AS PER PUC COMMENTS	FEB 94	RAL
3	REVISED AS PER TOWNS' COMMENTS	FEB 94	RAL
4	REVISED AS PER SCRCA COMMENTS	FEB 94	RAL
5	REVISED FOR FINAL SUBMISSION	APR 94	RAL

UMA Engineering Ltd.
Engineers & Planners

David J. Whitney
BRANCH MANAGER

ENGINEER'S STAMP
REGISTERED PROFESSIONAL ENGINEER
PROVINCE OF ONTARIO
12/04/94
D. J. WHITNEY

WESTERN LAND CO. INC.

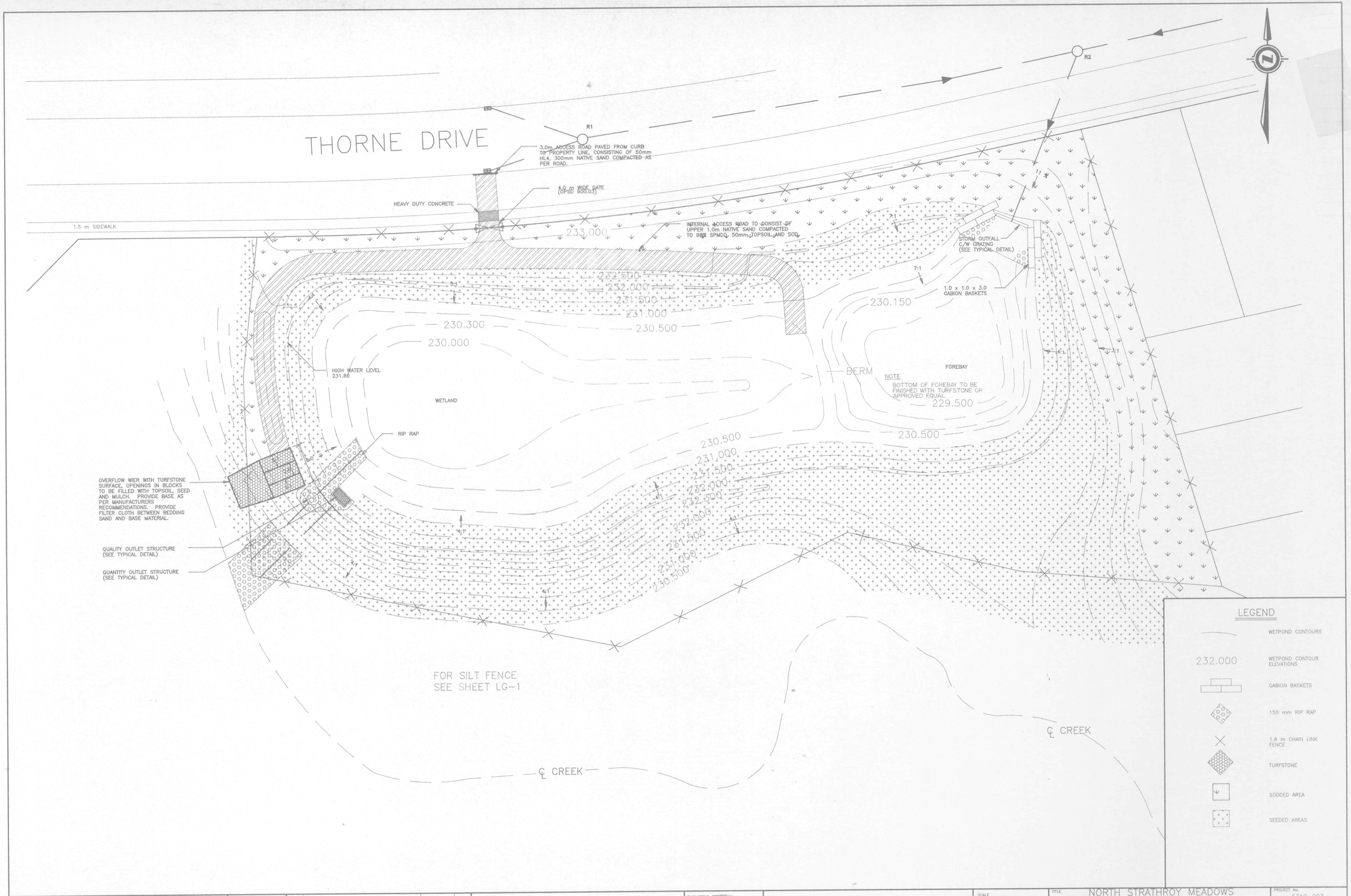
4967A YONGE STREET
WILLOWDALE, ONTARIO

SCALE
SCALE - 1 : 250
2.5 0 5m

TITLE
NORTH STRATHROY MEADOWS
PHASE 2
TOWN OF STRATHROY

GENERAL LAYOUT AND GRADING PLAN

PROJECT No. 6310-003
SHEET No. SWM-1
PLAN FILE No. 89



AS CONSTRUCTED NOTES	AS CONSTRUCTED SERVICES	COMPLETION

DESIGN	GER
DRAWN	GER
CHECKED	RAL
APPROVED	DJW
DATE	DEC 93
FB	

No.	REVISIONS	DATE	BY
1	SUBMITTED FOR APPROVAL	DEC 93	RAL
2	REVISED AS PER PUC COMMENTS	FEB 94	RAL
3	REVISED AS PER TOWNS' COMMENTS	FEB 94	RAL
4	REVISED AS PER SCRCA COMMENTS	FEB 94	RAL
5	REVISED FOR FINAL SUBMISSION	APR 94	RAL

UMA Engineering Ltd.
Engineers & Planners
BRANCH MANAGER

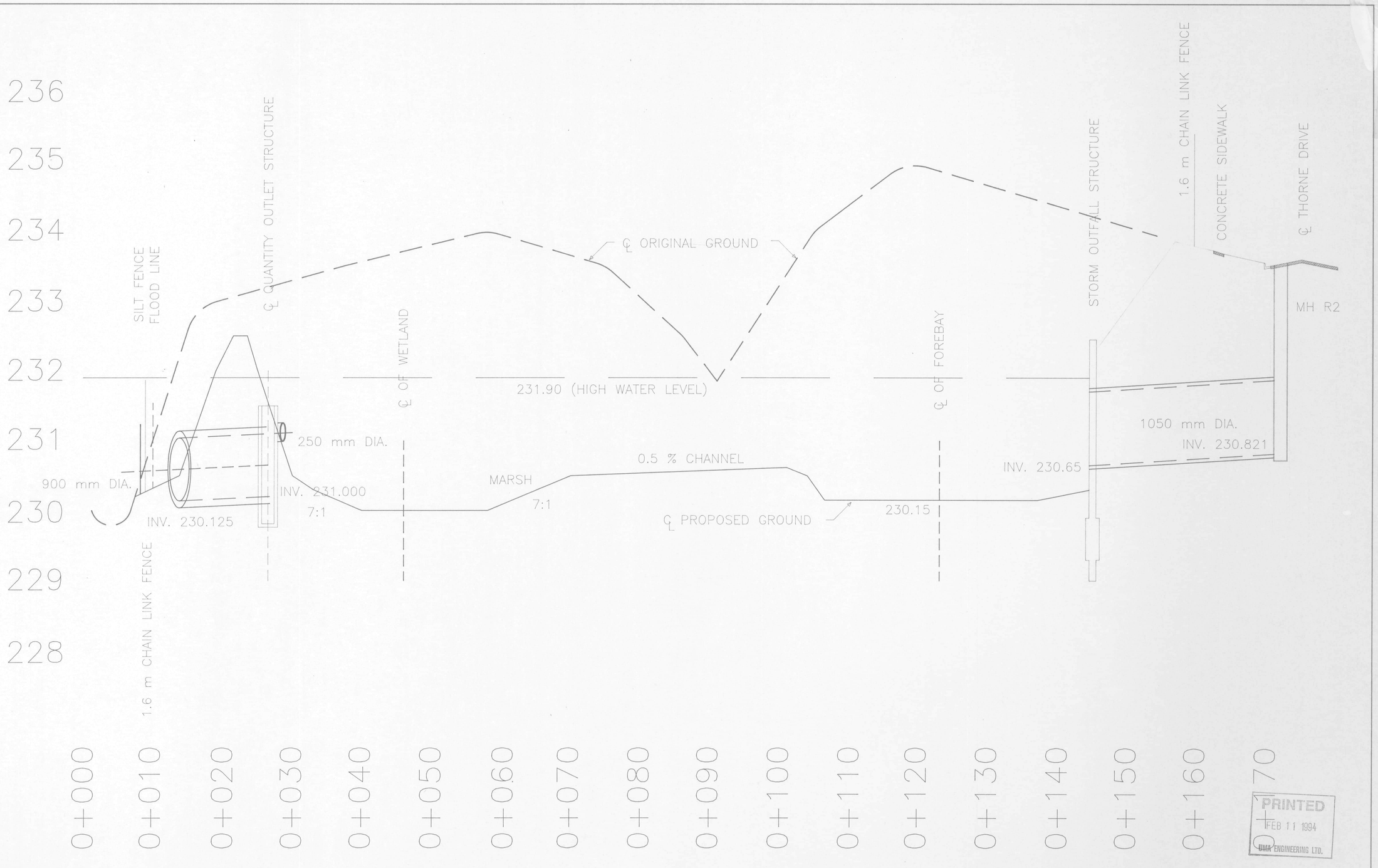
ENGINEER'S STAMP
REGISTERED PROFESSIONAL ENGINEER
PROVINCE OF ONTARIO
12/04/94
D. J. WHITNEY

WESTERN LAND CO. INC.
4967A YONGE STREET
WILLOWDALE, ONTARIO

SCALE
SCALE – 1 : 250
2.5 0 5m

TITLE
NORTH STRATHROY MEADOWS
PHASE 2
TOWN OF STRATHROY
SURFACE MATERIAL IDENTIFICATION
WETPOND LANDSCAPING

PROJECT No. 6310-003
SHEET No. SWM-4
PLAN FILE No. 89



PRINTED
FEB 11 1994
UMA ENGINEERING LTD.

AS CONSTRUCTED NOTES	AS CONSTRUCTED SERVICES	COMPLETION

DESIGN	GER
DRAWN	GER
CHECKED	RAL
APPROVED	DJW
DATE	DEC 93
FB	

No.	REVISIONS	DATE	BY
1	SUBMITTED FOR APPROVAL	DEC 93	RAL

UMA Engineering Ltd.
Engineers & Planners
BRANCH MANAGER

ENGINEER'S STAMP
REGISTERED PROFESSIONAL ENGINEER
PROVINCE OF ONTARIO
12/12/94
D. J. WHITNEY

WESTERN LAND CO. INC.
4967A YONGE STREET
WILLOWDALE, ONTARIO

SCALE
HORZ 1 : 250
2.5 0 5m
VERT 1 : 25
0.25 0 0.5m

TITLE
NORTH STRATHROY MEADOWS
PHASE 2
TOWN OF STRATHROY
WETPOND PROFILE
SECTION A – A

PROJECT No. 6310-003
SHEET No. SWM-2
PLAN FILE No. 89

No Additional Information

APPENDIX A-6

SWMP-06 - Molnar Industrial Park, Strathroy

Watershed: East Sydenham
Facility Type: Wet Pond
Type of Controls: Quantity
Drainage Area (ha): 26.5
In-Service Date: 2010
ECA (prior to CLI): not known

Molnar SWM

0.2 0 0.11 0.2 Kilometers

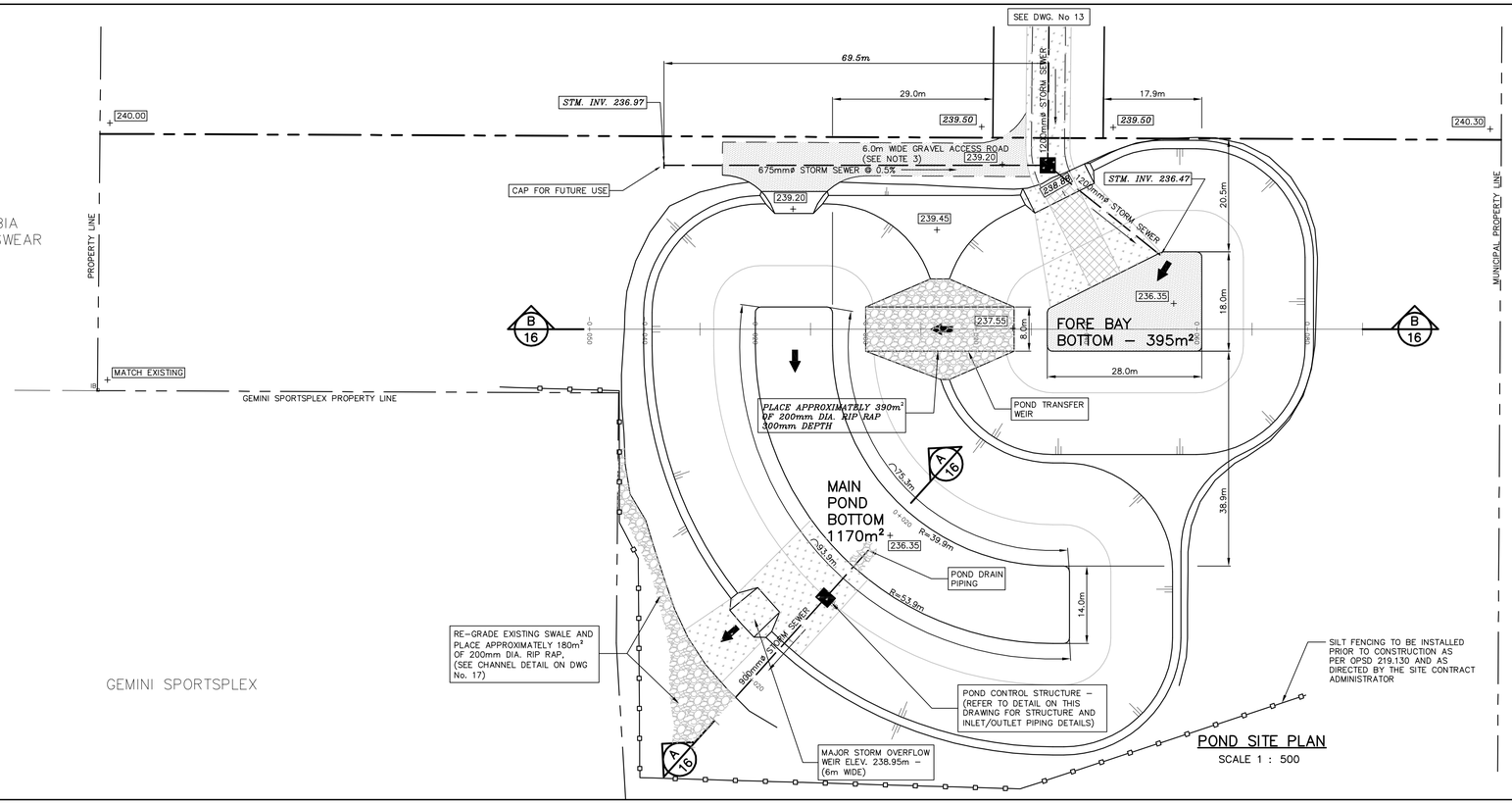
WGS_1984_Web_Mercator_Auxiliary_Sphere

Legend

- Adelaide Metcalfe Address
- North Middlesex Address Unit
- Thames Centre Address
- Parcels

Notes

6/04/2024



POND SITE PLAN

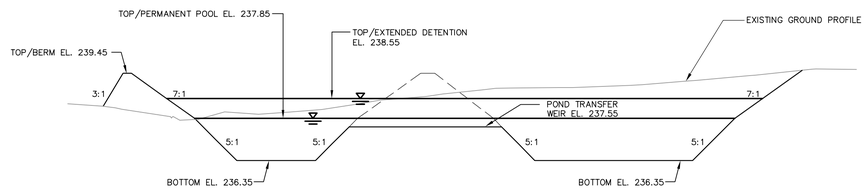
SCALE 1 : 500

NOTES:

1. AS A MINIMUM, THE STORMWATER MANAGEMENT FACILITY FOREBAY SHALL BE EXCAVATED PRIOR TO OTHER SITE WORKS AND UTILIZED AS A SEDIMENT CONTROL BASIN FOR SITE DURING CONSTRUCTION.
2. KNIFE GATE VALVE TO BE RESILIENT SEATED ALL STAINLESS, SUITABLE FOR DEAD-END CONNECTION.
3. GRANULAR DEPTHS FOR POND AND ACCESS ROAD AND FOREBAY BOTTOM
   a) ACCESS ROAD – 100mm GRANULAR 'A'
      – 200mm GRANULAR 'B'
   b)FOREBAY BOTTOM – 300mm GRANULAR 'A'
   GRANULARS FOR ACCESS ROAD AND FOREBAY BOTTOM WILL BE PAID UNDER ITEMS 2 AND 3

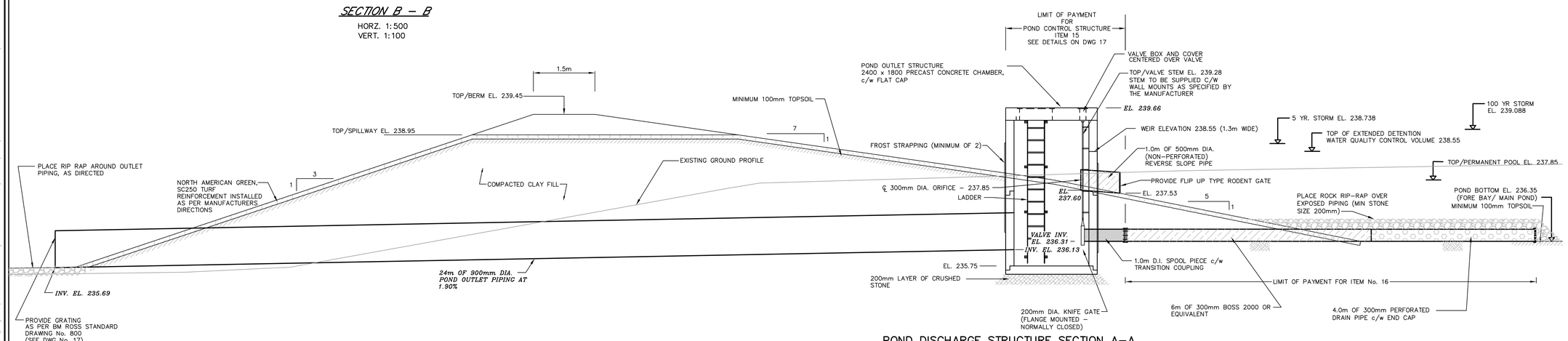
LEGEND:

- CABLE CONCRETE MAT (CC 35) OR APPROVED EQUAL
- SC250 NORTH AMERICAN GREEN TURF REINFORCEMENT
- 323 — EXISTING CONTOUR
- POND FLOW DIRECTION
- SILT FENCING
- 200mm RIP-RAP



SECTION B – B

HORZ. 1:500
VERT. 1:100



POND DISCHARGE STRUCTURE SECTION A–A

SCALE 1 : 50

LEGEND

- SAN. or STM. — EXISTING SEWERS, SANITARY or STORM
- MH. CB. — MANHOLE and CATCHBASIN
- W — WATERMAIN — FIRE HYDRANT
- G — GASMAIN
- T — UNDERGROUND TELEPHONE
- H — UNDERGROUND HYDRO
- TV — UNDERGROUND T.V. CABLE
- H B T H–B LT — UTILITY POLES

NOTE

The locations of existing underground utilities are shown in an approximate way only and have not been independently verified by the owner or its representative. The contractor shall determine the exact location of all existing utilities before commencing work and agrees to be fully responsible for any damages which might be occasioned by the contractor's failure to exactly locate and preserve any and all underground utilities.

BENCHMARK INFORMATION

BM 1 Elev. 242.845
CST nail and flag in East face of fence post on West side of Adair Street ±159m South of Wright Street

BENCHMARK INFORMATION

Design By: R.M.C. Checked By: D.L.E.

AS RECORDED

The information on this record drawing is believed to be reliable, however it may be based, in part, upon information provided by others, which can not be verified by B.M. Ross and Associates Limited. Those relying on this record drawing are advised to obtain additional verification of its accuracy before applying it for any purpose.

Dec. 7, 2010
Date

No.	DATE	REVISION
1	Sept. 30, 2009	Issued for Municipal Review
2	Oct. 20, 2009	Issued for MOE Approval
3	Nov. 2, 2009	Silt fencing added
4	Mar. 24, 2010	Issued for Tender
5	Dec. 7, 2010	As Recorded Information

BMROSS engineering better communities
Goderich (519) 524-2641 Mount Forest (519) 323-2945

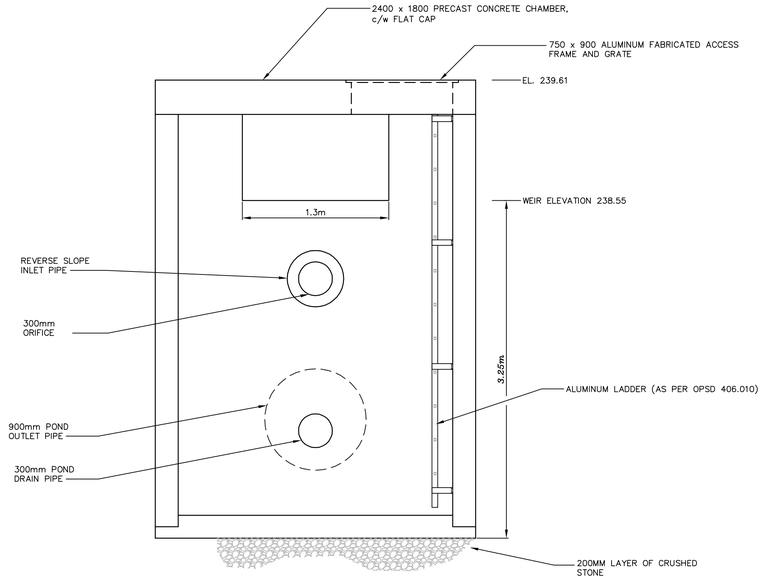
STRATHROY-CARADOC
URBAN OPPORTUNITY - RURAL HOSPITALITY

Municipality of Strathroy Caradoc
Molnar Industrial Park
Stormwater Management Facilities and Structures Detail Plan

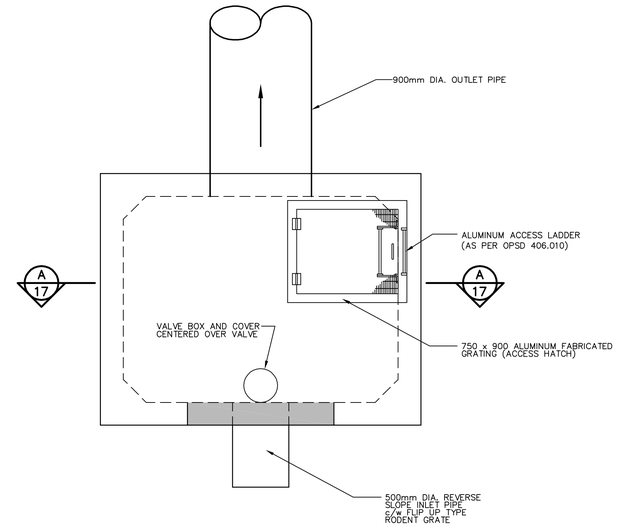
Project No. 08122

Scale: As shown

Drawing No. 16 of 17



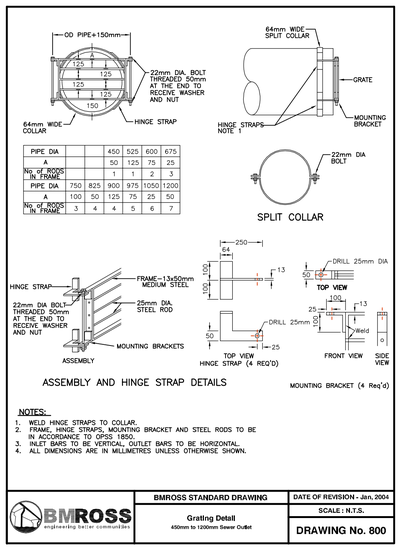
SECTION A–A



PLAN VIEW

POND OUTLET CONTROL STRUCTURE

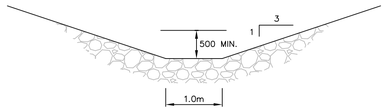
SCALE 1 : 25



ASSEMBLY AND HINGE STRAP DETAILS

NOTES:-
1. WELD HINGE STRAPS TO COLLAR.
2. FRAME, HINGE STRAPS, MOUNTING BRACKET AND STEEL RODS TO BE IN ACCORDANCE TO OPSS 1850.
3. INLET BARS TO BE VERTICAL, OUTLET BARS TO BE HORIZONTAL.
4. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SHOWN.

BMROSS STANDARD DRAWING	DATE OF REVISION - Jan, 2004
Grating Detail 450mm to 1200mm Sewer Outlet	SCALE : N.T.S.
	DRAWING No. 800



SWM FACILITY ROCK RIP–RAP SWALE DETAIL

SCALE N.T.S.

Design By: R.M.C. Checked By: D.L.E.

AS RECORDED

The information on this record drawing is believed to be reliable, however it may be based, in part, upon information provided by others, which can not be verified by B.M. Ross and Associates Limited. Those relying on this record drawing are advised to obtain additional verification of its accuracy before applying it for any purpose.

Dec. 7, 2010
Date

No.	DATE	REVISION
1	Sept. 30, 2009	Issued for Municipal Review
2	Oct. 20, 2009	Issued for MOE Approval
3	Mar. 24, 2010	Issued for Tender
4	Dec. 7, 2010	As Recorded Information

BMROSS engineering better communities
Goderich (519) 524-2641 Mount Forest (519) 323-2945

STRATHROY-CARADOC
URBAN OPPORTUNITY - RURAL HOSPITALITY

Municipality of Strathroy Caradoc
Molnar Industrial Park
Stormwater Management Pond Miscellaneous Details Plan

Project No. 08122

Scale: As Shown

Drawing No. 17 of 17

No Additional Information

APPENDIX A-7

SWMP-07 - Bennett Cres, Mt. Brydges

Watershed: Thames River
Facility Type: Wet Pond
Type of Controls: Quantity/Quality
Drainage Area (ha): 33.9
In-Service Date: 2013
ECA (prior to CLI): not known

Bennet SWM

Legend

Parcels

Notes

6/06/2024

0.1 0 0.05 0.1 Kilometers

WGS_1984_Web_Mercator_Auxiliary_Sphere

PRINT RECORD		
NO	TO	DATE
6	STRATHROY–CARADOC	AUG 30/11
6	CLIENT	AUG 30/11
2	STRATHROY–CARADOC	DEC 21/11
2	SPRIET ASSOCIATES	DEC 21/11
2	CLIENT	DEC 21/11

SEE SHEET 23 FOR LOT GRADING

100mm TO 300mm ANGULAR RIP RAP (MIN. 0.75m THICK)

CONSTRUCT NEW HEADWALL FOR 750ø INLET TO CONVEY MAJOR FLOW FROM SOUTHWEST END OF SITE TO THE SWM FACILITY AS PER OPSD 804.040 C/W GRATE OPENING AS PER OPSD 804.05 & HANDRAIL AS PER OPSD 980.101 ALONG TOP OF HEADWALL & WINGWALLS. 750ø INV=238.30

CONSTRUCT BERM ACROSS EXISTING RAVINE CROSSING TO ENSURE 750ø STORM SEWER HAS MIN. 0.3m COVER. BERM TO MATCH EX. GRADE ON EITHER SIDE AT MAX 3:1 SLOPE (TYP.)

PROVIDE COMPOSITE TURF REINFORCEMENT MAT AS MANUFACTURED BY TENSAR – V MAX^2 SC250 ON 3:1 SLOPES ALONG THE RAVINE CROSSING AS INDICATED BY HATCHING AND SHOWN ON SHEET 28

NOTE:
ENGINEERED FILL TO BE CLEAN, NATIVE FILL OR IMPORTED PIT–RUN MATERIAL, PLACED IN 300mm DEEP (MAX.) LIFTS, COMPACTED TO 95% SPMDD AND PROOF ROLLED, ALL TO THE SATISFACTION OF THE GEOTECHNICAL ENGINEER. ALL SERVICES TO BE CONSTRUCTED ON CLEAN, COMPACTED FILL MATERIAL THROUGH RAVINE CROSSING.

250yr PONDING LIMIT (237.78m)

INSTALL LIGHT DUTY SILT FENCE AS PER OPSD 219.110

EROSION HAZARD LIMIT

1.85m HIGH WALL
T/W=39.05
B/W=37.20

TOP OF STEEP RAVINE

EX. 800ø CSP
INV=232.61

EX. DRY RAVINE

45.0–750 ST–1.5%

3:1 MAX TO MATCH EXISTING (TYP.)

TOP OF POND=238.50

CONSTRUCT NEW HEADWALL FOR 750ø INLET AS PER OPSD 804.040 C/W GRATE OPENING AS PER OPSD 804.05 & HANDRAIL AS PER OPSD 980.101 ALONG TOP OF HEADWALL & WINGWALLS. 750ø INV=237.68

ELEV.=237.10
ELEV.=237.00 (PERMANENT POOL)

ELEV.=236.90

EXISTING SLOPE TO BE LINED WITH 100mm TO 300mm ANGULAR RIP RAP UNDERLAIN WITH TERRAFIX 270R GEOTEXTILE OR APPROVED EQUAL FOR WEIR SPILLWAY. (MIN. 0.75m THICK, 4.0m WIDE). SEE DETAIL ON SHEET 29

CONSTRUCT NEW HEADWALL FOR 750ø OUTLET AS PER OPSD 804.040 C/W GRATE OPENING AS PER OPSD 804.05 & HANDRAIL AS PER OPSD 980.101 ALONG TOP OF HEADWALL & WINGWALLS. 750ø INV=235.60

CLAY COLLAR (SEE DETAIL ON SHEET 29)

BOTTOM OF POND=235.70

100mm TO 300mm ANGULAR RIP RAP (MIN. 0.75m THICK) – SEE DETAIL ON SHEET 29

TURFSTONE LINED OVERFLOW WEIR – 6m WIDE WITH 3:1 SIDE SLOPES C/W RIP RAP ARMOUR ELEV=238.20

6.0m WIDE TURFSTONE LINED WEIR ELEV=237.00

CONSTRUCT NEW HEADWALL FOR 750ø AS PER OPSD 804.040 C/W GRATE OPENING AS PER OPSD 804.05 & HANDRAIL AS PER OPSD 980.101 ALONG TOP OF HEADWALL & WINGWALLS. 750ø INV=236.15

20.0m–750ø STM OUTLET–1.0%

16.5m–750ø REVERSE STM–8.8%

C/L EX. CREEK

300 TO 500mmø ROCK PROTECTION, 0.80m THICK, UNDERLAIN WITH TERRAFIX 270R GEOTEXTILE OR APPROVED EQUAL. SEE CROSS SECTION OF OUTLET ON SHEET 28

AREAS DISTURBED ON THE EXISTING RAVINE TO BE RESTORED WITH COMPOSITE TURF REINFORCEMENT MAT AS MANUFACTURED BY TENSAR – V MAX^2 SC250

SWM OUTLET (1:25yr) LID=238.58

EROSION HAZARD LIMIT

PROVIDE CLAY COLLAR FOR EACH PIPE (SEE DETAIL ON SHEET 29)

16.0m–300ø STM–1.0%

4.0m–200ø REVERSE STM–2.0%

300ø STM PIPE AT 1.0% WITH VALVE TO DRAIN POND

BLOCK 218
STORM WATER MANAGEMENT FACILITY
0.900 Ha

CLEAR STONE JACKET

CONCRETE COLLARS (AS PER DETAIL ON SHEET 29)

RIP RAP ENCLOSURE WITH RODENT GRATE

QUANTITY CELL
POND FLOOR=235.70
900mm THICK CLAY LINER OR APPROVED EQUIVALENT
BOTTOM ELEV.=234.80

4:1 SLOPE

2m SAFETY BENCH AT 10:1 SLOPE

MAINTENANCE ACCESS RAMPS

3:1 SLOPE MAX

OUTER EDGE OF ACCESS ROAD ELEV=238.58

4.0m WIDE ASPHALT MAINTENANCE ACCESS

MATCH GRADE AT PROPERTY LINE AT 3:1 MAX SLOPE

EX. POST AND WIRE FENCE TO BE REMOVED

INSTALL LIGHT DUTY SILT FENCE AS PER OPSD 219.110

IB(1335)

SEDIMENT AND EROSION CONTROL NOTES

1. PROTECT ALL EXPOSED SURFACES AND CONTROL ALL RUNOFF DURING CONSTRUCTION.
2. ALL EROSION CONTROL MEASURES TO BE IN PLACE BEFORE STARTING CONSTRUCTION AND REMAIN IN PLACE UNTIL RESTORATION IS COMPLETE.
3. MAINTAIN EROSION CONTROL MEASURES DURING CONSTRUCTION.
4. ALL COLLECTED SEDIMENT TO BE DISPOSED OF AT AN APPROVED LOCATION.
5. MINIMIZE AREA DISTURBED DURING CONSTRUCTION.
6. ALL DEWATERING TO BE DISPOSED OF IN AN APPROVED SEDIMENTATION BASIN.
7. PROTECT ALL CATCHBASINS, MANHOLES AND PIPE ENDS FROM SEDIMENT INTRUSION WITH GEOTEXTILE (TERRAFIX 270R).
8. KEEP ALL SUMPS CLEAN DURING CONSTRUCTION.
9. PREVENT WIND–BLOWN DUST.
10. STRAW BALES TO BE USED IN LOCALIZED AREAS AS DIRECTED BY THE ENGINEER DURING CONSTRUCTION.
11. STRAW BALES TO BE TERMINATED BY ROUNDING BALES TO CONTAIN AND FILTER RUNOFF.
12. WHEN ALL RESTORATION IS COMPLETED REMOVE SEDIMENT CONTROL MEASURES AND RESTORE IMPACTED AREAS.
13. ALL OF THE ABOVE NOTES AND SEDIMENT AND EROSION CONTROL MEASURES AND ANY ADDITIONAL SEDIMENT AND EROSION CONTROL MEASURES ARE TO BE IN ACCORDANCE WITH THE MINISTRY OF NATURAL RESOURCES GUIDELINES ON SEDIMENT AND EROSION CONTROL FOR URBAN CONSTRUCTION SITES.

LEGEND

- DENOTES PROPOSED ASPHALT MAINTENANCE ACCESS
- DENOTES PROPOSED RIP RAP SPILLWAY (300 TO 500mmø ROCK PROTECTION, 0.80m THICK, UNDERLAIN WITH TERRAFIX 270R GEOTEXTILE OR APPROVED EQUAL.)
- DENOTES PROPOSED RIP RAP SPILLWAY (100mm TO 300mm ANGULAR RIP RAP (MIN. 0.75m THICK)
- DENOTES PROPOSED TURFSTONE LINER
- 78.65 DENOTES PROPOSED GRADE
- ±78.65 DENOTES EX. GRADE TO BE MATCHED
- DENOTES SILT FENCE

124
FFF=43.24
USF=40.40
W/O

FIXED BOLLARDS WITH CHAIN
SWM INFO. SIGN

1.5m CONCRETE SIDEWALK

GUIDE RAIL AS PER OPSD 912.130

DCB16
LID=42.11

DCB15
LID=42.17

0.3m HIGH ARMOR STONE WALL

SEE SECTION ON SHEET 29

CONCRETE SECTION (SEE DETAIL ON SHEET 29)

100mm TO 300mm ANGULAR RIP RAP SPILLWAY (MIN. 0.75m THICK)

TURFSTONE LINED SPILLWAY (SEE DETAIL ON SHEET 29)

2m SAFETY BENCH AT 10:1 SLOPE

CONSTRUCT NEW HEADWALL FOR 1200ø INLET AS PER OPSD 804.040 C/W GRATE OPENING AS PER OPSD 804.05 & HANDRAIL AS PER OPSD 980.101 ALONG TOP OF HEADWALL & WINGWALLS. 1200ø INV=237.00

19.m 300ø STM PIPE AT 1.0% WITH VALVE TO DRAIN QUALITY CELL

TURFSTONE LINED QUALITY CELL
POND FLOOR=235.70
900mm THICK CLAY LINER OR APPROVED EQUIVALENT

100mm TO 300mm ANGULAR RIP RAP SPILLWAY (MIN 0.75m THICK)

WATER LEVEL GAUGE (SEE DETAIL ON SHEET 29)

ELEV.=236.90

ELEV.=237.00 (PERMANENT POOL)
ELEV.=237.10

INV=37.56

CLAY COLLAR (SEE DETAIL ON SHEET 29)

2.0m TOP OF BERM ELEV=237.45

S36

S37

STREET D

R37

1.5m CONCRETE SIDEWALK

0.3m HIGH ARMOR STONE WALL

FFF=43.00
USF=40.16
125
W/O

FFF=43.07
USF=40.23
126

CB40
LID=39.56
INV=37.76

1.0m INFILTRATION TRENCH

PRINTED
DEC 2 2 2011

UNLESS THIS NOTE APPEARS IN COLOUR, THIS DRAWING IS NOT AN ORIGINAL

EXISTING SERVICES	DRAWING #, SOURCE	DATE	AS CONSTRUCTED SERVICES	COMPLETION

DETAILS	No.	REVISIONS	DATE	CONSULTANT
DESIGN BY JR	1	FIRST SUBMISSION	AUG 30/11	DE()L
DRAWN BY JR	2	SECOND SUBMISSION	DEC 21/11	DE()L
CHECKED BY JF				
F.BK. 969				

FILE: DEL10–107 GRADING & SWM.C3D.DWG

CONSULTANT OR DIVISION

Consulting Civil Engineers
41 Adelaide St. N., Unit 71
London, Ontario N6B 3P4
Phone (519) 672–8310
Fax (519)672–4182
e–mail: deveng@deveng.net

development engineering (London) Limited

ENGINEER'S STAMP
LICENSED PROFESSIONAL ENGINEER
E. B. WSZOL
PROVINCE OF ONTARIO

SCALE
SCALE – 1 : 250
2.5 0 5m

TITLE
PARKHOUSE DRIVE SUBDIVISION
MOUNT BRYDGES, ONTARIO

STORM WATER MANAGEMENT FACILITY

PROJECT No. DEL10–107
SHEET No. 27
PLAN FILE No.

S:\Projects\DEL10–107 GRADING & SWM.C3D.dwg
Wednesday, DEC 21/11–3:59 pm

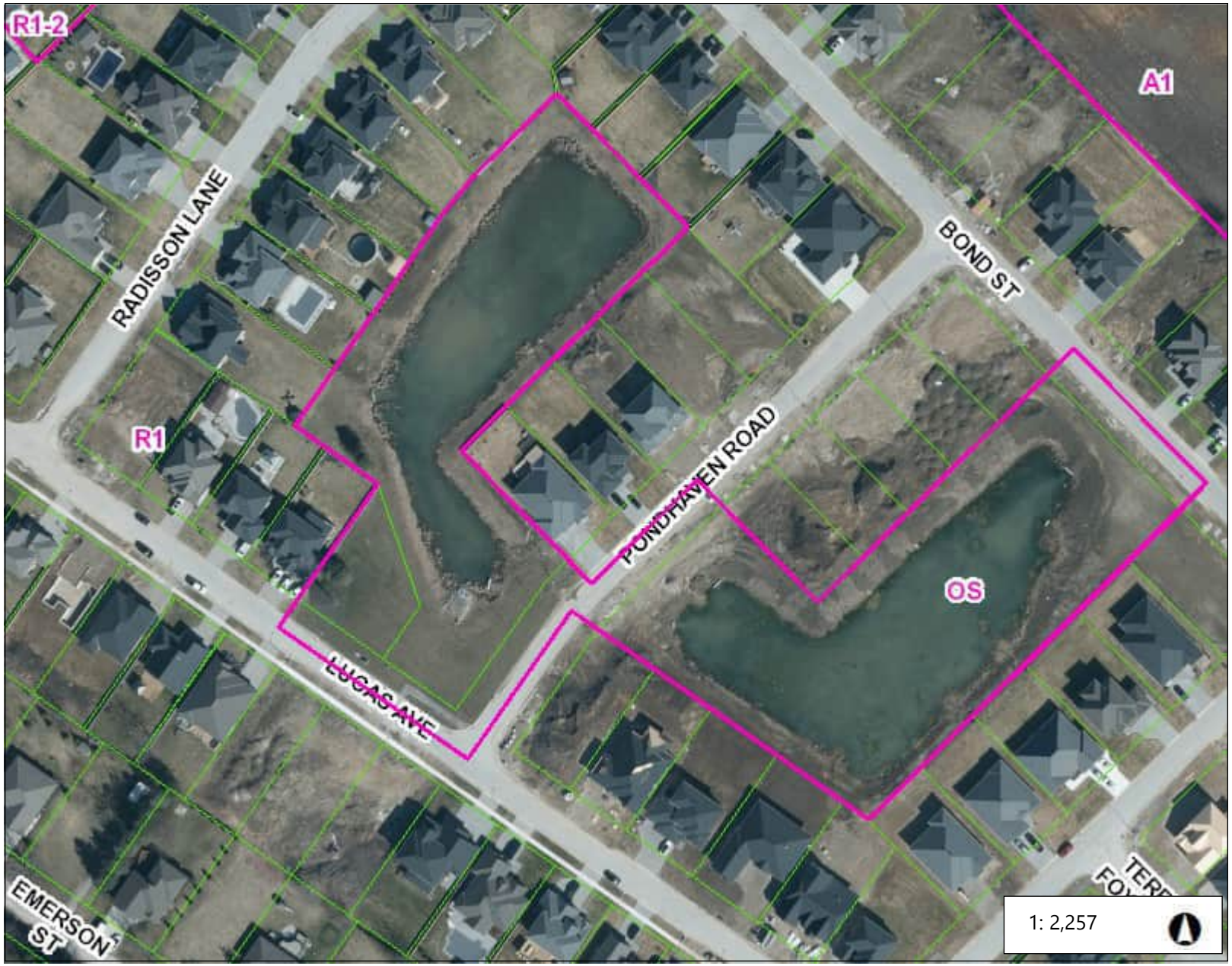
No Additional Information

APPENDIX A-8

SWMP-08 and 09 - Lucas St/Pondhaven Ln, Mt. Brydges

Watershed: East Sydenham
Facility Type: Wetland
Type of Controls: Quantity/Quality
Drainage Area (ha): 34.5
In-Service Date: 2014 **ECA (prior to CLI):** 4605-9D6N3K

Pondview SWM Facilities



Legend

- Strathroy-Caradoc Zoning
- Parcels

Notes

6/06/2024

0.1 0 0.06 0.1 Kilometers

WGS_1984_Web_Mercator_Auxiliary_Sphere

Ontario

Ministry of the Environment
Ministère de l'Environnement

ENVIRONMENTAL COMPLIANCE APPROVAL
NUMBER 4605-9D6N3K
Issue Date: November 15, 2013

Township of Strathroy-Caradoc
351 Frances Street
Strathroy-Caradoc, Ontario
N7G 2L7

Site Location: Woods Edge Subdivision
Part 1, Ref Plan 34M-12, 34M-11
Part of Lot 21, 14, 14-A, and 15, Concession 3
Township of Strathroy-Caradoc, County of Middlesex

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act , R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:

establishment of wastewater infrastructure to be constructed to service the approximately 27 hectare Woods Edge residential development, located in the north-east part of the community of Mt. Brydges, north of Glendon Drive and east of Adelaide Road, largely within the Sydenham River watershed in the Township of Strathroy-Caradoc, including stormwater management facilities for the collection, treatment and disposal of stormwater run-off, and dewatering sewage, if necessary, from the development, to provide Enhanced Level water quality control and erosion protection, and to attenuate post-development peak flows to to pre-development levels for all storm events up to and including the 100-year storm event, discharging via the Lipsit Drain and the Sydenham River to Lake St Clair, consisting of the following:

sanitary sewers on Fairview Avenue, Terry Fox Court, Regent Street, Lockwood Street, Pondview Lane, Radisson Lane, Woods Edge Road, the easement from Queen Street, and Forest Meadow Drive, connecting to the existing 250 mm diameter sanitary sewer stub on Adelaide Road;

storm sewer on Woods Edge Road, connecting to the existing 375 mm diameter storm sewer stub on Adelaide Road;

storm sewers on Forest Meadow Drive, Woods Edge Road, the easement to Radisson Lane, Fairview Avenue, Lockwood Street, Radisson Lane, including rear lot catchbasins, and the easement from Radisson Lane, discharging to SWM Pond 1, identified below;

storm sewers on Regent Street, Lockwood Street and Pondview Lane, including rear lot catchbasins, discharging to SWM Pond 2, identified below;

storm sewers on Terry Fox Court, Regent Street, Pondview Lane and Fairview Avenue, including rear lot catchbasins, discharging to SWM Pond 2;

stormwater management facility (catchment area 34.5 hectares): - two (2) separate interconnected constructed wetlands, identified as SWM Pond 1 and SWM Pond 2, located north and south of Pondview Lane, east of Lockwood Street, having a combined permanent pool volume of 1,530 m 3 ,

an extended detention volume of 8,115 m 3 , and a total storage volume of 10,146 m 3 , including the permanent pool volume, at a total depth of approximately 3.8 m;
- SWM Pond 2 (southerly wetland) with two (2) sediment forebays, discharging to SWM Pond 1;
- SWM Pond 1 (northerly wetland) with one (1) sediment forebay, discharging via a 750 mm diameter outlet storm sewer to an existing 750 mm diameter storm sewer located to the west of Lockwood Road, identified as the Lipsit Drain, eventually discharging to the Sydenham River;

including erosion/sedimentation control measures during construction and all other controls and appurtenances essential to the proper operation of the aforementioned Works;

all in accordance with the submitted supporting documents listed in Schedule "A" forming part of this Approval.

For the purpose of this environmental compliance approval, the following definitions apply:

"Approval" means this entire document including the application and any supporting documents listed in any schedules in this Approval;

"Director" means a person appointed by the Minister pursuant to section 5 of the Environmental Protection Act for the purposes of Part II.1 of the Environmental Protection Act;

"Ministry" means the ministry of the government of Ontario responsible for the Environmental Protection Act and the Ontario Water Resources Act and includes all officials, employees or other persons acting on its behalf;

"Owner" means the The Township of Strathroy-Caradoc and includes their successors and assignees;

"Source Protection Plan" means a drinking water source protection plan prepared under the Clean Water Act, 2006;

"Water Supervisor" means the Water Supervisor of the London office of the Ministry;

"Works" means the sewage works described in the Owner's application(s) and this Approval.

You are hereby notified that this environmental compliance approval is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1. GENERAL PROVISIONS

(1) The Owner shall ensure that any person authorized to carry out work on or operate any aspect of the Works is notified of this Approval and the Conditions herein and shall take all reasonable measures to ensure any such person complies with the same.

(2) Except as otherwise provided by these Conditions, the Owner shall design, build, install, operate and maintain the Works in accordance with the description given in this Approval, and the application for approval of the Works.

(3) Where there is a conflict between a provision of any submitted document referred to in this Approval and the Conditions of this Approval, the Conditions in this Approval shall take precedence, and where there is a conflict between the listed submitted documents, the document bearing the most recent date shall prevail.

(4) Where there is a conflict between the listed submitted documents, and the application, the application shall take precedence unless it is clear that the purpose of the document was to amend the application.

(5) The Conditions of this Approval are severable. If any Condition of this Approval, or the application of any requirement of this Approval to any circumstance, is held invalid or unenforceable, the application of such Condition to other circumstances and the remainder of this Approval shall not be affected thereby.

(6) The issuance of, and compliance with the Conditions of this Approval does not:

(a) relieve any person of any obligation to comply with any provision of any applicable statute, regulation or other legal requirement, including, but not limited to, the obligation to obtain approval from the local conservation authority necessary to construct or operate the sewage Works; or

(b) limit in any way the authority of the Ministry to require certain steps be taken to require the Owner to furnish any further information related to compliance with this Approval.

(7) This Approval includes the treatment and disposal of stormwater run-off for a drainage area of 34.5 hectares draining to the wetland facilities, assuming an average imperviousness of 25%. Any changes within the drainage area that might increase the required storage volumes or increase the flows to or from the wetland facilities or any structural/physical changes to the wetland facilities including the inlets or outlets will require an amendment to this Approval.

2. EXPIRY OF APPROVAL

This Approval will cease to apply to those parts of the Works which have not been constructed within **five (5) years** of the date of this Approval.

3. CHANGE OF OWNER

(1) The Owner shall notify the Water Supervisor and the Director, in writing, of any of the following changes within **thirty (30) days** of the change occurring:

(a) change of Owner;

(b) change of address of the Owner;

(c) change of partners where the Owner is or at any time becomes a partnership, and a copy of the most recent declaration filed under the Business Names Act , R.S.O. 1990, c. B17 shall be included in the notification to the Water Supervisor;

(d) change of name of the corporation where the Owner is or at any time becomes a corporation, and a copy of the most current information filed under the Corporations Information Act , R.S.O. 1990, c. C39 shall be included in the notification to the Water Supervisor.

4. OPERATION AND MAINTENANCE

(1) The Owner shall ensure that the design minimum liquid retention volume is maintained at all times.

(2) The Owner shall inspect the Works at least **once a year** and, if necessary, clean and maintain the Works to prevent the excessive build-up of sediments, and/or vegetation.

(3) The Owner shall maintain a logbook to record the results of these inspections and any cleaning and maintenance operations undertaken, and shall keep the logbook at the Owner's office for inspection by the Ministry. The logbook shall include the following:

(a) the name of the Works; and

(b) the date and results of each inspection, maintenance and cleaning, including an estimate of the quantity of any materials removed.

5. TEMPORARY EROSION AND SEDIMENT CONTROL

(1) The Owner shall install and maintain temporary sediment and erosion control measures during construction and conduct inspections once every **two (2) weeks** and after each significant storm event (a significant storm event is defined as a minimum of 25 mm of rain in any 24 hours period). The inspections and maintenance of the temporary sediment and erosion control measures shall continue until they are no longer required and at which time they shall be removed and all disturbed areas reinstated properly .

(2) The Owner shall maintain records of inspections and maintenance which shall be made available for inspection by the Ministry, upon request. The record shall include the name of the inspector, date of inspection, and the remedial measures, if any, undertaken to maintain the temporary sediment and erosion control measures.

6. RECORD KEEPING

The Owner shall retain for a minimum of **five (5) years** from the date of their creation, all records and information related to or resulting from the operation and maintenance activities required by this Approval.

7. SOURCE PROTECTION

The Owner shall, within **sixty (60) calendar days** of the Minister of the Environment posting approval of a Source Protection Plan on the environmental registry established under the Environmental Bill of Rights, 1993 for the area in which this Approval is applicable, apply to the Director for an amendment to this Approval that includes the necessary measures to conform with all applicable policies in the approved Source Protection Plan.

Schedule "A"

1. Application for Environmental Compliance Approval , dated August 15, 2013, and received on August 19, 2013, submitted by Spriet Associates London Limited;

2. Revised Application received on September 9, 2013, submitted by Spriet Associates Limited;

3. Woods Edge Subdivision, Mt. Brydges, Ontario, Lupine Properties Ltd., Stormwater Management Report , dated June 2013, prepared by Spriet Associates Limited;

4. Hydrogeological Assessment, Proposed Residential Development, Longwoods Development Middlesex Inc., Mount Brydges , dated December 5, 2011, prepared by JFM Environmental Limited;

5. Pipe Data Form and Storm and Sanitary Sewer Design Sheets, dated June 2013, prepared by Spriet Associates Limited;

6. Set of Engineering Drawings, Woods Edge Subdivision, (29 drawings), dated August 14, 2013,

prepared by Spriet Associates Limited;

7. Permit to Take Water, No. 2731-99YQZL, issued August 13, 2013, to Lupine Properties Limited;

8. Consent letter from John Lean of Lupine Properties Limited to the Ministry, undated;

9. Copy of letter from JFM Environmental Limited to Lupine Properties Limited, dated September 30, 2013;

10. E-mail from John Spriet of Spriet Associates Limited to the Ministry, dated September 30, 2013;

11. Letter from St. Clair Conservation to the Ministry, dated October 1, 2013; and

12. E-mails from John Spriet of Spriet Associates Limited to the Ministry, dated November 13 and 14, 2013.

The reasons for the imposition of these terms and conditions are as follows:

1. Condition 1 is imposed to ensure that the Works are built and operated in the manner in which they were described for review and upon which approval was granted. This Condition is also included to emphasize the precedence of Conditions in the Approval and the practice that the Approval is based on the most current document, if several conflicting documents are submitted for review.

2. Condition 2 is included to ensure that, when the Works are constructed, the Works will meet the standards that apply at the time of construction to ensure the ongoing protection of the environment.

3. Condition 3 is included to ensure that the Ministry records are kept accurate and current with respect to approved Works and to ensure that any subsequent Owner of the Works is made aware of the Approval and continues to operate the Works in compliance with it.

4. Condition 4 is included to require that the Works be properly operated and maintained such that the environment is protected.

5. Condition 5 is included as installation, regular inspection and maintenance of the temporary sediment and erosion control measures is required to mitigate the impact on the downstream receiving watercourse during construction, until they are no longer required.

6. Condition 6 is included to require that all records are retained for a sufficient time period to adequately evaluate the long-term operation and maintenance of the Works.

7. Condition 7 is included to ensure that the Works covered by this Approval will conform to the significant threat policies and designated Great Lakes policies in the Source Protection Plan.

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

1. The portions of the environmental compliance approval or each term or condition in the environmental compliance approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The environmental compliance approval number;
6. The date of the environmental compliance approval;
7. The name of the Director, and;
8. The municipality or municipalities within which the project is to be engaged in.

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*****
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Director appointed for the purposes of Part II.1 of the Environmental Protection Act
Ministry of the Environment
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

*** Further information on the Environmental Review Tribunal 's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 314-3717 or www.ert.gov.on.ca**

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 15th day of November, 2013

Edgardo Tovilla
Director
appointed for the purposes of Part II.1 of the *Environmental Protection Act*

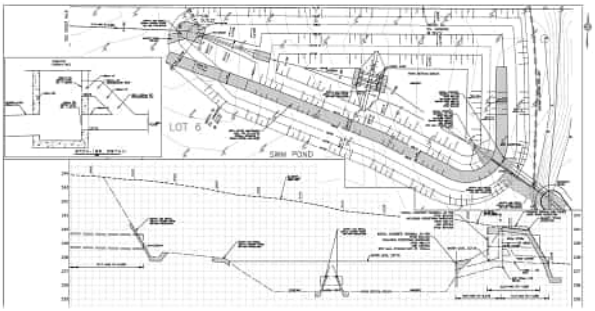
DC/
c: DWMD Supervisor, MOE London office
John Spriet, Spriet Associates London Limited

No Additional Information

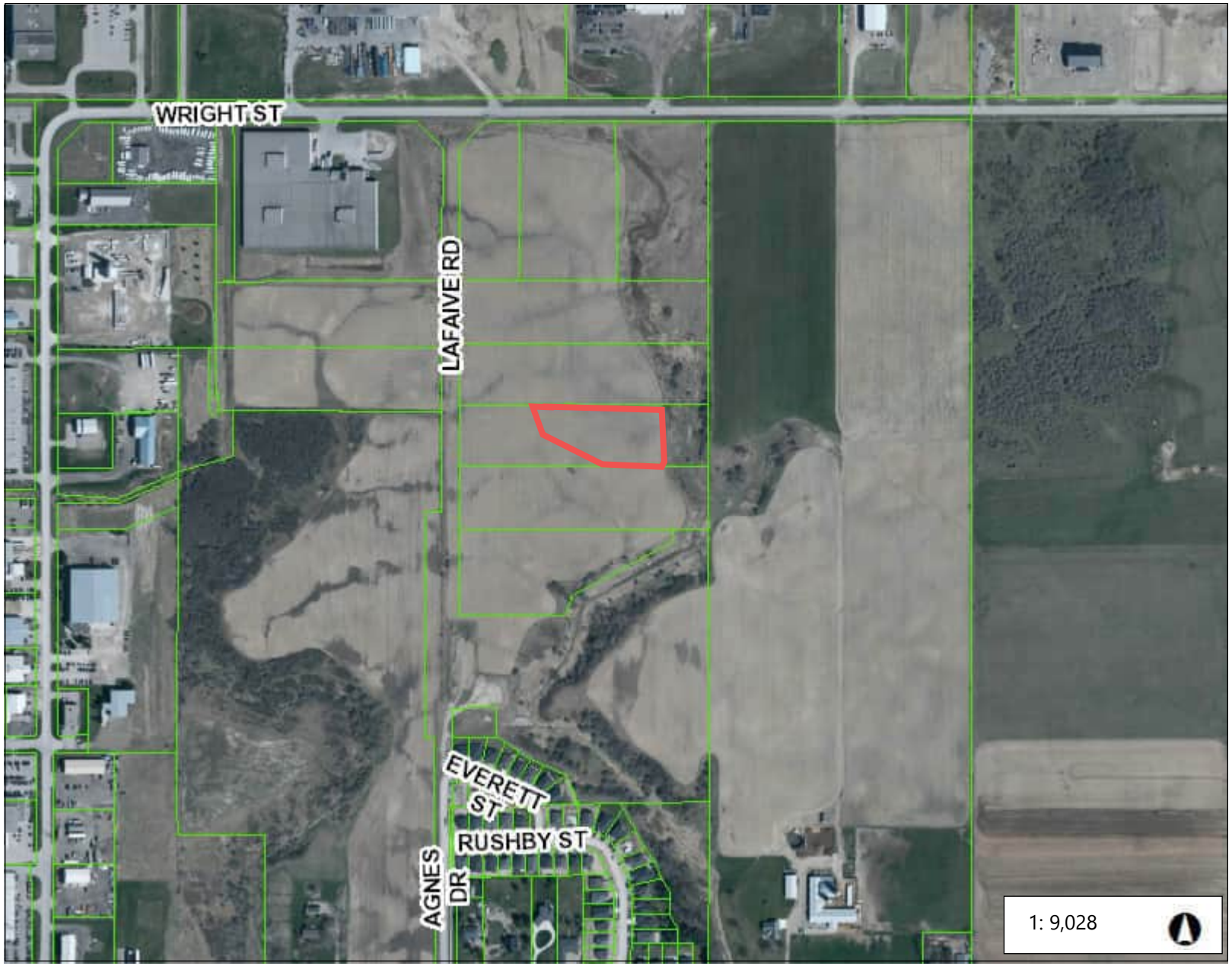
APPENDIX A-9

SWMP-010 - Agnes Drive Roadway Extension SWM Pond, Strathroy

Watershed: East Sydenham
Facility Type: Wet Pond
Type of Controls: Quantity/Quality
Drainage Area (ha): 12.5
In-Service Date: TBD **ECA (prior to CLI):** N/A



Agnes DR N SWM



Legend

Parcels

Notes

6/17/2024

0.5 0 0.23 0.5 Kilometers

WGS_1984_Web_Mercator_Auxiliary_Sphere

SEE SHEET No.6

121.7–900 ST–0.35%

0+100

SUPPLY AND INSTALL 300mm QUARRY STONE RIP–RAP PROTECTION

QUARRY STONE SPILLWAY

STM OUTLET

INV.=238.65

INV.=238.65

0+120

600ø POC @ 0.45%

5H:1V

6H:1V

5H:1V

0+140

7H:1V

10H:1V

4.00

238.40

0+160

237.70 WL

237.20

235.00 FOREBAY

0+180

3x600 HDPE

237.40

POND BOTTOM–235.00

MAINBAY

0+200

SUPPLY AND INSTALL 300mm QUARRY STONE RIP–RAP PROTECTION

5H:1V

3H:1V

MATCH TO EX. GRADING @ 3H:1V

3H:1V

6H:1V

3H:1V

MATCH TO EX. GRADING @ 3H:1V

INSTALL CONCRETE HEADWALL AS PER OPSD 804.030 INCLUDING SAFETY RAILING OPSD 980.101 AND GRATING OPSD 804.050

INSTALL CONCRETE HEADWALL AS PER OPSD 804.030 INCLUDING SAFETY RAILING OPSD 980.101 AND GRATING WITH MAX. OPENING SIZE OF 100mm

3H:1V

10H:1V

3H:1V

6H:1V

NATURAL HERITAGE SITE LIMIT

LOT 6

SWM POND

PROP. ACCESS MAINTENANCE PATH, 10:1 OR FLATTER (200mm GRANULAR 'A' 50mm TOPSOIL AND SEED)

238.10

4.00

238.50

239.50

240.50

241.50

10H:1V

3H:1V

6H:1V

900 OVERFLOW

ST105

SUPPLY AND INSTALL 300mm QUARRY STONE RIP–RAP OVERFLOW

SUPPLY AND INSTALL 300mm QUARRY STONE RIP–RAP PROTECTION

DEGROOT DRAIN

ST.M.H.105
(1200mm DIA.)

250mm DIA. ORIFICE PLATE INV. = 238.55

450mm ST

450mm 30° PREFABRICATED BEND

450mm ST

450 x 450mm 60° PREFABRICATED WYE

STMH–105

238.55

REVERSE SLOPE 600mm ST

150mm DIA. ORIFICE PLATE INV. = 237.70

450mm ST

237.70

FLOW

STMH–105 DETAIL

NTS

244
243
242
241
240
239
238
237
236
235
234

243.81
243.55
243.23
242.72
242.31
241.94
241.31
241.00

EX. GROUND PROFILE ALONG STORM POND

SUPPLY AND INSTALL 300mm QUARRY STONE RIP–RAP PROTECTION

INV=238.64

121.7–900 ST–0.35%

SUPPLY AND INSTALL 300mm QUARRY STONE RIP–RAP PROTECTION

SUPPLY AND INSTALL 300mm QUARRY STONE RIP–RAP PROTECTION

FOREBAY

3x600ø HDPE

POND BOTTOM 235.50

MAINBAY

WATER LEVEL 237.70

WATER LEVEL 237.70

INSTALL CONCRETE HEADWALL AS PER OPSD 804.030 INCLUDING PEDESTRIAN BARRICADE OPSD 980.101 AND GRATING OPSD 804.050

INSTALL CONCRETE HEADWALL AS PER OPSD 804.030 INCLUDING PEDESTRIAN BARRICADE OPSD 980.101 AND GRATING WITH MAX. OPENING SIZE OF 100mm

EX. GROUND PROFILE ALONG C/L OF EASEMENT

ST 105

240.52

240.07

237.59

PROVIDE 600mm MIN COVER OVER 900ø OVERFLOW

QUARRY STONE OVERFLOW

900ø STORM

30° BEND

450ø STORM

450ø STORM

450ø – 30° WYE

SEE STMH–105 DETAIL

22.0–450 ST–1.00%

16.0–600 ST–5.31%

17.3–450 ST–1.00%

STORM SEWER INVERT

STATION

0+100 | 0+120 | 0+123.3 | 0+140 | 0+160 | 0+180 | 0+200 | 0+220 | 0+235.2 | 0+240 | 0+251.2 | 0+260 | 0+268.5

236.50 600E | 237.35 600W 237.70 450E | 237.53 450E

EXISTING SERVICES	DRAWING #, SOURCE	DATE	AS CONSTRUCTED SERVICES	COMPLETION

DETAILS	
DESIGN	CSL
DRAWN BY	JDA
CHECKED	CSL
APPROVED	CSL
DATE	OCT. 2022
	221009–08

No.	REVISIONS	DATE	CONSULTANT
1.	MECP SUBMISSION	OCT.2022	SPRIET

CONSULTANT OR DIVISION

SPRIET ASSOCIATES
LONDON LIMITED
CONSULTING ENGINEERS
155 YORK STREET -- LONDON (519) 672-4100 -- N6A 1A8

ENGINEER'S STAMP

LICENSED PROFESSIONAL ENGINEER
G.A. VERFEYKEN
100509821
Oct. 26/22
PROVINCE OF ONTARIO

STRATHROY-CARADOC
URBAN OPPORTUNITY - RURAL HOSPITALITY

SCALE
HORZ. 1:250
VERT. 1:50
2.5m 0 5.0m HORIZONTAL
0.5 0 1m VERTICAL

TITLE
AGNES DRIVE EXTENSION
SWM POND & OUTLET

PROJECT No. 221009
SHEET No. 7
PLAN FILE No.

221009 SHT No.8 Agnes Drive Extension

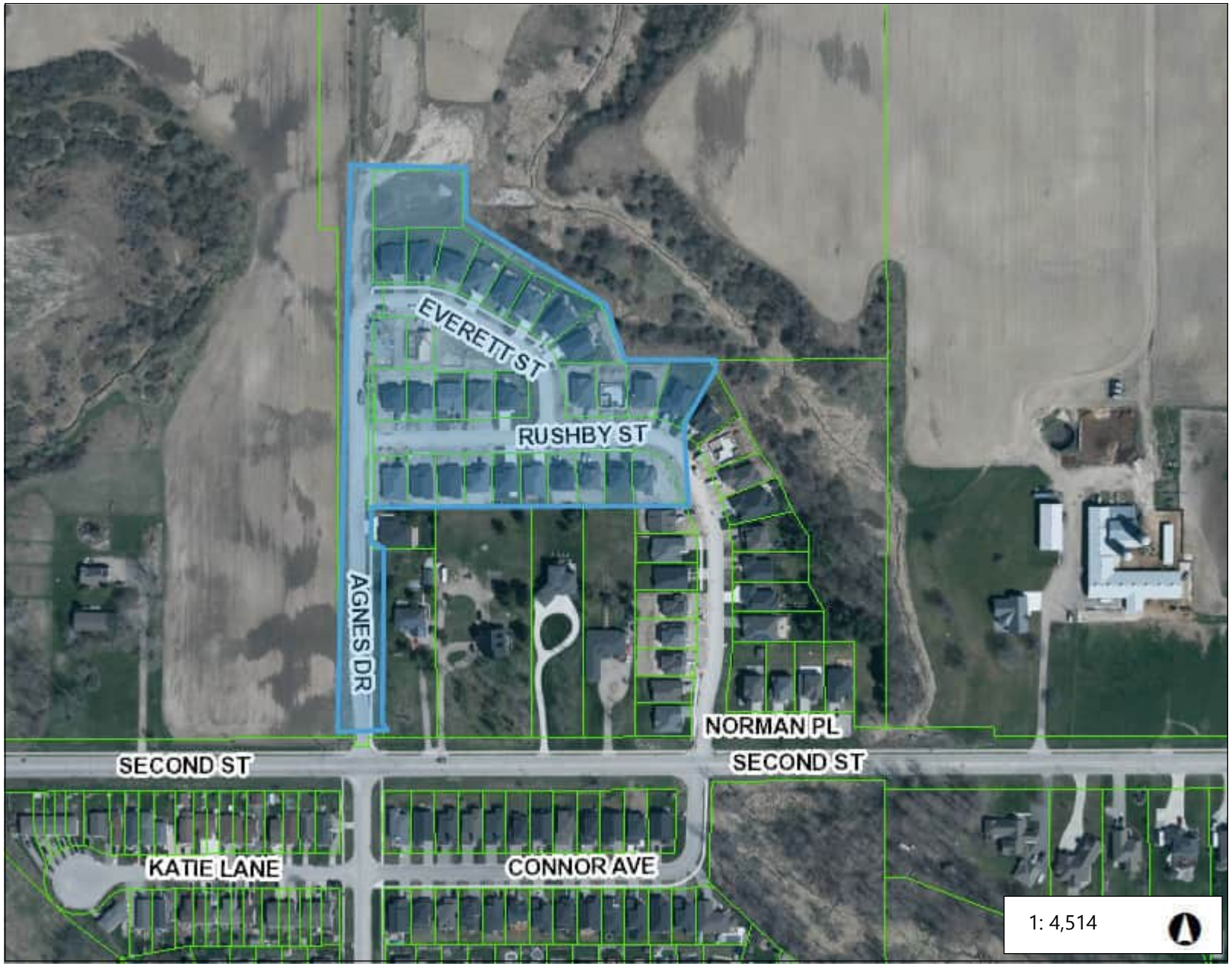
No Additional Information

APPENDIX A-10

SWMP-011-(not noted in CLI) Agnes Drive South SWM Pond, Strathroy

Watershed: East Sydenham
Facility Type: Infiltration Pond
Type of Controls: Quantity/Quality
Drainage Area (ha): 4.8
In-Service Date: circa 2015-20
ECA (prior to CLI): N/A

Exist Agnes SWM Area



Legend

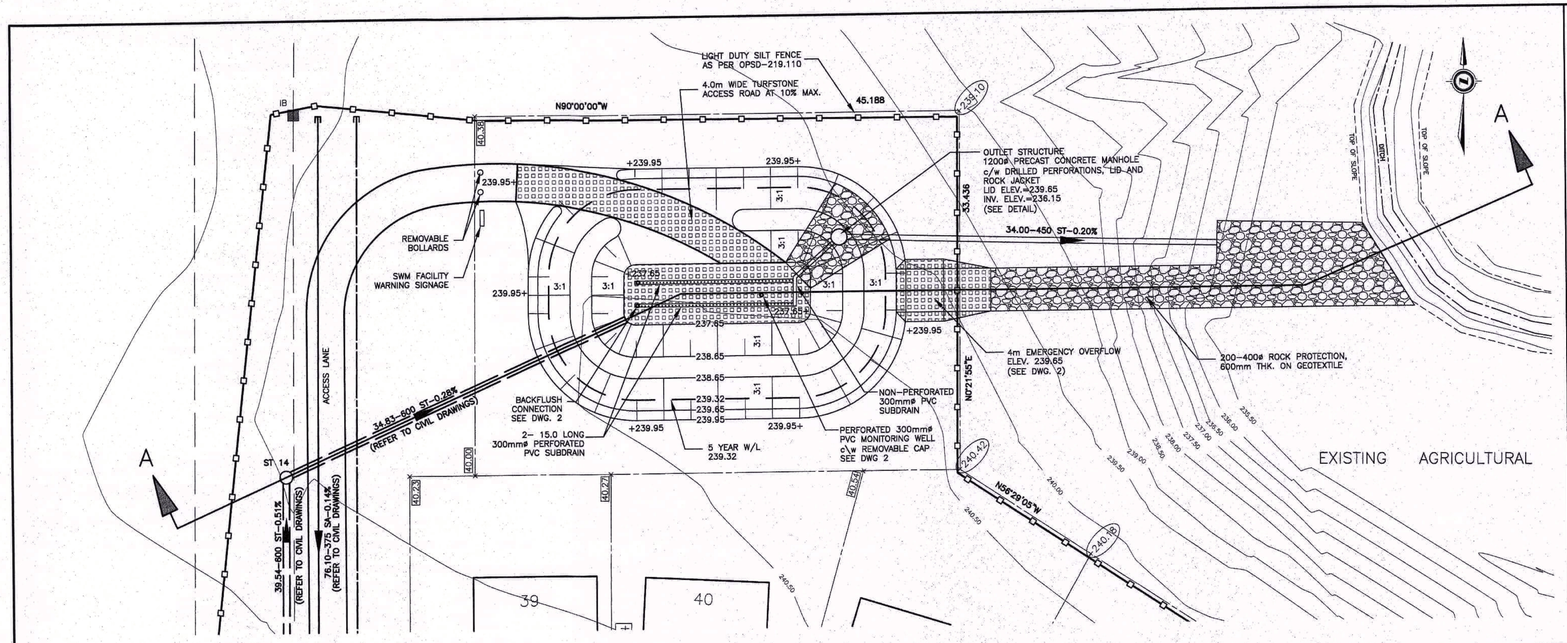
Parcels

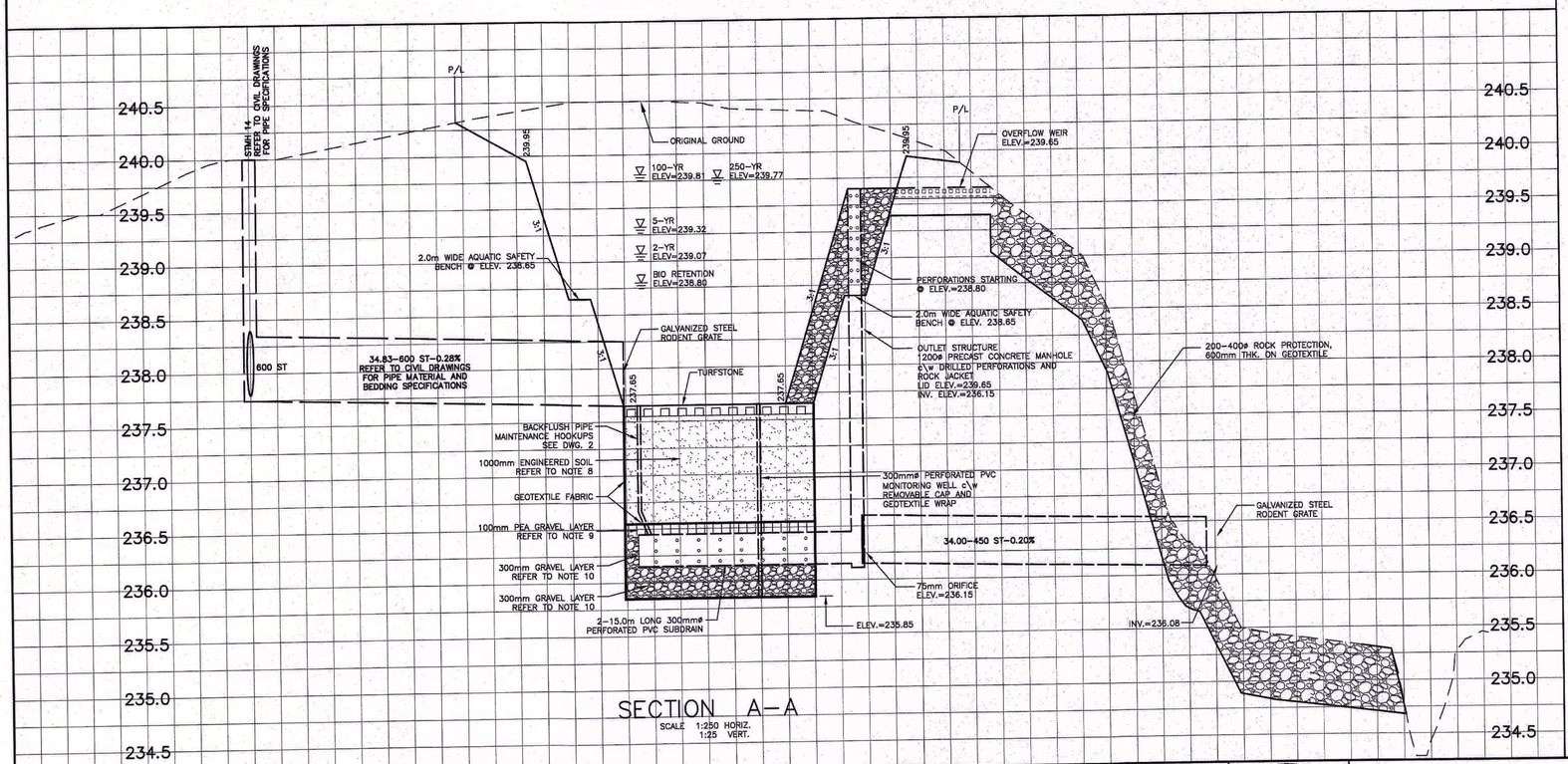
Notes

6/06/2024

0.2 0 0.11 0.2 Kilometers

WGS_1984_Web_Mercator_Auxiliary_Sphere





SECTION A-A

SCALE 1:250 HORIZ.
1:25 VERT.

LEGEND:

- EXISTING GRADE (265)
- PROPOSED GRADE (255.80+)
- PROPOSED MANHOLE
- LIMIT OF EXISTING VEGETATION
- PROPOSED SLOPE
- SILT FENCING
- PROPOSED TURFSTONE
- PROPOSED ROCK PROTECTION
- EXISTING GROUND ELEVATION (+263.67)

NOTES:

1. ALL TURFSTONE SHALL BE 600x400x80mm IN DIMENSIONS AND VOIDS FILLED WITH TOPSOIL AND GRASS SEED.
2. ALL GEOTEXTILE SHALL BE TERRAFIX 270R UNLESS OTHERWISE NOTED.
3. ALL BERMS SHALL BE CONSTRUCTED WITH APPROVED NATIVE CLAYEY MATERIAL PLACED IN 300mm LOOSE LIFTS AND COMPACTED TO AT LEAST 95% S.P.M.D.D.
4. ALL RIP RAP AND ROCK PROTECTION TO BE FREE OF CONCRETE RUBBLE.
5. ALL TOPSOIL SHALL BE FREE OF CLUMPS, BRANCHES, STONES GREATER THAN 50MM IN DIA, ETC. AND SHALL BE FINE GRADED NO SOONER THAN 2 WEEKS IN ADVANCE OF APPLYING THE HYDROSEED.
6. 4.0 WIDE TURFSTONE ACCESS ROAD TO BE CONSTRUCTED WITH TURFSTONE (600x400x80) ON 150mm COMPACTED GRANULAR 'A' AND 375mm COMPACTED GRANULAR 'B'
7. FACILITY TO BE SEEDED UTILIZING AN OBLIGATE SEED MIXTURE

GROUNDCOVER	APPLICATION RATE	CONDITION
OBLIGATE WETLAND MIXTURE	12kg/ha	HYDRO SEED c/w BONDED FIBRE MATRIX
COSMOS SEDGE	10.0	
LURID SEDGE	10.0	
BOTTOM BUSH	33.0	
BLUE FLAG	0.5	
BONSET	0.5	
WOOL GRASS	5.0	
SOFT STEM BULRUSH	1.0	
GIANT BUR REED	30.0	
SOFT RUSH	10.0	

8. ENGINEERED SOIL
   ENGINEERED SOIL TO CONTAIN:
   - 85 TO 88% SAND
   - 8 TO 12% SOIL FINES
   - 3 TO 5% ORGANIC MATTER (LEAF COMPOST)

   OTHER CRITERIA:
   - PHOSPHORUS SOIL TEST INDEX (P-INDEX) VALUE BETWEEN 10 TO 30 ppm
   - CATIONIC EXCHANGE CAPACITY (CEC) GREATER THAN 10 meq/100g
   - FREE OF STONE, STUMPS, ROOTS AND OTHER LARGE DEBRIS
   - pH BETWEEN 5.5 AND 7.5
   - INFILTRATION RATE GREATER THAN 25mm/hr
9. PEA GRAVEL:
   - WASHED 3 TO 10mm DIAMETER CLEAR STONE
10. GRAVEL:
    - WASHED D50=50mm (10mm TO 100mm) DIAMETER CLEAR STONE
11. ROCK PROTECTION:
    - WASHED D50=300mm (200mm TO 400mm) DIAMETER CLEAR STONE

EXISTING SERVICES	DRAWING No., SOURCE	DATE	AS CONSTRUCTED SERVICES	COMPLETION

DETAILS	
DESIGN	DPG
DRAWN BY	RJG
CHECKED	CJM
APPROVED	CJM
DATE	JULY/12

No.	REVISIONS	DATE	CONSULTANT
-	-	-	-

AECOM
London, Ontario
519.673.0510

ENGINEER'S SEAL
LICENSED PROFESSIONAL ENGINEER
C. J. MOON
100163905
27-07-2012
PROVINCE OF ONTARIO

STRATHROY-CARADOC
URBAN OPPORTUNITY - RURAL HOSPITALITY

SCALE
HORIZONTAL SCALE - 1 : 250
2.5 0 5m
VERTICAL SCALE - 1 : 25
.25 0 .5m

TITLE
AMBER MEADOWS
MUNICIPALITY OF STRATHROY

SWM FACILITY

PROJECT No. 60271052
SHEET No. 1
PLAN FILE No.

No Additional Information

APPENDIX B

Detailed Gap Review of Current SWM Guidance Documents

Subdivision Agreement/Site Plan Requirements

Current Requirements	Gaps
Subdivision Agreement Wording 1. DEFINITIONS Agreement Wording **"Services"** means the general descriptions of the services to be provided by the Subdivider as detailed in this Agreement and its Schedules, including but not limited to, facilities required for the detention and enhancement of stormwater and for the purpose of ensuring perpetual maintenance and operation and any measures necessary to implement stormwater quality controls not subject to regulations pursuant to the *Ontario Water Resources Act*; **"Storm Water System"** means and includes but not limited to all storm sewers, catchment basins, drainage systems, stormwater collection areas including ponds, pump stations, together with such additional installments and equipment as may be prescribed in the Special Conditions and General Specifications for the storm water system contained in Schedule "C" attached hereto; 2. INSTALLATION OF SERVICES BY SUBDIVIDER (a) Services and Infrastructure (i) Services to be installed before building permits are issued; (b) storm sewers, stormwater management facilities, watermains and building connections to the lot line; 8. STORMWATER MANAGEMENT The Subdivider shall provide to the Municipality a Stormwater Management Plan, a Sediment and Erosion Control Plan, and Final Detailed Servicing and Grading Plans as part of Schedule "C". As part of the process of preparing the above-noted Plans, Drawings and Specifications in Schedule "C", the Subdivider at its own expense, shall provide the Municipality with a Functional Servicing Report satisfactory to the Municipality which shall include projected development population based on the Municipality's standards, and calculations determining the stormwater demand based on the Municipality's design guidelines. This information will be used to complete stormwater modelling of the proposed stormwater system and the preparation of the associated reports, by consultants selected by the Municipality, at the Subdivider's expense. The Stormwater Management Plan shall address infiltration of roof top runoff and ensure that water quality, including temperature, is maintained. The Stormwater Management Plan, the Sediment and Erosion Control Plan, and the Final Detailed Servicing and Grading Plans must be approved by the Municipality, the Engineer, the Ministry of the Environment, Conservation and Parks or such of its successor(s) as has responsibility for this matter at the time, the St. Clair Region Conservation Authority and any other third party as required by law. The approved sediment and erosion control measures shall be in place prior to any work being undertaken on the subject Lands. Environmental protection measures recommended in the Stormwater Management plan required above that are not capable of being addressed under the *Ontario Water Resources Act*, shall be implemented by the Subdivider under this Agreement. The Subdivider shall, in	1. DEFINITIONS Agreement Wording "Storm Water System" Commentary: Subdivision agreements should have a prohibition on lots having depressed driveways and below grade garages. If these are allowed, they should be prohibited on properties adjacent to overland flow routes within the subdivision. 8. STORMWATER MANAGEMENT Commentary: Requirements in Subdivision Agreements should be coordinated with current SWM requirements in Strathroy-Caradoc Servicing Standards.

Current Requirements	Gaps
accordance with the Stormwater Management Plan, and the Sediment and Erosion Control Plan, and to the satisfaction and approval of the Municipality: (a) Cause storm drainage to be disposed of in accordance with the terms and conditions of a Certificate of Approval issued by the Ministry of the Environment, Conservation and Parks or such of its successor(s) as has responsibility for this matter at the time, if such Certificate of Approval is required, and in accordance with the specifications of the St. Clair Region Conservation Authority, if required, and in accordance with the Stormwater Management Plan; (b) Construct and install storm sewers and appurtenances, stormwater management facilities, catch basins and leads in accordance with the Stormwater Management Plan sufficient to drain the Lands and adjoining lands; and further to provide connections for any future storm sewers as may be required by the Municipality; (d) Implement construction fencing, and sediment and erosion control measures in accordance with the Final Stormwater Management Plan and with the Sediment and Erosion Control Plan and the drawings of the Engineering Plans. All sediment and erosion control measures shall be in place prior to site alteration and shall remain in place until site development is complete; (e) Provide the Municipality with all easements across the Subdivision or adjoining lands for the purpose of the Stormwater System and of any drainage works that may be required to provide an approved outlet for stormwater and to protect any natural watercourse. This shall include, but is not limited to, the obligation of the Subdivider to ensure that the stormwater easements remain free from all encroachments and encumbrances; (f) Receive written permission from the St. Clair Region Conservation Authority under Ontario Regulation 171/06 pursuant to Section 28 of the *Conservation Authorities Act* for any stormwater management outlets to the drainage corridor. The Municipality shall have the right pursuant to this Agreement to require the Subdivider to change the proposed location or elevation of Dwelling Units in the event of any unforeseen fluctuations in the water table. The Municipality agrees that it will not exercise this right without consulting the Municipality's Engineer, the Subdivider or its Professional Engineer. 13. LANDS FOR MUNICIPALITY PURPOSES (i) The Subdivider shall, at the time of assumption of the final phase of development by the Municipality per clause 15, convey Block XXX to the Municipality for stormwater management purposes. 14. EASEMENTS The Subdivider agrees that easements as may be required for access, utility, servicing, the Stormwater System, or drainage purpose shall be granted to the appropriate agency. The Subdivider further agrees to the preparation, execution and registration at the Land Titles Office for Middlesex No. 33, at its expense, concurrently with the registration of Plan of Subdivision (prior to the registration of any Deeds of Transfer or of any liens, mortgages or other charges) a Grant of Easement required as shown in Schedule "G" to the Municipality or its agent, and Bell Canada or other utility whereby they shall have the right, license and authority at all times to:	(f) Permission from the Applicable Conservation Authority Note that all individual Conservation Authority regulations have been replaced with *O. Reg. 41/24: PROHIBITED ACTIVITIES, EXEMPTIONS AND PERMITS* under the *Conservation Authorities Act.* For information on how this regulation is to be implemented, refer to: • O. Reg. 41/24: PROHIBITED ACTIVITIES, EXEMPTIONS AND PERMITS (ontario.ca) • UTRCA Transitional Procedures for the Implementation of O.Reg. 41-24 (thamesriver.on.ca) • Policies and Guidelines – St. Clair Region Conservation Authority (scrca.on.ca) • Interim GL Conservation Ontario

Current Requirements	Gaps
ii) To enter with or without vehicle, machinery or other equipment and material and to construct, repair, replace, inspect, operate and maintain the Municipality's storm sewers, stormwater management facilities, drains and sanitary sewers, including all necessary fixtures for all purposes, upon, over and along and across the said lands shown as storm or sanitary sewer easements on the said Plan, together with rights such as may be necessary to obtain unobstructed access, ingress and egress over all lands shown on the said Plan, including but not limited to the stormwater easements, to and from public highways; to and from the said storm water management facilities, catch basins, storm sewers and drains and sanitary sewers, respectively to be constructed, repaired, replaced, removed and operated and maintained; 15. SPECIAL CONDITIONS Assumption by Municipality of Stormwater Facilities (e) Upon completion of the final phase of development, being 85% build out of that phase, the Subdivider shall provide for municipal assumption and ownership of any facilities required for the detention and enhancement of stormwater quality, and for the purpose of ensuring perpetual maintenance and operation; and the Subdivider shall implement all environmental protection measures recommended in the final stormwater management plan that are not capable of being addressed under the *Ontario Water Resources Act*. a. Prior to the assumption of the Stormwater Management Facility by the Municipality, the Municipality shall have received for its review and approval a report which includes an Operational SWM Report completed by a Professional Engineer that advises on the following items, including but not limited to: i. hydraulic operation of the facility (detention time, evidence or occurrence of overflows), condition of vegetation in and around facility, occurrence of obstructions at the inlet and outlet, evidence of spills and oil/grease contamination; and frequency of trash build-up. ii. measured sediment depths (where appropriate) and clean out of sediment where necessary; iii. results of flow and quality monitoring – including temperature; iv. additional conditions relevant to the long and short-term operation of the pond; v. recommendations for immediate maintenance, repair actions; and, vi. recommendations for a future annual inspection and maintenance program and an annual cost estimate for such; b. Prior to assumption of the Stormwater Management Facility by the Municipality immediate maintenance and repairs identified in the Operational SWM Report shall be completed to the satisfaction of the Municipality; c. Where significant costs of future annual inspection and maintenance programs are identified, a contribution to such costs may be negotiated between the Municipality and the Subdivider; and d. Prior to assumption of the Stormwater Management Facility by the Municipality, such Stormwater Management Facility shall be fully constructed and operational, to the satisfaction of the Municipality. e. Prior to assumption of the Stormwater Management Facility by the Municipality, such Stormwater Management Facility shall be fully cleaned out and clear of any sediment, to the satisfaction of the Municipality. Fencing (l) That the Subdivider shall install a chain link fence within the stormwater management pond block (Block 346) along the perimeter in accordance with Schedule "C". The chain link fence must have a height of 1.2 metres, with a gate at the stormwater access point adjacent to the public street access. The chain link fence and gate shall be installed to the satisfaction of the Municipality, and at the sole expense of the Subdivider.	15. SPECIAL CONDITIONS Commentary on: Assumption by Municipality of Stormwater Facilities SWM requirements in should be coordinated with current SWM requirements in Strathroy-Caradoc Servicing Standards. Wording and terminology should be the same between the agreements and the servicing standards whenever possible. Assumption requirements should include: • Preparation and submission of an Operations and Maintenance Manual which reflects: o Conditions of Approvals ▪ ECA ▪ Other approvals/conditions ▪ Servicing Standards o Requirements for ongoing monitoring o Lifecycle costing for sediment removal, replanting, repairs, etc. o Standard Forms/Checklists ▪ Assumption inspection form ▪ End of Warranty form ▪ Monitoring forms ▪ Maintenance forms ▪ Annual inspection form • Completion of the following forms: o Assumption inspection form o Maintenance form showing remedial work undertaken Commentary on: Fencing Due to inherent risk of having standing water, suggest fence height around SWM facility of 1.8 m. Current Ontario SWM GL does provide the option of the strategic

Current Requirements	Gaps
(m) That the Subdivider shall install a chain link fence within the parkland block (Block 345) along the perimeter in accordance with Schedule "C". The chain link fence must have a height of 1.2 metres, with a gate at the stormwater access point adjacent to the public street access. The chain link fence and gate shall be installed to the satisfaction of the Municipality, and at the sole expense of the Subdivider. 26. ACCEPTANCE, MAINTENANCE AND ASSUMPTION OF THE SERVICES Certificate of Acceptance Upon completion of the construction and installation of the Services, upon compliance with the Subdivider's ongoing obligations to the satisfaction of the Municipality, the Subdivider may submit to the Municipality a Certificate of Completion. The Certificate of Completion shall include the following: (a) A Completion Certificate in the form substantially set out in schedule "K" from the Professional Engineer certifying that the Services have been carried out in conformance with the approved plans and specifications outlined in this agreement (b) any deficiencies identified by the Municipality during its inspection have been completed or repaired (c) dwellings have been completed on at least 85% of the lots as shown on the plan (d) a video camera inspection (CCTV) of all storm and sanitary sewers accompanied by a report from the inspection company completed within no more than sixty (60) days before the submission to the Municipality for the Certificate of Acceptance (e) a certificate issued by the Professional Engineer that all water valves, curb stops and hydrants have been inspected for operation (f) a certified statement of a registered Ontario Land Surveyor that such Ontario Land Surveyor has found or replaced all standard iron bars as shown on the Phase II Plan at a date not earlier than thirty (30) days before the submission to the Municipality for the Certificate of Acceptance (g) a package including a Final Lot Grading Certificate issued by the Professional Engineer for each lot and block on the plan certifying that that the grading and drainage for each lot and block are in accordance with the approved subdivision grading plan (h) "as-built" drawings for the works and services in digital AutoCAD and PDF format and two (2) full sized paper drawings Upon completion of items (a) to (h) above, the Municipality shall issue the Certificate of Acceptance thereby commencing the one (1) year warranty period. Warranty Period	planting of thorn bearing trees and shrubs such as hawthorn and raspberry in conjunction with or in lieu of fencing depending on the risk management approach of a municipality. 26. ACCEPTANCE, MAINTENANCE AND ASSUMPTION OF THE SERVICES Warranty Period End of Warranty period requirements should include completion of the following forms: • End of Warranty form • Maintenance form showing remedial work undertaken

Current Requirements	Gaps
From the date of the Municipality's issuance of the Certificate of Acceptance, the Subdivider shall maintain the Services for a period of one year and provide the necessary guarantees and the requisite security thereof, required under section 29 herein. <u>Assumption</u> On the one year anniversary of the date of the Municipality issuance of the Certificate of Acceptance and upon being satisfied that the Services have been constructed and installed according to the Municipality's specifications, standards and requirements and that all grades and levels have been established to the satisfaction of the Engineer, the Municipality shall assume the Services by bylaw, at which time the ownership of the services shall vest in the Municipality and the Subdivider shall have no claim or rights thereto, other than those accruing to it as a subdivider of land abutting on streets on which the Services are installed. The Services shall not be assumed by bylaw until: 1. the Municipality's council has received and adopted a written report by the Engineer that all the above Services have been constructed or installed to Municipality specifications and that other Municipality departments, which are concerned, have been informed of these matters; and 2. the Subdivider has provided the Municipality with satisfactory evidence that all persons owed money by the Subdivider in connection with the services have been paid in full. 3. The works in Schedule "C" and cost of completion in Schedule "H" will be identified in a statement certified by a duly qualified (Ontario) architect or consulting engineer satisfactory to the Municipality. Such statement shall be used to establish the amount of security required by the Municipality pursuant to Sections 29 and 30 of this Agreement and shall identify separately the value of the works where it is to be assumed by the Municipality as part of its infrastructure. The said estimate shall be provided by the owner to confirm the value of services as tangible capital assets when assumed by the Municipality as more particularly described in Schedule "C" and Schedule "H". 4. Submit to the Municipality copies of the updated application documents of the Ministry of Environment, Conservation and Parks Environmental Compliance Approval Certificates for storm, sanitary, and stormwater management facilities which are to be assumed by the Municipality. The updated applications are to reflect the Municipality as being owner of the works. (The Subdivider is to be responsible for all fees payable to the Ministry in relation to the issuance of updated certificates.)	:
<u>Site Plan Agreement Wording</u> 2. **General Conditions:** The attached Schedules 'A', 'B' are hereby approved by the Municipality subject to the following conditions: **Construction in Accordance with the Plans:** **Grading and Drainage:** x) The property shall be graded & drained to the satisfaction of the Municipality and in accordance with the approved Stormwater Management Plan attached as Schedule "B" for the site so that:	Commentary: SWM requirements in should be coordinated with current SWM requirements in Strathroy-Caradoc Servicing Standards. Wording and terminology should be the same between the agreements and the servicing standards whenever possible. As site plans typically involve catchment areas < 5 ha, it is important that the type of SWM facility chosen is both technically effective and has a manageable life cycle cost. If to be publicly owned assumption requirements should include:

Current Requirements	Gaps
-the flow of water resulting from the Development, or any grading and drainage facilities shall not create an erosion problem or aggravate an existing problem, and; -the flow of water shall not cause a drainage problem on the development site or on other land.	• Preparation and submission of an Operations and Maintenance Manual which reflects: o Conditions of Approvals ▪ ECA ▪ Other approvals/conditions ▪ Servicing Standards o Requirements for ongoing monitoring o Lifecycle costing for sediment removal, replanting, repairs, etc. o Standard Forms/Checklists ▪ Assumption inspection form ▪ End of Warranty form ▪ Monitoring forms ▪ Maintenance forms ▪ Annual inspection form • Completion of the following forms: o Assumption inspection form o Maintenance form showing remedial work undertaken If to be privately owned approval requirements should include: • Preparation and submission for review of an Operations and Maintenance Manual which reflects: o Conditions of Approvals ▪ ECA ▪ Other approvals/conditions ▪ Servicing Standards o Requirements for ongoing monitoring o Lifecycle costing for sediment removal, replanting, repairs, etc. o Standard Forms/Checklists ▪ Assumption inspection form ▪ End of Warranty form ▪ Monitoring forms ▪ Maintenance forms ▪ Annual inspection form • Completion of the following forms: o Assumption inspection form o Maintenance form showing remedial work undertaken • Sufficient surety for maintenance over life span of facility.

Strathroy-Caradoc Servicing Standards, October 2021

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10.1 INTRODUCTION

When lands are developed, the proponent is required to implement Stormwater Management (SWM) measures to address water quantity, water quality, downstream erosion or flooding and water balance issues. This may be accommodated through a range of available strategies. This section will outline Stormwater Management requirements for several strategies, however the most current guidelines from the Ministry of the Environment Conservation and Parks (MECP) may be used to supplement this document. Stormwater Management measures shall be to the satisfaction of the Municipality. Consideration must be provided to downstream capacity, legal outlet, and cost sharing issues. The Stormwater Management requirements outlined in this document should be considered during the draft plan preparation stage prior to any formal design submission. For most projects, an initial consultation meeting with the Municipality is recommended to establish SWM scope and acceptable methods to be included in the draft plan and/or predesign submission. A summary of preferred criteria is summarized in the table below:

<table>
<tr><td>Water Quality</td><td>Enhanced Level of Protection (80% S.S. Removal)</td></tr>
<tr><td>Erosion Protection</td><td>No overland discharge until storms greater than 10-year storm event unless released as sheet discharge</td></tr>
<tr><td>Quantity Control</td><td>All storms released at or below predevelopment release rates up to 250-year storm event</td></tr>
<tr><td>Low Impact Development</td><td>All Low Impact Development Systems must have emergency relief pipes to storm sewers, must be located outside of Road Right of Ways, and must have easements</td></tr>
<tr><td>Large Residential Development (> 50 homes)</td><td>Preferred design would include storm sewers and a wet pond(s). Low Impact Development Systems should have limited use and not be installed within road right of way.</td></tr>
<tr><td>Industrial/Commercial and Multi-Residential Developments</td><td>Preferred design would include a dry pond with oil and grit separators for sites smaller than 5 hectares and a wet pond for sites larger than 5 hectares</td></tr>
<tr><td>Small Developments or Expansions</td><td>Quantity control may be achieved through lot level grading with an oil and grit separator providing quality control</td></tr>
</table>

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10.1 INTRODUCTION

Commentary:
Standards should:

- Prohibit End of Pipe Infiltration Facilities
- Require some sort of surety on Private SWM facilities
- State that use of LID measures are for environmental enhancement and cannot be counted on as part of the mandated quantity or quality treatment.

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10.2 SUBMISSION / APPROVAL PROCEDURES

10.2.1 Initial Consultation Meeting

For most developments, an initial consultation meeting should be organized with the Municipality before the draft plan stage. This will allow the developer and Municipality to determine the scope of the project and the related requirements. This will ensure adequate consideration is given for Stormwater Management elements in the planning and layout stages. An initial consultation meeting with the Municipality will assist in accelerating the timeline for review and approval.

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10.2 SUBMISSION / APPROVAL PROCEDURES

Submission/Approval Procedures should be coordinated between Subdivision/Site Plan Agreement requirements and those required in Strathroy-Caradoc Servicing Standards.

Wording and terminology should be the same between the agreements and the servicing standards whenever possible.

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10.2.2 Predesign Submission A design brief outlining the following for Stormwater Management design criteria should be submitted to the Municipality for approval prior to commencing detailed design. This submission should include: a) An overview of existing predevelopment conditions b) A summary of strategies and tools (including applicable software) which will be used to complete Stormwater Management calculations and modelling c) A summary of the intended targets and criteria which will be used for the engineering design d) Identification of external areas which travel through the site and issues caused by external flows that are to be conveyed through the site e) The location and preliminary layout for proposed drainage and Stormwater Management features including accommodating external flows **10.2.3 Detailed Submission & Stormwater Management Report** An engineered design package must be submitted for approval which includes the following for all proposed developments: a) Engineered drawings including detailed plan, profile, details, cross sections, grading and area plan and design sheet for all storm sewers, drainage features, water levels, Stormwater Management facilities (SWMF), infiltration features and Stormwater Management features including accommodations for external flows that are conveyed through the site including a sediment and erosion control plan. b) Clearly identified overland flow routes, overland storage areas and related elevations. c) Detailed Stormwater Management Report including quantity control, quality control and erosion control. This Report should include supporting calculations for all features, modeling (modelling output), hydrology summary, stage-storage-discharge (including design storms) and drawdown calculation tables. The Report shall also cover groundwater considerations, downstream receiving channel details/considerations, Stormwater Management phasing requirements, monitoring and maintenance procedures. Geotechnical Reports and Hydrogeological Reports will be required to support proposed Stormwater Management measures.	
10.3 REFERENCES The engineering design package should adhere and following Acts and references: **10.3.1 Applicable Acts** a) Provincial a. Clean Water Act (2006) b. Conservation Authorities Act (1990) c. Drainage Act (1990) d. Environmental Bill of Rights (1993)	**10.3 REFERENCES** Commentary: Preamble to this section should note that proponents are required • to ensure compliance with all relevant acts regardless of the list provided • to ensure compliance to regulations from the required provincial and federal acts Note that all individual Conservation Authority regulations have been replaced with *O. Reg. 41/24: PROHIBITED ACTIVITIES, EXEMPTIONS AND PERMITS* under the *Conservation Authorities Act.* For information on how this regulation is to be implemented, refer to: • O. Reg. 41/24: PROHIBITED ACTIVITIES, EXEMPTIONS AND PERMITS (ontario.ca)

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e. Municipal Act (2001) f. Ontario Water Resources Act (1990) g. Ontario Endangered Species Act (2007) h. Ontario Environmental Protection Act (1990 i. Ontario Provincial Policy Statement j. Environmental Assessment Act (1990) b) Federal a. Species at Risk Act (2002) b. Fisheries Act (1985) c. Canadian Environmental Assessment Act (1999) **10.3.2 General Stormwater Management Design References** a) Stormwater Management Practices Planning and Design Manual (MOE, 2003) Ministry of the Environment, 2003 b) Low Impact Development Stormwater Management Planning and Design Guide Sustainable Technologies Evaluation Program, Living Website c) Low Impact Development Stormwater Planning and Design Guide Credit Valley Conservation and Toronto Region Conservation, 2011	• UTRCA Transitional Procedures for the Implementation of O.Reg. 41-24 (thamesriver.on.ca) • Policies and Guidelines – St. Clair Region Conservation Authority (scrca.on.ca) • Interim GL Conservation Ontario
10.4 DESIGN REQUIREMENTS **10.4.1 Quantity Control Requirements** All proposed developments must restrict their site outflow to equal or less than predevelopment release rates during all storm events. Sites (commercial, industrial) and smaller subdivisions shall include calculations for the 5,10, 25, 100 and 250-year storm events. For larger subdivisions (greater than 50 lots) or large sites (greater than 5 Hectares), calculations shall be for the 5, 10, 25, 50, 100 and 250-year storm events. If discharge from the site is conveyed as overland flow across downstream properties, it is preferred that the proponent overcontrols the design storms up to and including the 10-year storm event to be discharged into a subsurface pipe only. Overland discharge will only be allowed for storm events less than the 10-year storm if they are released in a sheet flow condition at less than predevelopment rates with municipal approval. Overland discharge should not be released as “point discharge” unless it is consistent with predevelopment conditions. **10.4.2 Water Quality Requirements** **10.4.2.1 Target Total Suspended Solids Removal** All proposed developments should receive a minimum level of treatment for enhanced quality protection (80% T.S.S. Removal) unless otherwise approved in advance by the Conservation Authority (copy of approval to be supplied to Municipality). **10.4.2.2 Oil and Grit Separator**	

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The application of Oil and Grit Separators (OGS) or comparable system is limited to developments of 4 Hectares or less. For developments larger than 4 Hectares, an OGS will not be considered adequate water quality protection regardless of how the development is delineated, unless otherwise approved. When an OGS services a private site, the OGS must be located on private lands with consideration for how the owner will access the OGS for regular maintenance. **10.4.3 Erosion Control Requirements** All Stormwater Management Facilities require extended detention. However, developments with a receiving outlet that is sensitive to erosion will be required to provide adequate erosion control in addition to the quality control extended detention. All large developments, or developments with a receiving outlet that is sensitive to erosion, must design additional storage at reduced release rates for common rain events (less than 2 year) in accordance with the current design guidelines from the MECP. **10.4.4 Water Balance Requirements** Water balance measures shall be considered by the proponent within the predesign submission. The proponent shall be responsible to determine if the MECP will require water balance as part of an Environmental Compliance Approval (ECA). Where the MECP does not require water balance as part of an ECA approval, the Municipality promotes water balance methods through infiltration or exfiltration but does not require water balance calculations. If water balance is required by the MECP, the calculations shall also be submitted to the Municipality. **10.4.5 End of Pipe Facility Requirements** Stormwater Management Facilities (i.e., ponds, wetlands, etc.) are required to have the following design criteria: **10.4.5.1 SWMF Inlet Pipe Design Criteria** Stormwater Management facility inlets must function in gravity flow and the inlet pipe invert shall be above the projected 5-year storm ponding elevation. Special exceptions will be made to allow ponding to the spring line level of the pipe at the Municipality's discretion. **10.4.5.2 SWMF Outlet Pipe Design Criteria** All Stormwater Management facility outlets must be designed with consideration to allow debris removal if they fail to function. The preferred outlet configuration would include a headwall and safety railing at the end of pipe. **10.4.5.3 SWMF Safety Considerations** All Stormwater Management facilities must be designed in accordance with the current safety guidelines provided by the MECP. Proposed slopes steeper than the current MECP guideline shall be approved by the Municipality within or before predesign submission. The proponent must fence the Stormwater Management facility to the satisfaction of the Municipality. **10.4.5.4 SWMF Outlet Protection** Stormwater Management Facility Outlet Pipes shall be protected by a grate with vertical bars with a spacing no larger than Radius of the downstream orifice or pipe. **10.4.5.5 Vegetation / Plantings**	**Modification to 10.4.5 End of Pipe Facility Requirements** Change "Stormwater Management Facilities (i.e., ponds, wetlands, etc.) are required to have the following design criteria:" To "In addition to adhering to the Ontario Stormwater Management Planning and Design Manual (2003), Stormwater Management Facilities (i.e., ponds, wetlands, etc.) are required to have the following design criteria:" Add the following sections: **10.4.5.6 Stormwater Management Facility Storage Volumes** The working volumes of the sediment forebay and the detention pond (s) should allow for an average depth of sediment of 0.3 m in the forebay and the pond (s). To lengthen the service life, individual SWM facilities should be oversized by 10% with regard to treatment volume for the design storms selected. **10.4.5.7 Stormwater Management Safety** SWM Pond design features to reduce the risk of injury to children (aged1 to 8 years) or adults with physical or mental impairments, while maintaining facility

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All plantings should in accordance with the Ministry of the Environment, Conservation and Parks Guidelines. Vegetation shall be designed using local species that are considered natural/low maintenance. A plantings drawing must be submitted to the Municipality on large subdivisions (greater than 50 lots).	function. In addition to these the Proponent must consider safety features to restrain access to deep standing water through a series of spatial, physical, natural and aesthetic barriers or through alternatives to direct access. Specific guidance includes but is not limited to: 1. Stormwater from the forebay shall be held in a permanent wet retention pond and should be located in the facilities lower cell (assuming the general main cell design reflects an overall safety criteria of gentle slopes and aquatic safety benches or suitable barriers); 2. Within open space and park areas in lieu of fencing, unmowed vegetated buffers will be required around the perimeter. This buffer should be comprised of tall grasses and wild flowers, followed by trees and densely planted shrubs. A densely vegetated margin on the aquatic safety bench is to serve as an aesthetic amenity and an additional natural barrier; 3. This dense unfriendly vegetation should act as a natural barrier to all but the most determined individuals. Openings can be provided if warnings are posted advising those who approach the facility of its purpose, operation and potential safety hazards; 4. Posted warning signs should be visible at emergency access points in the event that the barrier is penetrated. An aquatic safety bench must be constructed around the forebay and the main treatment cells with the lower edge to be located 0.9 m above the pond bottom with a minimum 2 m width and incorporate a slope of 10:1 or flatter; 5. Pedestrian and cycle paths must always be located no lower than the 10 year storm event water elevation with at least 0.9 m freeboard from the permanent pool of water and are only permitted where the safety bench is present and have adequate signage to warn the public of potential safety hazards during pond operation; and 6. Access roads below the 10 year storm event water elevation are to be posted with hazard signage Paths below this point and leading to the lower portions of a facility to warn the public of potential safety hazards during pond operation.
10.4.6 Low Impact Development Systems 10.4.6.1 General Requirements If the proponent intends to implement Low Impact Development Systems (LIDS) a list of LID types, locations and extent shall be provided to the Municipality for approval at the predesign submission stage. While Low Impact Development Systems are promoted, they cannot be the sole source of quantity control. In addition to implementing Low Impact Development Systems,	10.4.6 Low Impact Development Systems Commentary: The Municipality should support efforts to incorporate LID measures into development to enhance the environment as part of sustainability goals of Strathroy-Caradoc. These can contribute to buildings getting LEED Certification or developments achieving Envision Certification which are laudable goals. However, practical experience in the past 10-years in Southwestern Ontario has found that LIDS are not necessarily effective low costs

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both the internal drainage system and Stormwater Management outflows shall be provided through a pipe system and outlet configuration capable of handling a minimum of 20% of the post development inlet flow for a 5-year storm. 10.4.6.2 Infiltration Gallery Requirements a) No infiltration galleries are permitted within Road Right of Ways. b) Permissible locations include infiltration corridors adjacent to Right of Way, parks, pond access areas, rear yards and maintenance setbacks to drains. c) All infiltration galleries shall have a catchbasin with perforated pipe leads within stone trenches. d) All catchbasins shall have an emergency relief flow outlet to the storm sewer or emergency relief flow pipe system. e) All galleries and leads within private property shall have adequately sized easements designated for future maintenance. f) Leads from road Right of Ways shall be located through rear yard access (preferred) or side yard access with larger lots on each side to account for maintenance requirements. Affected lots will require calculations of basement, underside of footing, and lead elevations. g) Each rear yard infiltration catchbasin shall service a maximum of 8 lots. h) All infiltration catchbasins shall be protected with a permanent sediment measure such as FleXstorm inlet sediment trap or approved equal. i) Infiltration Catchbasins shall be located a minimum of 1.5m from any rear property line and 0.6m from a side yard property line. j) The proponent shall submit detailed drawings including plan, layout, cross-sections and elevations for exfiltration and emergency relief pipes as well as supporting calculations. Emergency relief leads will require a detail plan and profile including elevations of exfiltration pipes leaving the catchbasins. 10.4.6.3 Groundwater Considerations a) If Low Impact Development Systems are a proposed method of Stormwater Management, the proponent is required to prove that there is no risk of contamination to potable groundwater or risk to Designated Vulnerable Areas identified by MECP. A Report from the Hydrogeologist may be required if local wells or shallow groundwater are present in the vicinity of the development. b) A Geotechnical Report and Hydrogeology Report stamped by a qualified professional shall be provided to: i. Support the implementation of Low Impact Development Systems. ii. Confirm that the long-term high groundwater elevation is 1m (minimum) below the invert of the infiltration galleries in all areas.	solutions for SWM or drainage, have issues with community acceptance (create wet areas, require resident maintenance of boulevard), and require frequent maintenance as they are mostly infiltration-based systems. Therefore, it is recommended that LID systems not be considered as part of the mandated quantity or quality treatment.
10.5 HYDROLOGY Storm Water Management Facilities and/or measures shall be designed using accepted practices as outlined in the most current edition of the publication entitled "Stormwater Management Practices Planning and Design Manual" published be MECP/MOE and generally conform to the design criteria within this manual, all to the satisfaction of the Municipality. This section discusses potential systems to meet current SWM criteria. 10.5.1 Catchment Delineation Area plans shall be included in the Stormwater Management Report clearly defining all tributary catchments. Area plans are required for the predevelopment conditions/modeling, storm sewer design areas, post development conditions including overland flow routes to	

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Stormwater Management facility including identifying any ponding areas and related ponding depths. All external areas tributary to the site shall be fully shown in plan view showing applicable areas and runoff conditions.

Area plans should include existing elevations and overland flow patterns outside of the development property for a minimum distance of 15m surrounding the entire perimeter.

10.5.2 Overland Flow Routes
Major flows must be safely conveyed via a defined Overland Flow Route (OFR) to an appropriate outlet without causing damage to private property or municipal infrastructure, and with minimum risk to the public. The maximum allowable ponding depth shall be 300mm in rear yards and 150mm on roadways during storms up to and including the 25-year storm. The maximum allowable ponding depth shall be 450mm in rear yards and 200mm on roadways during storms greater than the 25-year storm. The following information shall also be included:

a) Ponding limits and associated depths for areas used as quantity storage

b) Overland Flow Route conveyance calculations, where requested

It is strongly recommended that overland flow routes be constructed in Road right of ways (R.O.W.s). The proponent shall avoid overland flow routes from Road R.O.W.s through private lands or from rear yards to R.O.W.'s being directed between buildings. The Municipality may require easements for overland flow routes in this situation.

10.5.3 Design Storms

In the design of site plans or subdivisions, "critical design storms" shall be in accordance with section 10.4.1. Storm events should be modelled using a Modified Chicago Storm Distribution with a 3-hour duration and a Ratio of time to Peak to total duration of 0.33. Rainfall intensity duration frequency (IDF) parameters are summarized below.

Rainfall Parameters for Intensity Duration Frequency Curves

<table>
<tr><th>Parameter</th><th>25mm</th><th>5yr</th><th>10yr</th><th>25yr</th><th>50yr</th><th>100yr</th><th>250yr</th></tr>
<tr><td>A</td><td>538.850</td><td>1137.257</td><td>1425.011</td><td>1835.352</td><td>2225.884</td><td>2561.151</td><td>3048.220</td></tr>
<tr><td>B</td><td>6.331</td><td>7.184</td><td>7.382</td><td>7.844</td><td>8.620</td><td>9.093</td><td>10.03</td></tr>
<tr><td>C</td><td>0.809</td><td>0.830</td><td>0.843</td><td>0.858</td><td>0.871</td><td>0.880</td><td>0.888</td></tr>
</table>
These design storms and IDF parameters are for Stormwater Management only. Storm sewers shall be designed in accordance with Section 3.

10.5.4 Stormwater Management Calculations

SWMHYMO and Visual OTTHYMO are the accepted modelling software to be used for SWM engineering design. Other modelling software will be considered, but approval should be received from the Municipality (at their discretion) prior to commencing detailed design. For small sites (up to 2.0 ha), the Rational Method or Modified Rational Method may be appropriate.

For sites larger than 2.0 Hectare, the rational method or modified rational method will not be approved. Supporting documentation and references should be supplied at the predesign stage for the selected modeling parameters, if not provided within this document. Detailed standard parameters are outlined in Section 10.4.5.
</td><td>
10.5.2 Overland Flow Routes
Commentary:

The Standards, similar to what is recommended in subdivision agreements, should have a prohibition on lots having depressed driveways and below grade garages. If these are allowed, they should be prohibited on properties adjacent to overland flow routes within the subdivision.
</td></tr>
</table>

<table>
<tr><th colspan="2">SECTION 10 – STORMWATER MANAGEMENT</th></tr>
<tr><th>Current Text</th><th>Comment</th></tr>
<tr><td>

10.5.5 Hydrology Modeling Parameters

For Stormwater Management modeling, the following parameters are required unless otherwise approved:

a) Percent Impervious

Land Use	Total impervious	Directly Connected Impervious
Single Family Residential (Lots smaller than 375m^2)	50%	40%
Single Family Residential (Lots 375m^2 to 550m^2)	40%	30%
Single Family Residential (Lots larger than 550m^2)	35%	25%
Multi-Family Residential	60 - 80%	50 - 60%
Undeveloped Residential	40 – 50%	30 - 40%
Commercial / Industrial	70 - 90%	50 - 80%

b) Infiltration Losses

SCS curve method or Horton Method are acceptable models for calculating infiltration losses.

c) Initial Abstraction

Land Use	Accepted Value (mm)
Impervious	2
Lawn Area	5
Other Pervious Areas	8

d) Curve Numbers

Curve numbers should be AMC II conditions unless Modified curve numbers are used.

10.5.6 Rational Method Parameters

The following runoff coefficients should be used for all rational method or modified calculations unless otherwise approved:

</td><td></td></tr>
</table>

SECTION 10 – STORMWATER MANAGEMENT	
Current Text	Comment
<table><tr><td>Single Family Residential (Lots smaller than 375m²)</td><td>0.60</td></tr><tr><td>Single Family Residential (Lots 375m² to 550m²)</td><td>0.50</td></tr><tr><td>Single Family Residential (Lots larger than 550m²)</td><td>0.45</td></tr><tr><td>Multi-Family Residential</td><td>0.65 – 0.80</td></tr><tr><td>Undeveloped Residential</td><td>0.50</td></tr><tr><td>Commercial</td><td>0.70 – 0.85</td></tr><tr><td>Industrial</td><td>0.70-0.90</td></tr><tr><td>Parks, Cemetery, Playgrounds & Farmlands</td><td>0.20</td></tr></table>	
10.6 MONITORING AND MAINTENANCE 10.6.1 Construction Phase Details and instructions should be included within the Stormwater Management construction drawings to prevent offsite migration of sediments during construction should be provided for all Stormwater inlets and Stormwater flow paths. 10.6.2 Pre-Assumption Sediment Measures Details and instructions should be included within the Stormwater Management Report and on construction drawings outlining the decommissioning construction phase sediment control measures and removal/disposal of sediment collected during construction. The Stormwater Management Report should describe procedures that the contractor shall undertake to ensure that all sediment accumulated during construction is properly removed from the system, including removal of all sediment from all structures and Stormwater Management features. 10.6.3 Post-Assumption Operation and Maintenance Detailed instructions for monitoring and maintaining all Stormwater Management features within the system should be provided in the Stormwater Management Report. These instructions shall include details on inspection procedures, sediment removal and disposal procedures.	Commentary: 10.6.3 Post-Assumption Operation and Maintenance This section should be revised to coordinate with proposed revisions to Section 15. SPECIAL CONDITIONS, Assumption by Municipality of Stormwater Facilities in t Subdivision Agreements and in any similar section in Site Plan Agreements.
10.7 MECP & CONSERVATION AUTHORITY APPROVAL The proponent is responsible to obtain all necessary approvals from the Conservation Authority and MECP. The proponent shall provide a copy of all approvals to the Municipality.	
10.8 INTERIM / PHASING CONSIDERATIONS Adequate details outlining various phasing and interim conditions must be included within the Stormwater Management Report for large developments. The proposed phasing plan shall include details on how water quantity and quality is protected at various phases of construction and clearly outline temporary sediment and erosion control features required between phases to protect downstream lands.	Commentary: 10.8 INTERIM / PHASING CONSIDERATIONS This should be coordinated so that there are standard conditions between the Standards and applicable Subdivision Agreements.
10.9 MONITORING OF PRIVATE SITE Every 5 years (maximum) or upon the written request of the Municipality, the Owner shall hire a Professional Engineer (at their own cost) to verify the condition of all existing Stormwater Management features. The Engineer shall provide a Report to the Owner and Municipality which outlines if the Stormwater Management feature is functioning as intended. If the Stormwater Management feature is not functioning as intended, the Engineer shall provide a schedule of required maintenance activities or corrections which the Owner	Commentary: 10.9 MONITORING OF PRIVATE SITE This should be coordinated so that there are standard conditions between the Standards and applicable Site Plan Agreements.

SECTION 10 – STORMWATER MANAGEMENT	
Current Text	Comment
must undertake. Upon maintenance of the Stormwater Management feature, the Owner shall have the Engineer submit a formal certification of completion letter to the Municipality.	

APPENDIX C

Stormwater Management Policy Manual Draft Table of Contents

Municipality of Strathroy-Caradoc

Stormwater Management Policy Manual

Draft

December 25, 2024

Prepared for:

RVA

STRATHROY-CARADOC
URBAN OPPORTUNITY - RURAL HOSPITALITY

STORMWATER MANAGEMENT POLICY MANUAL

TABLE OF CONTENTS

LIST OF TABLES

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APPENDICES

ERRATA/REVISIONS

Table ER 1.1 – List of Errata and Revisions

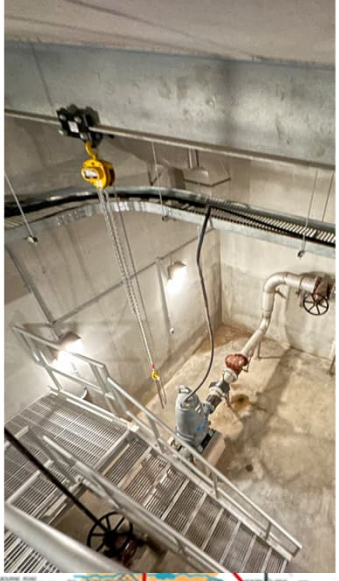
Date	Revision Number	Description
December 25, 2024	0.1	Draft SWM Policy Manual Issued for Review

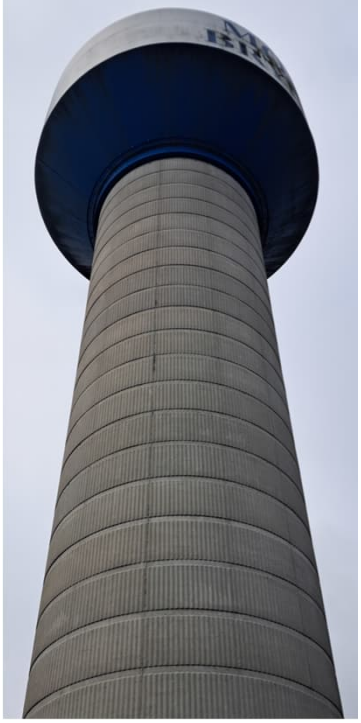
APPENDIX D

Stormwater Master Plan Project Fact Sheet

Strathroy-Caradoc Water, Wastewater, and Stormwater Master Plan
Project Fact Sheet - Stormwater Management

	PROJECT	LOCATION	MCEA SCHEDULE	TOTAL COST	ANTICIPATED YEAR OF IMPLEMENTATION																				
					2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046
STORMWATER MANAGEMENT RECOMMEDATIONS	**STORMWATER MANAGEMENT RECOMMEDATIONS**																								
	Stage 1 SWM Policy																								
	Initial Policy	Municipality	Approved	$100,000	$50,000	$50,000																			
	Policy Update	Municipality	Approved	$100,000											$50,000									$50,000	
	Stage 2 Assessment of Existing Facilities and Adoption of Assumption Procedures																								
	SWMP-01- Pinetree Ln/Riverview Dr	Strathroy	Approved	$36,000			$36,000																		
	SWMP-02 - Parkview Dr/Parkview Cres (north)	Strathroy	Approved	$36,000			$36,000																		
	SWMP-03 - Parkview Dr/Parkview Cres (south)	Strathroy	Approved	$67,000			$31,000	$36,000																	
	SWMP-04 - Second Str. & Adair Blvd.	Strathroy	Approved	$36,000				$36,000																	
	SWMP-05 - Head St N/ Thorne Dr	Strathroy	Approved	$36,000				$36,000																	
	SWMP-06 - Molnar Industrial Park	Strathroy	Approved	$36,000					$36,000																
	SWMP-07 - Bennett Cres	Mount Brydges	Approved	$36,000					$36,000																
	SWMP-08 and 09 - Lucas St/Pondhaven Ln	Mount Brydges	Approved	$3,000			$3,000																		
	SWMP-011 - Agnes Drive Roadway South SWM Pond	Strathroy	Approved	$29,000					$29,000																
	Stage 3: Implement SWM Lifecycle Management Program (Pond Restoration)																								
	SWMP-01- Pinetree Ln/Riverview Dr	Strathroy	Approved	$1,100,000					$50,000	$500,000														$50,000	$500,000	
	SWMP-02 - Parkview Dr/Parkview Cres (north)	Strathroy	Approved	$385,000						$35,000	$350,000														
	SWMP-03 - Parkview Dr/Parkview Cres (south)	Strathroy	Approved	$220,000							$20,000	$200,000													
	SWMP-04 - Second Str. & Adair Blvd.	Strathroy	Approved	$550,000									$50,000	$500,000											
	SWMP-05 - Head St N/ Thorne Dr	Strathroy	Approved	$550,000								$50,000	$500,000												
	SWMP-06 - Molnar Industrial Park	Strathroy	Approved	$385,000										$35,000	$350,000										
	SWMP-07 - Bennett Cres	Mount Brydges	Approved	$550,000											$50,000	$500,000									
	SWMP-08 and 09 - Lucas St/Pondhaven Ln	Mount Brydges	Approved	$760,000														$60,000	$350,000	$350,000					
	SWMP-010 - Agnes Drive Extension SWM Pond	Strathroy	Approved	$700,000																	$350,000	$350,000			
	SWMP-011 - Agnes Drive South SWM Pond	Strathroy	Approved	$440,000												$40,000	$400,000								
			SWM TOTAL:	**$5,955,000**	**$50,000**	**$50,000**	**$106,000**	**$108,000**	**$151,000**	**$535,000**	**$370,000**	**$250,000**	**$550,000**	**$535,000**	**$450,000**	**$540,000**	**$400,000**	**$60,000**	**$350,000**	**$350,000**	**$350,000**	**$350,000**	**$0**	**$50,000**	**$550,000**	**$0**





MUNCIPALITY OF STRATHROY - CARADOC

Water, Wastewater and Stormwater Master Plan

Appendix 5 – Project Fact Sheet

October 31, 2024

R.V. Anderson Associates Limited
557 Southdale Road East, Suite 200
London, ON N6E 1A2

	PROJECT	LOCATION	MCEA SCHEDULE	TOTAL COST	ANTICIPATED YEAR OF IMPLEMENTATION																			
					2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046
WATER MASTER PLAN	WATER MASTER PLAN																									
	Strathroy Water System																									
	Centre Street Watermain Upgrades	Strathroy	Approved	$840,000							$84,000	$756,000														
	Concord Drive Watermain Upgrades	Strathroy	Approved	$760,000							$76,000	$684,000														
	Riverview Drive Watermain Upgrades	Strathroy	Approved	$760,000							$76,000	$684,000														
	Oak Avenue Watermain Upgrades	Strathroy	Approved	$1,830,000							$183,000	$1,647,000														
	North Street Watermain Upgrades	Strathroy	Approved	$1,770,000								$177,000	$1,593,000													
	Locke Heights Watermain Upgrades	Strathroy	Approved	$1,430,000								$143,000	$1,287,000													
	Lamore Crescent Watermain Upgrades	Strathroy	Approved	$1,210,000									$121,000	$1,089,000												
	Mill Pond Crescent Watermain Upgrades	Strathroy	Approved	$1,430,000									$143,000	$1,287,000												
	Head Street Watermain Upgrades	Strathroy	Approved	$2,030,000										$203,000	$1,827,000											
	Mount Brydges Water System																									
	Storage Upgrades	Mount Brydges	B	$2,575,000	$175,000	$2,400,000																				
	Hydraulic Modeling																									
	Annual Updating of Hydraulic Model	Municipality	Approved	$400,000	$50,000	$50,000	$50,000	$50,000	$50,000						$50,000	$25,000					$50,000	$25,000				
			WATER TOTAL:	$15,035,000	$225,000	$2,450,000	$50,000	$50,000	$50,000	$0	$419,000	$4,091,000	$3,144,000	$2,579,000	$1,877,000	$25,000	$0	$0	$0	$0	$50,000	$25,000	$0	$0	$0	$0
	WASTEWATER MASTER PLAN																									
	Mount Brydges Wastewater System																									
	WWTF Expansion Schedule C Class EA	Mount Brydges	C	$350,000	$200,000	$150,000																				
	WWTF Expansion Design and Construction	Mount Brydges	C	$25,768,000		$500,000	$500,000	$8,100,000	$8,274,560	$8,393,440																
	Existing Servicing Phase 1	Mount Brydges	Approved	$5,400,000			$540,000	$4,860,000																		
	Existing Servicing Phase 2	Mount Brydges	Approved	$5,400,000					$540,000	$4,860,000																
	Existing Servicing Phase 3	Mount Brydges	Approved	$5,400,000							$540,000	$4,860,000														
	Existing Servicing Phase 4	Mount Brydges	Approved	$5,400,000									$540,000	$4,860,000												
	Existing Servicing Phase 5	Mount Brydges	Approved	$5,400,000											$540,000	$4,860,000										
	Existing Servicing Phase 6	Mount Brydges	Approved	$5,400,000													$540,000	$4,860,000								
	Existing Servicing Phase 7	Mount Brydges	Approved	$5,400,000															$540,000	$4,860,000						
	Existing Servicing Phase 8	Mount Brydges	Approved	$5,400,000																	$540,000	$4,860,000				
	Existing Servicing Phase 9	Mount Brydges	Approved	$5,400,000																			$540,000	$4,860,000		
	Existing Servicing Phase 10	Mount Brydges	Approved	$5,400,000																					$540,000	$4,860,000
	Hydraulic Modeling																									
	Updating of Wastewater Hydraulic Model	Municipality	Approved	$600,000	$50,000	$50,000	$50,000	$50,000	$50,000						$50,000	$50,000	$50,000	$50,000	$50,000						$50,000	$50,000
			WASTEWATER TOTAL:	$80,718,000	$250,000	$700,000	$1,090,000	$13,010,000	$8,864,560	$13,253,440	$540,000	$4,860,000	$540,000	$4,860,000	$590,000	$4,910,000	$590,000	$4,910,000	$590,000	$4,860,000	$540,000	$4,860,000	$540,000	$4,860,000	$590,000	$4,910,000
STORMWATER MANAGEMENT RECOMMENDATIONS	STORMWATER MANAGEMENT RECOMMENDATIONS																									
	Stage 1 SWM Policy																									
	Initial Policy	Municipality	Approved	$100,000	$50,000	$50,000																				
	Policy Update	Municipality	Approved	$100,000											$50,000										$50,000	
	Stage 2 Assessment of Existing Facilities and Adoption of Assumption Procedures																									
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	SWMP-03 - Parkview Dr/Parkview Cres (south)	Strathroy	Approved	$67,000			$31,000	$36,000																		
	SWMP-04 - Second Str. & Adair Blvd.	Strathroy	Approved	$36,000				$36,000																		
	SWMP-05 - Head St N/ Thorne Dr	Strathroy	Approved	$36,000				$36,000																		
	SWMP-06 - Molnar Industrial Park	Strathroy	Approved	$36,000					$36,000																	
	SWMP-07 - Bennett Cres	Mount Brydges	Approved	$36,000					$36,000																	
	SWMP-08 and 09 - Lucas St/Pondhaven Ln	Mount Brydges	Approved	$3,000			$3,000																			
	SWMP-011 - Agnes Drive Roadway South SWM Pond	Strathroy	Approved	$29,000					$29,000																	
	Stage 3: Implement SWM Lifecycle Management Program (Pond Restoration)																									
	SWMP-01- Pinetree Ln/Riverview Dr	Strathroy	Approved	$1,100,000					$50,000	$500,000														$50,000	$500,000	
	SWMP-02 - Parkview Dr/Parkview Cres (north)	Strathroy	Approved	$385,000						$35,000	$350,000															
	SWMP-03 - Parkview Dr/Parkview Cres (south)	Strathroy	Approved	$220,000							$20,000	$200,000														
	SWMP-04 - Second Str. & Adair Blvd.	Strathroy	Approved	$550,000									$50,000	$500,000												
	SWMP-05 - Head St N/ Thorne Dr	Strathroy	Approved	$550,000								$50,000	$500,000													
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	SWMP-08 and 09 - Lucas St/Pondhaven Ln	Mount Brydges	Approved	$760,000														$60,000	$350,000	$350,000						
	SWMP-010 - Agnes Drive Extension SWM Pond	Strathroy	Approved	$700,000																	$350,000	$350,000				
	SWMP-011 - Agnes Drive South SWM Pond	Strathroy	Approved	$440,000												$40,000	$400,000									
			SWM TOTAL:	$5,955,000	$50,000	$50,000	$106,000	$108,000	$151,000	$535,000	$370,000	$250,000	$550,000	$535,000	$450,000	$540,000	$400,000	$60,000	$350,000	$350,000	$350,000	$350,000	$0	$50,000	$550,000	$0
PPCP	PPCP Recommendations																									
	PPCP Data to updating the Wastewater Hydraulic Model	Municipality	Approved	$300,000	$25,000	$25,000	$25,000	$25,000	$25,000						$25,000	$25,000	$25,000	$25,000	$25,000						$25,000	$25,000
			PPCP TOTAL:	$300,000	$25,000	$25,000	$25,000	$25,000	$25,000	$0	$0	$0	$0	$0	$25,000	$25,000	$25,000	$25,000	$25,000	$0	$0	$0	$0	$0	$25,000	$25,000
			TOTAL CAPITAL COST:	$102,208,000	$550,000	$3,225,000	$1,271,000	$13,193,000	$9,090,560	$13,788,440	$1,329,000	$9,201,000	$4,234,000	$7,974,000	$2,942,000	$5,500,000	$1,015,000	$4,995,000	$965,000	$5,210,000	$940,000	$5,235,000	$540,000	$4,910,000	$1,165,000	$4,935,000