# Township of Severn

## Servicing Master Plan

Submitted August 29, 2025

Final Report

# STATEMENT OF QUALIFICATIONS AND LIMITATIONS

The attached Report (the "Report") has been prepared by Civica Infrastructure Inc. (the "Consultant") at the request of, and for the exclusive use of, the client (the "Client") in accordance with the terms of agreement between the Consultant and the Client, including the scope of work detailed therein (the "Agreement").

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August 29, 2025 CIVICA Ref: SEV23-0001

Mr. Derek Burke
Township of Severn
1024 Hurlwood Lane
Severn ON L3V 0Y6

Attention: Mr. Burke

**RE: Township of Severn Water, Wastewater and Stormwater Servicing Master Plan**

Dear Derek,

I am pleased to present the final report for the Water, Wastewater, and Stormwater Master Plan for the Township of Severn. This comprehensive document represents the culmination of research, stakeholder engagement, and strategic planning to ensure the sustainable management of the township's water resources and infrastructure. The master plan addresses the current and future needs of the Township of Severn, providing a roadmap for the development and maintenance of water, wastewater, and stormwater systems.

We thank the Township of Severn's council, staff, and residents for their invaluable contributions and support throughout this process. We look forward to continuing our partnership as we move into the implementation phase of this master plan. Please find the final report attached for your review. Should you have any questions or require further clarification on any aspect of the report, do not hesitate to contact me directly.

Thank you for the opportunity to assist the Township of Severn in this important endeavour. We are confident that the Water, Wastewater, and Stormwater Master Plan will serve as an important tool in guiding the township toward a resilient and sustainable future.

Sincerely,

Alan Villabolos, Project Manager

cc: Briana Sullivan, P.Eng. – Civica Infrastructure Inc.

Ilmar Simanovskis, P.Eng. – Civica Infrastructure Inc.

# Revision History

| Name | Date | Version |
|---|---|---|
| Final | August 29, 2025 | 1 |
| | | |
| | | |

# Executive Summary

The Township of Severn Water, Wastewater, and Stormwater Servicing Master Plan (SMP) provides a long-range strategy to guide municipal servicing infrastructure through to the year 2051. Developed under the framework of the Municipal Class Environmental Assessment (EA), the SMP establishes preferred solutions for water, wastewater, and stormwater infrastructure, aligning them with anticipated growth and regulatory obligations. The Master Plan considers population growth forecasts derived from the County of Simcoe's Municipal Comprehensive Review of 17,790 people by 2051, with targeted intensification in Coldwater and Westshore. Growth rates for each settlement boundary were developed further and forecasted against actual growth rates and potential absorption rates. Washago remains largely stable due to lagoon constraints, and the Master Plan acknowledges the South Division Road Secondary Plan and the potential impact to the Townships land budget. The SMP uses a 30-year horizon to identify infrastructure needs which extend beyond current capacity.

Servicing solutions are based on adopted engineering standards, MECP guidelines, and system-specific performance measures. For water systems, key performance criteria include designing 400 litre per person per day consumption, maintaining distribution pressures between 40 and 101.5 psi, achieving fire flow requirements, and providing 25% equalization and 25% emergency storage capacity. For wastewater, key performance criteria include designing for 350 litre per person per day sewage generation, managing sewage peaking factors, providing an infiltration and inflow (I/I) allowance of 0.23 L/s/ha, and pumping station sizing for new growth. For stormwater systems, the key performance criteria include designing for 5-year (minor) and 100-year (major) events, providing Level 1 treatment (80% total suspended solids removal) and supporting water-balance in development.

Optimization strategies such as supply and demand-side management, smart metering, and I/I reduction are included to reduce future capital impacts and increase servicing resilience. These form the foundation for capacity management across all serviced communities.

In Coldwater, the wastewater treatment capacity is nearly all consumed and the system will be expanded in two phases for a population of 3,750 to mirror the water treatment capacity. The Municipal Class Environmental Assessment is underway and expected to result in the expansion of the plant. The wastewater collection system requires upgrades to both the Main Pumping Station, the Sturgeon Bay Road Pumping Station, the future relocation of the Anderson Line Pumping Station, as well as twinning of the existing forcemain to the plant. The water distribution system requires a new elevated water storage tank and a transmission watermain loop to serve growth in the north end. These works are timed with development phasing. A $6 million water quality improvement project is proposed to address existing hardness, iron, manganese, and colour issues.

In Westshore, a deficiency in the existing wastewater treatment systems that were constructed in 2006 was identified and reduces the available capacity to serve the continued development pressure in this area. An imminent project is required to resolve these issues and restore the capacity to its approved rating. This project is valued at $8.856M and includes the new headworks system, screen and grit removal, 1,000m$^3$ equalization tank with pumping to the Sequencing Batch Reactor (SBR) influent chamber, increased SBR blower capacity, and an upgraded phosphorus chemical dosing system. In addition to the wastewater treatment optimization project, expansion of both water and wastewater infrastructure is required for a population up to 5,889 by 2051. The expanded wastewater plant is valued at $20M and will provide an estimated 2,300 M3/day ADF capacity. The expanded water treatment plant is valued at $13.25M and will provide an additional 2,780 m3/ day capacity (serving 2,181 ERU's) which allows for a 5% buffer to maximum day. Preliminary studies should begin by 2026 to support this. Alternatives were evaluated for improved looping and futureproofing of the water and wastewater network; the preferred solution is to create a new servicing corridor along Stockdale Road and Brennen Line to Menoke Beach area to serve new growth demands.

In Washago, population growth is constrained by lagoon capacity and the Master Plan forecasts this area will not see major development growth. However, maintenance strategies are recommended, including sludge removal, bathymetric surveys, and lagoon optimization studies.

The greenfield areas of the South of Division Road Secondary Plan are not currently intended for future full municipal servicing; however, development applications have been made in this area to consider a much higher density and full municipal serviced growth. The viability and sequencing of proposed servicing infrastructure is dependent on detailed Secondary Plan Master Planning exercises at a cost of $80,000 for the coordination with adjacent properties within the Secondary Plan area and neighboring municipality of Orillia impacted by the proposed land use change.

Growth will remain limited in the rural and privately serviced areas. No expansion of municipal water or wastewater systems is recommended outside current serviced settlement boundaries.

Stormwater planning is based on MECP guidelines with the dual-drainage approach (5-year minor and 100-year major systems) that emphasizes quantity, quality, and erosion control. A stormwater pond cleanout program has been proposed using bathymetric surveys to guide a long-term remediation plan and build internal capacity to manage the new consolidated linear infrastructure CLI-ECA. The SMP also recommends ongoing asset management enhancements, annual water and wastewater capacity allocation reporting, and additional staff resources in 2026 to support ECA compliance.

The SMP identifies both growth-related and benefit-to-existing infrastructure investments, with estimated capital costs outlined in project-specific summaries. The total conceptual cost of implementing the Master Plan is estimated at $124,618,200. The SMP update informed the Development Charges Background Study, and as a result, the majority of projects were incorporated into the 2024 Development Charges update and are reflected in this report. Subsequent to that process, additional project cost concepts and potential grant opportunities have been identified, which may necessitate a future amendment to the Development Charges bylaw. Funding for the implementation of the Master Plan will be derived from a combination of development charges, water and wastewater user rates, tax levy, and capital reserve contributions.

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# 1.0 Introduction

## 1.1 Purpose

The purpose of the Servicing Master Plan is to identify and select preferred alternative water supply and storage; wastewater collection and treatment; and stormwater management servicing strategies for the three primary settlements and five rural settlement areas for the development planning horizon of 30 years which minimizes impacts to both the natural and social environments and are both technically feasible and economically sensible.

## 1.2 Study Area

The study area includes all of the Township of Severn with a focus on the communities and settlements where municipal water and wastewater services are in place or planned as part of future growth forecasting where full servicing will be required. The Township and the major serviced communities are presented in Figure 1-1.

The communities of primary focus for this Master Plan are where there is current municipal servicing available or where future servicing will be required to meet planned growth. Table 1-1 provides a summary of the current population in key study areas, and the type of servicing currently available.

Table 1-1 Current Community Servicing Solutions

| Community Description | Current Population (2021) | Current Servicing |
|---|---|---|
| Coldwater | 1,493 | Municipal Water and Wastewater |
| Westshore | 2,749 | Municipal Water and Wastewater |
| Washago | 304 | Municipal Water and Wastewater |
| Bass Lake | 404 | Municipal Water Private Septic |
| Severn Estates | 63 | Municipal Water Private Septic |
| Sandcastle Estates | 163 | Municipal Water Private Septic |
| South Div. Special Planning Area 1, 2 | (not approved) | Unserviced with intent for full servicing |
| South Div. Special Planning Area 3 | (not approved) | Unserviced with intent for full servicing |
| Rural Areas (Ardtrea, Fesserton, Severn Falls, Marchmont, Port Severn and all rural areas) | 9,400 | Private Well and Septic or equivalent |
| Total Population | 14,576 | |

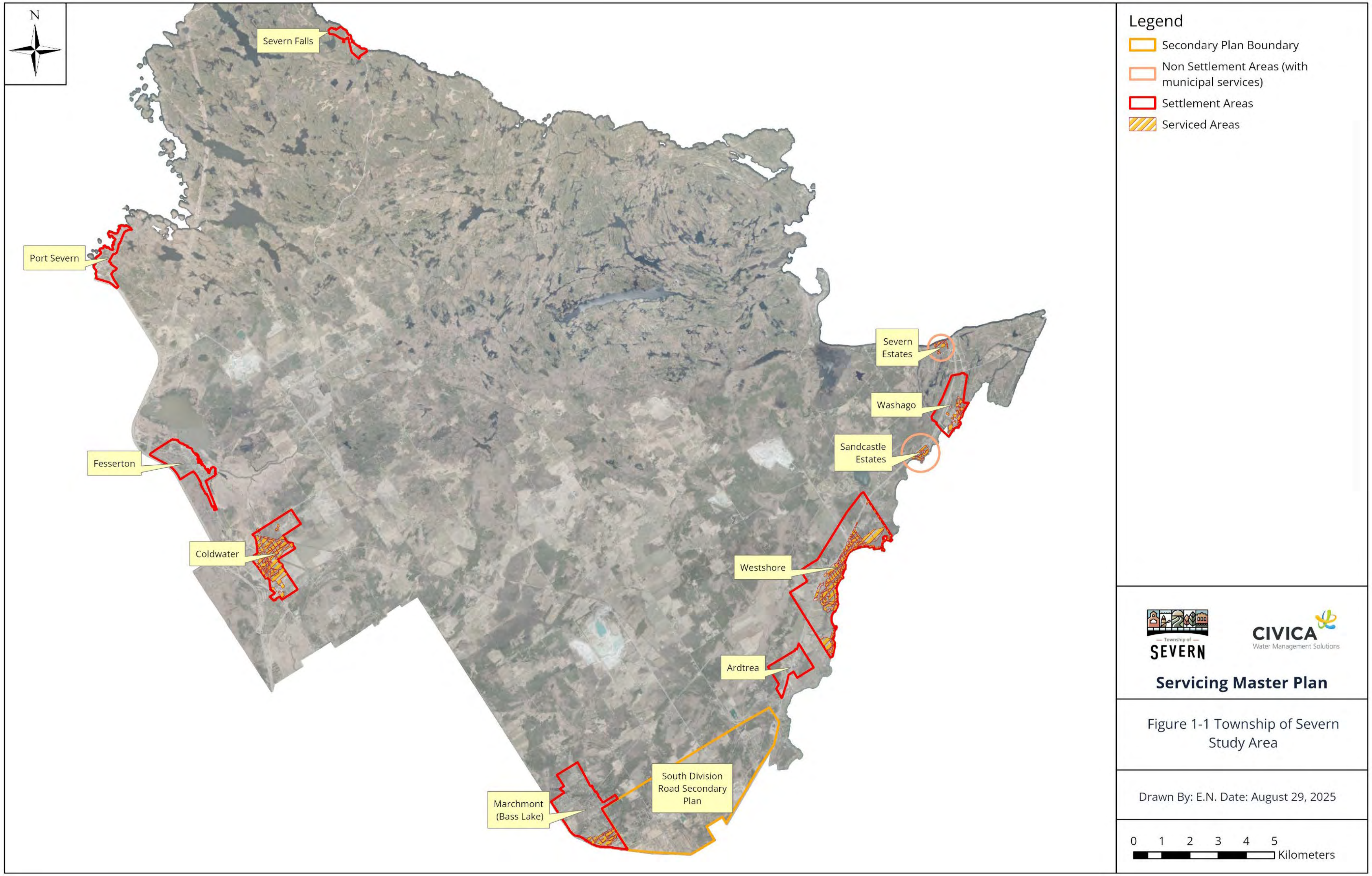



Figure 1-1 Township of Severn Study Area

## 1.3 Community Servicing Approach

The Severn Official Planning policy is to provide 15 years of land supply for development of which there is at least 3 years supply of serviced residential units prepared to proceed with development. This approved inventory includes lands zoned for intensification, redevelopment, and draft approved and registered plans of subdivision.

In order to ensure that a minimum 15-year supply of designated land and a 3-year supply of serviced lands are available, the Township's Community Servicing Approach is to monitor the land supply, servicing capacities and growth rates and report annually to Council and the County of Simcoe in respect of the success of meeting these targets and future growth prospects and needs for the Township. This Master Plan enhances the approach by providing realistic servicing capacities of Severn's existing and planned growth of each water and wastewater system as they support the entire township independent of settlement area designation.

## 1.4 Coordination with Neighbouring Municipalities

The Township of Severn shares boundaries and services with several neighbouring municipalities, including the Township of Tay, Township of Georgian Bay, Town of Gravenhurst, Township of Muskoka Lakes, Township of Ramara, the City of Orillia, and the Township of Oro-Medonte. Coordinating infrastructure planning and servicing with these municipalities is critical for efficiency, compliance, and sustainable development.

Washago Water Supply Agreement: Severn currently has a shared water servicing agreement with the Township of Ramara to supply water to a portion of the Washago community.

The South Division Secondary Plan includes provisions requiring shared municipal servicing agreements with the City of Orillia, particularly in Area 3.

Engagement with the Township of Ramara is essential to align servicing strategies across boundaries. Collaboration with the City of Orillia: Initiate discussions with Orillia to confirm servicing responsibilities and financial contributions. Align planning efforts with Township of Tay, Township of Georgian Bay, Town of Gravenhurst, and Township of Oro-Medonte to manage infrastructure needs and development impacts.

Severn's partnerships with neighbouring municipalities are vital for the success of its infrastructure planning. This Master Plan recommends fostering collaborative relationships, particularly with Ramara and Orillia to ensure sustainable growth.

## 1.5 Class Environmental Assessment Process

Requirements of the EA Act for municipal infrastructure projects. This planning process provides a consistent method of identifying and assessing potential environmental impacts and helps to ensure that project planning is undertaken in a manner that considers all aspects of the environment. Key components of the EA planning process include:

- Consultation with potentially interested parties early and throughout the process.
- Consideration for a reasonable range of alternative solutions.
- Systematic evaluation of alternatives.
- Clear and transparent documentation; and
- Traceable decision-making

The Municipal Class EA process and associated documentation serve as a public statement of the decision-making process followed by municipalities for the planning and implementation of necessary infrastructure.

### Planning Process

Figure 1-2 illustrates the five-phase planning and design process outlined in the Municipal Class EA document. The corresponding phases are briefly described below:

Phase 1 Identify the problem (deficiency) or opportunity, which may include public consultation to confirm/review the problem or opportunity.

Phase 2 Identify a reasonable range of alternative solutions to address the problem or opportunity. This Phase also includes an inventory of the natural environment to identify potential mitigation measures and to assist in the evaluation of alternatives in terms of the identified evaluation criteria. A preferred solution is chosen based on the results of the evaluation and considering input received from the public, review agencies, and Indigenous communities throughout the planning process. It is at this point that the appropriate Schedule (B or C) is chosen for the undertaking. If Schedule B is selected, the process and decisions are then documented within a Project File. Schedule C projects must proceed through the additional Phases 3 and 4.

Phase 3 Examine the alternative methods for implementing the preferred solution, which typically involve design alternatives. A more detailed inventory of the natural, social, economic, and technical environment is undertaken to assess the impacts of the alternative designs, to minimize negative effects and maximize positive effects.

Phase 4 Document the Municipal Class EA process followed in an Environmental Study Report (ESR), which includes a summary of the rationale and the planning, design, and consultation process followed for the project and make the documentation available for consideration by the public, review agencies, and Indigenous communities for a minimum 30-day review period.

Phase 5 Complete contract drawings and documents and proceed to construction and operation with monitoring to ensure adherence to environmental provisions and commitments.

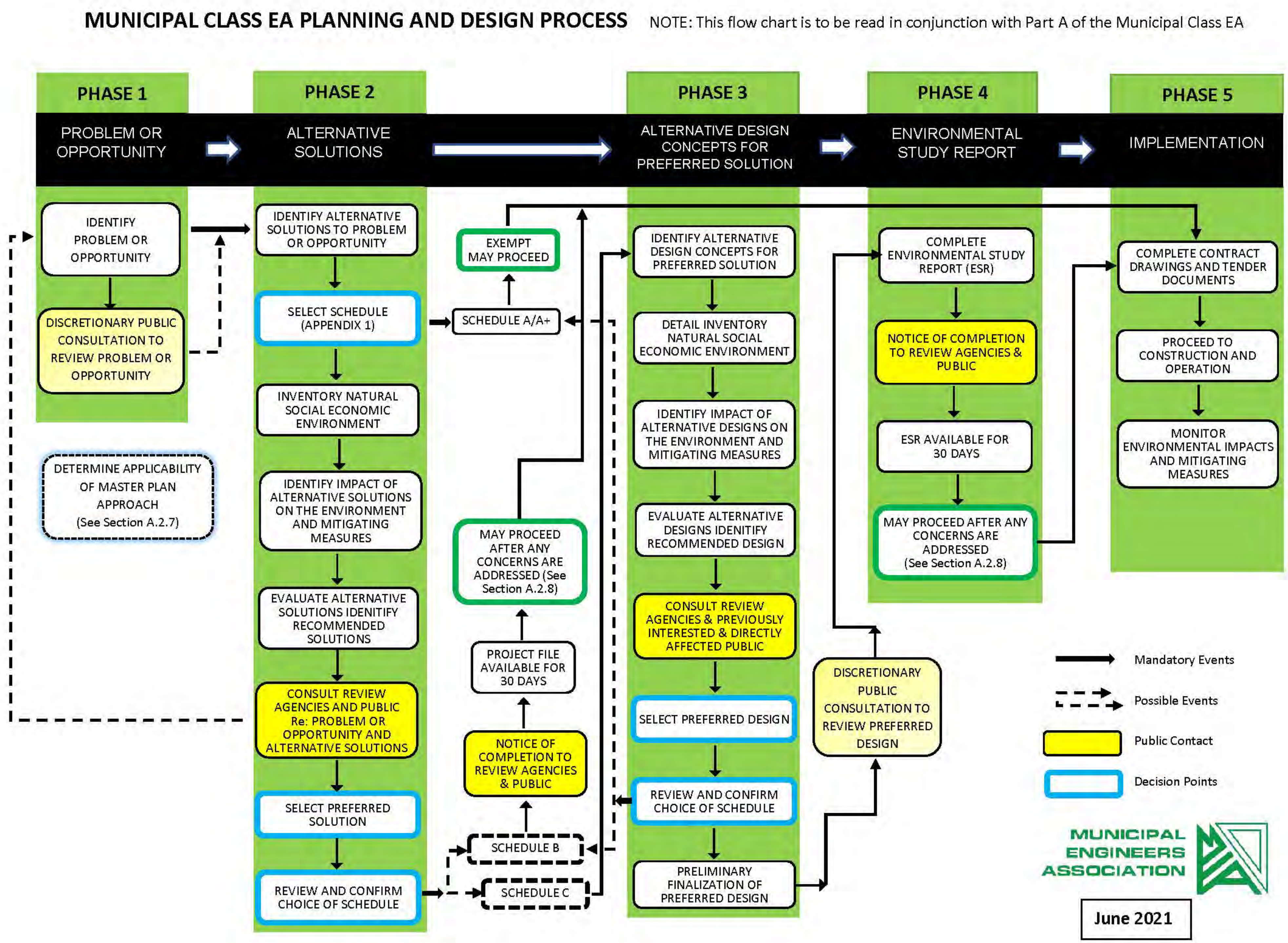



Figure 1-2 MEA Class EA Planning and Design Process

### Types of Projects

The Municipal Class EA document provides a framework by which projects are classified as exempt, Schedule B, or Schedule C. Classification of a project is based on a variety of factors including the potential impacts to the environment, general complexity of the project, and project costs. It is the responsibility of the proponent to identify the appropriate schedule for a given project, and to review the applicability of the chosen schedule at various stages throughout the project. Each schedule requires a different level of documentation and review to satisfy the Municipal Class EA requirements.

Exempt projects are permitted to proceed with no further consultation and are generally projects of low impact where no new land is required.

Schedule B projects have the potential for some adverse environmental impacts. The proponent is required to undertake a screening process by completing Phases 1 and 2 of the Municipal Class EA process and carrying out mandatory consultation activities to ensure that the public, agencies Indigenous communities, and other stakeholders are aware of the project and that their concerns are considered and/or addressed. These types of projects require that a Project File be prepared and filed for review.

Schedule C projects have the potential for significant environmental impacts and must proceed under the full planning and documentation procedures (i.e., Phases 1 through 5) of the Municipal Class EA document. An Environmental Study Report is to be prepared and filed on the public record for review by the public, agencies Indigenous communities, and other stakeholders.

### Master Plan Approach

This study is being undertaken in accordance with the Master Plan requirements outlined in the Municipal Class EA document. This approach was developed to recognize the benefits of considering a group of related projects, or an overall system prior to addressing individual projects or areas.

Master Plans are long-range plans undertaken to create a framework for future projects that form part of an integrated system. The projects identified within Master Plans are typically distributed geographically throughout a broader area, and are intended to be implemented over time, dependent on project triggers including required maintenance, available funding, etc.

The scope of Master Plans varies significantly, and the Municipal Class EA document offers four general approaches that address Master Plans of varying complexity. This SMP was developed following Approach 2, which involves the completion of a

Master Plan document at the conclusion of Phases 1 and 2, fulfilling the requirements for Schedule B projects. This SMP provides the basis for projects identified as Schedule C undertakings. These types of projects would be subject to the completion of subsequent Phases 3 and 4 of the Municipal Class EA process.

**Part II Orders**

If significant outstanding issues concerning the Schedule B projects identified within this report have not been addressed and could be better addressed through an Individual EA process, any member of the public can ask for a higher level of assessment. This is known as a Part II Order request.

A Part II Order request can be made within the specified review period as outlined in the Notice of Study Completion. A Part II Order request is submitted only when issues cannot be resolved through the Municipal Class EA process, discussions with the proponent or with mediation. It should be noted that a Part II Order request should not be submitted to delay or stop the planning and implementation of a project.

Once a request is made and if the request has been declined by the Minister, the proponent can implement the project subject to any conditions imposed. If the request has been granted, the proponent may be required to begin preparing Terms of Reference for an Individual EA, should they still wish to move ahead with the project.

# 2.0 Background Information

Servicing for future growth is a municipal requirement based on long-term planning and policy implementation at various levels of government. The following are the main reports, policies and documents used to develop the content in this Master Plan.

## 2.1 County of Simcoe Official Plan

The County of Simcoe Official Plan reference is to the February 2023 Office Consolidation. This document identified population forecasts for the municipalities and identifies a 2051 population goal of 17,790 and an employment goal of 5,640 for the Township of Severn. The designated greenfield area density targets for Severn is 45 residents and jobs per hectare. The intensification target of delineated built-up areas is 20 percent

## 2.2 Township of Severn Strategic Plan

The strategic plan is a document based on community needs and how these are translated into Council's priorities for the current term of Council to 2026. There are four priority areas being 1) economic development, 2) Infrastructure to match growth, 3) customer service focus, and 4) high-speed internet. This servicing Master Plan directly contributes to achieving the priority of providing the future infrastructure needed to support growth for the water, wastewater and stormwater services.

## 2.3 Township of Severn Official Plan

Severn's Official Plan was recently updated and adopted by Council in November 2022 and sets local planning goals and objectives that are consistent with the County of Simcoe's Official Plan and other provincial policies. This includes identifying areas of physical growth and change over the next 30 years.

In order to meet the challenge of integrating land use and growth planning, infrastructure engineering and the funding of the required infrastructure which supports sustainable community building, the Township relies on a number of master plans. The Official Plan provides the vision, goals and direction for growth in the Township that the Servicing Master Plan will support.

Master Plans may be prepared on the basis of an infrastructure class (i.e. water servicing) or for a defined Settlement Area (i.e. Coldwater) and where completed for a defined Settlement Area may include all classes of infrastructure including water, wastewater, transportation, stormwater servicing, and parks and recreation necessary to support the long term growth of that community.

The Servicing Master Plan evaluates the entire Township, with particular focus on its existing three fully serviced settlement areas, five rural settlement areas, one secondary plan, and two non-settlement area small municipal drinking water systems. The Servicing Master Plan provides comprehensive documentation of the development and evaluation of water, wastewater and stormwater servicing strategies to support the Official Plan and its settlement structure and growth management strategy.

Master Plans, where obligated, shall be completed in accordance with the requirements of the Municipal Class Environmental Assessment document which is approved under the Ontario Environmental Assessment Act and shall include a comprehensive public consultation and engagement strategy. As such, the conclusions and recommended projects and strategies of the Servicing Master Plan may be incorporated and implemented into the Official Plan without the requirement for public notice and public consultation in addition to that undertaken as part of the Work.

Section 15.3.4 of the Official Plan, requires Severn to integrate provincial policy recommendations for climate change planning into municipal operations by including GHG inventories and GHG reduction targets into Asset Management Plans, conservation and demand management plans, strategic plans and infrastructure master plans.

## 2.4 Asset Management Plan

The Township of Severn Asset Management Plan was last updated in January 2021 and provides the planned investments and strategies to meet current and future needs through assessing asset conditions, setting service level targets and planning for investments and infrastructure projects aimed at reaching the target service levels and community needs. Where appropriate, consideration for planned investments will be given status where they support the recommendations of the programs and projects identified as part of the growth needs of this master planning study.

## 2.5 Development Charges Background Study

The Township has completed an update to its Development Charges (DC) Background Study, undertaken by Watson and Associates Economists Ltd. This work was carried out concurrently with the Servicing Master Plan (SMP), allowing the two processes to inform one another and ensuring alignment between long-term infrastructure planning and growth-related cost recovery. As a result, the majority of projects identified through this Master Plan were incorporated into the 2024 DC update. Since completion of the background study, additional infrastructure needs have been identified, and a future amendment to the DC bylaw may be required to address these emerging priorities.

## 2.6 Climate Change Action Plan- Sustainable Severn Sound

The Climate Change Action Plan was created in 2018 through the efforts of Sustainable Severn Sound a regional sustainability program that is supported by seven municipalities in Simcoe County and several supporting organizations. The data reporting and future targets identified in this document provide guidance on environmental and GHG impact and reduction strategies and inform decision-making and evaluation methods considered in the master plan to ensure that future infrastructure is providing the type of sustainable solutions that align with longer-term GHG reduction goals.

### 2.7 Engineering Standards

The engineering standards for water, wastewater and stormwater provide the guidance and criteria that have been applied in assessing future servicing needs and in ensuring that design criteria are consistently applied in forecasting both planned growth and actual demands. These standards have been considered in the master planning process and have been applied where appropriate to ensure sufficient capacity is forecast and in a way that strikes a balance between actual demands and the future sustainability of built infrastructure.

## 3.0 Description of Project Area

The following describes the characteristics of the study area and considerations that have been included in the identification and evaluation of alternative solutions to the problem/opportunity statement.

### 3.1 Land Use

The official plan identifies three broad categories of land use 1) Natural Heritage System, 2) Settlement Area, and 3) Agricultural/Rural Area which are each described below.

#### 3.1.1 Natural Heritage System

The natural heritage system is characterized by two major categories being Greenland and Environmental Protection Areas.

Greenland is designated where the natural heritage features, ecological functions and biodiversity of the natural heritage system within the Township are located. These features are as defined in the County of Simcoe Official Plan where the various natural heritage system areas are defined.

Environmental Protection Areas are defined and apply to lands which are designated Environmental Protection in the Official Plan. These lands are generally comprised of intermittent or permanent streams together with a ten-meter setback from the top of bank and will be excluded from developable lands where encountered within the urban areas or where development policies permit the application of development approvals.

The natural heritage system is presented in Appendix A as Schedule F from the Severn Official Plan.

### 3.1.2 Settlement Area

The settlement areas are those land uses where organized communities are permitted and consist of areas for living, employment, and open spaces as the three major land use designations. The settlement living area is primarily used for residential purposes, the employment includes commercial and industrial uses with the defined settlement areas and open space provides for public open spaces such as parks and other natural amenities.

### 3.1.3 Countryside Areas

Areas that are predominantly for residential purposes include rural areas, agricultural, shoreline residential areas, and country residential areas.

The rural areas are generally the lands that are the site of agricultural and rural land uses and that are classes outside the class 1, 2, and 3, for potential agricultural capability based on the Canada Land Survey.

Shoreline residential areas applies to existing shoreline residential areas that are outside the defined settlement areas along Lake Couchiching, along the Severn River, and on certain lakes such as Sparrow Lake. These are generally all considered privately serviced areas.

Country residential areas only apply to lands that have been generally developed as a country residential or, Draft Approved plan of subdivision, or approval through a site-specific Official Plan amendment prior to the adoption of the current Official Plan. It is anticipated that future designations of this type will be difficult to create as the focus for growth will be within the current urban centres where existing servicing is available and expansion of these services will be preferred over the creation of new systems.

## 3.2 Species at Risk

The Endangered Species Act 2007 requires consideration of habitats and conservation of environments where identified species of risk have been reported. As this consideration is generally related to conservation lands or areas of ecological significance, the risk of identifying these species is limited yet must be considered in the areas where there is potential for presence.

At the master planning stage, the legislation has been reviewed to make note of any risks to be considered. This however is not a comprehensive review and more detailed studies may be required by any land development proponents where there is a risk of impact.

As a cursory review, Ontario Regulation 832/21, Habitat was reviewed to identify any area that may be known to exist in the Township of Severn.

### 3.2.1 Eastern Foxsnake Habitat

Severn is noted as an area that has been identified as a habitat of the eastern foxsnake along with Midland, Penetanguishene, Tay, Tiny and Muskoka.

### 3.2.2 Engelmann's Quilwort Habitat

This species has been located in the Severn River but is not considered to be present where there is quickly flowing turbulent water, where water is more than five metres deep or where there is heavily shaded areas between June 1 and Sept 30.

It is also recommended that potential sites for development consider a species at risk assessment to confirm compliance with regulations under this Act.

## 3.3 Watershed Environment

Severn is predominantly located in the Severn Sound watershed as presented in Figure 3-1. with areas to the northeast contributing to the Black-Severn River Watershed / Lake Couchiching Sub watershed.

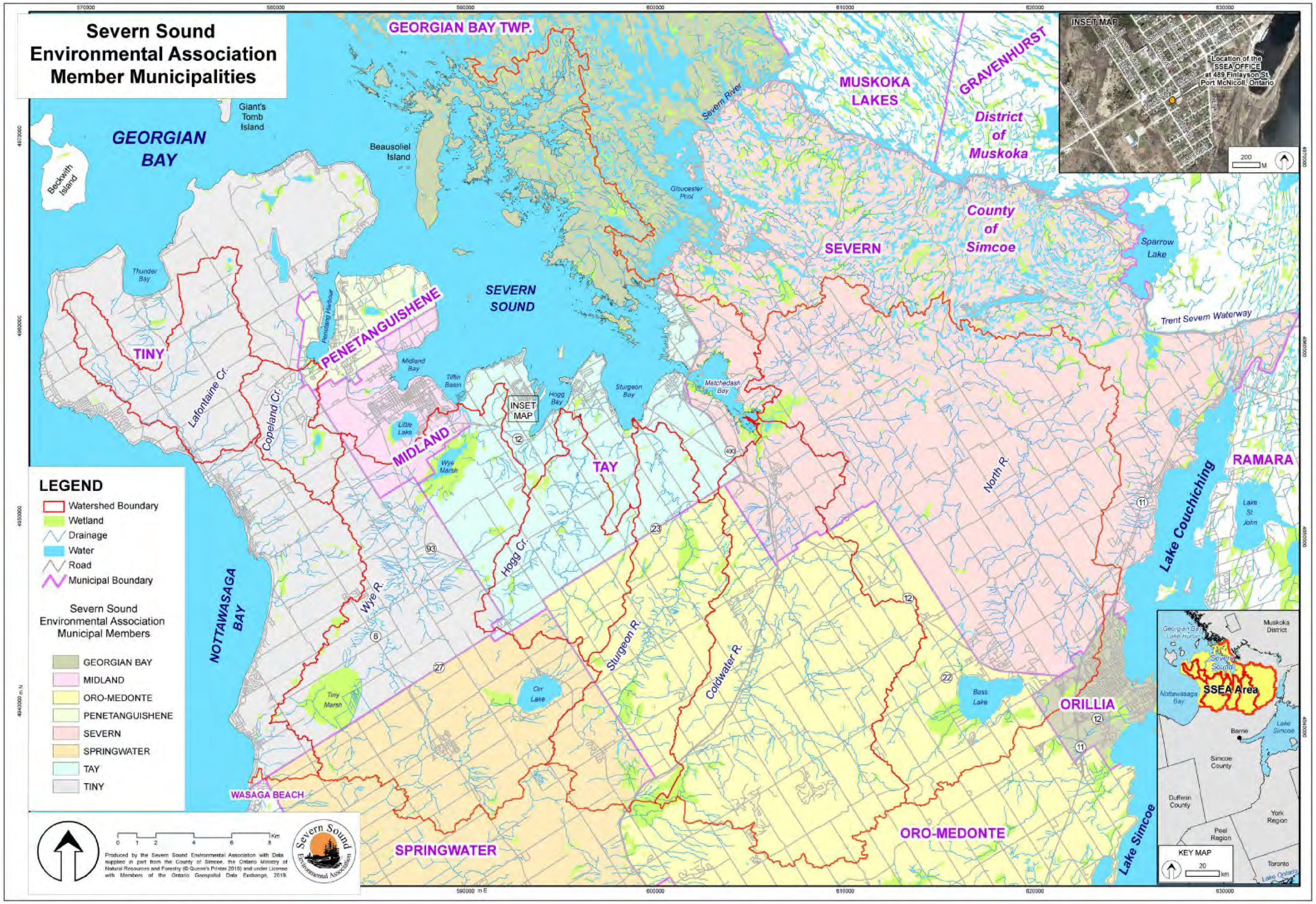



Figure 3-1 Watershed Characteristics

## 3.4 Source Water Protection

Township of Severn's Official Plan and Zoning By-law include source water protection as outlined in the Clean Water Act. The Source Water Protection Plan identifies the source protection area for Severn and threats to the drinking water sources. Severn is located within the Severn Sound and Black-Severn River source protection areas. The report identified 118 significant and potentially significant threats to our drinking water. These threats include:

- sanitary sewage
- use of fertilizers and other agricultural materials
- use of pesticides
- handling and storage of fuel
- handling and storage of chemicals
- How to reduce threats to water protection

The Township has collaborated with the Lake Simcoe Region Conservation Authority and the Severn Sound Environmental Association to develop resources and educational materials to help protect the water sources. Sources of risk include; Municipal threats such as road salt, winter maintenance, fuels, landfills and waste management systems; residential threats such as septic systems, fuel, oil and chemicals; agricultural threats such as manure, fertilizers, pesticide use, chemicals, abandoned wells and septic systems; and industrial, commercial and institutional threats such as chemicals and dense non-aqueous phase liquids. These programs are encouraged and considered to be a priority in preserving and protecting water supply resources to meet the current and long-term needs of the community. Any actions or activities that are identified in this master plan are to be in alignment with source protection goals and will be set out in a manner to support good stewardship of these resources.

## 3.5 Socio Economic Environment

The Economic Development Strategy was completed in April 2024 as prepared by Explorer Solutions. The strategy was created based on community participation and the larger goals of enhancing capacity to attract and retain businesses, improving engagement in economic development, access to communications technology, and being prepared to meet the housing demand and changing demographics with future servicing, water and road infrastructure. The strategy identifies the following strategic priorities:

- Increase support to local businesses
- Balance Severn’s tax base to support diverse community

- Enhance and promote local tourism
- Match lifestyle amenities and residential growth
- Safeguard community interest in relation to the aggregate industry

Based on the outcome of the Economic Development Strategy it is noted that the goals of the strategy align with the goals of the servicing master plan in that the priority is to ensure that infrastructure is provided in a timely manner to meet the needs of growing communities and to fulfil planning forecasts in the priority growth communities. Therefore, any infrastructure projects that are identified to accomplish the economic development goals will be supported in the servicing master plan as well.

# 4.0 Design Criteria

## 4.1 Water System

The Servicing Master Plan has used the following water system design criteria presented in Table 4-1 to project water demands, determine capacity requirements, and establish the infrastructure required, as outlined in the Township of Severn Engineering Design Criteria (2024).

Table 4-1 Water Design Criteria

| | Parameter | Criteria |
|---|---|---|
| Water Demand | Residential Average Day Demand | 400 L/c/d |
| | Maximum Day Demand Factor | 2.0 |
| | Peak Hour Demand Factor | 4.5 |
| | Employment Consumption | 28,000 L/ha/d |
| | Industrial Water Demand | 36,000 l/ha/d |
| System Performance | Pressures | 40 -101.5 psi |
| | Fire Flow | MOE, Fire Underwriters Survey, and N.F.P.A.24 Approach |
| System design objective | | Greater of maximum day demand plus fire flow or peak hour demand |

## 4.2 Wastewater System

Wastewater design criteria are based on the Township of Severn Engineering Standards updated in 2024 and are summarized in Table 42.

Table 4-2 Wastewater Design Criteria

| | Parameter | Criteria |
|---|---|---|
| Peak Flow Design Parameters | Residential average daily flow | 350 L/cap/d |
| | Peaking Factor | Harmon's Peaking Factor (min 1.5, max 4.0) |
| | Commercial and Institutional sewage flow | 28 $m^3$/ha/day with PF of 1.6 |
| | Industrial Sewage Flows | 36 $m^3$/ha/day with PF per MECP Design Guide |
| | Infiltration Allowance when foundation drains are not connected to the Sanitary Sewer | 0.23 L/s/ha |
| System Performance | I/I Infiltration Rate | 0.23 L/s/ha |
| | Flow Velocity | Min 0.6 m/s, Max 3.0 m/s |

## 4.3 Stormwater Management System

Stormwater management is to conform to the MECP design guidelines (2003) and the requirements of the Township of Severn Engineering Design Criteria (2024). The stormwater management requirements include quantity control, quality control, sediment and erosion control and baseflow maintenance.

Quantity control is based on the dual drainage approach with the minor (network conveyance) system being able to convey the 5-year return period event and the major (overland) system being able to convey the 100-year return period event.

Post development peak flow is to be controlled to pre-development conditions for the 5, 10, 25, and 100 year return period. The SCS 24 hour design storm shall be used for the rural catchment areas and the Chicago 4 hour design storm shall be used for the urban catchments. Both conditions should be evaluated to confirm the worst-case conveyance and storage needs.

Quality control is to achieve Level 1 treatment to 80 percent total suspended solids removal.

Where urban areas are serviced with ditches and culverts as well as areas in the rural community adjacent to municipal-owned roads are to continue with this method of servicing unless proposed to be upgraded as a result of redevelopment and the need for increased quality and quantity control needs to meet regulatory requirements.

# 5.0 Existing Servicing

## 5.1 Existing Water and Wastewater Systems

The Township of Severn currently operates 6 water treatment and distribution systems, along with 3 wastewater treatment facilities and collection systems.

The Westshore wastewater system operates 9 sewage pump stations that convey sewage to one dual SBR (Sequencing Batch Reactor) treatment system rated for 1,390 $m^3$/day (ADF) and 4,768 $m^3$/day Peak Flow.

The Coldwater wastewater system operates 4 sewage pump stations that convey sewage to a split treatment system consisting of one (1) SBR (Sequencing Batch reactor) and one (1) return-activated treatment system that has an ADF of 921 $m^3$/day and a peak flow of 3420 $m^3$/day

The Washago wastewater system operates 3 sewage pump stations that convey sewage lagoon for treatment. The system is rated for 227.5 m3/day (ADF) and 81,900 m3/year annual flow.

The Township services 1179 residential and commercial properties in Westshore, 66 residential homes in Sandcastle Estates, 26 residential homes in Severn Estates, 162 residential homes in Bass Lake, 125 residential and commercial properties in Washago and 691 residential and commercial properties in Coldwater.

## 5.2 Existing Stormwater Management System

The Municipal Stormwater Management (SWM) System serving the Township of Severn drainage area, is a separate system for stormwater within the Severn Sound and Black-Severn River watersheds. The Municipal SWM System consists of storm sewers in some locations, culverts, ditches, Stormwater Management Facilities, and outlets. The Township owns and maintains a Stormwater System consisting of 7.9 kilometres of storm sewer mains, 400 kilometres of open ditches, catch basins, manholes, 14 stormwater management facilities and one Oil Grit Separator. Details of the storm ponds are summarized in Table 51 as reported from the ECA record 148-S701.

Table 5-1 Stormwater Management Facility Descriptions

| No. | SWMF Name | Location | Receiver of Discharge | Outlet Location | Catchment Area | Volume | Design Storm |
|---|---|---|---|---|---|---|---|
| 1 | Caswell Creek SWMF | 51 Donlands Court | Municipal Drain #2 | | 0.05 ha | 600 $m^3$ | 100-yr |
| 2 | Gray Street SWMF | 11 Michael Ann Drive | Coldwater River | | 12.5 ha | Permanent pool of 570$m^3$ with extended detention volume of 510$m^3$ | 5 yr |
| 3 | Birkeshire Woods SWMF | 1871 Birkeshire Woods Lane | Existing drainage course | | -- | 6,116$m^3$ extended detention pond. | 25 yr |
| 4 | South Caden Estates SWMF (West Pond) | 1850 Elana Drive | Elana Drive roadside ditch | Discharge onto Elana Drive ditch | 25.99 ha | 3,761 $m^3$ permanent pool, 3,197 $m^3$ extended detention volume, 10,280 $m^3$ total storage | 100 yr |
| 5 | South Shore Caden Estates SWMF (East Pond) | 1969 Elana Drive | Elana Drive roadside ditch | Discharge onto Elana Drive ditch | 5.25 ha | Permanent pool volume of 821$m^3$, extended detention volume of 490 $m^3$, total storage of 1,826 $m^3$ | 100 yr |
| 6 | North Ridge Estates SWMF | 1598 Fawn Lane | North River | Discharging into level spreader channel | -- | Approx. total volume of 4,079 $m^3$, consisting of a 1,200 $m^3$ permanent pool and 2,879 $m^3$ extended storage | 100 yr |
| ~~7~~ | ~~Industrial Park SWMF~~ | ~~Lots 1 and 2 Concession VI~~ | To be removed from the ECA – Not Constructed | | | | |
| 7 | Simcoe Estates Locke Subdivision | 2280 Elana Drive | Discharging into level spreader channel | Discharging into Natural Watercourse | 15.05 | Provides extended detention volume of 2,242 m3, which represents a storage allowance of 149 m3/ha for the 15.05 ha catchment area. | 100 yr |
| 8 | Tri J Keller Trails SWMF | 4011 Jilem Court | North River Drainage Basin | | 8.76 ha | Permanent pool of 438$m^3$, total extended detention volume of 1,937$m^3$ | 100 yr |
| 9 | Meadowview Court SWMF | 1829 Meadowview Court | North River | Culvert on Wainman Line | 10.5 ha | Total retention volume of 2,432$m^3$, minimum permanent pool volume of 702.5$m^3$ | 100 yr |
| 10 | Providence Lane (West Pond) SWMF | 1933 Providence Lane | Roadside ditches along Wainman Line and Hume Street | Discharge onto roadside ditches | 4.25 ha | Permanent pool approx. 569$m^3$, extended detention of 367$m^3$ total volume of 1,721 $m^3$ | 100 yr |
| 11 | Providence Lane (East Pond) SWMF | 1835 Providence Lane | Roadside ditches along Wainman Line and Hume Street | Discharge onto roadside ditches | 3.41 ha | Permanent pool of 585 $m^3$, extended detention volume of 309 $m^3$, total volume of 1,530 $m^3$ | 100 yr |
| 12 | Preston Estates SWMF | 1776 Loretta Avenue Lot 3, Concession 2 | Loretta Avenue road allowance | | NA | Three separate systems with storage volumes each of 745 $m^3$, 375 $m^3$, and 194 $m^3$ | 100 yr |
| 12B | Preston Estates SWMF | 1667 Loretta Avenue | Unopened Road allowance BLK 18 Plan 51M575 | | N/A | See above | 100 yr |
| 13 | Birchcliffe SWMF (Formerly Edglin Estates Drainage Pond) | 1100 Birchcliffe Crescent | | | NA | No storage volume noted | -- |
| 14 | Rimkey SWMF | 1421 Rimkey Cres | Existing drainage course to Telford Line roadside ditch | | 23.3 ha | 1,343 $m^3$ permanent pool, active storage of 930 $m^3$ | 100 yr |
| 15 | Couch Cove Estates (OGS) | 3917 Wood Ave | Lake Couchiching | | 3.2 ha | Sediment capacity of 6,150L and oil capacity of 2,945 L total capacity of 10,925 L | |
| 16 | Greenwood Landings (Dry Pond) | Not Assumed | | | | | |
| 17 | Greenwood Landings (Wet Pond) | Not Assumed | | | | | |
| 18 | Menoke Phase 1 | Not Assumed | | | | | |
| 19 | Turnbull Subdivision (West Pond) | Not Assumed | | | | | |
| 20 | Turnbull Subdivision (East Pond) | Not Assumed | | | | | |

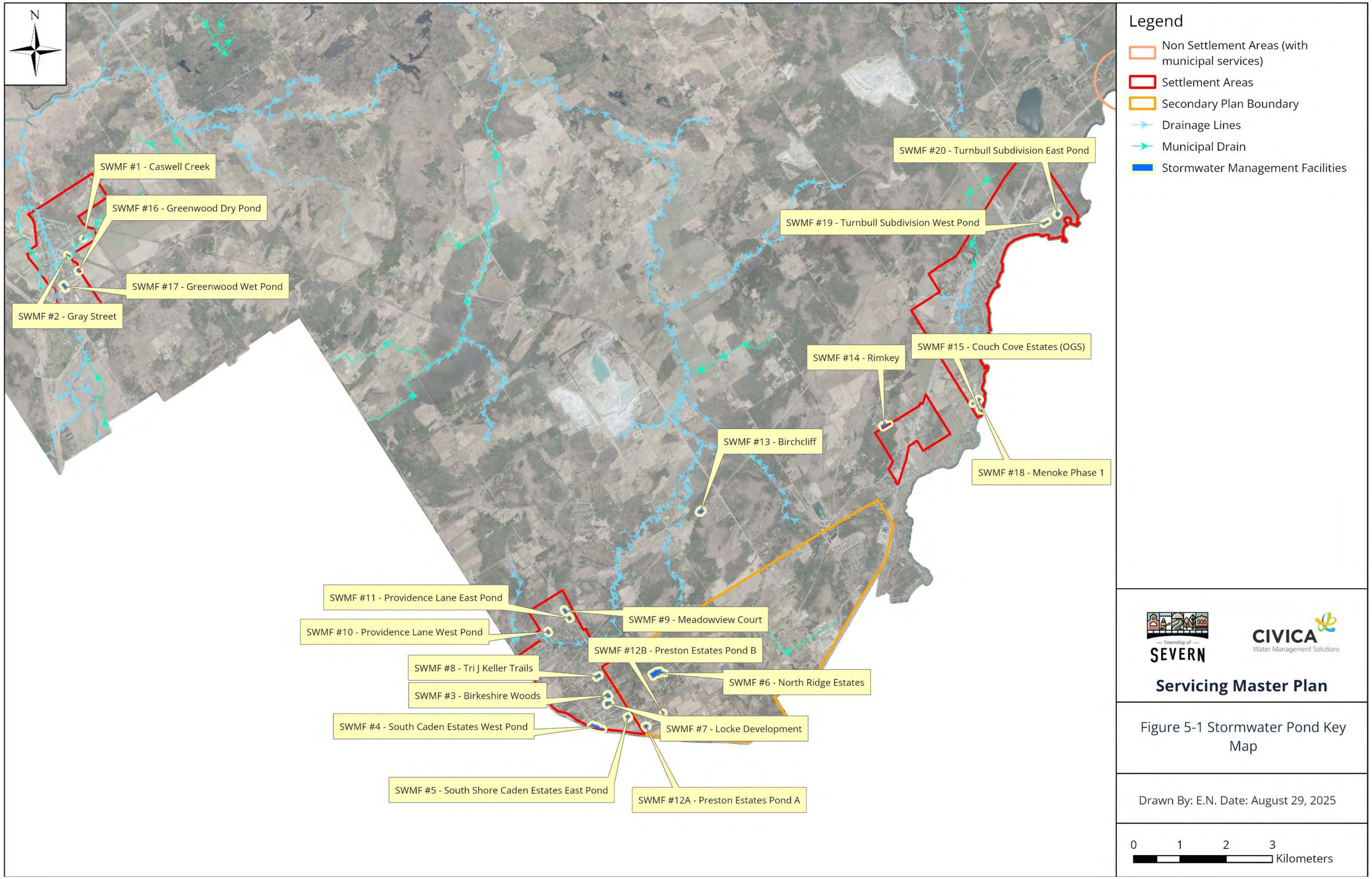



Figure 5-1 Stormwater Pond Key Map

# 6.0 Future Conditions

## 6.1 Population Projections

The population forecast for the Township of Severn is summarized in Table 6-1 with characteristics for each of the identified areas described below.

Table 6-1 Population Forecast

| Housing Equivalent Residential Units Population (Equivalent) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2021 | 2031 | 2041 | 2051 | 2021 | 2031 | 2041 | 2051 |
| Severn Township (County Forecast) | | | | | 14,750 | 15,763 | 16,776 | 17,790 |
| Washago | 121 | 121 | 121 | 121 | 304 | 304 | 304 | 304 |
| Coldwater | 553 | 753 | 953 | 1,153 | 1,493 | 2,033 | 2,573 | 3,113 |
| Westshore | 1,018 | 1,618 | 2,018 | 2,181 | 2,749 | 4,369 | 5,449 | 5,889 |
| Bass Lake | 161 | 161 | 161 | 161 | 404 | 404 | 404 | 404 |
| Severn Estates | 25 | 25 | 25 | 25 | 63 | 63 | 63 | 63 |
| Sandcastle Estates | 65 | 65 | 65 | 65 | 163 | 163 | 163 | 163 |
| South Div SP * | | 600 | 1,000 | 1,200 | - | 1,620 | 2,700 | 3,240 |
| South Div SP Area 3* | | 200 | 300 | 300 | - | 540 | 810 | 810 |
| Rural Areas | 5,222 | 5,327 | 5,433 | 5,542 | 9,400 | 9,588 | 9,780 | 9,975 |
| Total | 7,165 | 8,870 | 10,076 | 10,748 | 14,576 | 19,084 | 22,246 | 23,961 |
| Growth Rate per Planning Period | | 1,704 | 1,207 | 672 | | 4,508 | 3,162 | 1,716 |
| Avg. Annual Absorption Rate (Units per year) | | 170 | 121 | 67 | | | | |

The base population forecast is determined by Simcoe County and represents the growth forecast that is anticipated and that is in line with the overall growth plan for the County. As can be seen in the first row above, the 2051 planned population is 17,790 persons.

When assessing population growth forecasts on a community basis, the population for the priority growth communities is further detailed in the table above and described as follows:

### 6.1.1 Washago

Washago is not anticipated to grow any further in the planning horizon. There currently are some limited sites for commercial development and some limited residential development, however, a significant constraint in the community is the existing sewage treatment lagoon system. At this stage of the growth plan, it is recommended that there is limited growth opportunity and therefore no anticipated population growth. Washago represents about 1.3 percent of the forecast 2051 population across the Township.

### 6.1.2 Coldwater

Coldwater currently has the most constrained wastewater servicing conditions and as part of the parallel process with the update to the Development Charge Background Study, population data has been reviewed to support necessary area-specific development charges for this community, and will ultimately align with the recently updated draft Official Plan.

Coldwater is a community with significant urban expansion areas and is forecast to achieve approximately 2.5 percent annual growth. With a current population of 1,493, the 2051 overall growth rate will result in a doubling of the population. Coldwater represents about 13.0 percent of the forecast 2051 population across the Township.

### 6.1.3 Westshore

The community of Westshore is the largest urban centre with a current population of 2,749 persons. The average annual growth rate for this community is similar to Coldwater at a rate of 2.6 percent. Westshore represents about 24.6 percent of the forecast 2051 population across the Township.

### 6.1.4 Bass Lake, Severn Estates and Sandcastle Estates

These communities are currently complete and have no additional growth potential with the future forecast remaining the same as currently stated. All three communities represent about 2.6 percent of the forecast 2051 population across the Township.

### 6.1.5 South of Division Road Secondary Plan

This planning area is identified in the Official Plan in Part E South of Division Road Secondary Plan and the planning policies are set out with the intention that the secondary plan establishes major road systems and future land use patterns prior to the approval of any development. This requirement was formulated on the basis of several reports including constraints with water and wastewater servicing and stormwater management that are pertinent to this study. There is currently no population growth in this area until such time as planning policies are met and development planning can proceed. However, it is expected that at some point this will occur and therefore future population is anticipated to be accommodated in this area. To provide an appropriate context in planned growth rate, the growth was assessed compared to the current population of the Township with future growth for this area resulting in an average annual growth rate of 0.7 percent that contributes to the entire growth rate. This area represents about 16.9 percent of the forecast 2051 population across the Township and will be the only growth area to start from greenfield conditions. The viability and sequencing of proposed servicing infrastructure is dependent on detailed Secondary Plan - Master Planning exercises at a cost of $80,000 as included in the Development Charges (2024) for the coordination with adjacent properties within the Secondary Plan area and neighboring municipality impacted by the proposed land use change.

### 6.1.6 Rural Areas

The rural areas consider all other lands outside of organized centres were servicing is from private well and septic. The growth in this area is generally related to rural lots, waterfront and infill opportunities. The assumed growth rate is 0.5 percent representing an increase in population of about 1,500 persons or 500 residential units. This would be equivalent to about 17 new units per year on average. The rural areas represent about 41.6 percent of the forecast 2051 population across the Township.

### 6.1.7 Summary of Growth Trends

Figure 6-1 summarizes the expected population forecast by community and provides context on how the majority of the population is anticipated to occur.

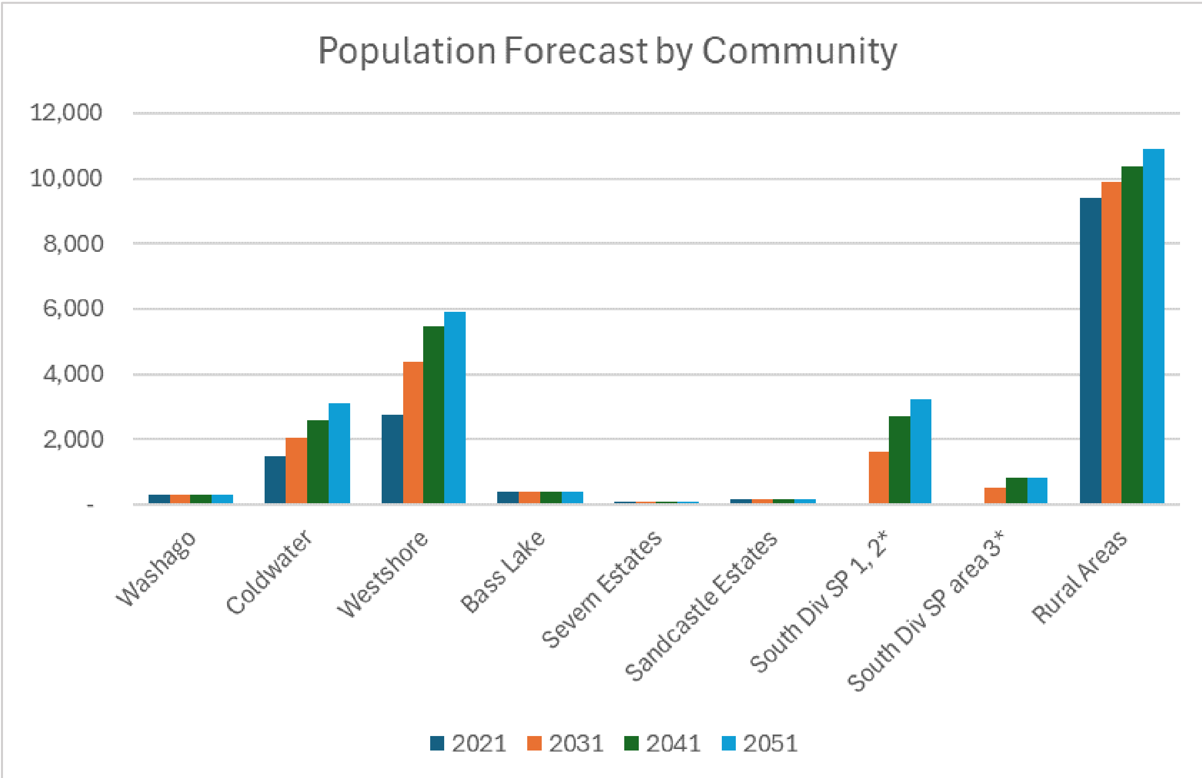



Figure 6-1 Population Forecast by Community

Figure 6-2 represents one of many annual residential unit absorption rates that could accommodate the planned population growth. This absorption forecast is an estimated rate based on the total expected absorption over each 10 year planning period and is intended to demonstrate the significant growth pressures experienced in new housing units anticipated for the years 2025 to 2035 and how this growth will demand the various services including water, wastewater and stormwater management identified in this report. There are several factors that will influence the actual absorption rate such as development approval lot count and phasing needs, completion of critical infrastructure related to servicing allocation, housing market conditions and supply and demand trends. It is noted however that the potential for this rate of growth is possible and servicing is therefore planned to be in place where needed to accommodate this pattern. Historically, the Township has experienced a rate of 90 new housing units per year. The 2024 Development Charge Background Study was based on approximately 90 new permanent and seasonal housing units per year over the mid-2024 to mid-2036 forecast period. For context, a 3% per year growth rate in Severn predicts 110 new housing starts in 2021, climbing to over 1,000 new housing starts per year by 2051 with a cumulative population of 35,360 by the end of 2051.

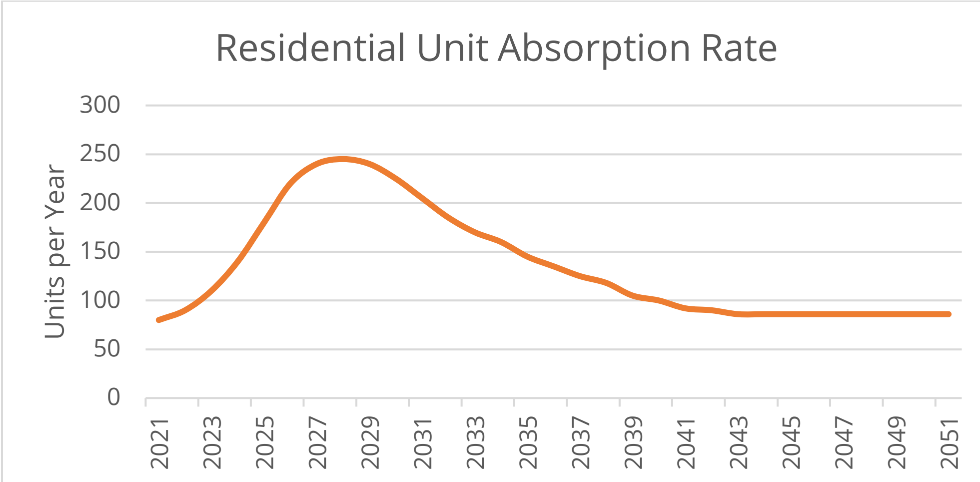



Figure 6-2 Residential Unit Absorption Rate

Figure 6-3 presents a relative comparison of the County of Simcoe growth forecast and the forecast based on expected housing starts as prepared by the Township based on conservative forecasts. It is noted that the proposed population for the Servicing Master Plan is forecasting significant growth in the coming periods. For a master planning exercise, the forecast provides a planning approach that will ensure servicing availability in a timely manner which can further be adjusted to match implementation timing with actual growth timing. These critical decisions are to be considered at key investment points such as land acquisition and capital construction of significant works. It is further noted that phasing and developer-funded/delivered projects may be considered where these investments contribute to the ultimate servicing capacity needs.

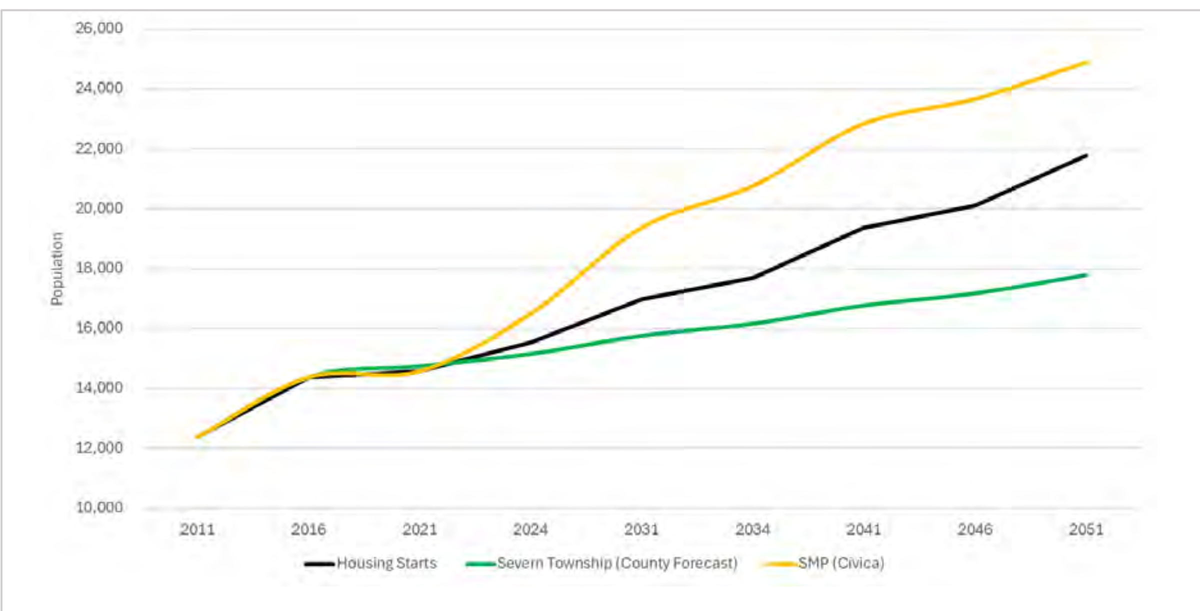



Figure 6-3 Comparator Population Growth Forecasts

# 7.0 Problem and Opportunity Statement

Following the completion of the updated 2025 Official Plan, the Township has identified the intent to direct most forms of development to settlement areas where water, wastewater, and stormwater services are planned or currently available. This presents the opportunity to identify and select preferred alternative water supply and storage; wastewater collection and treatment; and stormwater management servicing strategies to accommodate growth for a planning horizon which minimizes impacts on the natural and social environments and is technically feasible and economically sensible. Therefore the problem and Opportunity Statement is:

*As significant community growth is anticipated in the next 30 years, how best can the Township of Severn select preferred alternative water supply and storage; wastewater collection and treatment; and stormwater management servicing strategies to accommodate growth for a planning horizon which minimizes impacts the natural and social environments and is technically feasible and economically sensible.*

# 8.0 Evaluation of Servicing Alternatives

## 8.1 Evaluation Methodology

The selection of preferred solutions is based on evaluating the various alternatives against the following criteria and to the extent that each alternative addresses the problem/opportunity statement. The following are the four criteria considered in evaluating the various alternatives.

### 8.1.1 Technical Merit

Technical merit evaluates the feasibility and functionality of an alternative in how the approach can support the needs of the system and the community. Aspects such as the ability to integrate into existing systems, constructability, operational and maintenance considerations, and overall reliability of the approach based on track record and industry adoption.

### 8.1.2 Natural Environment

This criterion considers the potential impact on the natural environment because of the implementation of a particular solution. Typically impacts increase where the construction of a solution is significant within greenfield or undeveloped areas. In the case of this study, the priority of infrastructure location will be within existing rights of way and existing road or easement corridors. Factors also consider operational needs and how operation or failure of proper operation may impact the local environment related to air, land or water impacts.

### 8.1.3 Socio-Economic Environment

The socio-economic environment considers factors such as community disruption, impact on transportation and traffic systems that decrease usability, and direct impact on residents and businesses related to the implementation or operation of a proposed solution. Consideration is given to community safety, protection of infrastructure and loss of economic benefit related to a recommended alternative.

### 8.1.4 Financial

Financial consideration is given to the capital and operating costs of the various alternatives where there is recognition of the need to balance initial capital investment and the long-term operational and maintenance impacts of the alternative.

## 8.2 Servicing Alternatives

The servicing alternatives are considered for all three service types with appropriate descriptions on the application of each alternative.

### 8.2.1 Alternative 1 - Do Nothing

This alternative assesses how doing nothing can meet the objectives set out in the problem statement and is the first alternative for consideration where it may become evident that no action is needed to address the problem or opportunity that has been defined.

### 8.2.2 Alternative 2 - Limit Community Growth/ Demand Management

This alternative considers the option of limiting increased demand on water, wastewater, and stormwater services. As demand is directly related to population and consumer growth, the option of limiting growth is the approach that would be applied to limit demand on the system. In this alternative, the problem/ opportunity statement could be supported to the extent that there is available servicing capacity within the existing infrastructure systems. Any demands beyond available capacity could not be serviced resulting in limiting growth that exceeds available capacity. Additional considerations are provided in Table 8-1 as demand management alternatives.

Table 8-1 Demand Management Alternatives

| Initiative | Water System | Wastewater System | Stormwater System |
|---|---|---|---|
| Water Conservation Measures | Reducing water use has a direct benefit on the required system capacity to serve a community | Using less water in homes and businesses does benefit this system as flow reduction is evident although not a driving factor in overall performance | No benefit |
| Conservation with Reduced Outdoor Water Use | Highest demand occurs when outdoor water use is high during dry hot weather. This is the single largest factor in system capacity constraints. | No Benefit | No Benefit |
| Public Education | Information on household and business opportunities, inspections, and monitoring programs to assess opportunities and cost benefit of investments | Quality management education programs to understand impact of chemical and non-suitable disposal practices that impact performance of collection, pumping and treatment systems. | Educate on connection of stormwater systems and direct connection to natural environments. Proper use and disposal of chemicals, fertilizers, and commercial product to protect natural environment |

### 8.2.3 Alternative 3 - System Optimization / Supply Management

This alternative considers capacity optimization where there is an opportunity to increase servicing capacity through initiatives that can improve the performance of the system. The following considerations are provided in Table 8-2 as supply management alternatives.

Table 8-2 Supply Management Alternatives

| Initiative | Water System | Wastewater System | Stormwater System |
|---|---|---|---|
| System maintenance and operational efficiency | Flushing, leak detection programs, renewal and rehabilitation of network and meter replacement to track consumer usage. | Flushing, rehabilitation, flow monitoring and inflow analysis to assess cost-benefit of extraneous flow reduction initiatives | Pond and Oil/grit separate maintenance and cleaning, flow monitoring and discharge quality sampling, street sweeping, |
| Leak/loss Reduction | System leakage relates to aged infrastructure, and understanding sources of loss that can be recovered | The issue is through extraneous flows where infiltration occurs through groundwater entry due to cracks, and inflow from surface areas related to rain event inflows, eavestroughs and overland flow that enters the collection system. | No significant benefit |

| Initiative | Water System | Wastewater System | Stormwater System |
|---|---|---|---|
| Public Education | Information on household and business opportunities, inspections, and monitoring programs to assess opportunities and cost benefit of investments | Quality management education programs to understand impact of chemical and non-suitable disposal practices that impact performance of collection, pumping and treatment systems. | Educate on connection of stormwater systems and direct connection to natural environments. Proper use and disposal of chemicals, fertilizers, and commercial product to protect natural environment |

### 8.2.4 Alternative 4 - Build New Infrastructure

Where growth exceeds existing capacity and optimization does not meet future demands, the alternative of building new infrastructure is considered the next best approach. This alternative identified future constraints and needed replacement or an increase in capacity for new areas where intensification causes constraints in the existing system. The key driver for this alternative is the growth in population and new demands on the water and wastewater system. For the stormwater system, the impact is generally related to the expansion of the urban area where additional lands are caused to flow in existing drainage areas that may not have necessarily contemplated the increase in the existing infrastructure capacity.

## 8.3 Recommended Servicing Alternatives

Table 8-3 is the evaluation matrix for the identified alternatives. Based on the outcome of the evaluation, it is recommended that:

- Supply and Demand Management best practices be implemented and/or enhanced based on the Township's currently adopted best practices. Specific recommendations for the type and extent of programs to be carried out are identified in the Implementation Section of this Report.
- Based on population projections and system capacity modelling, infrastructure recommendations be identified to ensure that the future infrastructure network has sufficient capacity that meets the design criteria needs. These works generally include pipe expansion or extension where needed to provide servicing to the intensification and new growth areas as well as capacity expansion where treatment capacity or pumping conveyance capacity constraints are identified.

Table 8-3 Evaluation of Servicing Alternatives

| Criteria | Alt. 1- Do nothing | Alt. 2-Limit Growth/ Demand Management | Alt. 3-System Optimization/ Supply Management | Alt. 4-Build New Infrastructure |
|---|---|---|---|---|
| Technical Merit | Does not address the needs created by new growth | Limiting growth is not a viable alternative as housing demands and community objectives require new housing to meet population growth targets.<br>Demand management options are proven and beneficial in mitigating servicing demands related to water consumption and outdoor water use. Limiting growth is not feasible as it contradicts the problem/ opportunity statement | Supply management options are proven and beneficial in mitigating servicing demands. Key initiatives are related to inflow and infiltration reduction in sanitary systems to optimize available network capacity, and leak detection and water loss management in water systems to optimize amount of usable water supply. Stormwater system optimization relates to treatment and storage capacity preservation through cleaning and maintaining systems. | Where needed, new infrastructure will generally consist of piping to transmit services to expansion areas or increase capacity of constrained links in existing serviced areas. Technical considerations relate to easy of construction, hazard or water crossing challenges and depth of construction related to local topography challenges. System treatment capacity increases are to be included where limited optimization to expand capacity is available. |
| Natural Environment | Risk to the natural environment will increase due to insufficient treatment capacity for sewage and increased risk of network surcharging for sewage collection and pumping systems. | Reducing demands through the various alternatives advances sustainability objectives while potentially creating additional capacity to service some of the new population growth. | Improving system performance and reliability through supply side management best practices would be expected to have a net benefit on the environment due to reduce energy demands, higher system reliability and lower risk of failure and release to the environment. | As most infrastructure needs are in currently existing intensification areas, there is expected to be minimal impact to the natural environment and existing ROW corridors are the primary route to be recommended.<br><br>Where greenfield or rural infrastructure is required to meet new greenfield development, these corridors will be through existing or proposed ROW's. |
| Socia-Economic | Will stall or limit community growth to meet provincial growth targets | Reducing household costs through conservation and resource consumption and reduced impacts by potentially deferring infrastructure expansion. | Increased system reliability, sustainability and redundancy will benefit the community through service reliability and firm capacity availability | Local disruption due to construction and inconvenience to traffic flow and community access is expected. Once complete, projects will allow for growth that fulfills problem/ opportunity statement thereby enhancing long term socio-economic condition. |

| Criteria | Alt. 1- Do nothing | Alt. 2-Limit Growth/ Demand Management | Alt. 3-System Optimization/ Supply Management | Alt. 4-Build New Infrastructure |
|---|---|---|---|---|
| Financial | No direct cost created in the do nothing option, however there is the impact when current assets that will continue to require remediation and maintenance. | Demand management options are generally high benefit for low implementation and management costs resulting in effective resource use and deferral of more costly infrastructure construction. | Supply management best practices are a proven approach with high benefit for marginal costs. Increased reliability reduces risk of unexpected failures or system capacity reductions | Highest costing alternative due to cost of new infrastructure related to water, wastewater, and stormwater servicing. However is a necessary approach where no further optimization or consumption management benefits can be gained. |
| Overall Evaluation | Does not meet requirements of a growing community and does not address the problem/opportunity statement, | Recommended as next best alternative where demand management may resolve short term issues and extend timing for infrastructure expansion.<br><br>Options Carried Forward as part of overall solution | Recommended as next best alternative where supply management may resolve short term issues and extent timing for infrastructure expansion.<br><br>Options Carried Forward as part of overall solution | To be carried forward as a recommended long-term solution to meet future growth demands. Timing of actual need will depend on growth patterns and effective implementation of Demand and Supply management best practices.<br><br>Option Carried Forward as part of overall solution |

# 9.0 Evaluation of Supply and Demand Side Alternatives

The following are various program enhancements and expansions that further support supply and demand side management for the water, wastewater, and stormwater systems. As these are all beneficial programs to support the Township there is no ranking of preference. Rather, as the Township is implementing many of these recommendations in current programs, the next step is to assess program improvements and additions that further the benefit of both Supply and Demand side management practices and further the goal of optimizing system performance.

## 9.1 Demand Side Optimization Alternatives

Demand-side optimization solutions for water and wastewater systems focus on reducing water consumption, improving efficiency, and promoting sustainable water use practices among consumers. These solutions aim to address demand-side pressures on water resources, minimize wastage, and optimize the use of available water supplies. Demand-side optimization solutions considered include:

### 9.1.1 Water Conservation Programs:

This alternative includes public education and outreach campaigns to raise awareness about the importance of water conservation and encourage behaviour change among consumers. This can include providing incentives for water-saving measures such as installing low-flow fixtures, water-efficient appliances, and landscaping practices that minimize outdoor water use.

Another conservation alternative is the use of water rates as a conservation tool. Utility rate structures are typically composed of a fixed portion and consumption-based portion. The fixed portion is designed to recover essential operating costs that do not vary with consumption, such as staffing, insurance, and system administration. In many cases, particularly for smaller drinking water systems, a significant reliance on the fixed portion is necessary to ensure stable and sustainable funding for operations. The variable charge is applied to water used beyond the base allowance and holds higher-use customers accountable for their consumption. While Severn's current structure provides financial stability and resilience for utility operations, particularly in the three smaller systems, a gradual shift toward a heavier reliance on consumption-based charges could further strengthen conservation outcomes. Such a transition would need to be carefully managed to balance the dual objectives of system sustainability and demand reduction.

#### 9.1.2 Smart Metering and Monitoring:

This alternative considers deploying smart metering and monitoring systems to track water consumption in real time, detect leaks, and identify opportunities for efficiency improvements. This type of program provides consumers with access to water usage data and insights to empower them to make informed decisions about their water consumption habits.

#### 9.1.3 Greywater and Rainwater Harvesting:

This alternative considers the continued promotion of recycling systems and rainwater harvesting systems to capture and reuse water for non-potable applications such as irrigation, toilet flushing, and landscape maintenance. This can include providing guidance and incentives for the installation of rain barrels, cisterns, and greywater treatment systems in residential and commercial buildings.

#### 9.1.4 Water Audits and Efficiency Programs:

This alternative considers conducting water audits and efficiency assessments for residential, commercial, and industrial facilities to identify opportunities for water savings and efficiency improvements. This can include offering technical assistance, rebates, and financial incentives for implementing water-saving measures and upgrading water infrastructure.

#### 9.1.5 Land Use Planning and Zoning:

This alternative considers incorporating water-efficient landscaping requirements, stormwater management practices, and water-sensitive urban design principles into land use planning and zoning regulations. In addition to the current planning approaches, this could include further requirements for native and drought-tolerant plants, permeable surfaces, and green infrastructure to reduce outdoor water demand and minimize runoff.

### 9.2 Supply-Side Optimization Alternatives

Supply-side optimization solutions for water and wastewater systems focus on improving the availability, reliability, and efficiency of water supply and treatment infrastructure. These solutions aim to enhance the management of water resources, minimize losses, and ensure sustainable water supply for communities. Supply-side optimization solutions considered for this study include:

#### 9.2.1 Infrastructure Rehabilitation and Upgrades:

This alternative includes retrofitting and upgrading aging water supply and wastewater treatment infrastructure to improve performance, reliability, and efficiency. Where capacity expansion is recommended, these expansions will be considered in conjunction with the condition of the existing infrastructure such that condition improvements will be implemented as part of a capacity increase project. An annual investment is identified in the plan based on the Townships' existing Asset Management Plan and recommended investment strategy.

### 9.2.2 Water Loss Management:

This alternative considers implementing leak detection programs, pressure management strategies, and water pipe maintenance programs to reduce water losses from leaks and breaks in the water distribution system. Techniques can include using advanced technologies such as acoustic sensors, satellite monitoring, and data analytics to identify and address water loss hotspots. It is recommended that current water loss programs continue with the goal of identifying and reducing water loss.

### 9.2.3 Water Recycling and Reuse:

This alternative considers Implementing water recycling and reuse programs to treat and reuse wastewater for non-potable applications such as irrigation, industrial processes, and toilet flushing. It can include investing in advanced treatment technologies such as membrane filtration, reverse osmosis, and UV disinfection to ensure water quality and safety for reuse. This alternative may be less beneficial than other alternatives but does remain a consideration should specific opportunities with private partners emerge. At this point, the cost for such an approach from a public infrastructure perspective and based on the two-tiered service delivery responsibility would make this a low-priority initiative.

### 9.2.4 Sanitary Inflow and Infiltration Reduction

Inflow and Infiltration (I/I) reduction initiatives offer significant benefits as supply-side management strategies for wastewater systems. By addressing sources of extraneous water entering the collection system, such as through leaks, cracks, or improper connections, the Township can optimize the performance and capacity of the infrastructure. This leads to reduced costs, minimized risk of system overflows and backups, and enhanced operational efficiency. Further, I/I reduction efforts contribute to the preservation of water resources by preventing unnecessary water from entering the wastewater system, thus conserving valuable treatment capacity. Overall, I/I reduction measures serve to improve the reliability, resilience, and sustainability of wastewater systems, ensuring their long-term viability and effectiveness in serving communities.

### 9.2.5 Developer-led Inflow and Infiltration Reduction Initiatives

I/I reduction is generally thought of as the responsibility of the Township where these activities are identified under system maintenance and part of the ongoing costs of system ownership. However, York Region and many municipalities within the Region have demonstrated a sustainable and cost-effective strategy to reduce I/I and gain allocation capacity through system optimization. This program has been able to create capacity through joint partnerships with the development community on specific developments where sanitary constraints have limited the ability for new development. This approach has been very effective in achieving mutually beneficial goals where the local and regional municipalities can document actual remediation with measures of reduction in I/I flows and where the developer, in exchange for the investment in finding and remediating system defects, is granted servicing allocation that matches the amount of reduction. This has proven to be a very effective approach to achieving optimization of the collection system, remediation of defects, and allocation of servicing capacity for new homes that previously could not be accommodated within the sanitary system due to high I/I flows taking up valuable pipe capacity.

### 9.2.6 Sanitary Sewer Flow Monitoring

Sanitary sewer flow monitoring plays a crucial role in the supply-side management of wastewater systems by providing valuable insights into system performance and identifying opportunities for optimization. By continuously monitoring flow rates and patterns within the sewer network, the Township can detect and quantify sources of inflow and infiltration (I/I), such as leaks, illegal connections, and groundwater infiltration. This enables utilities to prioritize infrastructure repairs and upgrades, target I/I reduction efforts effectively, and minimize the volume of extraneous water entering the system. Additionally, flow monitoring helps utilities optimize hydraulic capacity, anticipate future demand trends, and improve system efficiency, ultimately leading to reduced treatment costs, minimized risk of sewer overflows, and enhanced operational resilience. Overall, sanitary sewer flow monitoring serves as a proactive and data-driven approach to managing wastewater systems, ensuring reliable service delivery and sustainable resource management.

Currently, none of the Township's Sewage Pumping stations have flow monitoring capability. More recently, the Turnbull SPS included SCADA which actively reports flows. This should be applied to all SPS based on a reasonable servicing and capacity threshold. This plan recommends installation on Coldwater Main SPS, Home Hardware SPS, and Community Centre Drive due to vacant lands to the south. It also recommends installation on Westshore Main SPS (should be about the same as inlet meter), and the Wood Avenue SPS as development pressure within the south Westshore area provides the greatest risk to this catchment area

#### 9.2.7 Low-Impact Development Stormwater Management:

This alternative considers implementing green infrastructure practices such as rain gardens, bioswales, permeable pavements, and retention ponds to capture, treat, and infiltrate stormwater runoff with the benefit of providing best management practices to reduce peak flows, mitigate flooding, and improve water quality being returned to the natural environment. This alternative remains a valuable component of stormwater management when suitable conditions are in place or can be created to meet performance objectives.

#### 9.2.8 Optimized Pumping and Distribution Systems:

This alternative considers installing energy-efficient pumps, valves, and controls to optimize the operation of water distribution systems and minimize energy consumption through the use of variable frequency drives over conventional start and stop systems. These systems apply to both water and wastewater systems and although may involve higher upfront capital costs, may provide benefits in operational flexibility and overall station efficiency.

#### 9.2.9 Asset Management and Predictive Maintenance:

This alternative considers developing comprehensive asset management programs to prioritize maintenance activities, optimize asset life cycles, and minimize downtime and is currently in practice in the Township. It is recommended to continue with this program and enhance assessment opportunities were warranted to further increase reliability and cost control strategies.

### 9.3 Optimization Program Recommendations

Based on the review of these alternatives and current practices in the Township, it is recommended that current programs that support these enhancement solutions continue to be funded and delivered and that additional funding be considered to enhance these alternatives into the future. As part of this study, an enhancement program is recommended with identified funding to augment current programs and create an increased focus on the relationship of this plan to other Township priorities that are in alignment with efficiency and environmental sustainability priorities. The following programs are categorized as water, wastewater, and stormwater programs with funding needs for the next 10 years. It is also recommended that the program be allocated $10,000 in additional staff resources be included in the 2026 budget for annual ECA compliance.

Program components, anticipated outcomes, and required funding are summarized in Table 9-1, Table 9-2, and Table 9-3.

Table 9-1 Water System Optimization Program Financial Plan

| Description | Rationale | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Prepare and update WRc Water Loss reporting for unbilled and water loss analysis | Standard methodology to define and track water consumption by category | $15,000 | $7,000 | $7,000 | $7,000 | $7,000 | $7,000 | $7,000 | $7,000 | $7,000 | $7,000 |
| Outdoor water management and public education | Review and enhance water use awareness and summer outdoor use education to target overall water consumption reduction | $5,000 | $5,000 | $5,000 | $5,000 | $5,000 | $5,000 | $5,000 | $5,000 | $5,000 | $5,000 |
| Smart metering | Deploy smart metering and monitoring systems to track water consumption and identify opportunities for efficiency improvements | $100,000 | $100,000 | $100,000 | $100,000 | $100,000 | | | | | |
| Total | | $120,000 | $112,000 | $112,000 | $112,000 | $112,000 | $12,000 | $12,000 | $12,000 | $12,000 | $12,000 |

Table 9-2 Wastewater System Optimization Program Financial Plan

| Initiative | Components | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Inflow and Infiltration Reduction Program | To determine the amount of groundwater and rainwater entering the system and where to focus targeted efforts for remediation. (assume rotation of 5 flow meters and a rain gauge site on an annual basis) | $75,000 | $75,000 | | | | | | $75,000 | $75,000 | |
| Inflow and Infiltration Reduction - Smoke and Dye testing | To assess the potential for direct connections to extraneous sources | | | | $25,000 | $25,000 | $25,000 | | | | |
| System modelling software selection and model development | Confirm preferred model software support method and develop a spatial model for current and future assessments | $20,000 | $5,000 | $5,000 | $5,000 | $5,000 | $5,000 | $5,000 | $5,000 | $5,000 | $5,000 |
| Remediation of maintenance hole and line defects | Investment in physical remediation based on prioritized defect plan and annual CCTV investigations | $90,000 | $90,000 | $90,000 | $90,000 | $90,000 | $90,000 | $90,000 | $90,000 | $90,000 | $90,000 |
| Sewage Pumping Station flow monitoring installations | Assessment design and installation of flow meters and related SCADA equipment at Coldwater Main SPS, Home Hardware SPS, Community Centre Drive inline monitoring, Westshore Main SPS. | $50,000 | $100,000 | $100,000 | $100,000 | | | | | | |
| Total | | $235,000 | $270,000 | $195,000 | $195,000 | $95,000 | $120,000 | $120,000 | $120,000 | $170,000 | $170,000 |

Table 9-3 Stormwater System Optimization Program Financial Plan

| Initiative | Components | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Investigate separate stormwater foundation drain systems for Coldwater due to high I/I levels | A significant portion of the sanitary flow is derived from foundation and sump pump discharges. There is a benefit to considering alternative collection of these flows through a third pipe system | | $30,000 | | | | | | | | |
| Prepare a study to confirm sediment accumulation and remediation requirements for stormwater ponds | Pond cleanout based on sediment accumulation and pond performance is a requirement of the CLI-ECA approvals | $80,000 | | | | | | | | | |
| Anticipated Stormpond cleanout costs | Assumed cleanout program is developed and implemented | | $600,000 | | $600,000 | | $600,000 | | $600,000 | | $600,000 |
| Additional support for other CLI-ECA requirements | These include additional stormwater system monitoring, reporting and remediation planning. Funding based on anticipated annual investment | | $10,000 | $10,000 | $10,000 | $10,000 | $10,000 | $10,000 | $10,000 | $10,000 | $10,000 |
| Public Education and Awareness | stormwater storage and reuse, discharge of banned products into storm sewer and private side stormwater and sump pump water management | | $5,000 | $5,000 | $5,000 | $5,000 | $5,000 | $5,000 | $5,000 | $5,000 | $5,000 |
| Total | | $80,000 | $645,000 | $15,000 | $615,000 | $15,000 | $615,000 | $15,000 | $615,000 | $15,000 | $615,000 |

# 10.0 Evaluation Criteria for Growth Area Servicing Alternatives

## 10.1 Evaluation Criteria

The following evaluation criteria are considered in the various network alternatives identified through the modelling and evaluation process that identifies and proposes infrastructure solutions to create the needed servicing capacity.

### 10.1.1 Flexibility, Redundancy, and Integration

This criterion considers how flexible the option is to design changes or additional/future flow conditions and how easy it is to integrate the planned system with the existing system while maximizing the utilization of the current assets. Where an upsizing of an existing asset is considered, there is also the benefit of a parallel or alternate route addition of a new asset that may increase redundancy while preserving the intrinsic value of an existing asset.

### 10.1.2 Constructability

This criterion considers ease of construction, clash or conflict with other assets and the sensitive nature of any location. As well there is the consideration of how the new asset will interface with existing projects or how coordination can be best achieved.

### 10.1.3 Operation and Maintenance Requirements

This criterion considered the operational and maintenance aspects of an alternative with more complex systems being less preferred. The highest preference is gravity systems and solutions not requiring pumping or other mechanical means of operation that inherently add energy costs, increased risk of failure and potentially higher consequences to the environment or community.

### 10.1.4 Social and Environmental Benefits

This criterion considers the disruption that is likely to occur during construction that is related to traffic disruption, noise and other local impacts and inconveniences. Environmental impact during project execution on sensitive receivers such as watercourses or environmentally sensitive lands or potential longer-term environmental impact on land, flora and fauna, biodiversity, public health, and water resources. Where there are mitigation measures available to restore or replace potential impact effects, these may be considered a viable approach to restoring the environment post-construction.

### 10.1.5 Economic Benefit

Economic criteria consider the initial capital costs and the relative operational and maintenance needs of the alternative. Priority is given to less technical solutions for transmission being gravity systems over pumping and other more complicated solutions unless there is a significant capital cost difference due to route length of technical challenge of construction for the gravity approach.

# 11.0 Growth Area Servicing Alternatives

## 11.1 Coldwater

### 11.1.1 Community and Growth Characteristics

The community of Coldwater population forecast is presented in Table 11-1.

Table 11-1 Coldwater Population Forecast

| | 2021 | 2031 | 2041 | 2051 | Ultimate |
|---|---|---|---|---|---|
| Demographics | | | | | |
| Population | 1,388 | 2,033 | 2,573 | 3,113 | 3,750 |
| Residential Units | 553 | 753 | 953 | 1,153 | 1,389 |
| ICI Accounts | 60 | 60 | 60 | 60 | 60 |

As part of the SMP process, The Township identified a preliminary population of 2,816 persons by 2051 based on a growth rate of 40 to 50 persons per year.

In reviewing the available lands and potential servicing capacity of the existing and future water and wastewater treatment systems, the 2051 target was adjusted to 3,113 persons and the ultimate community population was added to recognize the available water treatment capacity in the planning forecast with a proposed population of 3,750 persons.

### 11.1.2 Water System

The Coldwater Water Supply and Distribution System obtains its raw water from any one of two 200mm diameter drilled wells (Well 1 & 3) located on the pump house property or from a 150mm diameter drilled well (Well 2) located across the street from the pump house. The distribution system is comprised of 8.9 kilometres of water main ranging in size from 50mm to 300mm. There are 10 sample stations, 5 blow-offs, 83 fire hydrants and 3 private hydrants in the Coldwater system. There is no elevated storage tank in the system but rather an underground storage reservoir with a capacity of 1,612 $m^3$ and five 450L pressure tanks providing an effective storage capacity of 2,250 L of storage.

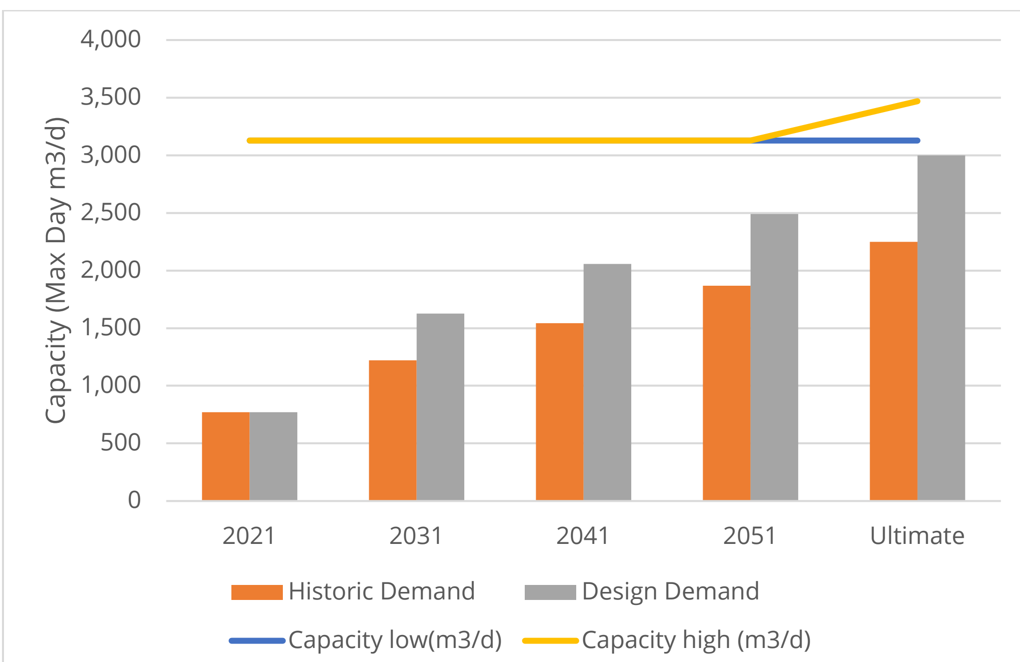
#### *11.1.2.1 Treatment and Storage Capacity*

Water treatment capacity is based on providing a community maximum day demand as determined through historic consumption data and the target design demands. The following Figure 11-1 provides information on both the historic water consumption rate and the consumption rate anticipated based on design demand consumption rates. This methodology has been applied in assessing the need and timing for treatment plant expansion to select a phasing and timing plan that will avoid overbuilding capacity while ensuring sufficient capacity is available when needed based on servicing the population anticipated from the growth forecast.

There is a further level of conservatism factored into the water supply/demand analysis which factors the water supply need assuming that only 85 percent of the available water supply capacity is committed to servicing thereby ensuring a 15 percent uncommitted reserve will be available should there be any unanticipated delays in delivering a future expansion.

Coldwater is also the only community where an ultimate population has been considered. This is due to the unique circumstances with the significant available water treatment capacity. This ultimate population was derived to be 3,750 persons based on the expectation that the treatment plant will be able to service this population based on the historic consumption rates, however will be the point where an expansion will need to be in the planning stage. It is noted that this population was identified to support the expansion requirements of the sewage treatment system and align both systems as growth phases occur. It is also noted that ultimate in this context is only a next stage placeholder and the population forecast will become more clear as the planning horizon emerges.

Figure 11-1 Coldwater Water Treatment Capacity



Storage capacity is based on the design requirement to meet fire flow design demands, equalization storage of 25 percent of the max day demand, and emergency storage which is 25 percent of the sum of the fire storage and equalization storage.

The available and required treatment capacity and water storage is summarized in Table 11-2 for the planning period based on the design requirements.

Table 11-2 Coldwater Water Treatment and Storage Requirements

| | 2021 | 2031 | 2041 | 2051 | ultimate |
|---|---|---|---|---|---|
| Water System Capacity | | | | | |
| Treatment Capacity (m3/d) | | 3,128 | 3,128 | 3,128 | 3,128 |
| Storage Available (m3) | | 1,612 | 1,612 | 1,612 | 1,612 |
| Recommended Capacity Increase | | | | | |
| Treatment Capacity Increase (m3/d) | | | | | 341 |
| Storage Increase (m3) | | | | | 81 |

Therefore there is sufficient water treatment capacity to meet the ultimate servicing population based on historic demand, however, a planned expansion will be required to be in place sometime after 2051 depending on growth rate and changes to design consumption rates. While overall storage capacity is sufficient to 2051, the distribution analysis indicates that network looping and localized pressure support are required in the north/northeast settlement area. Accordingly, an integrated project combining a 300 mm ring loop and a 200 $m^3$ elevated storage tank is recommended to both strengthen fire flow and provide for future storage needs shortly after the planning horizon.

Although the Coldwater Drinking Water System treatment capacity is sufficient for the planned growth, the system has long-standing aesthetic water quality concerns evident through consistent record of customer complaint / issues relating to parameters such as colour, hardness, iron, and manganese. These concerns, while not enforceable under O. Reg. 169/03 which sets the specific standards for microbiological, chemical, and radiological parameters in drinking water; are subject to provincial aesthetic objectives and operational guidelines. The opportunity to explore water quality improvements in the Coldwater Drinking Water System is recommended by this Master Plan.

| | Provincial Aesthetic Objective or Operational Guideline | Coldwater Water System Recent Ranges |
|---|---|---|
| Color | 5 NTU | 3 - 5 raw (0.10 - 0.68 NTU Distribution) |
| Hardness | 80-100 mg/l | 313 - 369 (raw) mg/l |
| Manganese | 50 ug/l | 66.7 - 72.6 ug/l (raw) |
| Iron | 300 ug/l | 379 - 658 (raw) |

These elevated levels contribute to frequent public complaints regarding scale buildup, fixture staining, and dependence on private treatment devices, such as water softeners.

The Coldwater Water Treatment Plant, constructed in 1994, utilized a treatment process appropriate to the groundwater source at the time. In 2008, the facility was expanded to include two Granular Activated Carbon (GAC) filters, a softening system, and a backwash settling tank. These additions provided modest improvements but have not fully mitigated concerns with aesthetic water quality. Given the persistent nature of aesthetic complaints and the elevated levels of hardness and dissolved metals, it is recommended that the Township initiate a water quality enhancement feasibility study between 2026 and 2028, examining central treatment options for hardness reduction, and iron and manganese removal and evaluate options such as lime softening, additional ion exchange, or pre-oxidation and filtration, to address the source water quality. In addition to the water quality enhancement feasibility study, the Township should engage the public regarding water quality objectives and potential upgrades through a specific education and consultation initiative. The willingness to fund the improvements will be key as the current water quality meet all requirements of O. Reg. 169/03 and the potential process enhancement is considered aesthetic improvement. The estimated cost for implementing a water quality improvement project in Coldwater is $6.0 million, which is proposed to be funded through a combination of user water rates and development charges (DCs). Based on the Development Charges Background Study, approximately 61% of the project cost is attributed to growth, and 39% to the existing community. This ensures that the financial burden is equitably shared between existing users and new development, aligning with the principle of growth paying for growth while also addressing long-standing community needs.

#### *11.1.2.2 Distribution Capacity*

The distribution network was modelled to assess the current and ultimate capacity to service the community based on base flow demands and critical fire flow distribution modelling. Based on this assessment, it was determined that additional servicing will be required to meet future demands anticipated in the north area of the existing settlement boundary as presented in Figure 11-2. At the same time for this servicing, it is recommended that a minimum 200m3 water storage tank be provided in this same area to provide an adequate storage supply and peak demand capacity for fire flow protection both for existing residents and growth shortly after the planning period. The timing of this infrastructure will be contingent on planning progress in this area and will require adjustment based on when planning applications are presented. It is recommended that the construction of this loop and elevated tank be included as a condition of approval were appropriate and based on the size of future proposed plans of subdivision. The capital cost for Alternative 1 is $2.112M for the 300mm watermain and $3.08M for a 200m$^3$ reservoir. The timing for these projects is recommended to proceed in the 2031 timeframe assuming development in this area will be progressing by that time. The cost table is presented as Table 11-3.

#### *11.1.2.3 Evaluation Analysis of Preferred Solution*

For the water production system, there is sufficient supply to meet demands to 2051 therefore resulting in no need for expansion in the near future. Storage capacity is sufficient to 2051 however will be required and will be triggered should the lands in the northeast section when the urban boundary proceeds.

The proposed infrastructure has been identified to follow existing or future anticipated rights of way that will avoid private easement agreements or other non-standard infrastructure requirements for approval and construction. It is also expected that these works will be constructed as part of a larger subdivision plan, or identified and delivered through a consolidated servicing plan that will be initiated to service the first approvals in the area. The constructability is expected to be through conventional open-cut methods with limited risk of tunnelling or other more difficult installation methods. There are limited alignment alternatives due to the nature of the existing system configuration and the need to service lands outside the current network infrastructure. Therefore, the identified routing is preferred as the most efficient and effective in providing long-term servicing.

This alternative also provides for typical operational and maintenance requirements that are currently within the skill set and work plans of the Township. The social and environmental impacts are driven by growth and the need to develop green field sites. This community growth has an impact on the overall community composition as well, drainage, environmental protections and mitigation requirements will be defined through the requirements of the planning and approvals process and will be confirmed as part of the final approval for the future subdivisions. Should the Township be required to provide common servicing outside of a specific development application, the option of entering into a delivery agreement with a developer can be considered as part of the overall area servicing.

There is an economic benefit to proceeding with the servicing recommendations as new development lands will be made available provided that infrastructure construction is in line with development approvals and capital costs are included in the Townships DC study for funding.

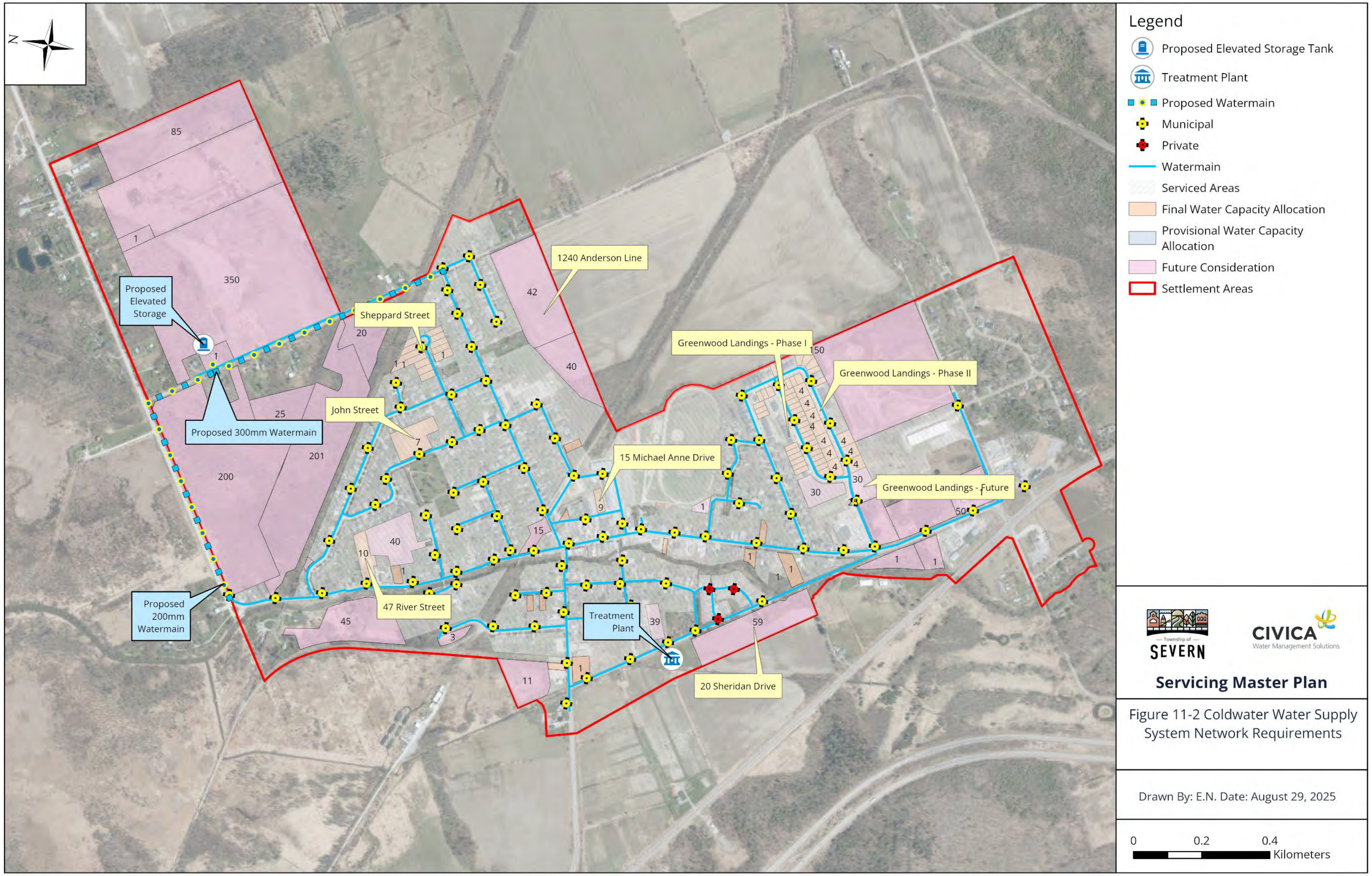



Figure 11-2 Coldwater Water Supply System Network Requirements

Table 11-3 Coldwater Alternative 1 Water System Capital Plan

| Alternative 1 | | | | Cost Estimate | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Description** | **Rationale** | **Infrastructure** | **Unit** | **Unit Cost** | **Quantity** | **Base** | **Contingencies (10%)** | **Budget Estimate** |
| **Water Distribution System** | 300mm Ring loop from north point of River St along Upper Big Chute Rd, then Anderson Line to Gray St. | To provide new reservoir situated along ring main and to serve existing and future population with firm fire flow capacity storage and pressure. | New watermain | m | $1,200 | 1,600 | $1,920,000 | $192,000 | $2,112,000 |
| | | | New Elevated Tank | m3 | $14,000 | 200 | $2,800,000 | $280,000 | $3,080,000 |
| **Water Treatment System** | Water Treatment Upgrades | Treatment train upgrades to address hardness | New treatment system | LS | | 1 | $5,500,000 | $500,000 | $6,000,000 |
| **Total** | | | | | | | | | **$11,192,000** |

### 11.1.3 Wastewater System

The Coldwater wastewater treatment plant and collection system consists of works for the collection and transmission of sewage, consisting of trunk sewers, 5 sewage pumping stations and forcemains, with discharge into the Sewage Treatment Plant.

The wastewater treatment plant is in need of an expansion and an Environmental Assessment for this expansion is nearing completion. Civica consulted with the EA team to align the Master Plan forecast with the service population the EA was seeking to service. It was recommended that a servicing target of 3,750 persons be used to align the wastewater treatment capacity to the water system capacity. From a master planning perspective, this approach is reasonable, however, it is recommended to consider phasing strategies for key elements of the treatment plant to both allow for operational efficiency during the growth phase while ensuring major structural components are adequately sized to meet longer-term needs. As a design target for process and treatment systems, it is recommended to size these components based on a 20-year planning horizon (2041).

#### *11.1.3.1 Treatment Capacity*

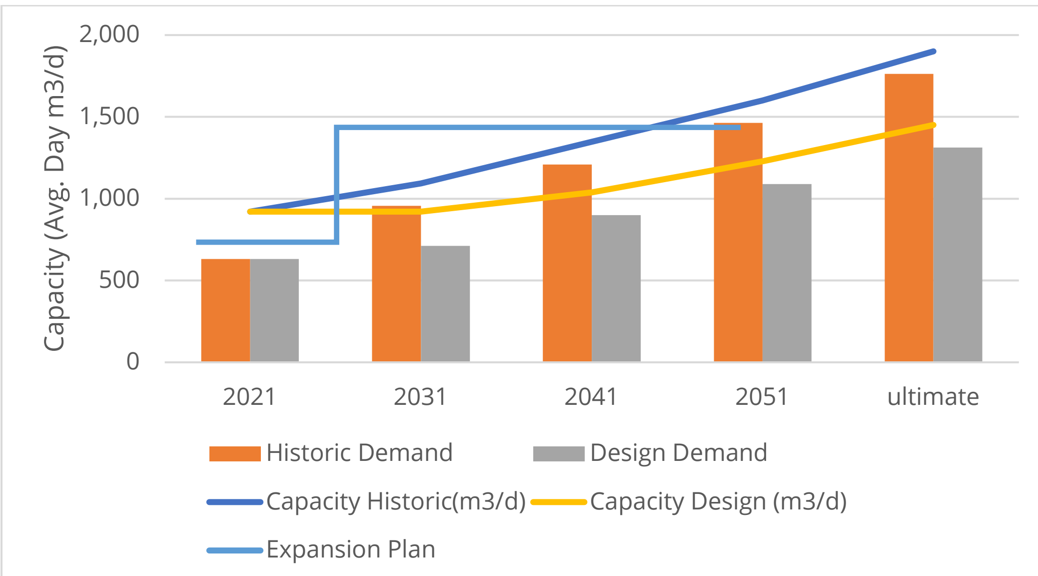
The Coldwater wastewater treatment plan has a characteristic where the actual per capita flow generation rates are higher than the design flow rates where the actual per capita flow is averaging approximately 470 l/cap/d and the design target is 350 l/cap/d. This is confirmed by existing flow records and is primarily due to high groundwater conditions and higher-than-expected inflow and infiltration rates into the collection system. This is presented in Figure 11-3.

Based on the forecast and EA currently being planned, there is a need to provide a plant expansion prior to 2031 to allow growth to proceed. The required increase in treatment capacity to 2051 is 980 $m^3$/d with an interim process treatment capacity to 2041 of 427 $m^3$/d. The following Table 11-4. The cost estimate is based on recent sewage plant expansion costs which provides a guidance cost of approximately $20,500 up to $32,000 per $m^3$ of treatment capacity. It is also noted that should a phased approach be followed, the first phase to meet 2041 demands may have a higher cost due to the potential need for ultimate civil infrastructure to be built earlier to benefit from cost efficiencies in the ultimate capacity stage of construction.

Table 11-4 Coldwater Sewage Treatment Plant Expansion Costs

| | 2021 | 2041 | Ultimate |
|---|---|---|---|
| Capacity Increase ($m^3/d$) | | 579 | 500 |
| Total Capacity ($m^3/d$) | 921 | 1,500 | 2,000 |
| Cost Estimate | | $15.0M* | $11.0M |

Figure 11-3 Coldwater Sewage Treatment Capacity Forecast




### *11.1.3.2 Collection System Capacity*

The sewage collection system and pumping stations were modelled to assess future capacity needs based on the currently proposed growth and population distribution. Based on this assessment, it was determined that the Main Sewage Pumping Station, Sturgeon Bay Road Sewage Pumping Station (Station 3), and the Anderson Line Sewage Pumping Station (Station 2) will require expansion. Additionally, the existing forcemain from the Main Sewage Pumping Station upstream of the Sewage Treatment Plan is being planned to be twinned as part of the sewage treatment plant expansion project.

For the Anderson Line Sewage Pumping Station, it is noted that there is an opportunity to incorporate the servicing of the existing homes using this pumping station and to redirect the flow to a future pumping station that will be required as part of the Anderson Line development proposal. It is recommended that this consideration be included in the subdivision approval process and that an agreement with the landowners be made to accommodate this proposal.

The sanitary network is presented in Figure 11-4 and the cost estimates are presented in Table 11-5.

#### *11.1.3.3 Evaluation Analysis of Preferred Solution*

For the wastewater treatment system, there is an urgent need for additional capacity and a project EA and design has been initiated. Although the details of that process are proceeding, estimated costs of the treatment expansion have been included in this Master Plan as a baseline. The wastewater collection system has capacity within the network however anticipated capacity constraints are identified for the Main, Sturgeon Bay and Anderson Line sewage pumping stations, as well as the forcemain to the sewage plant which is being incorporated into the treatment plant expansion design.

The proposed infrastructure has been identified to support growth and will be required in a timely manner to align with allocation commitments and community development timing. The recommended upgrades provide additional system flexibility, redundancy and integration as the additional capacity increases overall growth potential. As these are existing stations, there are limited land requirement issues. However, increases in wet-well sizing will necessitate by-pass operations or the installation adjacent to the existing system. Operation and maintenance requirements should be similar to current operations with the anticipated increase and monitoring and control through additional instrumentation.

The social and environmental benefits include ability for community growth to continue and increased capacity to address future flow increases and reduce risk of station overflow. The economic benefit is also related to community growth increasing economic activity and community vibrancy. Capital cost of the projects is directly growth related and therefore eligible for development charge funding.

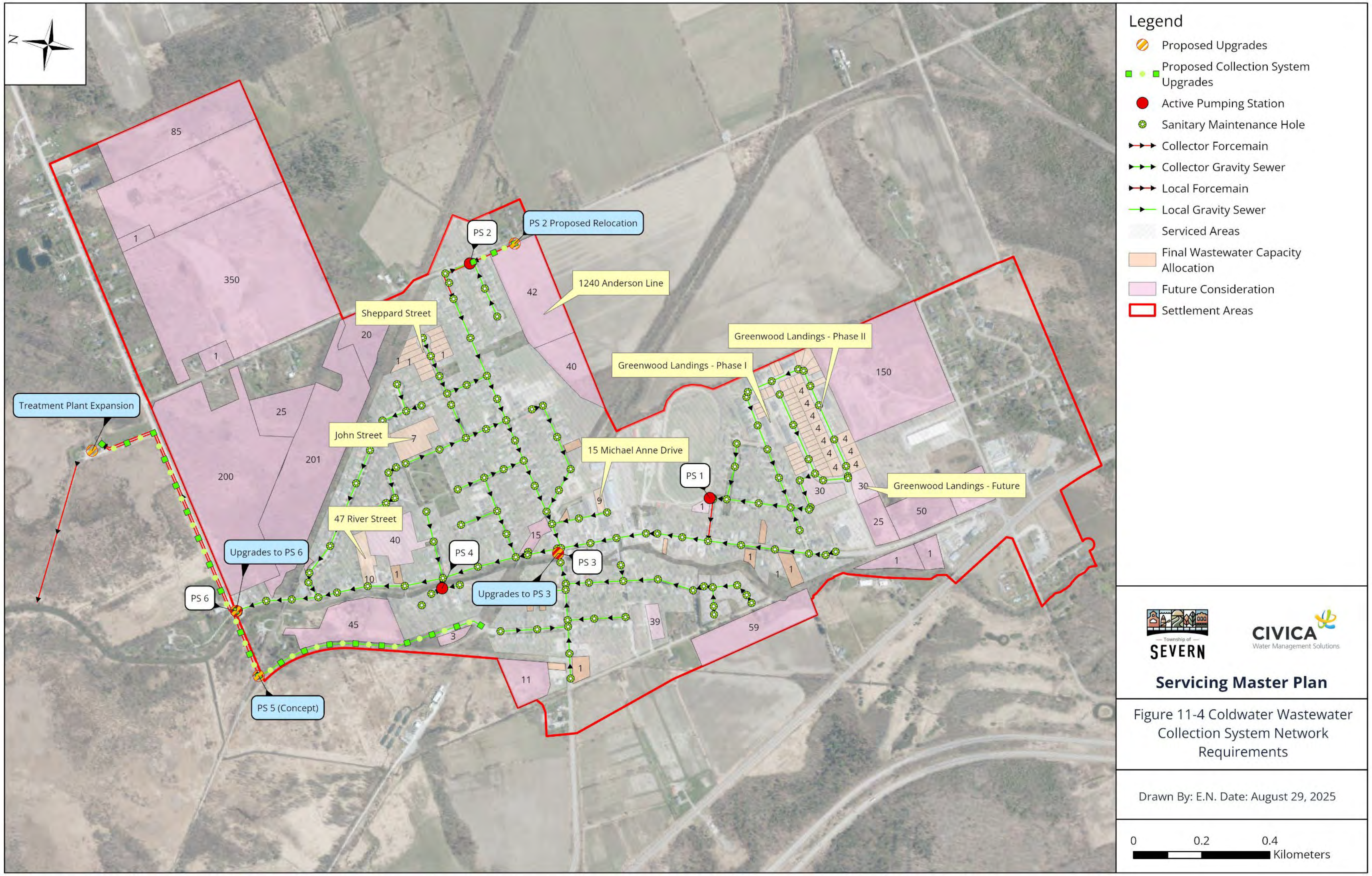



Figure 11-4 Coldwater Wastewater Collection System Network Requirements

Table 11-5 Coldwater Alternative 1 Wastewater System Capital Plan

| Alternative 1 | | | | Cost Estimate | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Description** | **Rationale** | **Infrastructure** | **Unit** | **Unit Cost** | **Quantity** | **Base** | **Contingencies (10%)** | **Budget Estimate** |
| **Wastewater Collection Systems** | Increase forcemain capacity to WWTP and allocation of funding for Pumping Station Expansion as required based on growth. | Future sewage flows will require increased capacity | Forcemain increase currently in design with WWTP upgrade (Estimate budget) | m | $1,800 | 780 | $1,400,000 | $140,000 | $1,540,000 |
| | | | Upgrade Main PS from 23 l/s to 70 l/s | LS | | 70 l/s | $2,500,000 | $250,000 | $2,750,000 |
| | | | Upgrade PS 3 station from 17 l/s to 50 l/s with infrastructure replacements | LS | | 50 l/s | $3,500,000 | $350,000 | $3,850,000 |
| | PS 3 (Sturgeon Bay pumping station) upgrade to accommodate new growth and improve existing system capacity | Existing station has capacity challenges and is in need of replacement. Assumed replacement cost to accommodate new growth expansion. | Decommission Station and redirect sewer | LS | | 1 | $300,000 | $30,000 | $330,000 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | PS 2 (at Anderson Line) to be decommissioned and flow incorporated into 1240 Anderson Line Development | Existing PS 2 station serves a small population and there is benefit to redirect flow to future station required by new development | New station with revised capacity to be provided through direct development not DC's | LS | | 1.6 L/s | $500,000 | $50,000 | $550,000 |
| | | | Anderson Line Area Collection System (future consideration) | LS | | 1 | $2,700,000 | $300,000 | $3,000,000 |
| **Wastewater Treatment Systems** | Wastewater Treatment Plant Upgrades | Capacity expansion to 1.5 MLD | First phase of expansion to accommodate growth and renewal. | m3/day | $23,000 | 579 | $13,317,000 | $1,683,000 | $15,000,000 |
| | | Capacity expansion to 2.0 MLD | Second phase of expansion leveraging pre-serviced additional extended aeration plant. | m3/day | $20,500 | 500 | $10,250,000 | $750,000 | $11,000,000 |
| **Total** | | | | | | | | | **$38,020,000** |

## 11.2 Westshore

### 11.2.1 Community Growth and Characteristics

The community of Westshore population forecast is presented in Table 11-6.

Table 11-6 Westshore Population Forecast

| | 2021 | 2031 | 2041 | 2051 |
|---|---|---|---|---|
| Demographics | | | | |
| Population | 2,749 | 4,369 | 5,449 | 5,889 |
| Residential Units | 1,018 | 1,618 | 2,018 | 2,181 |
| ICI Accounts | 20 | 21 | 21 | 21 |

As part of the SMP process, The Township identified a population of 5,889 persons by 2051 based on a growth rate of 100 persons per year and represents the highest growth rate community for the existing communities.

### 11.2.2 Water System

The Westshore water system consists of water treatment and reservoir storage on site and in combination with the wastewater treatment facilities that are located at the same site. Distribution is through the existing community with new development areas being extended from the existing infrastructure.

#### *11.2.2.1 Treatment Capacity*

The treatment plant was constructed in 2006 and water expansion will be required prior to 2031 to meet future growth demands. The current rated capacity of the water treatment plant is 2,780 m3/day. The system approvals provides each of the filtration trains are rated to treat water at rates up to 2,085 m3/day or 24.13 L/s, while each of the UV units are capable of providing the required level of disinfection at a rate of 4,170 m3/day equivalent to 48.26 L/s. As there is significant development pressure in this community it is recommended that expansion studies proceed by 2026 to ensure capacity is available when required to meet approved and pending development applications. These projects have been previously identified and are in the current Development Charges by-law. The anticipated expansion requirements within the planning period are to achieve double the current capacity.

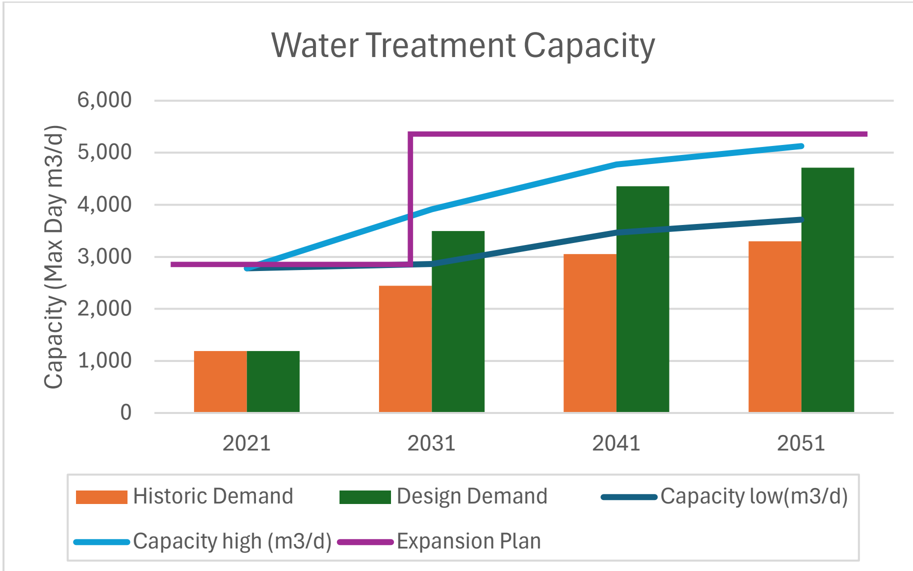



Figure 11-5 Westshore Water Treatment Capacity

### *11.2.2.2 Distribution Capacity*

The new growth areas are predominantly in the southwestern areas with some growth also available to approve in the northeastern limits of the urban area. In assessing the future demands, the system capacity is sufficient to meet current demands and fire protection requirements. However, as system demands increase in particular in the southwest area, peak demands plus fire flow requirements result in the need for a secondary feed loop as well as additional storage capacity.

In assessing the feasibility and consideration of future development areas, two servicing solutions were developed. The first solution is presented in Figure 11-6 and proposed that a ring loop be created internal to the proposed development land areas and that a new elevated tank be provided near the highway corridor to ensure supply and pressure needs for fire flow are maintained as community build out proceeds.

The alternative solution is presented in Figure 11-7 and considers a broader servicing loop that proceeds west along Stockdale Road to the western boundary limit and then south to the lake with a new elevated tank at the high elevation area near the north western limit of the urban area.

### *11.2.2.3 Evaluation Analysis of Preferred Solution*

A key consideration of developing two scenarios for this community was the potential growth impact of the special policy area located all along Highway 11 to the north limits of the urban boundary. It is recognized that the timing of these lands is most likely outside the planning horizon, however, consideration of servicing may be best included at this stage of planning and will create significant benefits in future cost containment.

The common benefits of both solutions is the increase in system flexibility, redundancy and integration where current pressure constraints in the south area will only become more critical as growth in that area continues. By proceeding with a secondary loop, the system resilience and long term service level will be maintained and reduce any further constraints for development approvals.

The constructability is reasonably typical with the requirement for tunneling or microboring under the highway corridor. However, there may be cost efficiencies if this construction is coordinated with the preferred wastewater servicing solution in the next section.

The social and environmental benefits relate to providing sufficient capacity to meet the growth demand in a timely manner and to allow for future development applications within this service corridor to proceed without servicing constraints related to transmission capacity.

The economic benefit is supported based on the growth demands. It is noted that the urban perimeter alternative 2 is significantly more infrastructure in the initial phase, however it is believed that the long term benefit of this route will outweigh the short term investment needed to complete the project.

Figure 11-6 Westshore Water Supply System Network Alternative 1

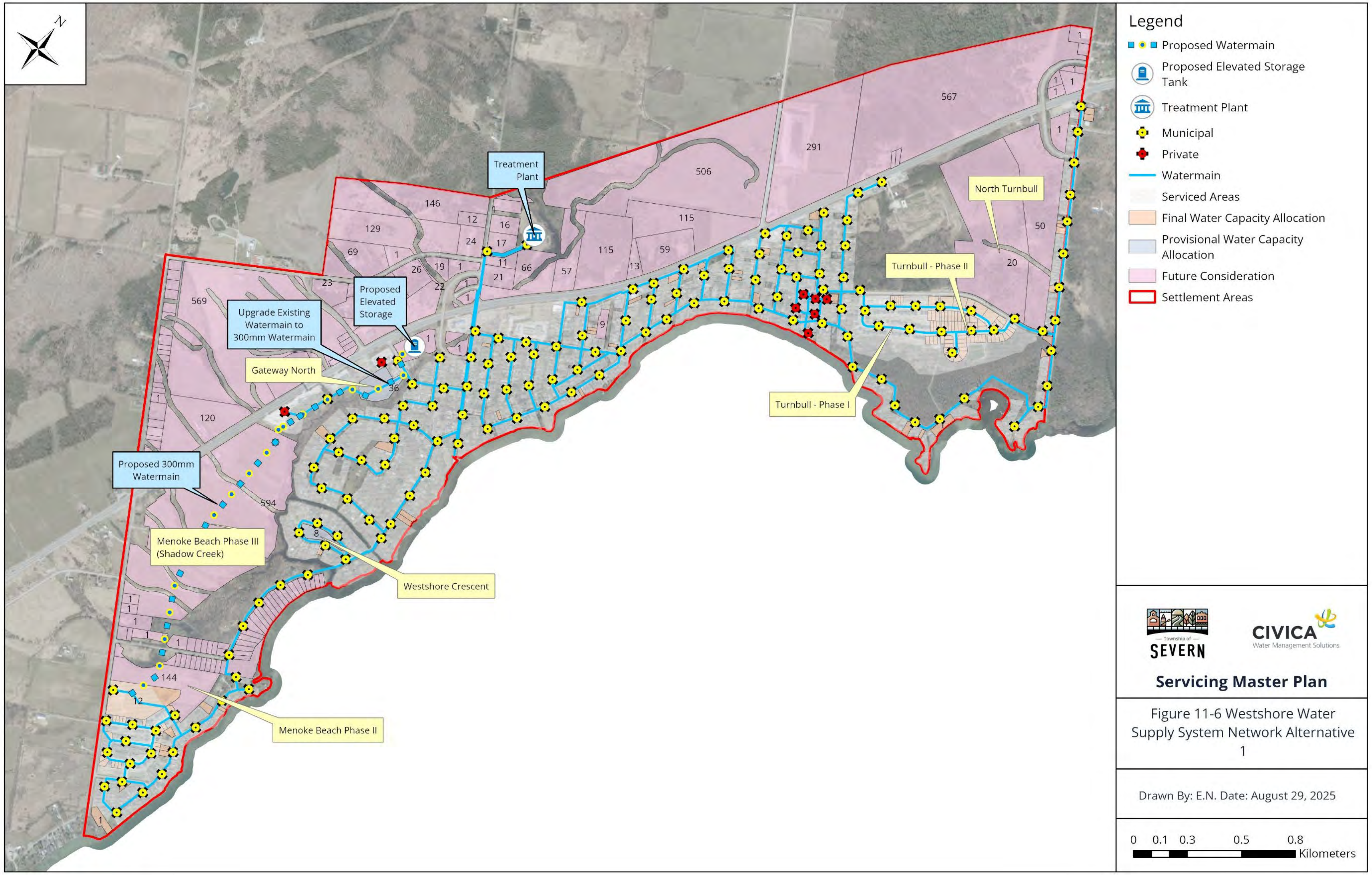


Figure 11-7 Westshore Water Supply System Network Alternative 2

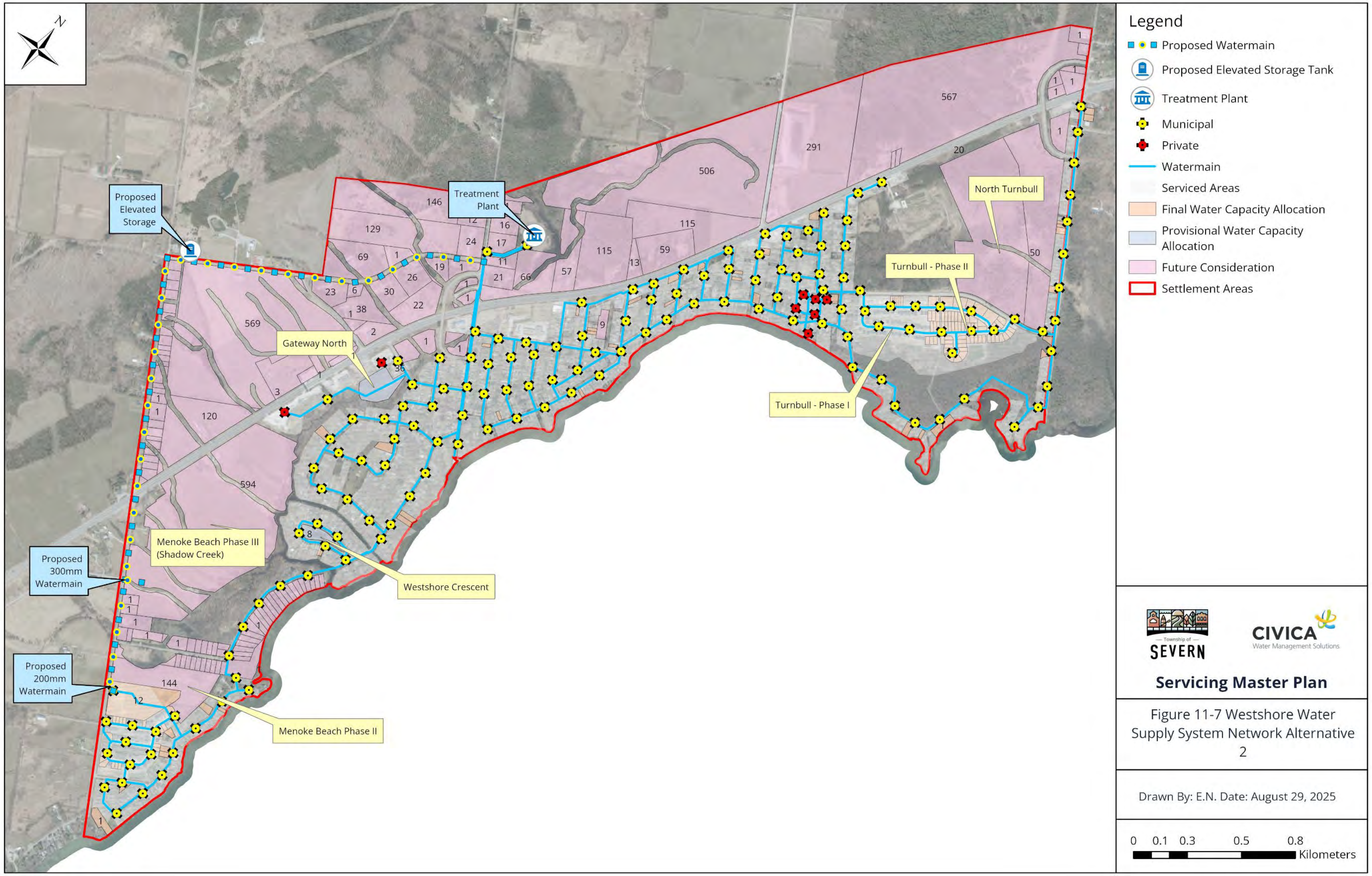


Table 11-7 Westshore Alternatives 1 and 2 Water System Capital Plan

| Alternative 1 | | | | Cost Estimate | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Description** | **Rationale** | **Infrastructure** | **Unit** | **Unit Cost** | **Quantity** | **Base** | **Contingencies (10%)** | **Budget Estimate** |
| **Water Distribution System** | 300mm Ring loop from Bayou and Grand Tamarack Cres | As part of LIV development need to provide 300mm or greater capacity to connect from Bayou at Tamarack Cres to Wood Ave (or equivalent) | Upsize Grand Tamarack Cres from 200 to 300 | m | $1,200 | 300 | $360,000 | $36,000 | $396,000 |
| | | | Upsize from Grand Tamarack at take off to Weber's to reach LIV development | m | $1,200 | 500 | $600,000 | $60,000 | $660,000 |
| | Future Ring Loop for Goldstein Rd (identified as internal to development and not shown on figure) | To increase supply for fire protection on Goldstein via future development north of Turnbull Dr. | To be included with future development servicing | | | | | | |
| **Total** | | | | | | | | | **$1,056,000** |

| Alternative 2 | | | | **Cost Estimate** | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Description** | **Rationale** | **Infrastructure** | **Unit** | **Unit Cost** | **Quantity** | **Base** | **Contingencies (10%)** | **Budget Estimate** |
| **Water Distribution System** | 300mm Ring loop along Menoke Beach Rd from Couchiching Ave to Stockdale Rd and to Plant. | Provide supply to lower area to meet future fire flow needs and provide redundancy of supply. | New 300 mm watermain | m | $1,200 | 4,000 | $4,800,000 | $480,000 | $5,280,000 |
| | Future Ring Loop for Goldstein Rd | To increase supply for fire protection on Goldstein via future development north of Turnbull Dr. | To be included with future development servicing | | | | | | |
| **Total** | | | | | | | | | **$5,280,000** |

No Alternatives **Cost Estimate**

| | Description | Rationale | Infrastructure | Unit | Unit Cost | Quantity | Base | Contingencies (10%) | Budget Estimate |
|---|---|---|---|---|---|---|---|---|---|
| **Water Treatment System** | Westshore Treatment Plant Expansion | Treatment plant capacity expansion required to satisfy growth to 2051 | Water Treatment Facility | m3/day | $4,250 | 2,780 | $11,815,000 | $1,185,000 | $13,000,000 |
| | | Required for storage volumes at the target population | New Elevated Tank | m3 | $18,000 | 200 | $3,600,000 | $400,000 | $4,000,000 |
| **Total** | | | | | | | | | **$17,000,000** |

### 11.2.3 Wastewater System

The Westshore Wastewater Treatment and Collection System consists of works for the collection and transmission of sewage, consisting of trunk sewers, pumping stations and forcemains, with discharge into the wastewater treatment plant located on the same site as the water treatment plant.

#### *11.2.3.1 Treatment Capacity*

The wastewater treatment plant was constructed in 2006 and capacity expansion will be required before 2031 to meet future growth demands. As there is significant development pressure in this community it is recommended that expansion studies proceed by 2026 to ensure capacity is available when required to meet approved and pending development applications. These projects have been previously identified and are in the current Development Charges by-law.

In addition to long-term expansion needs, a recent process capacity assessment identified imminent optimization requirements necessary to restore the plant's rated capacity and maintain reliable performance at current and near-term flows. These include upgrading the headworks system, constructing a 1,000 $m^3$ plant influent equalization (EQ) tank to flatten diurnal peaks and stabilize SBR operation, associated headworks sewage pumping station, and increasing filter feed pump capacity by installing variable frequency drives (VFDs) with a new control algorithm for continuous filter operation. Other immediate measures include recalibration of SBR level and pressure transducers to restore decant capacity, consideration of overflow pipe elevation adjustments if required, and operational strategies such as increasing MLSS during cold-weather maximum month flows.

Further upgrades are also identified for the medium term to fully realize plant capacity, including SBR blower capacity improvements, increased phosphorus dosing pump capacity, and installation of a mechanical thickener with dedicated biosolid storage in the existing sludge holding tanks. While the UV disinfection system and sludge stabilization processes are appropriately sized and performing well, the firm capacity of the filtration system (41.25 L/s with one unit out of service under MECP guidelines) and the phosphorus dosing pumps require re-evaluation once the EQ tank is in place.

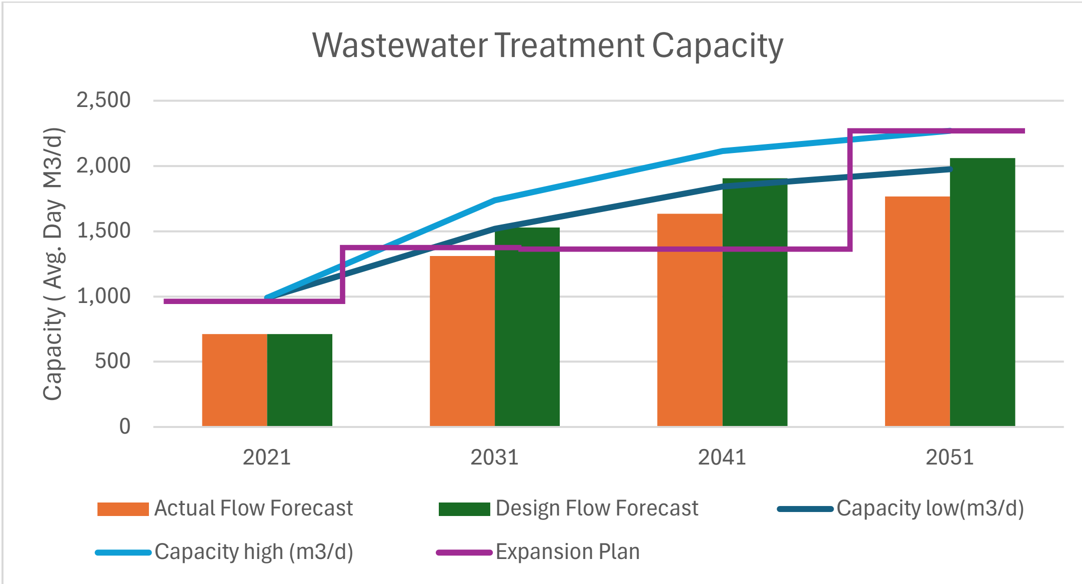



Figure 11-8 Westshore Wastewater Treatment Capacity

### *11.2.3.2 Collection System Capacity*

The Township of Severn's sewage collection systems in Westshore operate under a Consolidated Linear Environmental Compliance Approval (ECA). However, several components of the system do not align with real-world conditions, leading to challenges in meeting performance objectives.

Design assumptions, such as expected flows and infiltration rates, have proven inaccurate. Components like the Lakeside Drive and Bramshott Pumping Stations experience flow patterns that differ from ECA parameters. It is a recommendation of this Master Plan to Request for Revised ECA Schedule and submit a request to the MECP for a revised performance schedule.

Similar to the water system analysis, the Shadow Creek LIV community development lands pose the most significant servicing need and impact in addition to the other pending developments in this southwest area of the urban boundary. As well similar to the water system, two alternatives were evaluated being an internal routing and expansion of existing infrastructure within the existing community presented in Figure 11-9, and an external ring route that follows the western urban area boundary and along Stockdale Road. A pumping station from the LIV site that accommodates internal servicing needs will be required to transmit sewage to Stockdale Road where gravity sewer may be possible as presented in Figure 11-10. This alternative also considered a diversion of sewage from PS 1 to alleviate capacity constraints within the existing infrastructure network downstream.

#### *11.2.3.3 Evaluation Analysis of Preferred Solution*

Key considerations for the wastewater servicing alternatives evaluated was the potential future servicing of the special policy area located all along Highway 11 to the north limits of the urban boundary, and the significant disruption to the existing communities should upsizing of infrastructure along the existing servicing routes be undertaken. It is also recognized that the timing of these special policy lands are most likely outside the planning horizon, however, consideration of servicing may be best included at this stage of planning and will create significant benefits in future cost containment.

The common benefits of both solutions is providing the additional transmission capacity to the growth areas of the community in the southwest quadrant area. There is also a significant community and environmental benefit in prioritizing alternative 2 as this will minimize disruption of the existing community, provide for potential future servicing of the special policy lands for an interim period of approvals are accelerated, and creates a secondary servicing corridor that provides some redundancy and risk mitigation through the additional servicing corridor along the urban boundary.

The preference to alternative 2 is the increase in system flexibility, redundancy and integration where capacity constraints in the south area will require disruption of existing communities. By proceeding with the urban boundary corridor, the system will be more resilient and long term service levels will be maintained with more options for meeting future servicing needs.

The constructability is reasonably typical with the requirement for tunneling or microboring under the highway corridor. However, there may be cost efficiencies if this construction is coordinated with the preferred water servicing solution in the previous section.

The social and environmental benefits relate to providing sufficient capacity to meet the growth demand in a timely manner and to allow for future development applications within this service corridor to proceed without servicing constraints related to transmission capacity.

The economic benefit is supported based on the growth demands. It is noted that the urban perimeter alternative 2 is significantly more infrastructure in the initial phase, however it is believed that the long term benefit of this route will outweigh the short term investment needed to complete the project.

Figure 11-9 Westshore Wastewater Collection System Network Alternative 1

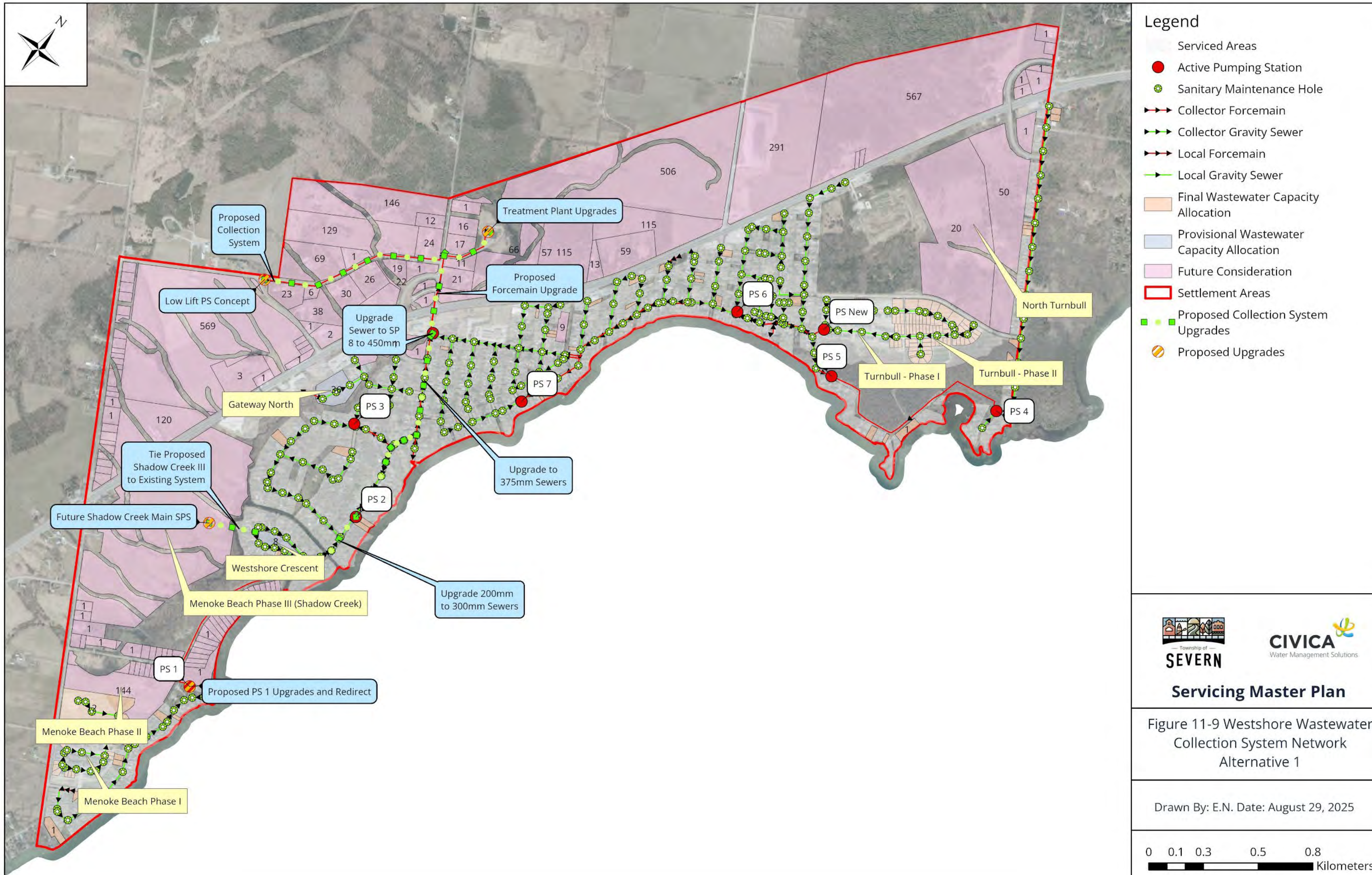


Figure 11-10 Westshore Wastewater Collection System Network Alternative 2

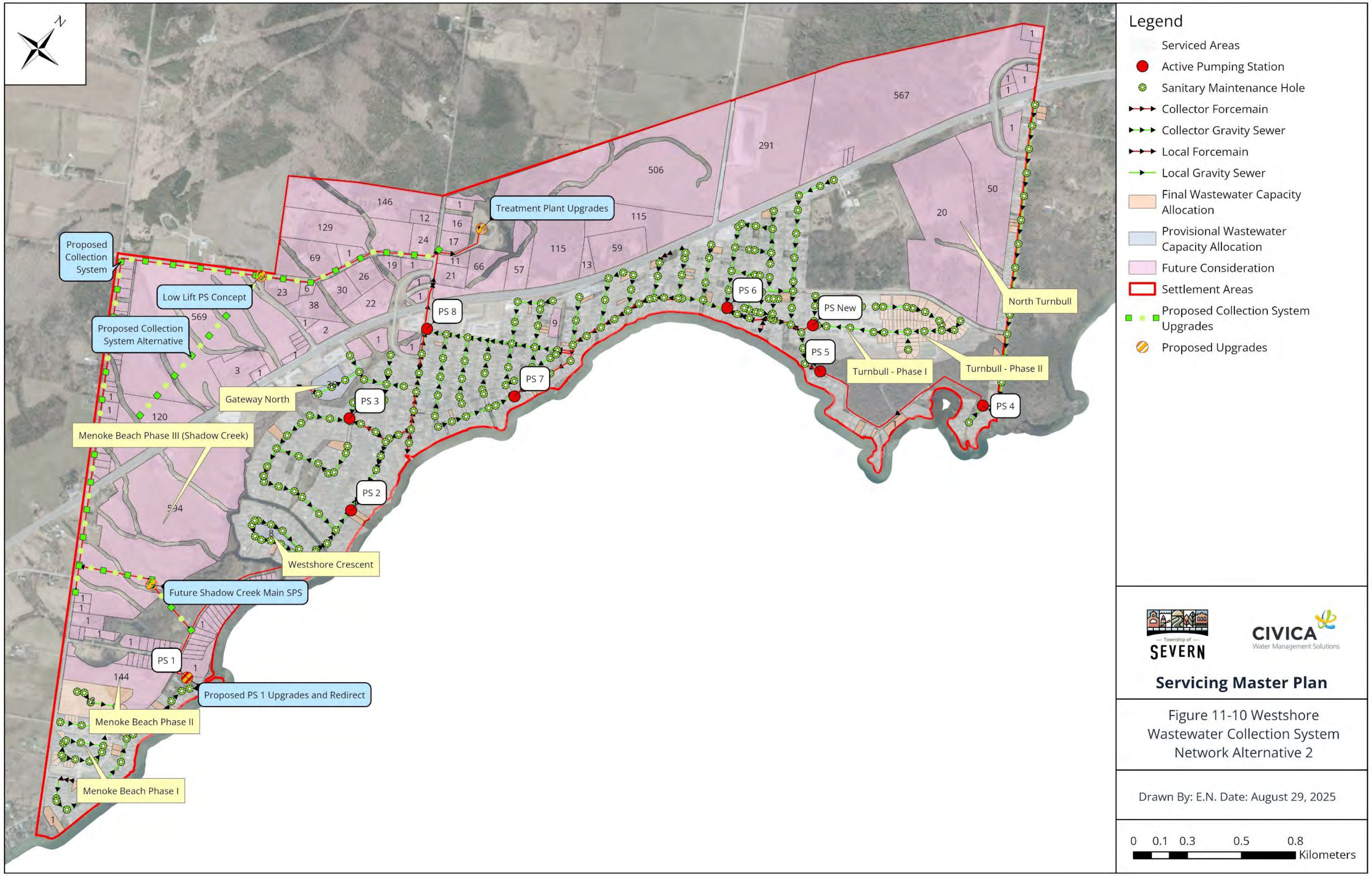


Table 11-8 Westshore Alternatives 1 and 2 Wastewater System Capital Plan

| Alternative 1 | | | | Cost Estimate | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Description** | **Rationale** | **Infrastructure** | **Unit** | **Unit Cost** | **Quantity** | **Base** | **Contingencies (10%)** | **Budget Estimate** |
| **Wastewater Collection Systems** | Service Shadow Creek internally | Leverage existing network were available and upsized sections as needed. Impact of significant upsizing evident in the alternative | PS2 Gravity sewer section upgrade from 250mm to 300 mm | m | $1,800 | 330 | $594,000 | $59,400 | $653,400 |
| | | | Upgrade PS 2 station from 17 l/s to 39 l/s | LS | | 1 | $600,000 | $60,000 | $660,000 |
| | | | Upgrade PS 2 forcemain from 150 mm to 250 mm | m | $1,800 | 500 | $900,000 | $90,000 | $990,000 |
| | | | Upgrade sewer along Bayou from 250 mm to 375 mm | m | $2,500 | 460 | $1,150,000 | $115,000 | $1,265,000 |
| | | | Upgrade PS 8 from 44 l/s to 82 l/s | LS | | 1 | $3,400,000 | $340,000 | $3,740,000 |
| | | | Upgrade PS 8 forcemain from 250 mm to 350 mm | m | $3,300 | 600 | $1,980,000 | $198,000 | $2,178,000 |
| **Total** | | | | | | | | | **$9,486,400** |

| Alternative 2 | | | | Cost Estimate | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Description** | **Rationale** | **Infrastructure** | **Unit** | **Unit Cost** | **Quantity** | **Base** | **Contingencies (10%)** | **Budget Estimate** |
| **Wastewater Collection Systems** | Redirect PS 1 from discharge to PS2 to discharge to new LIV Shadow Creek PS | leverage alternate flow route to treatment plant to relieve future capacity constraints at Main pumping station (PS1 peak flow of 15 l/s, Shadow Creek peak flow of 32 l/s) | 150 mm forcemain Twin from PS1 | m | $1,400 | 600 | $840,000 | $84,000 | $924,000 |
| | | | New Shadow Creek PS 50 l/s | LS | | 1 | $3,538,000 | $353,800 | $3,891,800 |
| | | | New twin 250 mm forcemain with hwy crossing to Stockdale | m | $2,000 | 2,000 | $4,000,000 | $400,000 | $4,400,000 |
| | | | New Gravity Sewer to treatment plant 375mm | m | $1,200 | 1,800 | $2,160,000 | $216,000 | $2,376,000 |
| **Total** | | | | | | | | | **$11,591,800** |

| No Alternatives | | | | **Cost Estimate** | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Description** | **Rationale** | **Infrastructure** | **Unit** | **Unit Cost** | **Quantity** | **Base** | **Contingencies (10%)** | **Budget Estimate** |
| **Wastewater Collection Systems** | Pumping Station 1 Upgrade | New capacity required to service Menoke Phase 2 | Pumping Station | LS | | 1 | $450,000 | $50,000 | $500,000 |
| **Wastewater Treatment Systems** | Westshore Plant Process Optimization and EQ Tank / Inlet Works | New EQ capacity to relieve capacity constraints at the plant. | EQ Tank | M3 | $2,700 | 1,000 | $2,700,000 | $300,000 | $3,000,000 |
| | | | Inlet Works | LS | | 1 | $1,800,000 | $200,000 | $2,000,000 |
| | | | Low lift station at treatment plant (50l/s) | LS | | 1 | $2,500,000 | $250,000 | $2,750,000 |
| | Westshore Treatment Plant Expansion | Capacity expansion to 2.27 MLD | Additional SBR and associated treatment processes | M3/day | $20,500 | 880 | $18,040,000 | $1,960,000 | $20,000,000 |
| **Total** | | | | | | | | | **$28,250,000** |

## 11.3 South of Division Road Secondary Plan

### 11.3.1 Community Growth and Characteristics

The South of Division Road Secondary Plan population forecast is presented in Table 11-9.

Table 11-9 South of Division Road Secondary Plan Population Forecast

| | 2021 | 2031 | 2041 | 2051 |
|---|---|---|---|---|
| Demographics | | | | |
| Population | 0 | 2,160 | 3,510 | 4,050 |
| Residential Units | 0 | 800 | 1,300 | 1,500 |
| ICI Accounts | 0 | 0 | 0 | 0 |

Although these lands are currently within Severn Township, they have been the subject of a boundary expansion study being conducted by the City of Orillia. The subject lands as currently identified within Township planning policy is presented in Figure 11-11. The City of Orillia extent of the boundary expansion that also includes the lands within Severn are presented in Figure 11-12. The process for these studies have been ongoing for some time resulting in delay in planning decisions related to servicing and ultimate community planning.

Although the City of Orillia has sufficient lands to accommodate growth to 2030, there is a need to expand the land area to meet provincial targets for the 30 year horizon to 2051. The most recent City of Orillia public consultation was completed on June 20, 2023 with no further details available as the timing of next steps. The next step is noted to be confirmation of Council direction on the level of development intensification and the resulting additional land required to complete the boundary expansion.

It is also known that development proposals for these lands have been ongoing for some time. Significant questions that remain unresolved include water and wastewater servicing solutions. As there remains uncertainty as to the status of much of these lands, final planning direction and servicing strategies remain unclear as options to incorporate the servicing needs into existing services in Orillia is a viable direction if boundary expansion occurs.

It is therefore recommended that future servicing consideration be evaluated once final boundary expansion decisions are made such that there is appropriate alignment between municipal status and municipal specific servicing solutions that may emerge from the final boundary location.

Figure 11-11 South of Division Road Secondary Plan (Official Plan Schedule D)

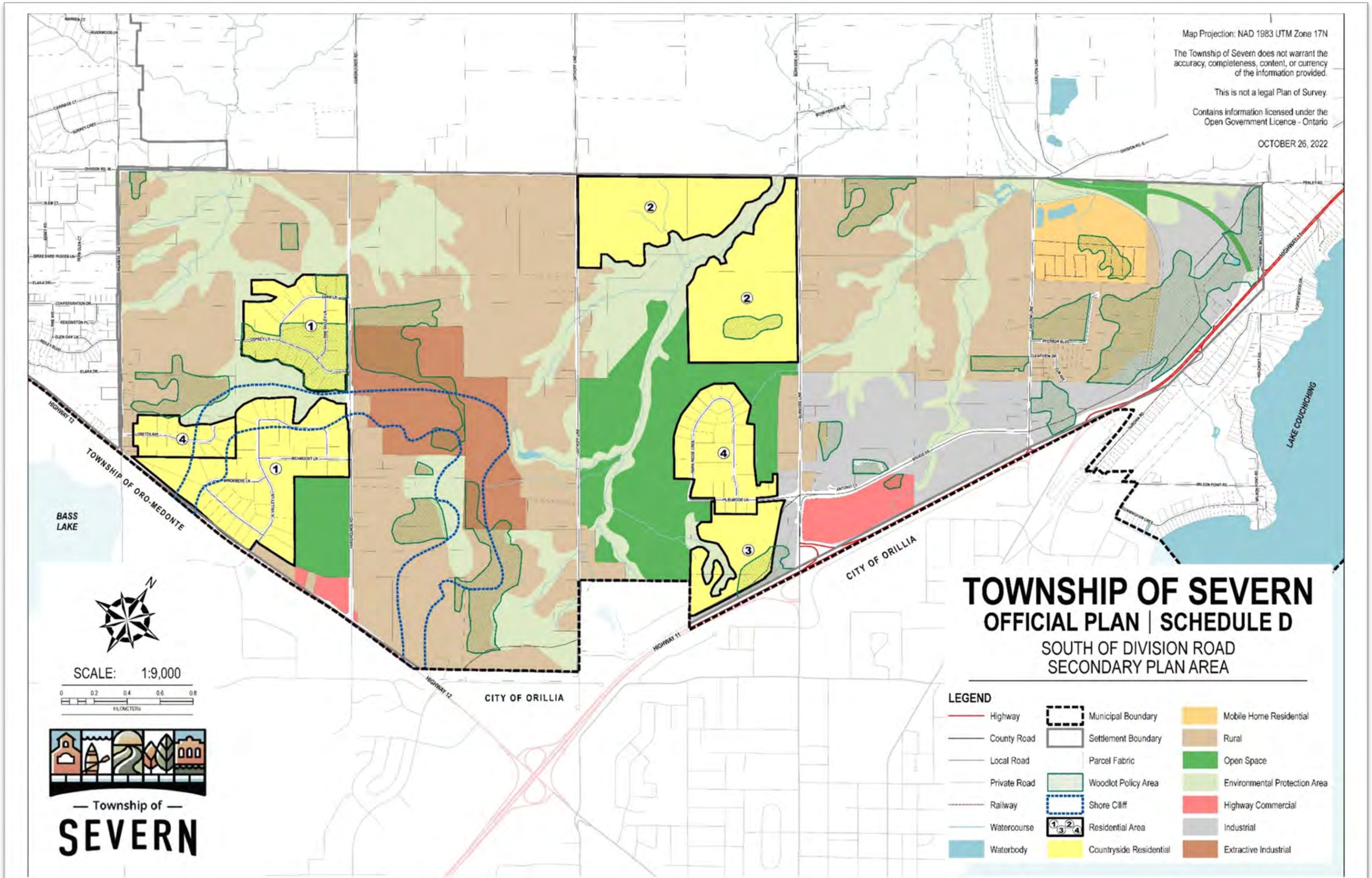


Figure 11-12 City of Orillia Settlement Boundary Expansion

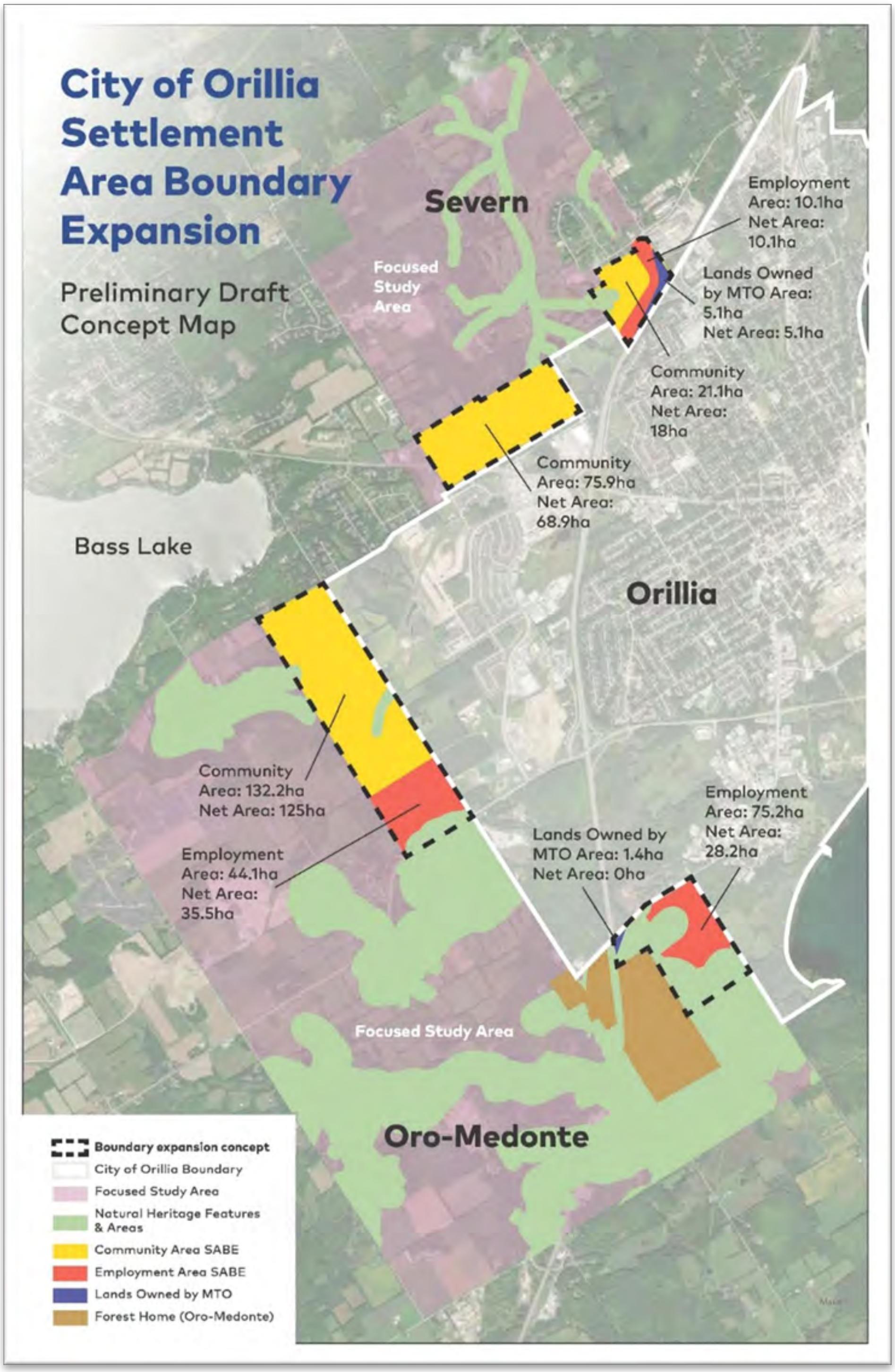
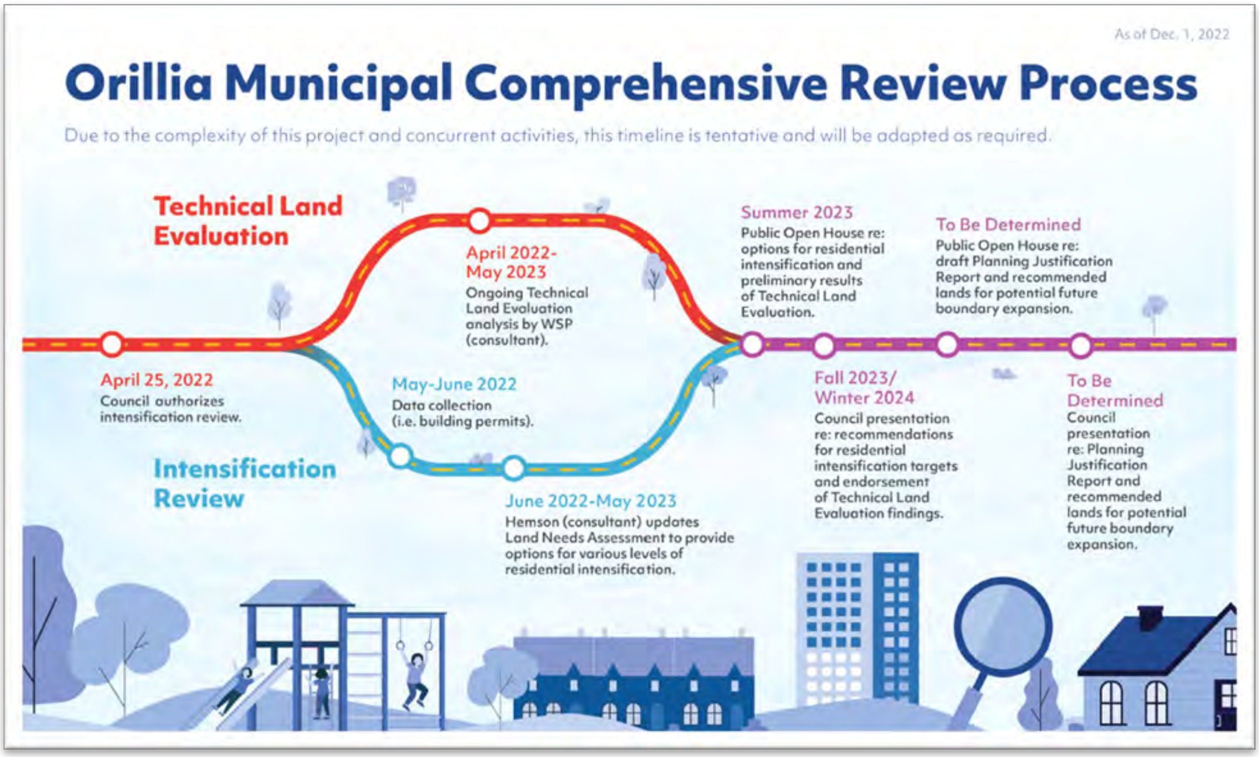


Figure 11-13 City of Orillia Expansion Process Schedule




## 11.4 Communities with No Additional Growth

The following communities were reviewed for current and future servicing needs as these areas are serviced by communal systems operated by the Township. These are Bass Lake, Severn Estates, Sandcastle Estates, and Washago.

### 11.4.1 Community Growth and Characteristics

The community populations for these areas are presented in Table 11-10.

Table 11-10 Non-Growth Community Areas Population

| | 2021 | 2031 | 2041 | 2051 |
|---|---|---|---|---|
| Demographics | | | | |
| Bass Lake | 404 | 404 | 404 | 404 |
| Severn Estates | 63 | 63 | 63 | 63 |
| Sandcastle Estates | 163 | 163 | 163 | 163 |
| Washago | 304 | 304 | 304 | 304 |

These communities are serviced with municipal water supply and private sewage septic systems. As the forecast for these communities is for no additional growth, there is no impact to the current servicing supply.

It is however noted that Washago is the only community that has some vacant lands available for growth were there is nominal opportunity for commercial development as well as several vacant lots. This system has been evaluated to confirm system needs for servicing the community with full build out.

### 11.4.2 Washago Water System

The existing water system for Washago consists of a surface water treatment plant and distribution system.

#### *11.4.2.1 Treatment Capacity*

The treatment capacity of the water production system is 544 $m^3$/d as shown in Figure 11-14 which is sufficient to meet the long-term needs of the community even when considering the potential infill that remains to be completed.

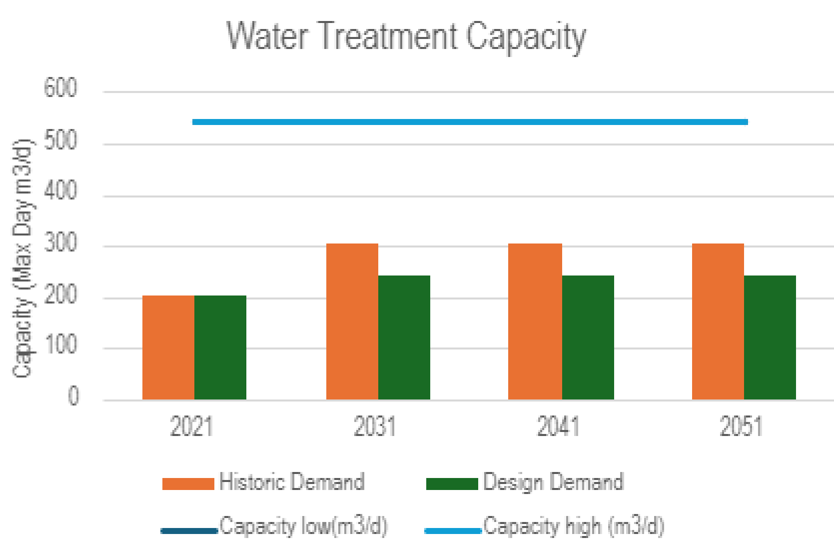



Figure 11-14 Washago Water Treatment Capacity

#### *11.4.2.2 Water Distribution Capacity*

The distribution system is shown in Figure 11-15 and was evaluated to confirm the current capacity and additional potential demands of the undeveloped lands in the service area. The recommendation for additional connectivity is to complete a loop around the Hamilton Street commercial area should additional development occur.

#### *11.4.2.3 Evaluation Analysis of Preferred Solution*

For the water production system, there is sufficient supply to meet demands to 2051 therefore resulting in no need for expansion in the near future. Storage capacity is sufficient for 2051 however will be required and will be triggered should the lands in the northeast section when the urban boundary proceed.

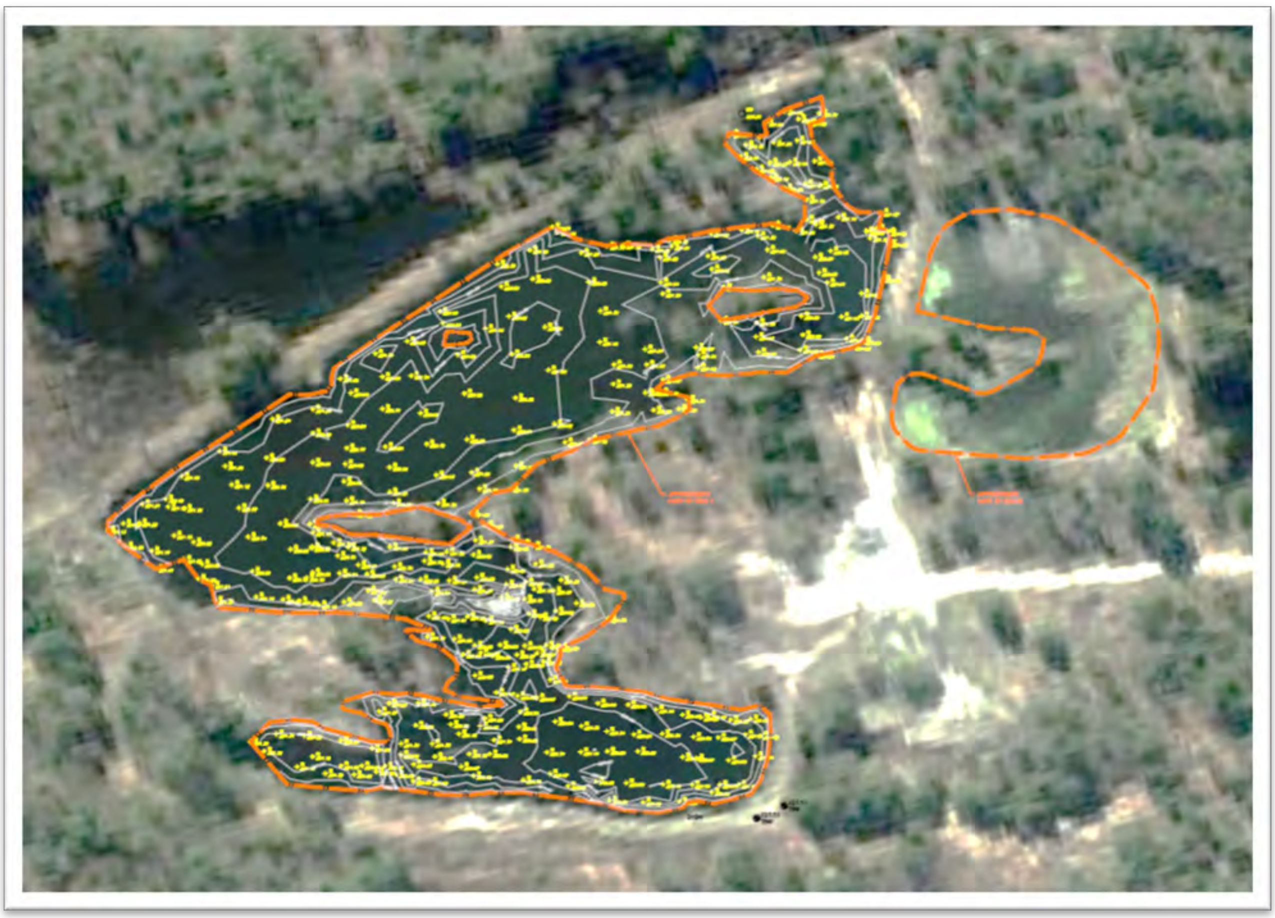
The proposed infrastructure has been identified to follow existing or future anticipated rights of way that will avoid private easement agreements or other non-standard infrastructure requirements for approval and construction. It is also expected that these works will be constructed as part of a larger subdivision plan, or identified and delivered through a consolidated servicing plan that will be initiated to service the first approvals in the area. The constructability is expected to be through conventional open-cut methods with limited risk of tunnelling or other more difficult installation methods. There are limited alignment alternatives due to the nature of the existing system configuration and the need to service lands outside the current network infrastructure. Therefore, the identified routing is preferred as the most efficient and effective in providing long-term servicing.


Figure 11-15 Washago Water Distribution System Network Alternative 1

### 11.4.3 Washago Wastewater System

The Washago Wastewater Treatment and Collection System consist of a 4.77 hectare dual-cell facultative lagoon and local collection sewers and related pumping stations. The system was constructed in 1985 and has not required significant maintenance for almost 40 years.

In 2019, Severn retained Tatham Engineering to perform a topographic survey of Cell #1 (Discharge Cell) in order to estimate the depth and volume of sludge in the bottom of the cell. The volume between these surfaces at approximately 10,200 m3, with an average depth of approximately 0.3 m (based on an area of approximately 28,100 m2). In 2024, Severn retained AHYDTECH Geomorphic to perform the sludge depth survey. At the time of this report, the findings are not available to compare the sludge accumulation.



#### *11.4.3.1 Treatment Capacity*

The lagoon capacity is limited to 81,900 $m^3$ annual total flow and the current and design demands are presented in Figure 11-16. There is no available area to expand treatment capacity of the lagoon system on the current site. Further, although the lagoon treatment levels are within operating and discharge parameters, further improvements in quality and quantity capacity will most likely require a mechanical treatment system. As this community is only anticipating limited growth, the cost to replace the lagoon systems with a mechanical plant is not feasible for the size of the community and is not recommended at this time. Assuming a mechanical plant treatment cost of $32,000 per $m^3$, replacement of the existing system for an average daily design flow of 225 m3/d would be $7,200,000 excluding site selection, land costs (should the preferred site be alternate to the current lagoon location).

As there is no requirement for modification or expansion of the existing lagoons, there is therefore no recommended upgrade projects.

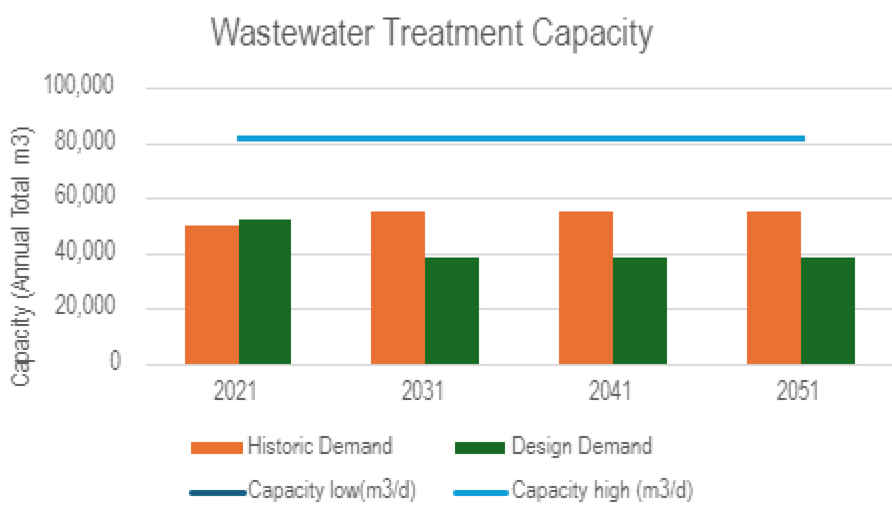



Figure 11-16 Washago Wastewater Treatment Capacity

#### *11.4.3.2 Collection System Capacity*

The sanitary collection and pumping station system capacity is shown in Figure 11-17 and is sufficient to meet the current and infill demands of the community. There are no recommended network additions that are the responsibility of the Township. However, due to grading constraints, any commercial development proposed in the Hamilton Street area will require ejector pumping to transmit sewage to the nearby gravity collection system.

#### *11.4.3.3 Evaluation Analysis of Preferred Solution*

For the water production system, there is sufficient supply to meet demands to 2051 therefore resulting in no need for expansion in the near future. Storage capacity is sufficient to 2051.

To maintain optimal performance and ensure environmental compliance, it is recommended to implement best management practices from the FCM guide on lagoon optimization. These recommendations include routine monitoring, future aeration improvements, and planned sludge removal, with a non-routine assessments to mitigating risks such as short-circuiting and odours.

Lagoon Optimization Plan

Conduct bathymetric surveys every 5 years to measure sludge accumulation and assess treatment capacity. Severn has completed study in 2019 and in 2024; with the next planned survey in 2029. The cost per study is approximately $15,000. In the 1-5 year range, use Rhodamine WT dye testing to trace short-circuiting within the lagoon and optimize flow patterns.

Perform desludging operations if surveys indicate critical accumulation (typically, every 10-15 years) Sludge removal will restore capacity and improve treatment efficiency of the facultative process (both aerobic and anaerobic decomposition).

Explore aeration systems to enhance oxygen levels, especially during winter months and periods of high organic loading. Aeration will improve effluent quality, reduce odour emissions, and support biological treatment processes. This is often used in ponds that experience higher than intended BOD loadings however requires additional pond depth and mechanical systems upgrades in the cell upstream of the primary lagoon.

Monitor effluent quality and visual appearance / odours. Ensure regular inspections during seasonal changes to anticipate and mitigate issues. Ensure all activities comply with MECP guidelines and are included in the Township's annual environmental compliance reports.

A scheduled approach minimizes operational disruptions and defers costly infrastructure replacements. The proposed 10-year maintenance plan for the Washago wastewater lagoon incorporates FCM best practices and focuses on monitoring and sludge management to ensure continued performance. Process enhancements should be explored if the performance of the process degrades or higher than intended loadings are being generated by the community, i.e. introduction of aeration process or reactive use of suspended solids settlement chemicals (ALUM dosing), By following this schedule, the Township can maintain treatment capacity, control odours, and meet provincial compliance standards efficiently and sustainably. The proposed 10-Year maintenance cost estimate is $695,000.


Figure 11-17 Washago Wastewater Collection System Network Alternative 1

Table 11-11 Washago Alternatives 1 Water and Wastewater System Capital Plan

| Alternative 1 | | | | Cost Estimate | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Description** | **Rationale** | **Infrastructure** | **Unit** | **Unit Cost** | **Quantity** | **Base** | **Contingencies (10%)** | **Budget Estimate** |
| **Water System** | Proposed 200 mm watermain to complete reliable supple if future development occurs in planning horizon | Servicing will be required where future demands are realized for fire flow and reliability of service supply | New watermain | m | $1,200 | 240 | $288,000 | $28,800 | $316,800 |
| **Total** | | | | | | | | | $316,800 |

| Alternative 1 | | | | Cost Estimate | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Description** | **Rationale** | **Infrastructure** | **Unit** | **Unit Cost** | **Quantity** | **Base** | **Contingencies (10%)** | **Budget Estimate** |
| **Wastewater Systems** | Hamilton Street Commercial area private low pressure sanitary pumping | Due to grades, future development will be required to provide low pressure sewage pumping to allow for discharge to existing gravity sewers. | By development | | | | | | |
| **Total** | | | | | | | | | **$0** |

## 11.5 Rural Area

### 11.5.1 Community Growth and Characteristics

The rural areas are the majority of the land coverage and include all the land uses noted in the official plan, where residential land use is permitted, there remains potential for further development where servicing is privately provided for water and wastewater needs. The population forecast for rural areas where development can occur is presented in Table 11-12.

Table 11-12 Rural Area Population Forecast

| | 2021 | 2031 | 2041 | 2051 |
|---|---|---|---|---|
| Demographics | | | | |
| Population | 9,400 | 9,879 | 10,383 | 10,913 |
| Residential Units | 5,222 | 5,489 | 5,768 | 6,063 |

The annual growth rate for the rural areas was assumed to be 1.8 percent per year which is an average increase of 50 persons or approximately 28 units per year.

The average historic growth for the Township has been approximately 80 units per year. As there is anticipated to be much more significant growth in the urban areas, the impact of growth variations in the rural areas is not anticipated to create significant demand for municipal support beyond what has historically provided.

As servicing is private for these properties, no further consideration is given in the Master Plan.

### 11.5.2 Septage Receiving and Biosolids Management

The Township has approximately 5,222 properties serviced by private septic systems, with projections estimating over 6,000 by 2051. While septic system maintenance is the responsibility of individual homeowners, the safe and sustainable management of biosolids (septage and hauled sewage) is a critical servicing issue with regional implications.

Severn has generally relied on the City of Orillia's Wastewater Treatment Centre (WWTC) for septage receiving. This long-standing, informal arrangement is governed by Orillia's general Hauled Sewage Policy, which allows acceptance from area municipalities. However, Orillia does not offer individual municipal agreements, and reserves the right to limit access during capacity or operational constraints. Despite these limitations, Orillia continues to play a central role in servicing the rural portions of Severn. The total septage for 2023 at Orillia's WWTC from all sources was 22,241 m3; this was approximately 0.4% of the total flow for the year (Source: Council Information Package). From the *County of Simcoe Septage and landfill leachate disposal feasibility study*, the Septage Acceptance Potential is estimated to be 32,850 m3 per year. The study also notes that the City of Orillia was in process of feasibility study for the addition of a septage equalization tank to increase septage handling capability at the time of the report. Currently, the Orillia facility (James St. W. station) operates 24/7 with a secure access system. The cost for septage disposal, as of March 1, 2025, is $34.35 per cubic metre.

For the northwestern areas of the Township, proximity to the Town of Midland presents another potential source for septage receiving. In 2025, Midland and Tiny Township jointly secured $3.6 million in provincial funding to construct a new septage receiving facility at the Midland WWTP. This intermunicipal success illustrates a viable model for regional collaboration in servicing rural growth. The County of Simcoe study estimated the Midland WWTP to have a Septage Acceptance Potential of 48,180 m3 per year.

Severn's own wastewater treatment infrastructure is not presently suitable for septage receiving. Coldwater and Westshore operate using aerobic systems (extended aeration and sequencing batch reactors), which are vulnerable to pH disruption, anaerobic microorganisms, and odorous compounds found in septage. The Washago Lagoon is at capacity and cannot accept additional loadings. Staff Reports from 2016 confirm that septage could destabilize these facilities, resulting in effluent non-compliance.

In Severn, future plant expansions may offer limited opportunities. The Coldwater WWTP may include septage receiving in its next expansion, with capacity estimated at no more than 20:1 Ratio of Available Hydraulic Capacity of the daily flow. If no Equalization Tank is provided in the upgrades, Septage Acceptance Potential is as a low as 37:1 Ratio of Available Hydraulic Capacity to account for the additional strength of septage in relation to common sewage with respect to BOD5. The Westshore WWTP could also be considered for future receiving once expanded, subject to environmental approvals and facility design.

The County of Simcoe Septage and landfill leachate disposal feasibility study recommended Alternative 4 for a Multi-Criteria Approach to Facility Selection. This alternative utilizes current hauled waste acceptance capacity at existing facilities while also completing select upgrades at a small number of treatment facilities based on multiple criteria including: avoiding sensitive watersheds, identifying facilities with the largest hydraulic capacity, geographic location relative to areas with high hauled waste production, and anticipated investment required to address population growth, in order to provide dedicated treatment for hauled waste generated over the planning period;

Recognizing the need for local control and long-term service stability, Severn has identified the development of a dedicated septage receiving facility as part of its Development Charges Background Study. The estimated total capital cost is $1.5 million with an expected external use of 40% by surrounding municipalities leaving a net cost to Severn of $900,000. This facility could be located strategically to serve the southern and central areas of the Township, reducing long hauls for septage transport, enhancing environmental protection, and ensuring equitable support for rural development.

This Master Plan recommends developing a long-range servicing strategy for biosolids management includes continuing to work with Orillia and Midland to secure multi-point regional access and advancing the planning and environmental approvals for a local receiving facility, especially aligned with plant expansions. It is also recommended that a system be develop to monitor hauled volumes from the Township and obtain records of facility usage specific to Severn at waste receiving partners. Funding opportunities through programs like the Housing-Enabling Water Systems Fund (HEWSF) will be a important in the success of addressing these issues.

With a combination of regional collaboration and local investment, the Township can ensure a robust, sustainable, and scalable biosolids management framework to support both existing and future unserviced development areas.

## 11.6 Stormwater System

### 11.6.1 Stormwater Management for New Developments

Any proposed Stormwater servicing for proposed/new growth areas are subject to following design standards for future developments.

- stormwater quantity control;
- stormwater quality control;
- erosion and sediment control; and
- water balance.

As final site configuration and treatment needs are individual to each application and specific to the local conditions, consideration of new stormwater infrastructure is to be reviewed and approved through application of the policies and standards in place with the Township and approval agencies. As these assets are constructed and commissioned, the Township is to coordinate and confirm the necessary record information and operation manuals are in place and that the system is operated and maintained in accordance with the MECP CLI-ECA requirements.

### 11.6.2 Existing Stormwater System Assessment

The existing stormwater systems were assessed based on a desktop review of available information and records. The central document for identification of stormwater assets is the CLI-ECA number 148-S701 dated March 7, 2023. As the new management requirements for stormwater systems come into effect, the Township is required to complete a number of assessments and plans that are detailed in the ECA document. Of particular importance and generally the most capital intensive component of stormwater systems is the maintenance and rehabilitation of stormwater ponds as sediment accumulation gradually diminishes the performance and function of the pond.

A key aspect of assessing and planning for stormpond maintenance and remediation is to undertake bathymetric surveys of each pond were the depth and corresponding volume of accumulated sediment can be determined and the remaining useful life of the pond predicted with increased accuracy over a desktop review. It is therefore recommended that a field investigations be planned for in the near future to provide a more accurate assessment of timing and cost of a full remediation plan.

For the purposes of the Servicing Master Plan, a desktop review was undertaken based on available pond design data, construction date or last clean out date as a condition baseline, and estimated sediment accumulation forecasting based on typical generation rates and designed storage capacity. This approach provides an indication of the priority of exiting ponds and estimated cleanout costs based on assumption of sediments that are assumed to be contaminated due to the potential for contaminants in the urban runoff.

The key map of pond locations is presented in Figure 11-18 and the stormpond cleanout financial forecast in presented in Table 11-13.


Figure 11-18 Stormwater Pond Key Map

Table 11-13 Stormwater Pond Cleanout Program (Desktop Evaluation)

| Location | Year Built | Prop Clean Out | Start year | Design Budget | Budget (2024$) |
|---|---|---|---|---|---|
| Birkeshire Woods SWMF (Golfview Estates) | 1997 | 2024 | 2025 | $86,000 | $660,000 |
| Gray Street SWMF | 1998 | 2024 | 2025 | $86,000 | $539,000 |
| Tri J Keller Trails SWMF | 2000 | 2024 | 2025 | $86,000 | $366,000 |
| North Ridge Estates SWMF | 2007 | 2024 | 2025 | $86,000 | $1,056,000 |
| Caswell Creek SWMF | 2000 | 2024 | 2025 | $86,000 | $89,000 |
| Providence Lane (West Pond) SWMF | 2000 | 2024 | 2025 | $86,000 | $202,000 |
| Meadowview Court SWMF | 2014 | 2025 | 2025 | $86,000 | $207,000 |
| Rimkey SWMF | 2017 | 2027 | 2025 | $86,000 | $295,000 |
| Providence Lane (East Pond) SWMF | 2000 | 2028 | 2026 | $86,000 | $172,000 |
| South Caden Estates SWMF (West Pond) | 2010 | 2034 | 2032 | $86,000 | $598,000 |
| South Shore Caden Estates SWMF (East Pond) | 2010 | 2036 | 2034 | $86,000 | $159,000 |
| Industrial Park SWMF (Stewarts Lane) | 1994 | 2043 | 2041 | $86,000 | $329,000 |
| Birchcliffe SWMF (Formerly Edglin Estates) | 1988 | 2044 | 2042 | $86,000 | $1,735,000 |
| Total | | | | $1,118,000 | $6,407,000 |

# 12.0 Greenhouse Gas Emissions Impact Assessment

The Township Official Plan identified greenhouse gas emissions (GHG) as a priority in the response to climate change and proactive mitigation. The GHG impact related to water and wastewater systems is multifactorial and driven directly by the volume of water being produced or treated to service the community. These impacts are best mitigated through operational efficiencies, proactive asset management and flow monitoring and analysis to assess the per capita flow rates and targeted initiatives that create systematic reductions in water leakage, wastewater inflow and infiltration and extraneous demands such as summer outdoor use and illegal connections of basement sumps and non-domestic sewage.

The Ontario Waterworks Association, and the Water Environment Association of Ontario, through their joint efforts, created an industry available Greenhouse Gas Emissions Inventory assessment tool specifically for water and wastewater type facilities. This tool primarily focuses on treatment plant conditions and includes detailed inventory information based on the various treatment processes, some of which are not necessarily present in the Township facilities.

The tool was applied as a baseline for assessing GHG generation rates for the Westshore water and wastewater plants, the Coldwater water and wastewater plants, and the Washago. The analysis is based on flow rate and organic demands for wastewater treatment calculations and on water production flow rate for the water treatment calculations. The comparison was based on current flow rates as the baseline condition, 2051 forecast flow rates as the future condition, as well as an estimated savings in leakage reduction and inflow and infiltration reduction in the water and wastewater networks that generate a reduction in overall demands. The flow rates used in the GHG model are presented in Table 12-1.

The GHG annual production of total CO2 equivalent is presented in Figure 12-1, and the net impact of the increase in treatment capacity on the increase in GHG output is presented demonstrates the efficiency that appears to be created in the larger future treatment plant capacity.

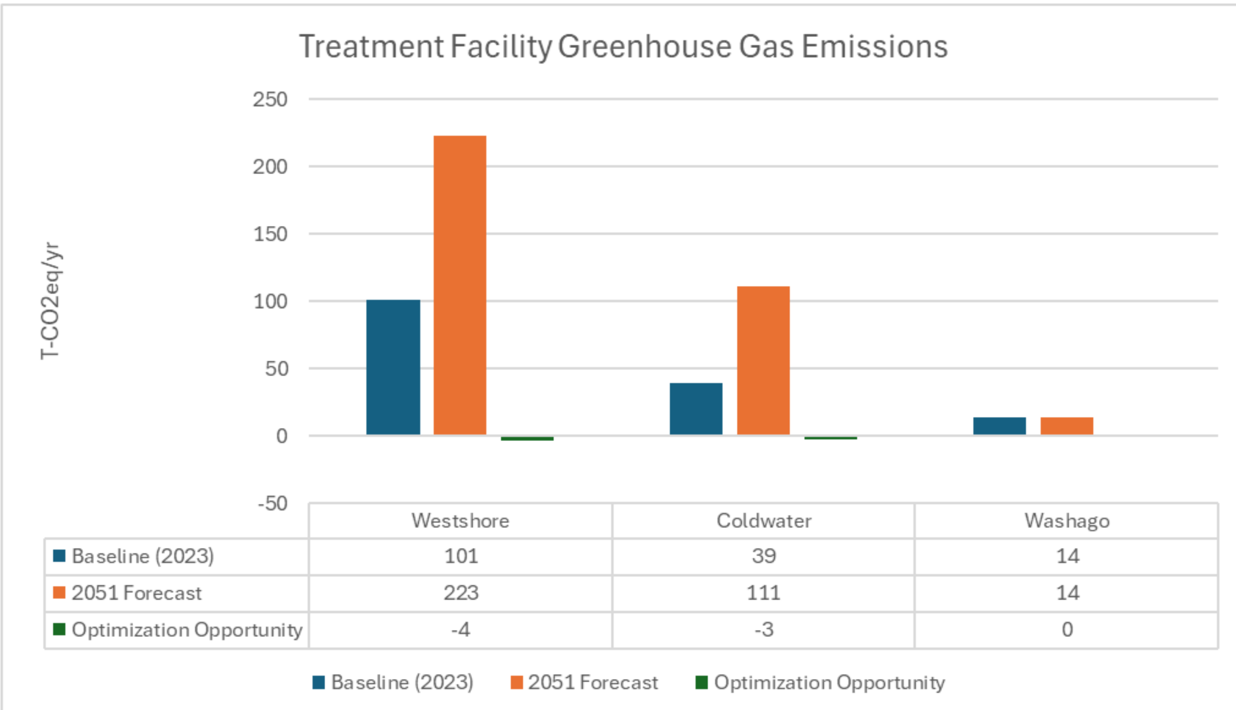
Table 12-1 Flow Data for GHG Model

| | Baseline Flow (m3/d) | 2051 Flow (m3/d) | Optimization Reduction |
|---|---|---|---|
| Westshore Water Plant | 677 | 2,355 | 165 |
| Westshore Wastewater Plant | 931 | 2,061 | 35 |
| Coldwater Water Plant | 394 | 1,500 | 43 |
| Coldwater Wastewater Plant | 626 | 1,763 | 51 |
| Washago Water Plant | 121 | 152 | 50 |
| Washago Wastewater Lagoon | 174 | 174 | NA |

Table 12-2 Relative Comparison of Treatment Increase to GHG Increase

| | Combined Increase in Treatment Capacity (%) | Increase in GHG Output (%) |
|---|---|---|
| Westshore | 175% | 121% |
| Coldwater | 220% | 185% |
| Washago | 11% | 0% |

Figure 12-1 GHG Analysis




## 13.0 Implementation Strategy

The evaluation of the water, wastewater and stormwater systems has been completed to assess the requirements to meet current service level expectations as well as long-term servicing needs to accommodate growth.

Development Charges should fund the majority of projects required to support growth. Costing for the various program areas and needs are recommended to be incorporated into future development charge studies to initiate collection as early as possible.

The overall program cost is recommended to be evaluated based on funding availability and incremental operational and efficiency studies are to be identified in future operating and capital programs to optimize work planning and program delivery.

As growth areas are being developed, early discussions with identified developers or larger developer groups are to be initiated to assess investment and advancement opportunities and the related development charge credits that could be assessed where applicable.

As growth is intended to pay for growth, the future servicing needs noted in this master plan are largely driven by growth and are to be included in any community expansion areas to ensure that both existing and future servicing needs are provided to meet the defined levels of service.

Allocation of Uncommitted Capacity

The Township of Severn has established a Servicing Allocation Policy that ensures sustainable growth while maintaining transparency and fairness in the use of available infrastructure. This policy reflects Severn's commitment to proactive management of water and wastewater to support community needs and development goals. Stormwater services do not have such a policy.

Severn's policy is a first-come, first-serve system that ensures that capacity is allocated equitably, giving priority to projects ready to proceed. Allocations are granted for three years, providing developers the time required to complete their projects and if allocated capacity is not utilized within the three-year period, it can be returned to the uncommitted capacity and made available for future developments.

Severn has demonstrated best practices through its annual reporting of uncommitted capacity to both Council and the public. This transparent approach ensures that stakeholders remain informed about available capacity and allows for timely decisions regarding infrastructure planning.

It is recommended by this Master Plan that Severn continue to report annually on allocated and uncommitted capacity to Council and make the reports publicly accessible; periodically review the three-year allocation period to ensure alignment with market conditions and project timelines; and explore opportunities to integrate collection system and distribution system capacity forecasting tools into the allocation policy to better predict future servicing needs within more defined zones within the serviced settlement boundaries.

Managing Growth Between Primary Settlement Areas

Managing growth between Coldwater and Westshore is critical, but limited financial capacity may restrict the ability to perform upgrades concurrently. Strategic planning is required to balance development across both areas. This Master Plan recommend prioritizing upgrades based on growth forecasts and infrastructure conditions; use annual capacity reports to guide development and adjust timelines; explore grants and partnerships to support infrastructure projects; and implement a growth staging policy to manage development in phases across the two areas.

## 14.0 SMP Updates

This Servicing Master Plan (SMP) is intended to serve as a living document. As the Township of Severn continues to grow and develop, the assumptions and recommendations within this plan must be revisited periodically to ensure they remain relevant, effective, and aligned with emerging needs and policy directions. Servicing demands, particularly for water supply, wastewater treatment, and stormwater management are influenced by changes in land use, population growth, environmental constraints, and regulatory updates. As such, the Township should undertake formal updates to the SMP on a 5-year basis or sooner as new settlement expansion areas and / or development pressures emerge. The Development Charges background study (2024) includes an update to the SMP by 2029 at an estimated cost of $60,000. These reviews will allow the Township to assess the adequacy of its servicing strategies, reevaluate system capacities and constraints, and consider refinements in design standards, growth targets, and improved capital cost of construction estimates.

To support clarity and traceability, version control and formal documentation of amendments to the SMP should be maintained. This versioning table will assist with tracking changes and provide transparency to stakeholders reviewing planning and development applications.

| Version No. | Date Author/Editor | Summary of Changes | Approved by | Approval Date |
|---|---|---|---|---|
| 1.0.0 | 2025-08-29 Civica | Initial release of the SMP | Council | yyyy-mm-dd |
| 1.0.1 | yyyy-mm-dd [Name/Position] | Minor text edits or clarification updates | [Name] | yyyy-mm-dd |

| Version No. | Date Author/Editor | Summary of Changes | Approved by | Approval Date |
|---|---|---|---|---|
| 1.1.0 | yyyy-mm-dd [Name/Position] | Major update to reflect updated flow data, modeling, or land use projections | [Name] | yyyy-mm-dd |
| 2.0.0 | yyyy-mm-dd [Name/Position] | Full SMP review and reissuance with new population and servicing forecasts | Council | yyyy-mm-dd |

## 15.0 Public Consultation

The record of public consultation is included in Appendix D and contains the list of stakeholder agencies consulted, the notices for the various stages of consultation, the materials presented for the two public consultation meetings, and the public engagement information that was gathered.

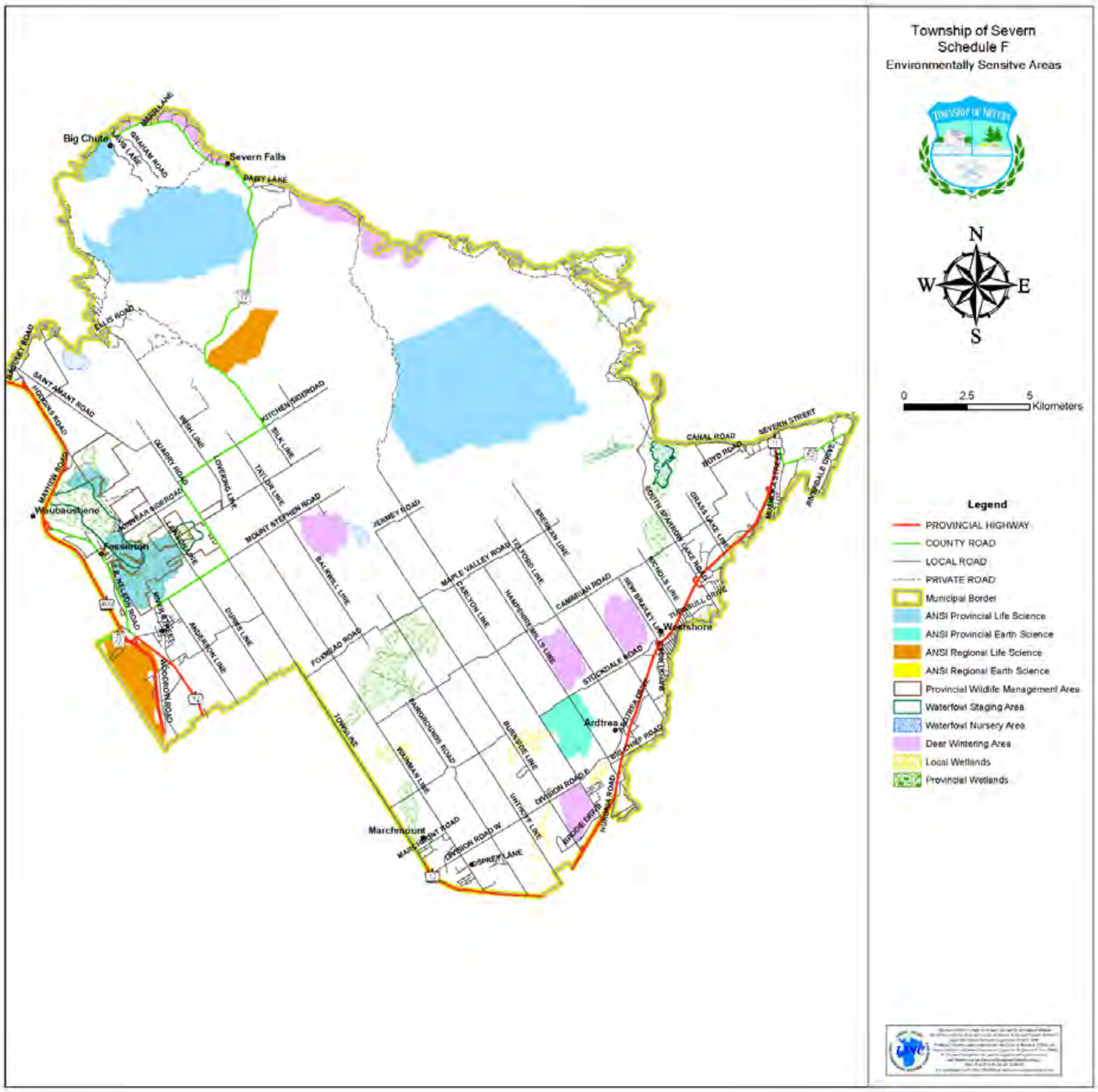
The public consultation process was initiated with the project notice of commencement that was released on July 17, 2023, and communicated the scope of the project the consultation process that would be followed and the main contacts for the project. The second public notice was the Notice of Public Information Centre 1 that was held at the Severn Administration Centre on December 5, 2023, from 5:00 pm to 7:00 pm. The presentation was provided in persons with printed material that was made available to attendees.

The Notice for the Second Public Information Centre was published April 25, 2024 and the meeting was held at the Severn Administration Centre on May 29, 2024 from 5:00 pm to 7:00 pm. Attendees were recorded and feedback gathered during the session.

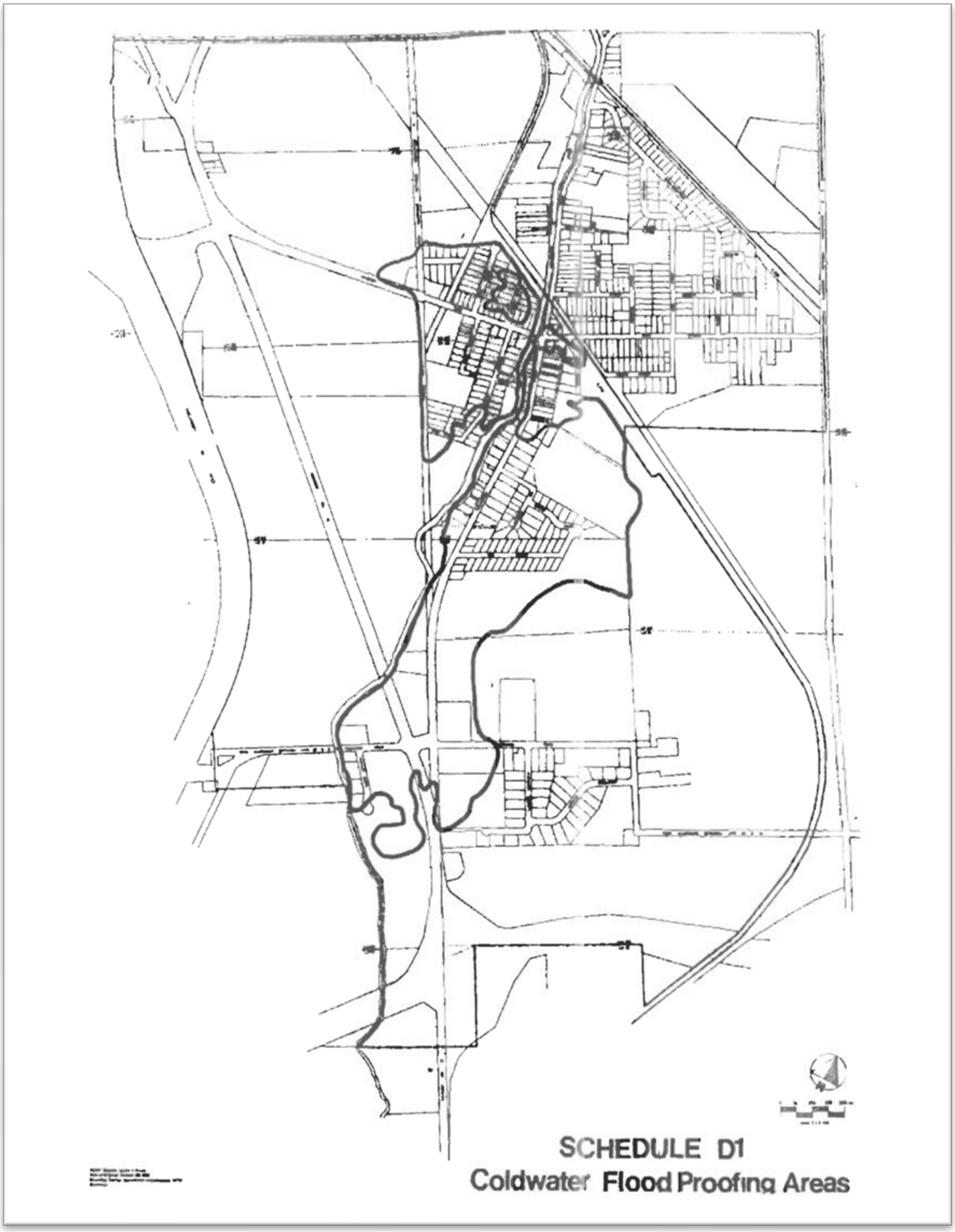
All comments and feedback were in support of the recommendations and there was a general agreement with the approach. Where possible, feedback was considered in the preparation of the report and included based on content.

The population forecasts, growth areas and servicing needs identified during the consultation process were supported.

# Appendix A- Environmentally Sensitive Areas

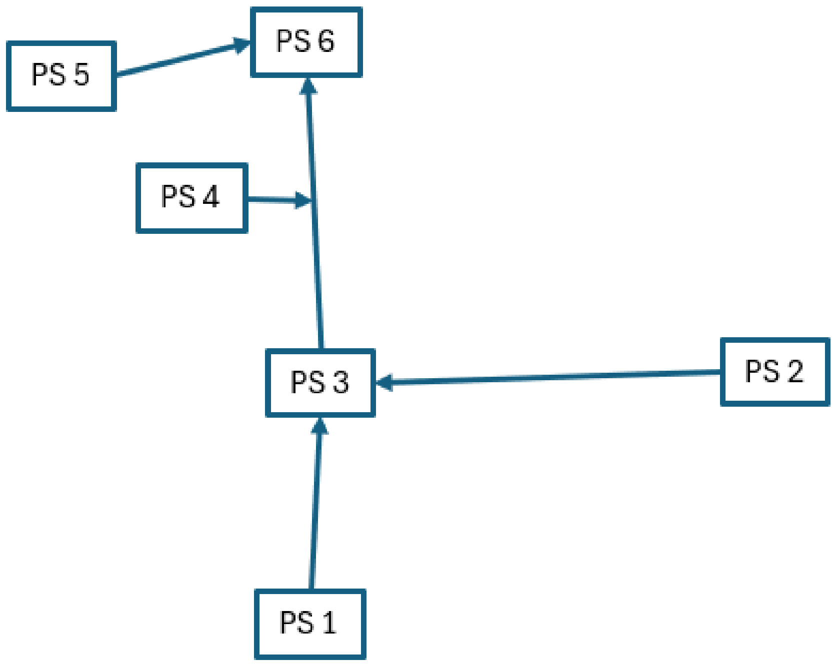


# Appendix A2 - Environmentally Sensitive Areas



# Appendix B Wastewater System Analysis

Part 1 Coldwater Pumping Station Layout



# PS1 SANITARY SEWER DESIGN SHEET

q = average per capita daily flow (Existing) 300 L/cap.d
q = average per capita daily flow 350 L/cap.d
c = unit of commercial/institutional flow 28.00 $m^3$/ha.d
ic = unit of peak extraneous flow 0.23 L/ha.s
p = unit of population density 2.51 ppu

Q(p) = peak population flow (L/s)
Q(i) = i x A = peak extraneous flow (L/s)
Q(c) = $\frac{c \times A}{86400}$ = peak commercial flow (L/s)
0
Q(d) = Q(p) + Q(i) = peak design flow (L/s)

P = population
M = peaking factor (Harmon)
P = p x # units / 1000
M = 1 + 14 / (4 + $P^{1/2}$) , maximum of 4.0, minimum of 2.0
Q = (P x q x M) / 86.4
M Min = 1.5
M Max = 4

DATE: ______ FILE No.: ______
DESIGNED: ______ PROJECT: ______
CHECKED: ______

SHEET No.: 1 OF 1

Nominal Sizing (mm)

| | |
|---|---|
| 200 | 600 |
| 250 | 675 |
| 300 | 750 |
| 375 | 900 |
| 450 | 1050 |
| 525 | |

| LOCATION | | | INDIVIDUAL | | | | CUMULATIVE | | | | | | | | | PROPOSED SANITARY SEWER | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STREET | FROM MH | TO MH | No. RESIDENTIAL UNITS | POP | RES. AREA (ha) | COM./INST. AREA (ha) | POP | RES. AREA (ha) | COM./INST. AREA (ha) | TOTAL AREA (ha) | PEAKING FACTOR (M) | POPULATION FLOW, Q(p) (L/s) | CUMULATIVE COM./INST. FLOWS (L/s) | PEAK EXTRANEOUS FLOW, Q(i) (L/s) | PEAK DESIGN FLOW, Q(d) (L/s) | LENGTH (m) | PIPE SIZE DIAMETER (mm) | GRADE (%) | MANNING'S n | CAPACITY (L/s) | FULL FLOW VELOCITY (m/s) | ACTUAL VELOCITY (m/s) | PERCENT FULL |
| Main (Existing) | 1 | 2 | 170 | 426.7 | 14.00 | | 426.70 | 14.00 | 0.00 | 14.00 | 4.00 | 5.926 | 0.000 | 3.220 | 9.146 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.66 | 39.4% |
| | 2 | 3 | 13 | 32.63 | 2.00 | | 459.33 | 16.00 | 0.00 | 16.00 | 3.99 | 6.368 | 0.000 | 3.680 | 10.048 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.68 | 43.3% |
| | 3 | 4 | 16 | 40.16 | 1.50 | | 499.49 | 17.50 | 0.00 | 17.50 | 3.97 | 6.893 | 0.000 | 4.025 | 10.918 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.69 | 47.1% |
| 3 | 3.1 | 3 | 16 | 40.16 | 1.50 | | 40.16 | 1.50 | 0.00 | 1.50 | 4.00 | 0.558 | 0.000 | 0.345 | 0.903 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.35 | 3.9% |
| Main (Buildout) | 1 | 2 | 455 | 1142.05 | 27.60 | | 1142.05 | 27.60 | 0.00 | 27.60 | 3.76 | 17.405 | 0.000 | 6.348 | 23.753 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.74 | 102.4% |
| | 2 | 3 | 13 | 32.63 | 2.00 | | 1174.68 | 29.60 | 0.00 | 29.60 | 3.75 | 17.863 | 0.000 | 6.808 | 24.671 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.74 | 106.4% |
| | 3 | 4 | 0 | 0 | 0.00 | | 1174.68 | 29.60 | 0.00 | 29.60 | 3.75 | 17.863 | 0.000 | 6.808 | 24.671 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.74 | 106.4% |
| 3 | 3.1 | 3 | 16 | 40.16 | 1.50 | | 40.16 | 1.50 | 0.00 | 1.50 | 4.00 | 0.651 | 0.000 | 0.345 | 0.996 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.36 | 4.3% |

# PS 2 SANITARY SEWER DESIGN SHEET

q = average per capita daily flow (Existing) 350 L/cap.d
q = average per capita daily flow 350 L/cap.d
c = unit of commercial/institutional flow 28.00 $m^3$/ha.d
ic = unit of peak extraneous flow 0.23 L/ha.s
p = unit of population density 2.51 ppu

Q(p) = peak population flow (L/s)
Q(i) = i x A = peak extraneous flow (L/s)
Q(c) = $\frac{c \times A}{86400}$ = peak commercial flow (L/s)
Q(d) = Q(p) + Q(i) = peak design flow (L/s)

P = population
M = peaking factor (Harmon)
P = p x # units / 1000
M = 1 + 14 / (4 + $P^{1/2}$) , maximum of 4.0, minimum of 2.0
Q = (P x q x M) / 86.4
M Min = 1.5
M Max = 4

DATE:
DESIGNED:
CHECKED:
FILE No.: 1
PROJECT:
SHEET No.: 1 OF 1

Nominal Sizing (mm)

| | |
|---|---|
| 200 | 600 |
| 250 | 675 |
| 300 | 750 |
| 375 | 900 |
| 450 | 1050 |
| 525 | |

| LOCATION | | | INDIVIDUAL | | | | CUMULATIVE | | | | | | | | | PROPOSED SANITARY SEWER | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STREET | MH | MH | UNITS | POP | (ha) | AREA | POP | (ha) | AREA | (ha) | FACTOR | FLOW, Q(p) | FLOWS | Q(i) | Q(d) | (m) | DIAMETER | (%) | MANNING'S n | (L/s) | VELOCITY | VELOCITY | FULL |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| Main (Existing) | | | | | | | | | | | | | | | | | | | | | | | |
| | 1 | 2 | 23 | 57.73 | 2.80 | | 57.73 | 2.80 | 0.00 | 2.80 | 4.00 | 0.935 | 0.000 | 0.644 | 1.579 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.41 | 6.8% |
| | 2 | ps | 0 | 0 | | | 57.73 | 2.80 | 0.00 | 2.80 | 4.00 | 0.935 | 0.000 | 0.644 | 1.579 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.41 | 6.8% |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| Main (Proposed) | | | | | | | | | | | | | | | | | | | | | | | |
| | 1 | 2 | 105 | 263.55 | 5.50 | | 263.55 | 5.50 | 0.00 | 5.50 | 4.00 | 4.270 | 0.000 | 1.265 | 5.535 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.58 | 23.9% |
| | 2 | ps | 0 | 0 | | | 263.55 | 5.50 | 0.00 | 5.50 | 4.00 | 4.270 | 0.000 | 1.265 | 5.535 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.58 | 23.9% |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |

## PS 3 SANITARY SEWER DESIGN SHEET

q = average per capita daily flow (Existing) 350 L/cap.d
q = average per capita daily flow 350 L/cap.d
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ic = unit of peak extraneous flow 0.23 L/ha.s
p = unit of population density 2.51 ppu

Q(p) = peak population flow (L/s)
Q(i) = i x A = peak extraneous flow (L/s)
Q(c) = c x A / 86400 = peak commercial flow (L/s)
Q(d) = Q(p) + Q(i) = peak design flow (L/s)

P = population
M = peaking factor (Harmon)
P = p x # units / 1000
$M = 1 + 14 / (4 + P^{1/2})$ , maximum of 4.0, minimum of 2.0
Q = (P x q x M) / 86.4
M Min = 1.5
M Max = 4

DATE:
DESIGNED:
CHECKED:
FILE No.: 1
PROJECT:

SHEET No.: 1 OF 1

| Nominal Sizing (mm) | |
|---|---|
| 200 | 600 |
| 250 | 675 |
| 300 | 750 |
| 375 | 900 |
| 450 | 1050 |
| 525 | |

| LOCATION | | | INDIVIDUAL | | | | CUMULATIVE | | | | | | | | | PROPOSED SANITARY SEWER | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STREET | FROM MH | TO MH | No. RESIDENTIAL UNITS | POP | RES. AREA (ha) | COM./INST. AREA (ha) | POP | RES. AREA (ha) | COM./INST. AREA (ha) | TOTAL AREA (ha) | PEAKING FACTOR (M) | POPULATION FLOW, Q(p) (L/s) | CUMULATIVE COM./INST. FLOWS (L/s) | PEAK EXTRANEOUS FLOW, Q(i) (L/s) | PEAK DESIGN FLOW, Q(d) (L/s) | LENGTH (m) | PIPE SIZE DIAMETER (mm) | GRADE (%) | MANNING'S n | CAPACITY (L/s) | FULL FLOW VELOCITY (m/s) | ACTUAL VELOCITY (m/s) | PERCENT FULL |
| Main (Existing) | From PS1 | 7.2 | | 499.49 | 17.50 | | | | | | | | | | | | | | | | | | |
| | From PS2 | 1 | | 57.73 | 2.80 | | | | | | | | | | | | | | | | | | |
| | 1 | 2 | 25 | 120.48 | 3.40 | | 120.48 | 3.40 | 0.00 | 3.40 | 4.00 | 1.952 | 0.000 | 0.782 | 2.734 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.48 | 11.8% |
| | 2 | 3 | 68 | 170.68 | 2.00 | | 291.16 | 5.40 | 0.00 | 5.40 | 4.00 | 4.718 | 0.000 | 1.242 | 5.960 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.59 | 25.7% |
| | 3 | 4 | 35 | 87.85 | 1.25 | | 379.01 | 6.65 | 0.00 | 6.65 | 4.00 | 6.141 | 0.000 | 1.530 | 7.671 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.63 | 33.1% |
| | 4 | 5 | 26 | 65.26 | 1.50 | | 444.27 | 8.15 | 0.00 | 8.15 | 4.00 | 7.199 | 0.000 | 1.875 | 9.073 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.65 | 21.6% |
| | 5 | 6 | 22 | 55.22 | | | 499.49 | 8.15 | 0.00 | 8.15 | 3.97 | 8.042 | 0.000 | 1.875 | 9.916 | | 300 | 0.50% | 0.013 | 68.4 | 0.97 | 0.66 | 14.5% |
| | 6 | 7 | 41 | 102.91 | | | 602.40 | 8.15 | 0.00 | 8.15 | 3.93 | 9.593 | 0.000 | 1.875 | 11.468 | | 300 | 0.50% | 0.013 | 68.4 | 0.97 | 0.69 | 16.8% |
| | 7 | ps | 297 | 745.47 | 7.70 | | 1347.87 | 15.85 | 0.00 | 15.85 | 3.71 | 20.272 | 0.000 | 3.646 | 23.917 | | 300 | 0.50% | 0.013 | 68.4 | 0.97 | 0.84 | 35.0% |
| | A | B | 6 | 15.06 | 1.00 | | 15.06 | 1.00 | 0.00 | 1.00 | 4.00 | 0.244 | 0.000 | 0.230 | 0.474 | | 300 | 0.50% | 0.013 | 68.4 | 0.97 | 0.29 | 0.7% |
| | B | C | 16 | 40.16 | | | 55.22 | 1.00 | 0.00 | 1.00 | 4.00 | 0.895 | 0.000 | 0.230 | 1.125 | | 300 | 0.50% | 0.013 | 68.4 | 0.97 | 0.37 | 1.6% |
| | C | D | 73 | 346.38 | | | 401.60 | 1.00 | 0.00 | 1.00 | 4.00 | 6.507 | 0.000 | 0.230 | 6.737 | | 300 | 0.50% | 0.013 | 68.4 | 0.97 | 0.60 | 9.9% |
| | D | E | 8 | 20.08 | | | 421.68 | 1.00 | 0.00 | 1.00 | 4.00 | 6.833 | 0.000 | 0.230 | 7.063 | | 300 | 0.50% | 0.013 | 68.4 | 0.97 | 0.60 | 10.3% |
| | E | 7 | 61 | 153.11 | | | 574.79 | 1.00 | 0.00 | 1.00 | 3.94 | 9.179 | 0.000 | 0.230 | 9.409 | | 300 | 0.50% | 0.013 | 68.4 | 0.97 | 0.65 | 13.8% |
| 2 | 2.2 | 2.1 | 7 | 17.57 | 2.30 | | 17.57 | 2.30 | 0.00 | 2.30 | 4.00 | 0.285 | 0.000 | 0.529 | 0.814 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.34 | 3.5% |
| | 2.1 | 2 | 4 | 10.04 | 0.50 | | 27.61 | 2.80 | 0.00 | 2.80 | 4.00 | 0.447 | 0.000 | 0.644 | 1.091 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.37 | 4.7% |
| 3 | 3.3 | 3.1 | 6 | 15.06 | | | 15.06 | 0.00 | 0.00 | 0.00 | 4.00 | 0.244 | 0.000 | 0.000 | 0.244 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.25 | 1.1% |
| | 3.2 | 3.1 | 10 | 25.1 | | | 40.16 | 0.00 | 0.00 | 0.00 | 4.00 | 0.651 | 0.000 | 0.000 | 0.651 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.32 | 2.8% |
| | 3.1 | 3 | 9 | 22.59 | 2.74 | | 62.75 | 2.74 | 0.00 | 2.74 | 4.00 | 1.017 | 0.000 | 0.630 | 1.647 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.42 | 7.1% |
| 4 | 4.1 | 4 | 13 | 32.63 | 1.00 | | 32.63 | 1.00 | 0.00 | 1.00 | 4.00 | 0.529 | 0.000 | 0.230 | 0.759 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.34 | 3.3% |
| 5 | 5.1 | 5 | 22 | 55.22 | 1.00 | | 55.22 | 1.00 | 0.00 | 1.00 | 4.00 | 0.895 | 0.000 | 0.230 | 1.125 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.37 | 4.9% |
| 6 | 6.1 | 6 | 37 | 92.87 | 2.50 | | 92.87 | 2.50 | 0.00 | 2.50 | 4.00 | 1.505 | 0.000 | 0.575 | 2.080 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.44 | 9.0% |
| 7 | 7.1 | 7.2 | 71 | 178.21 | | | 178.21 | 0.00 | 0.00 | 0.00 | 4.00 | 2.888 | 0.000 | 0.000 | 2.888 | | 300 | 0.50% | 0.013 | 68.4 | 0.97 | 0.47 | 4.2% |
| | 7.2 | 7.3 | 12 | 529.61 | | | 707.82 | 0.00 | 0.00 | 0.00 | 3.89 | 11.159 | 0.000 | 0.000 | 11.159 | | 300 | 0.50% | 0.013 | 68.4 | 0.97 | 0.68 | 16.3% |
| | 7.3 | 7 | 50 | 125.5 | | | 833.32 | 0.00 | 0.00 | 0.00 | 3.85 | 12.995 | 0.000 | 0.000 | 12.995 | | 300 | 0.50% | 0.013 | 68.4 | 0.97 | 0.71 | 19.0% |
| B | B.1 | B | 16 | 40.16 | 1.60 | | 40.16 | 1.60 | 0.00 | 1.60 | 4.00 | 0.651 | 0.000 | 0.368 | 1.019 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.37 | 4.4% |
| C | C.1 | C | 65 | 163.15 | 1.80 | | 163.15 | 1.80 | 0.00 | 1.80 | 4.00 | 2.644 | 0.000 | 0.414 | 3.058 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.49 | 13.2% |
| D | D.1 | D | 8 | 20.08 | 1.00 | | 20.08 | 1.00 | 0.00 | 1.00 | 4.00 | 0.325 | 0.000 | 0.230 | 0.555 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.31 | 2.4% |
| E | E.3 | E.4 | 24 | 60.24 | | | 60.24 | 0.00 | 0.00 | 0.00 | 4.00 | 0.976 | 0.000 | 0.000 | 0.976 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.36 | 4.2% |
| | E.4 | E.1 | 18 | 45.18 | | | 105.42 | 0.00 | 0.00 | 0.00 | 4.00 | 1.708 | 0.000 | 0.000 | 1.708 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.42 | 7.4% |
| | E.1 | E | 13 | 32.63 | 7.00 | | 138.05 | 7.00 | 0.00 | 7.00 | 4.00 | 2.237 | 0.000 | 1.610 | 3.847 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.52 | 16.6% |

# PS 3 SANITARY SEWER DESIGN SHEET

q = average per capita daily flow (Existing) 350 L/cap.d
q = average per capita daily flow 350 L/cap.d
c = unit of commercial/institutional flow 28.00 $m^3$/ha.d
ic = unit of peak extraneous flow 0.23 L/ha.s
p = unit of population density 2.51 ppu

Q(p) = peak population flow (L/s)
Q(i) = i x A = peak extraneous flow (L/s)
Q(c) = $\frac{c \times A}{86400}$ = peak commercial flow (L/s)
Q(d) = Q(p) + Q(i) = peak design flow (L/s)

P = population
M = peaking factor (Harmon)
P = p x # units / 1000
M = 1 + 14 / (4 + $P^{1/2}$) , maximum of 4.0, minimum of 2.0
Q = (P x q x M) / 86.4
M Min = 1.5
M Max = 4

DATE:
DESIGNED:
CHECKED:
FILE No.: 1
PROJECT:

SHEET No.: 1 OF 1

| Nominal Sizing (mm) | |
|---|---|
| 200 | 600 |
| 250 | 675 |
| 300 | 750 |
| 375 | 900 |
| 450 | 1050 |
| 525 | |

| LOCATION | | | INDIVIDUAL | | | | CUMULATIVE | | | | | | | | | PROPOSED SANITARY SEWER | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STREET | FROM MH | TO MH | No. RESIDENTIAL UNITS | POP | RES. AREA (ha) | COM./INST. AREA (ha) | POP | RES. AREA (ha) | COM./INST. AREA (ha) | TOTAL AREA (ha) | PEAKING FACTOR (M) | POPULATION FLOW, Q(p) (L/s) | CUMULATIVE COM./INST. FLOWS (L/s) | PEAK EXTRANEOUS FLOW, Q(i) (L/s) | PEAK DESIGN FLOW, Q(d) (L/s) | LENGTH (m) | PIPE SIZE DIAMETER (mm) | GRADE (%) | MANNING'S n | CAPACITY (L/s) | FULL FLOW VELOCITY (m/s) | ACTUAL VELOCITY (m/s) | PERCENT FULL |
| Main (build out) | From PS1 | 7.2 | | 1174.68 | 29.60 | | | | | | | | | | | | | | | | | | |
| | From PS2 | 1 | | 263.55 | 5.50 | | | | | | | | | | | | | | | | | | |
| | 1 | 2 | 25 | 326.3 | 3.40 | | 326.30 | 3.40 | 0.00 | 3.40 | 4.00 | 5.287 | 0.000 | 0.782 | 6.069 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.59 | 26.2% |
| | 2 | 3 | 79 | 198.29 | 2.00 | | 524.59 | 5.40 | 0.00 | 5.40 | 3.96 | 8.423 | 0.000 | 1.242 | 9.665 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.67 | 41.7% |
| | 3 | 4 | 42 | 105.42 | 1.25 | | 630.01 | 6.65 | 0.00 | 6.65 | 3.92 | 10.006 | 0.000 | 1.530 | 11.535 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.70 | 49.7% |
| | 4 | 5 | 26 | 65.26 | 1.50 | | 695.27 | 8.15 | 0.00 | 8.15 | 3.90 | 10.974 | 0.000 | 1.875 | 12.848 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.72 | 30.6% |
| | 5 | 6 | 22 | 55.22 | | | 750.49 | 8.15 | 0.00 | 8.15 | 3.88 | 11.787 | 0.000 | 1.875 | 13.661 | | 300 | 0.50% | 0.013 | 68.4 | 0.97 | 0.72 | 20.0% |
| | 6 | 7 | 71 | 178.21 | | | 928.70 | 8.15 | 0.00 | 8.15 | 3.82 | 14.373 | 0.000 | 1.875 | 16.248 | | 300 | 0.50% | 0.013 | 68.4 | 0.97 | 0.75 | 23.8% |
| | 7 | ps | 961 | 2412.11 | 7.70 | | 3340.81 | 15.85 | 0.00 | 15.85 | 3.40 | 46.044 | 0.000 | 3.646 | 49.690 | | 300 | 0.50% | 0.013 | 68.4 | 0.97 | 0.97 | 72.7% |
| | A | B | 611 | 1533.61 | 1.00 | | 1533.61 | 1.00 | 0.00 | 1.00 | 3.67 | 22.816 | 0.000 | 0.230 | 23.046 | | 300 | 0.50% | 0.013 | 68.4 | 0.97 | 0.83 | 33.7% |
| | B | C | 16 | 40.16 | | | 1573.77 | 1.00 | 0.00 | 1.00 | 3.66 | 23.361 | 0.000 | 0.230 | 23.591 | | 300 | 0.50% | 0.013 | 68.4 | 0.97 | 0.83 | 34.5% |
| | C | D | 73 | 183.23 | | | 1757.00 | 1.00 | 0.00 | 1.00 | 3.63 | 25.828 | 0.000 | 0.230 | 26.058 | | 300 | 0.50% | 0.013 | 68.4 | 0.97 | 0.86 | 38.1% |
| | D | E | 8 | 20.08 | | | 1777.08 | 1.00 | 0.00 | 1.00 | 3.63 | 26.097 | 0.000 | 0.230 | 26.327 | | 300 | 0.50% | 0.013 | 68.4 | 0.97 | 0.86 | 38.5% |
| | E | 7 | 120 | 301.2 | | | 2078.28 | 1.00 | 0.00 | 1.00 | 3.57 | 30.079 | 0.000 | 0.230 | 30.309 | | 300 | 0.50% | 0.013 | 68.4 | 0.97 | 0.89 | 44.3% |
| 2 | 2.2 | 2.1 | 18 | 45.18 | 2.30 | | 45.18 | 2.30 | 0.00 | 2.30 | 4.00 | 0.732 | 0.000 | 0.529 | 1.261 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.39 | 5.4% |
| | 2.1 | 2 | 4 | 10.04 | 0.50 | | 55.22 | 2.80 | 0.00 | 2.80 | 4.00 | 0.895 | 0.000 | 0.644 | 1.539 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.41 | 6.6% |
| 3 | 3.3 | 3.1 | 6 | 15.06 | | | 15.06 | 0.00 | 0.00 | 0.00 | 4.00 | 0.244 | 0.000 | 0.000 | 0.244 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.25 | 1.1% |
| | 3.2 | 3.1 | 17 | 42.67 | | | 57.73 | 0.00 | 0.00 | 0.00 | 4.00 | 0.935 | 0.000 | 0.000 | 0.935 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.36 | 4.0% |
| | 3.1 | 3 | 9 | 22.59 | 2.74 | | 80.32 | 2.74 | 0.00 | 2.74 | 4.00 | 1.301 | 0.000 | 0.630 | 1.932 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.43 | 8.3% |
| 4 | 4.1 | 4 | 13 | 32.63 | 1.00 | | 32.63 | 1.00 | 0.00 | 1.00 | 4.00 | 0.529 | 0.000 | 0.230 | 0.759 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.34 | 3.3% |
| 5 | 5.1 | 5 | 22 | 55.22 | 1.00 | | 55.22 | 1.00 | 0.00 | 1.00 | 4.00 | 0.895 | 0.000 | 0.230 | 1.125 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.37 | 4.9% |
| 6 | 6.1 | 6 | 52 | 130.52 | 2.50 | | 130.52 | 2.50 | 0.00 | 2.50 | 4.00 | 2.115 | 0.000 | 0.575 | 2.690 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.47 | 11.6% |
| 7 | 7.1 | 7.2 | 71 | 178.21 | | | 178.21 | 0.00 | 0.00 | 0.00 | 4.00 | 2.888 | 0.000 | 0.000 | 2.888 | | 300 | 0.50% | 0.013 | 68.4 | 0.97 | 0.47 | 4.2% |
| | 7.2 | 7.3 | 12 | 1204.8 | | | 1383.01 | 0.00 | 0.00 | 0.00 | 3.70 | 20.756 | 0.000 | 0.000 | 20.756 | | 300 | 0.50% | 0.013 | 68.4 | 0.97 | 0.81 | 30.4% |
| | 7.3 | 7 | 50 | 125.5 | | | 1508.51 | 0.00 | 0.00 | 0.00 | 3.68 | 22.474 | 0.000 | 0.000 | 22.474 | | 300 | 0.50% | 0.013 | 68.4 | 0.97 | 0.82 | 32.9% |
| B | B.1 | B | 16 | 40.16 | 1.60 | | 40.16 | 1.60 | 0.00 | 1.60 | 4.00 | 0.651 | 0.000 | 0.368 | 1.019 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.37 | 4.4% |
| C | C.1 | C | 65 | 163.15 | 1.80 | | 163.15 | 1.80 | 0.00 | 1.80 | 4.00 | 2.644 | 0.000 | 0.414 | 3.058 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.49 | 13.2% |
| D | D.1 | D | 8 | 20.08 | 1.00 | | 20.08 | 1.00 | 0.00 | 1.00 | 4.00 | 0.325 | 0.000 | 0.230 | 0.555 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.31 | 2.4% |
| E | E.3 | E.4 | 83 | 208.33 | | | 208.33 | 0.00 | 0.00 | 0.00 | 4.00 | 3.376 | 0.000 | 0.000 | 3.376 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.50 | 14.6% |
| | E.4 | E.1 | 18 | 45.18 | | | 253.51 | 0.00 | 0.00 | 0.00 | 4.00 | 4.108 | 0.000 | 0.000 | 4.108 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.53 | 17.7% |
| | E.1 | E | 13 | 32.63 | 10.00 | | 286.14 | 10.00 | 0.00 | 10.00 | 4.00 | 4.637 | 0.000 | 2.300 | 6.937 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.61 | 29.9% |

## PS 4 SANITARY SEWER DESIGN SHEET

q = average per capita daily flow (Existing) 350 L/cap.d
q = average per capita daily flow 350 L/cap.d
c = unit of commercial/institutional flow 28.00 $m^3$/ha.d
ic = unit of peak extraneous flow 0.23 L/ha.s
p = unit of population density 2.51 ppu

Q(p) = peak population flow (L/s)
Q(i) = i x A = peak extraneous flow (L/s)
Q(c) = c x A / 86400 = peak commercial flow (L/s)
Q(d) = Q(p) + Q(i) = peak design flow (L/s)

P = population
M = peaking factor (Harmon)
P = p x # units / 1000
M = 1 + 14 / (4 + $P^{1/2}$) , maximum of 4.0, minimum of 2.0
Q = (P x q x M) / 86.4
M Min = 1.5
M Max = 4

DATE:
DESIGNED:
CHECKED:
FILE No.: 1
PROJECT:
SHEET No.: 1 OF 1

| Nominal Sizing (mm) | |
|---|---|
| 200 | 600 |
| 250 | 675 |
| 300 | 750 |
| 375 | 900 |
| 450 | 1050 |
| 525 | |

| LOCATION | | | INDIVIDUAL | | | | CUMULATIVE | | | | | | | | | PROPOSED SANITARY SEWER | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STREET | MH | MH | UNITS | POP | (ha) | AREA | POP | (ha) | AREA | (ha) | FACTOR | FLOW, Q(p) | FLOWS | Q(i) | Q(d) | (m) | DIAMETER | (%) | MANNING'S n | (L/s) | VELOCITY | VELOCITY | FULL |
| Main (Existing) | | | | | | | | | | | | | | | | | | | | | | | |
| | 1 | ps | 8 | 20.08 | 2.80 | | 20.08 | 2.80 | 0.00 | 2.80 | 4.00 | 0.325 | 0.000 | 0.644 | 0.969 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.36 | 4.2% |
| Main (Future) | | | | | | | | | | | | | | | | | | | | | | | |
| | 1 | PS | 8 | 20.08 | 2.80 | | 20.08 | 2.80 | 0.00 | 2.80 | 4.00 | 0.325 | 0.000 | 0.644 | 0.969 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.36 | 4.2% |

## PS 5 SANITARY SEWER DESIGN SHEET

q = average per capita daily flow (Existing) 350 L/cap.d
q = average per capita daily flow 350 L/cap.d
c = unit of commercial/institutional flow 28.00 $m^3$/ha.d
ic = unit of peak extraneous flow 0.23 L/ha.s
p = unit of population density 2.51 ppu

Q(p) = peak population flow (L/s)
Q(i) = i x A = peak extraneous flow (L/s)
Q(c) = $\frac{c \times A}{86400}$ = peak commercial flow (L/s)
Q(d) = Q(p) + Q(i) = peak design flow (L/s)

P = population
M = peaking factor (Harmon)
P = p x # units / 1000
M = 1 + 14 / (4 + $P^{1/2}$) , maximum of 4.0, minimum of 2.0
Q = (P x q x M) / 86.4
M Min = 1.5
M Max = 4

DATE:
FILE No.: 1
DESIGNED:
PROJECT:
CHECKED:

SHEET No.: 1 OF 1

| Nominal Sizing (mm) | |
|---|---|
| 200 | 600 |
| 250 | 675 |
| 300 | 750 |
| 375 | 900 |
| 450 | 1050 |
| 525 | |

| LOCATION | | | INDIVIDUAL | | | | CUMULATIVE | | | | | | | | | | PROPOSED SANITARY SEWER | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STREET | MH | MH | UNITS | POP | (ha) | AREA | POP | (ha) | AREA | (ha) | FACTOR | FLOW, Q(p) | FLOWS | Q(i) | Q(d) | (m) | DIAMETER | (%) | MANNING'S n | (L/s) | VELOCITY | VELOCITY | FULL |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| Main (Existing) | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| Main (Future) | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | 1 | ps | 48 | 120.48 | 2.60 | | 120.48 | 2.60 | 0.00 | 2.60 | 4.00 | 1.952 | 0.000 | 0.598 | 2.550 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.47 | 11.0% |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |

# PS 6 SANITARY SEWER DESIGN SHEET

q = average per capita daily flow (Existing) 350 L/cap.d
q = average per capita daily flow 350 L/cap.d
c = unit of commercial/institutional flow 28.00 $m^3$/ha.d
ic = unit of peak extraneous flow 0.23 L/ha.s
p = unit of population density 2.51 ppu

Q(p) = peak population flow (L/s)
Q(i) = i x A = peak extraneous flow (L/s)
Q(c) = c x A / 86400 = peak commercial flow (L/s)
Q(d) = Q(p) + Q(i) = peak design flow (L/s)

P = population
M = peaking factor (Harmon)
P = p x # units / 1000
M = 1 + 14 / (4 + $P^{1/2}$) , maximum of 4.0, minimum of 2.0
Q = (P x q x M) / 86.4
M Min = 1.5
M Max = 4

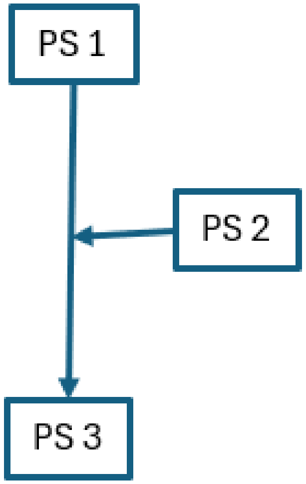
DATE:
DESIGNED:
CHECKED:
FILE No.: 1
PROJECT:

| Nominal Sizing (mm) | |
|---|---|
| 200 | 600 |
| 250 | 675 |
| 300 | 750 |
| 375 | 900 |
| 450 | 1050 |
| 525 | |

SHEET No.: 1 OF 1

| LOCATION | | | INDIVIDUAL | | | | CUMULATIVE | | | | | | | | | PROPOSED SANITARY SEWER | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STREET | MH | MH | UNITS | POP | (ha) | AREA | POP | (ha) | AREA | (ha) | FACTOR | FLOW, Q(p) | FLOWS | Q(i) | Q(d) | (m) | DIAMETER | (%) | MANNING'S n | (L/s) | VELOCITY | VELOCITY | FULL |
| Main (Existing) | | | | | | | | | | | | | | | | | | | | | | | |
| | PS3 | 1 | | 1347.87 | 15.85 | | | | | | | | | | | | | | | | | | |
| | PS4 | 3 | | 20.08 | 2.80 | | | | | | | | | | | | | | | | | | |
| | PS5 | 5 | | 0.00 | 0.00 | | | | | | | | | | | | | | | | | | |
| | 1 | 2 | 0 | 1347.87 | | | 1347.87 | 0.00 | 0.00 | 0.00 | 3.71 | 20.272 | 0.000 | 0.000 | 20.272 | | 375 | 0.50% | 0.013 | 124.0 | 1.12 | 0.79 | 16.4% |
| | 2 | 3 | 7 | 17.57 | 1.00 | | 1365.44 | 1.00 | 0.00 | 1.00 | 3.71 | 20.514 | 0.000 | 0.230 | 20.744 | | 375 | 0.50% | 0.013 | 124.0 | 1.12 | 0.80 | 16.7% |
| | 3 | 4 | 13 | 52.71 | 2.00 | | 1418.15 | 3.00 | 0.00 | 3.00 | 3.70 | 21.239 | 0.000 | 0.690 | 21.929 | | 375 | 0.50% | 0.013 | 124.0 | 1.12 | 0.81 | 17.7% |
| | 4 | 5 | 6 | 15.06 | 0.70 | | 1433.21 | 3.70 | 0.00 | 3.70 | 3.69 | 21.445 | 0.000 | 0.851 | 22.296 | | 375 | 0.50% | 0.013 | 124.0 | 1.12 | 0.81 | 18.0% |
| | 5 | PS | | 0 | | | 1433.21 | 3.70 | 0.00 | 3.70 | 3.69 | 21.445 | 0.000 | 0.851 | 22.296 | | 375 | 0.50% | 0.013 | 124.0 | 1.12 | 0.81 | 18.0% |
| 2 | 2.1.1 | 2.1 | 9 | 22.59 | | | 22.59 | 0.00 | 0.00 | 0.00 | 4.00 | 0.366 | 0.000 | 0.000 | 0.366 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.28 | 1.6% |
| | 2.1.2 | 2.1 | 6 | 15.06 | | | 37.65 | 0.00 | 0.00 | 0.00 | 4.00 | 0.610 | 0.000 | 0.000 | 0.610 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.32 | 2.6% |
| | 2.1 | 2 | 14 | 35.14 | 2.00 | | 72.79 | 2.00 | 0.00 | 2.00 | 4.00 | 1.179 | 0.000 | 0.460 | 1.639 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.42 | 7.1% |
| 3 | 31 | 3 | 12 | 30.12 | 1.50 | | 30.12 | 1.50 | 0.00 | 1.50 | 4.00 | 0.488 | 0.000 | 0.345 | 0.833 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.35 | 3.6% |
| 4 | 4.1.1 | 4.1 | 49 | 122.99 | | | 122.99 | 0.00 | 0.00 | 0.00 | 4.00 | 1.993 | 0.000 | 0.000 | 1.993 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.44 | 8.6% |
| | 4.1.2 | 4.1 | 23 | 57.73 | | | 180.72 | 0.00 | 0.00 | 0.00 | 4.00 | 2.928 | 0.000 | 0.000 | 2.928 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.49 | 12.6% |
| | 4.1 | 4 | 20 | 50.2 | 8.70 | | 230.92 | 8.70 | 0.00 | 8.70 | 4.00 | 3.742 | 0.000 | 2.001 | 5.743 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.58 | 13.7% |
| Main (Future) | | | | | | | | | | | | | | | | | | | | | | | |
| | PS3 | 1 | | 3340.81 | 15.85 | | | | | | | | | | | | | | | | | | |
| | PS4 | 3 | | 20.08 | 2.80 | | | | | | | | | | | | | | | | | | |
| | PS5 | 5 | | 120.48 | 2.60 | | | | | | | | | | | | | | | | | | |
| | 1 | 2 | 0 | 3340.81 | | | 3340.81 | 0.00 | 0.00 | 0.00 | 3.40 | 46.044 | 0.000 | 0.000 | 46.044 | | 375 | 0.50% | 0.013 | 124.0 | 1.12 | 0.99 | 37.1% |
| | 2 | 3 | 7 | 17.57 | 1.00 | | 3358.38 | 1.00 | 0.00 | 1.00 | 3.40 | 46.260 | 0.000 | 0.230 | 46.490 | | 375 | 0.50% | 0.013 | 124.0 | 1.12 | 0.99 | 37.5% |
| | 3 | 4 | 63 | 178.21 | 2.00 | | 3536.59 | 3.00 | 0.00 | 3.00 | 3.38 | 48.434 | 0.000 | 0.690 | 49.124 | | 375 | 0.50% | 0.013 | 124.0 | 1.12 | 1.01 | 39.6% |
| | 4 | 5 | 6 | 15.06 | 0.70 | | 3551.65 | 3.70 | 0.00 | 3.70 | 3.38 | 48.617 | 0.000 | 0.851 | 49.468 | | 375 | 0.50% | 0.013 | 124.0 | 1.12 | 1.01 | 39.9% |
| | 5 | PS | 446 | 1239.94 | 27.00 | | 4791.59 | 30.70 | 0.00 | 30.70 | 3.26 | 63.318 | 0.000 | 7.061 | 70.379 | | 375 | 0.50% | 0.013 | 124.0 | 1.12 | 1.11 | 56.8% |
| 2 | 2.1.1 | 2.1 | 9 | 22.59 | | | 22.59 | 0.00 | 0.00 | 0.00 | 4.00 | 0.366 | 0.000 | 0.000 | 0.366 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.28 | 1.6% |
| | 2.1.2 | 2.1 | 6 | 15.06 | | | 37.65 | 0.00 | 0.00 | 0.00 | 4.00 | 0.610 | 0.000 | 0.000 | 0.610 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.32 | 2.6% |
| | 2.1 | 2 | 14 | 35.14 | 2.00 | | 72.79 | 2.00 | 0.00 | 2.00 | 4.00 | 1.179 | 0.000 | 0.460 | 1.639 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.42 | 7.1% |
| 3 | 31 | 3 | 12 | 30.12 | 1.50 | | 30.12 | 1.50 | 0.00 | 1.50 | 4.00 | 0.488 | 0.000 | 0.345 | 0.833 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.35 | 3.6% |
| 4 | 4.1.1 | 4.1 | 49 | 122.99 | | | 122.99 | 0.00 | 0.00 | 0.00 | 4.00 | 1.993 | 0.000 | 0.000 | 1.993 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.44 | 8.6% |
| | 4.1.2 | 4.1 | 23 | 57.73 | | | 180.72 | 0.00 | 0.00 | 0.00 | 4.00 | 2.928 | 0.000 | 0.000 | 2.928 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.49 | 12.6% |
| | 4.1 | 4 | 20 | 50.2 | 8.70 | | 230.92 | 8.70 | 0.00 | 8.70 | 4.00 | 3.742 | 0.000 | 2.001 | 5.743 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.58 | 13.7% |

Part 2 Washago Pumping Station Layout



## PS 1 SANITARY SEWER DESIGN SHEET

q = average per capita daily flow (Existing) 300 L/cap.d
q = average per capita daily flow 350 L/cap.d
c = unit of commercial/institutional flow 28.00 $m^3$/ha.d
ic = unit of peak extraneous flow 0.23 L/ha.s
p = unit of population density 2.51 ppu

Q(p) = peak population flow (L/s)
Q(i) = i x A = peak extraneous flow (L/s)
Q(c) = c x A / 86400 = peak commercial flow (L/s)
0
Q(d) = Q(p) + Q(i) = peak design flow (L/s)

P = population
M = peaking factor (Harmon)
P = p x # units / 1000
M = 1 + 14 / (4 + $P^{1/2}$) , maximum of 4.0, minimum of 2.0
Q = (P x q x M) / 86.4
M Min = 1.5
M Max = 4

DATE:
DESIGNED:
CHECKED:
FILE No.:
PROJECT:
SHEET No.: 1 OF 1

| Nominal Sizing (mm) | |
|---|---|
| 200 | 600 |
| 250 | 675 |
| 300 | 750 |
| 375 | 900 |
| 450 | 1050 |
| 525 | |

| LOCATION | | | INDIVIDUAL | | | | CUMULATIVE | | | | | | | | | PROPOSED SANITARY SEWER | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STREET | FROM MH | TO MH | No. RESIDENTIAL UNITS | POP | RES. AREA (ha) | COM./INST. AREA (ha) | POP | RES. AREA (ha) | COM./INST. AREA (ha) | TOTAL AREA (ha) | PEAKING FACTOR (M) | POPULATION FLOW, Q(p) (L/s) | CUMULATIVE COM./INST. FLOWS (L/s) | PEAK EXTRANEOUS FLOW, Q(i) (L/s) | PEAK DESIGN FLOW, Q(d) (L/s) | LENGTH (m) | PIPE SIZE DIAMETER (mm) | GRADE (%) | MANNING'S n | CAPACITY (L/s) | FULL FLOW VELOCITY (m/s) | ACTUAL VELOCITY (m/s) | PERCENT FULL |
| Main (Existing) | 1 | 2 | 21 | 52.71 | 3.70 | | 52.71 | 3.70 | 0.00 | 3.70 | 4.00 | 0.732 | 0.000 | 0.851 | 1.583 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.41 | 6.8% |
| Main (Buildout) | 1 | 2 | 24 | 60.24 | 3.70 | | 60.24 | 3.70 | 0.00 | 3.70 | 4.00 | 0.976 | 0.000 | 0.851 | 1.827 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.43 | 7.9% |

## PS 2 SANITARY SEWER DESIGN SHEET

q = average per capita daily flow (Existing) 350 L/cap.d
q = average per capita daily flow 350 L/cap.d
c = unit of commercial/institutional flow 28.00 $m^3$/ha.d
ic = unit of peak extraneous flow 0.23 L/ha.s
p = unit of population density 2.51 ppu

Q(p) = peak population flow (L/s)
Q(i) = i x A = peak extraneous flow (L/s)
$Q(c) = \frac{c \times A}{86400}$ = peak commercial flow (L/s)
Q(d) = Q(p) + Q(i) = peak design flow (L/s)

P = population
M = peaking factor (Harmon)
P = p x # units / 1000
$M = 1 + 14 / (4 + P^{1/2})$ , maximum of 4.0, minimum of 2.0
Q = (P x q x M) / 86.4
M Min = 1.5
M Max = 4

DATE:
DESIGNED:
CHECKED:
FILE No.: 1
PROJECT:

SHEET No.: 1 OF 1

| Nominal Sizing (mm) | |
|---|---|
| 200 | 600 |
| 250 | 675 |
| 300 | 750 |
| 375 | 900 |
| 450 | 1050 |
| 525 | |

| LOCATION | | | INDIVIDUAL | | | | CUMULATIVE | | | | | | | | | PROPOSED SANITARY SEWER | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STREET | MH | MH | UNITS | POP | (ha) | AREA | POP | (ha) | AREA | (ha) | FACTOR | FLOW, Q(p) | FLOWS | Q(i) | Q(d) | (m) | DIAMETER | (%) | MANNING'S n | (L/s) | VELOCITY | VELOCITY | FULL |
| Main (Existing) | | | | | | | | | | | | | | | | | | | | | | | |
| | 1 | 2 | 9 | 22.59 | | | 22.59 | 0.00 | 0.00 | 0.00 | 4.00 | 0.366 | 0.000 | 0.000 | 0.366 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.28 | 1.6% |
| | 2 | ps | 7 | 17.57 | 1.70 | | 40.16 | 1.70 | 0.00 | 1.70 | 4.00 | 0.651 | 0.000 | 0.391 | 1.042 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.37 | 4.5% |
| 2 | 2.1 | 2 | 7 | 17.57 | | | 17.57 | 0.00 | 0.00 | 0.00 | 4.00 | 0.285 | 0.000 | 0.000 | 0.285 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.26 | 1.2% |
| Main (Proposed) | | | | | | | | | | | | | | | | | | | | | | | |
| | 1 | 2 | 9 | 22.59 | | | 22.59 | 0.00 | 0.00 | 0.00 | 4.00 | 0.366 | 0.000 | 0.000 | 0.366 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.28 | 1.6% |
| | 2 | ps | 7 | 17.57 | 1.70 | | 40.16 | 1.70 | 0.00 | 1.70 | 4.00 | 0.651 | 0.000 | 0.391 | 1.042 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.37 | 4.5% |
| 2 | 2.1 | 2 | 7 | 17.57 | | | 17.57 | 0.00 | 0.00 | 0.00 | 4.00 | 0.285 | 0.000 | 0.000 | 0.285 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.26 | 1.2% |

# PS 3 SANITARY SEWER DESIGN SHEET

q = average per capita daily flow (Existing) 350 L/cap.d
q = average per capita daily flow 350 L/cap.d
c = unit of commercial/institutional flow 28.00 $m^3$/ha.d
ic = unit of peak extraneous flow 0.23 L/ha.s
p = unit of population density 2.51 ppu

Q(p) = peak population flow (L/s)
Q(i) = i x A = peak extraneous flow (L/s)
Q(c) = c x A / 86400 = peak commercial flow (L/s)
Q(d) = Q(p) + Q(i) = peak design flow (L/s)

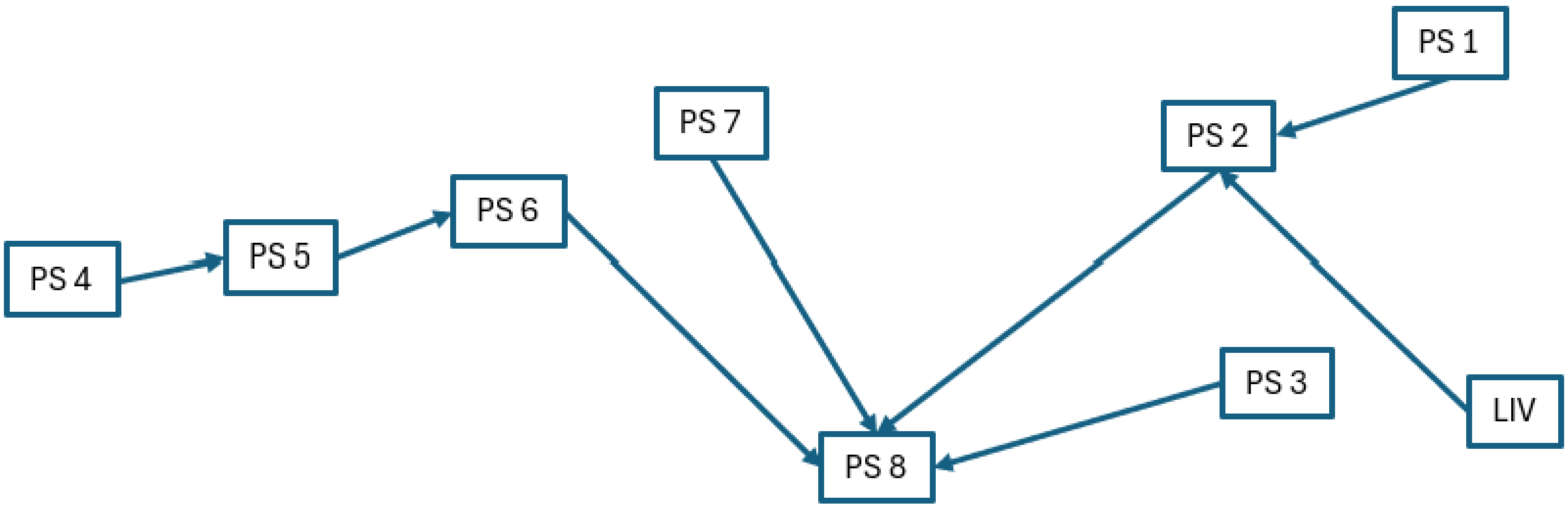
P = population
M = peaking factor (Harmon)
P = p x # units / 1000
M = 1 + 14 / (4 + $P^{1/2}$) , maximum of 4.0, minimum of 2.0
Q = (P x q x M) / 86.4
M Min = 1.5
M Max = 4

DATE:
DESIGNED:
CHECKED:
FILE No.: 1
PROJECT:
SHEET No.: 1 OF 1

| Nominal Sizing (mm) | |
|---|---|
| 200 | 600 |
| 250 | 675 |
| 300 | 750 |
| 375 | 900 |
| 450 | 1050 |
| 525 | |

| LOCATION | | | INDIVIDUAL | | | | CUMULATIVE | | | | | | | | | PROPOSED SANITARY SEWER | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STREET | FROM MH | TO MH | No. RESIDENTIAL UNITS | POP | RES. AREA (ha) | COM./INST. AREA (ha) | POP | RES. AREA (ha) | COM./INST. AREA (ha) | TOTAL AREA (ha) | PEAKING FACTOR (M) | POPULATION FLOW, Q(p) (L/s) | CUMULATIVE COM./INST. FLOWS (L/s) | PEAK EXTRANEOUS FLOW, Q(i) (L/s) | PEAK DESIGN FLOW, Q(d) (L/s) | LENGTH (m) | PIPE SIZE DIAMETER (mm) | GRADE (%) | MANNING'S n | CAPACITY (L/s) | FULL FLOW VELOCITY (m/s) | ACTUAL VELOCITY (m/s) | PERCENT FULL |
| Main (Existing) | | | | | | | | | | | | | | | | | | | | | | | |
| | From PS1 | 1 | | 52.71 | 3.70 | | | | | | | | | | | | | | | | | | |
| | From PS2 | 3 | | 40.16 | 1.70 | | | | | | | | | | | | | | | | | | |
| | 1 | 2 | 2 | 57.73 | 0.70 | | 57.73 | 0.70 | 0.00 | 0.70 | 4.00 | 0.935 | 0.000 | 0.161 | 1.096 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.37 | 4.7% |
| | 2 | 3 | 0 | 0 | 0.70 | | 57.73 | 1.40 | 0.00 | 1.40 | 4.00 | 0.935 | 0.000 | 0.322 | 1.257 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.39 | 5.4% |
| | 3 | 4 | 37 | 133.03 | 3.30 | | 190.76 | 4.70 | 0.00 | 4.70 | 4.00 | 3.091 | 0.000 | 1.081 | 4.172 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.53 | 18.0% |
| | 4 | 5 | 23 | 57.73 | 1.30 | | 248.49 | 6.00 | 0.00 | 6.00 | 4.00 | 4.026 | 0.000 | 1.380 | 5.406 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.57 | 12.9% |
| | 5 | PS | 7 | 17.57 | | | 266.06 | 6.00 | 0.00 | 6.00 | 4.00 | 4.311 | 0.000 | 1.380 | 5.691 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.57 | 13.5% |
| 2 | 2.1 | 2 | 5 | 12.55 | | | 12.55 | 0.00 | 0.00 | 0.00 | 4.00 | 0.203 | 0.000 | 0.000 | 0.203 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.24 | 0.9% |
| 3 | 3.1 | 3 | 4 | 10.04 | | | 10.04 | 0.00 | 0.00 | 0.00 | 4.00 | 0.163 | 0.000 | 0.000 | 0.163 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.22 | 0.7% |
| 4 | 4.1 | 4.2 | 5 | 12.55 | | | 12.55 | 0.00 | 0.00 | 0.00 | 4.00 | 0.203 | 0.000 | 0.000 | 0.203 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.24 | 0.9% |
| | 4.2 | 4 | 5 | 12.55 | | | 25.10 | 0.00 | 0.00 | 0.00 | 4.00 | 0.407 | 0.000 | 0.000 | 0.407 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.28 | 1.8% |
| | 4.3 | 4 | 2 | 5.02 | 1.80 | | 30.12 | 1.80 | 0.00 | 1.80 | 4.00 | 0.488 | 0.000 | 0.414 | 0.902 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.35 | 3.9% |
| 5 | 5.2 | 5.1 | 0 | 0 | | | 25.10 | 0.00 | 0.00 | 0.00 | 4.00 | 0.407 | 0.000 | 0.000 | 0.407 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.28 | 1.8% |
| | 5.3 | 5.1 | 0 | 0 | | | 25.10 | 0.00 | 0.00 | 0.00 | 4.00 | 0.407 | 0.000 | 0.000 | 0.407 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.28 | 1.8% |
| | 5.1 | 5 | 7 | 17.57 | 1.30 | | 42.67 | 1.30 | 0.00 | 1.30 | 4.00 | 0.691 | 0.000 | 0.299 | 0.990 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.36 | 4.3% |
| Main (build out) | | | | | | | | | | | | | | | | | | | | | | | |
| | From PS1 | 1 | | 60.24 | 3.70 | | | | | | | | | | | | | | | | | | |
| | From PS2 | 3 | | 40.16 | 1.70 | | | | | | | | | | | | | | | | | | |
| | 1 | 2 | 2 | 65.26 | 0.70 | | 65.26 | 0.70 | 0.00 | 0.70 | 4.00 | 1.057 | 0.000 | 0.161 | 1.218 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.38 | 5.3% |
| | 2 | 3 | 15 | 37.65 | 0.70 | | 102.91 | 1.40 | 0.00 | 1.40 | 4.00 | 1.668 | 0.000 | 0.322 | 1.990 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.44 | 8.6% |
| | 3 | 4 | 37 | 133.03 | 3.30 | | 235.94 | 4.70 | 0.00 | 4.70 | 4.00 | 3.823 | 0.000 | 1.081 | 4.904 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.56 | 21.1% |
| | 4 | 5 | 59 | 148.09 | 1.30 | | 384.03 | 6.00 | 0.00 | 6.00 | 4.00 | 6.223 | 0.000 | 1.380 | 7.603 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.62 | 18.1% |
| | 5 | PS | 7 | 17.57 | | | 401.60 | 6.00 | 0.00 | 6.00 | 4.00 | 6.507 | 0.000 | 1.380 | 7.887 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.63 | 18.8% |
| 2 | 2.1 | 2 | 5 | 12.55 | | | 12.55 | 0.00 | 0.00 | 0.00 | 4.00 | 0.203 | 0.000 | 0.000 | 0.203 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.24 | 0.9% |
| 3 | 3.1 | 3 | 4 | 10.04 | | | 10.04 | 0.00 | 0.00 | 0.00 | 4.00 | 0.163 | 0.000 | 0.000 | 0.163 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.22 | 0.7% |
| 4 | 4.1 | 4.2 | 39 | 97.89 | 1.00 | | 97.89 | 1.00 | 0.00 | 1.00 | 4.00 | 1.586 | 0.000 | 0.230 | 1.816 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.43 | 7.8% |
| | 4.2 | 4 | 5 | 12.55 | | | 110.44 | 1.00 | 0.00 | 1.00 | 4.00 | 1.790 | 0.000 | 0.230 | 2.020 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.44 | 8.7% |
| | 4.3 | 4 | 2 | 5.02 | 1.80 | | 115.46 | 2.80 | 0.00 | 2.80 | 4.00 | 1.871 | 0.000 | 0.644 | 2.515 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.47 | 10.8% |
| 5 | 5.2 | 5.1 | 0 | 0 | | | 110.44 | 1.00 | 0.00 | 1.00 | 4.00 | 1.790 | 0.000 | 0.230 | 2.020 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.44 | 8.7% |
| | 5.3 | 5.1 | 0 | 0 | | | 110.44 | 1.00 | 0.00 | 1.00 | 4.00 | 1.790 | 0.000 | 0.230 | 2.020 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.44 | 8.7% |
| | 5.1 | 5 | 7 | 17.57 | 1.30 | | 128.01 | 2.30 | 0.00 | 2.30 | 4.00 | 2.074 | 0.000 | 0.529 | 2.603 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.47 | 11.2% |

Part 3A- Westshore Option 1 Pumping Station Analysis



## PS 1 SANITARY SEWER DESIGN SHEET

q = average per capita daily flow (Existing) 300 L/cap.d
q = average per capita daily flow 300 L/cap.d
c = unit of commercial/institutional flow 28.00 $m^3$/ha.d
ic = unit of peak extraneous flow 0.05 L/ha.s
p = unit of population density 2.51 ppu

Q(p) = peak population flow (L/s)
Q(i) = i x A = peak extraneous flow (L/s)
Q(c) = c x A / 86400 = peak commercial flow (L/s)
0
Q(d) = Q(p) + Q(i) = peak design flow (L/s)

P = population
M = peaking factor (Harmon)
P = p x # units / 1000
M = 1 + 14 / (4 + $P^{1/2}$) , maximum of 4.0, minimum of 2.0
Q = (P x q x M) / 86.4
M Min = 1.5
M Max = 4

DATE:
DESIGNED:
CHECKED:
FILE No.:
PROJECT:
SHEET No.: 1 OF 1

| Nominal Sizing (mm) | |
|---|---|
| 200 | 600 |
| 250 | 675 |
| 300 | 750 |
| 375 | 900 |
| 450 | 1050 |
| 525 | |

| LOCATION | | | INDIVIDUAL | | | | CUMULATIVE | | | | | | | | | PROPOSED SANITARY SEWER | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STREET | MH | MH | UNITS | POP | (ha) | AREA | POP | (ha) | AREA | (ha) | FACTOR | FLOW, Q(p) | FLOWS | Q(i) | Q(d) | (m) | DIAMETER | (%) | MANNING'S n | (L/s) | VELOCITY | VELOCITY | FULL |
| Menoke Sub area | | | | | | | | | | | | | | | | | | | | | | | |
| Main (Existing) | 1 | 2 | 22 | 55.22 | | | 55.22 | 0.00 | 0.00 | 0.00 | 4.00 | 0.767 | 0.000 | 0.000 | 0.767 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.34 | 3.3% |
| | 2 | 3 | 29 | 72.79 | | | 128.01 | 0.00 | 0.00 | 0.00 | 4.00 | 1.778 | 0.000 | 0.000 | 1.778 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.42 | 7.7% |
| | 3 | 4 | 40 | 100.4 | | | 228.41 | 0.00 | 0.00 | 0.00 | 4.00 | 3.172 | 0.000 | 0.000 | 3.172 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.50 | 13.7% |
| | 4 | 5 | 40 | 100.4 | | | 328.81 | 0.00 | 0.00 | 0.00 | 4.00 | 4.567 | 0.000 | 0.000 | 4.567 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.55 | 19.7% |
| | 5 | 6 | 83 | 208.33 | 27.30 | | 537.14 | 27.30 | 0.00 | 27.30 | 3.96 | 7.382 | 0.000 | 1.365 | 8.747 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.65 | 37.7% |
| 2 | 2.1 | 2 | 25 | 62.75 | | | 62.75 | 0.00 | 0.00 | 0.00 | 4.00 | 0.872 | 0.000 | 0.000 | 0.872 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.35 | 3.8% |
| 3 | 3.1 | 3 | 30 | 75.3 | | | 75.30 | 0.00 | 0.00 | 0.00 | 4.00 | 1.046 | 0.000 | 0.000 | 1.046 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.37 | 4.5% |
| 4 | 4.1 | 4 | 40 | 100.4 | | | 100.40 | 0.00 | 0.00 | 0.00 | 4.00 | 1.394 | 0.000 | 0.000 | 1.394 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.40 | 6.0% |
| 5 | 5.1 | 5 | 60 | 150.6 | | | 150.60 | 0.00 | 0.00 | 0.00 | 4.00 | 2.092 | 0.000 | 0.000 | 2.092 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.44 | 9.0% |
| Main (Buildout) | 1 | 2 | 23 | 57.73 | | | 57.73 | 0.00 | 0.00 | 0.00 | 4.00 | 0.802 | 0.000 | 0.000 | 0.802 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.34 | 3.5% |
| | 2 | 3 | 29 | 72.79 | | | 130.52 | 0.00 | 0.00 | 0.00 | 4.00 | 1.813 | 0.000 | 0.000 | 1.813 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.43 | 7.8% |
| | 3 | 4 | 40 | 100.4 | | | 230.92 | 0.00 | 0.00 | 0.00 | 4.00 | 3.207 | 0.000 | 0.000 | 3.207 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.50 | 13.8% |
| | 4 | 5 | 40 | 100.4 | | | 331.32 | 0.00 | 0.00 | 0.00 | 4.00 | 4.602 | 0.000 | 0.000 | 4.602 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.55 | 19.8% |
| | 5 | 6 | 227 | 569.77 | 32.40 | | 901.09 | 32.40 | 0.00 | 32.40 | 3.83 | 11.979 | 0.000 | 1.620 | 13.599 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.73 | 58.6% |
| 2 | 2.1 | 2 | 25 | 62.75 | | | 62.75 | 0.00 | 0.00 | 0.00 | 4.00 | 0.872 | 0.000 | 0.000 | 0.872 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.35 | 3.8% |
| 3 | 3.1 | 3 | 30 | 75.3 | | | 75.30 | 0.00 | 0.00 | 0.00 | 4.00 | 1.046 | 0.000 | 0.000 | 1.046 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.37 | 4.5% |
| 4 | 4.1 | 4 | 40 | 100.4 | | | 100.40 | 0.00 | 0.00 | 0.00 | 4.00 | 1.394 | 0.000 | 0.000 | 1.394 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.40 | 6.0% |
| 5 | 5.1 | 5 | 60 | 150.6 | | | 150.60 | 0.00 | 0.00 | 0.00 | 4.00 | 2.092 | 0.000 | 0.000 | 2.092 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.44 | 9.0% |
| 6 | 6.1 | 6 | 144 | 361.44 | | | 361.44 | 0.00 | 0.00 | 0.00 | 4.00 | 5.020 | 0.000 | 0.000 | 5.020 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.56 | 21.6% |

## PS 2 SANITARY SEWER DESIGN SHEET

q = average per capita daily flow (Existing) 300 L/cap.d
q = average per capita daily flow 300 L/cap.d
c = unit of commercial/institutional flow 28.00 $m^3$/ha.d
ic = unit of peak extraneous flow 0.05 L/ha.s
p = unit of population density 2.51 ppu

Q(p) = peak population flow (L/s)
Q(i) = i x A = peak extraneous flow (L/s)
Q(c) = c x A / 86400 = peak commercial flow (L/s)
Q(d) = Q(p) + Q(i) = peak design flow (L/s)

P = population
M = peaking factor (Harmon)
P = p x # units / 1000
M = 1 + 14 / (4 + $P^{1/2}$) , maximum of 4.0, minimum of 2.0
Q = (P x q x M) / 86.4
M Min = 1.5
M Max = 4

DATE:
DESIGNED:
CHECKED:
FILE No.: 1
PROJECT:

SHEET No.: 1 OF 1

| Nominal Sizing (mm) | |
|---|---|
| 200 | 600 |
| 250 | 675 |
| 300 | 750 |
| 375 | 900 |
| 450 | 1050 |
| 525 | |

| LOCATION | | | INDIVIDUAL | | | | CUMULATIVE | | | | | | | | | PROPOSED SANITARY SEWER | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STREET | FROM MH | TO MH | No. RESIDENTIAL UNITS | POP | RES. AREA (ha) | COM./INST. AREA (ha) | POP | RES. AREA (ha) | COM./INST. AREA (ha) | TOTAL AREA (ha) | PEAKING FACTOR (M) | POPULATION FLOW, Q(p) (L/s) | CUMULATIVE COM./INST. FLOWS (L/s) | PEAK EXTRANEOUS FLOW, Q(i) (L/s) | PEAK DESIGN FLOW, Q(d) (L/s) | LENGTH (m) | PIPE SIZE DIAMETER (mm) | GRADE (%) | MANNING'S n | CAPACITY (L/s) | FULL FLOW VELOCITY (m/s) | ACTUAL VELOCITY (m/s) | PERCENT FULL |
| Main (Existing) | From PS1 | 3.2 | | 537.14 | 27.30 | | | | | | | | | | | | | | | | | | |
| | 1 | 2 | 19 | 47.69 | | | 47.69 | 0.00 | 0.00 | 0.00 | 4.00 | 0.662 | 0.000 | 0.000 | 0.662 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.33 | 2.9% |
| | 2 | 3 | 44 | 110.44 | | | 158.13 | 0.00 | 0.00 | 0.00 | 4.00 | 2.196 | 0.000 | 0.000 | 2.196 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.45 | 9.5% |
| | 3 | 4 | 84 | 727.9 | | | 886.03 | 0.00 | 0.00 | 0.00 | 3.83 | 11.793 | 0.000 | 0.000 | 11.793 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.70 | 28.0% |
| | 4 | PS | 28 | 70.28 | 87.50 | | 956.31 | 87.50 | 0.00 | 87.50 | 3.81 | 12.659 | 0.000 | 4.375 | 17.034 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.77 | 40.5% |
| 2 | 2.1 | 2 | 10 | 25.1 | | | 25.10 | 0.00 | 0.00 | 0.00 | 4.00 | 0.349 | 0.000 | 0.000 | 0.349 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.27 | 1.5% |
| 3 | 3.2 | 3.1 | 25 | 62.75 | 27.30 | | 62.75 | 27.30 | 0.00 | 27.30 | 4.00 | 0.872 | 0.000 | 1.365 | 2.237 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.45 | 9.6% |
| | 3.1 | 3 | 51 | 665.15 | | | 727.90 | 27.30 | 0.00 | 27.30 | 3.88 | 9.818 | 0.000 | 1.365 | 11.183 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.69 | 26.6% |
| 3.1a | 3.1a | 3.1 | 18 | 45.18 | | | 45.18 | 0.00 | 0.00 | 0.00 | 4.00 | 0.628 | 0.000 | 0.000 | 0.628 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.32 | 2.7% |
| 3.1b | 3.1b | 3.1 | 18 | 45.18 | | | 45.18 | 0.00 | 0.00 | 0.00 | 4.00 | 0.628 | 0.000 | 0.000 | 0.628 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.32 | 2.7% |
| PS | 4.1 | 4 | 28 | 70.28 | | | 70.28 | 0.00 | 0.00 | 0.00 | 4.00 | 0.976 | 0.000 | 0.000 | 0.976 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.36 | 4.2% |
| Main (Future) | From PS1 | 3.2 | | 901.09 | 32.40 | | | | | | | | | | | | | | | | | | |
| | 1 | 2 | 19 | 47.69 | | | 47.69 | 0.00 | 0.00 | 0.00 | 4.00 | 0.662 | 0.000 | 0.000 | 0.662 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.33 | 2.9% |
| | 2 | 3 | 44 | 110.44 | 0.00 | | 158.13 | 0.00 | 0.00 | 0.00 | 4.00 | 2.196 | 0.000 | 0.000 | 2.196 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.45 | 9.5% |
| | 3 | 4 | 686 | 2602.87 | | | 2761.00 | 0.00 | 0.00 | 0.00 | 3.47 | 33.293 | 0.000 | 0.000 | 33.293 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.86 | 79.2% |
| | 4 | PS | 28 | 70.28 | 92.60 | | 2831.28 | 92.60 | 0.00 | 92.60 | 3.46 | 34.051 | 0.000 | 4.630 | 38.681 | | 300 | 0.50% | 0.013 | 68.4 | 0.97 | 0.95 | 56.6% |
| 2 | 2.1 | 2 | 10 | 25.1 | | | 25.10 | 0.00 | 0.00 | 0.00 | 4.00 | 0.349 | 0.000 | 0.000 | 0.349 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.27 | 1.5% |
| 3 | 3.2 | 3.1 | 25 | 963.84 | 32.40 | | 963.84 | 32.40 | 0.00 | 32.40 | 3.81 | 12.752 | 0.000 | 1.620 | 14.372 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.74 | 62.0% |
| | 3.1 | 3 | 653 | 1639.03 | 30.00 | | 2602.87 | 62.40 | 0.00 | 62.40 | 3.49 | 31.578 | 0.000 | 3.120 | 34.698 | | 300 | 0.50% | 0.013 | 68.4 | 0.97 | 0.93 | 50.7% |
| 3.1 | 3.1a | 3.1 | 319 | 800.69 | 15.00 | | 800.69 | 15.00 | 0.00 | 15.00 | 3.86 | 10.732 | 0.000 | 0.750 | 11.482 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.70 | 49.5% |
| 3.1 | 3.1b | 3.1 | 319 | 800.69 | 15.00 | | 800.69 | 15.00 | 0.00 | 15.00 | 3.86 | 10.732 | 0.000 | 0.750 | 11.482 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.70 | 49.5% |
| 2 | 2.1.1 | 2 | | 0 | | | 0.00 | 0.00 | 0.00 | 0.00 | 4.00 | 0.000 | 0.000 | 0.000 | 0.000 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.00 | 0.0% |
| PS | 4.1 | 4 | 28 | 70.28 | | | 70.28 | 0.00 | 0.00 | 0.00 | 4.00 | 0.976 | 0.000 | 0.000 | 0.976 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.36 | 4.2% |

## PS 3 SANITARY SEWER DESIGN SHEET

q = average per capita daily flow (Existing) 300 L/cap.d
q = average per capita daily flow 300 L/cap.d
c = unit of commercial/institutional flow 28.00 $m^3$/ha.d
ic = unit of peak extraneous flow 0.05 L/ha.s
p = unit of population density 2.51 ppu

Q(p) = peak population flow (L/s)
Q(i) = i x A = peak extraneous flow (L/s)
Q(c) = c x A / 86400 = peak commercial flow (L/s)
Q(d) = Q(p) + Q(i) = peak design flow (L/s)

P = population
M = peaking factor (Harmon)
P = p x # units / 1000
M = 1 + 14 / (4 + $P^{1/2}$) , maximum of 4.0, minimum of 2.0
Q = (P x q x M) / 86.4
M Min = 1.5
M Max = 4

DATE:
DESIGNED:
CHECKED:
FILE No.: 1
PROJECT:

SHEET No.: 1 OF 1

| Nominal Sizing (mm) | |
|---|---|
| 200 | 600 |
| 250 | 675 |
| 300 | 750 |
| 375 | 900 |
| 450 | 1050 |
| 525 | |

| LOCATION | | | INDIVIDUAL | | | | CUMULATIVE | | | | | | | | | PROPOSED SANITARY SEWER | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STREET | MH | MH | UNITS | POP | (ha) | AREA | POP | (ha) | AREA | (ha) | FACTOR | FLOW, Q(p) | FLOWS | Q(i) | Q(d) | (m) | DIAMETER | (%) | MANNING'S n | (L/s) | VELOCITY | VELOCITY | FULL |
| Main (Existing) | | | | | | | 0.00 | 0.00 | 0.00 | 0.00 | 4.00 | 0.000 | 0.000 | 0.000 | 0.000 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.00 | 0.0% |
| | 1 | 2 | 5 | 12.55 | | | 12.55 | 0.00 | 0.00 | 0.00 | 4.00 | 0.174 | 0.000 | 0.000 | 0.174 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.23 | 0.8% |
| | 2 | 3 | 3 | 7.53 | | | 20.08 | 0.00 | 0.00 | 0.00 | 4.00 | 0.279 | 0.000 | 0.000 | 0.279 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.26 | 1.2% |
| | 3 | 4 | 25 | 62.75 | | | 82.83 | 0.00 | 0.00 | 0.00 | 4.00 | 1.150 | 0.000 | 0.000 | 1.150 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.38 | 5.0% |
| | 4 | PS | 14 | 35.14 | 11.00 | | 117.97 | 11.00 | 0.00 | 11.00 | 4.00 | 1.638 | 0.000 | 0.550 | 2.188 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.45 | 9.4% |
| 2 | 2.1 | 2 | 0 | 0 | | | 0.00 | 0.00 | 0.00 | 0.00 | 4.00 | 0.000 | 0.000 | 0.000 | 0.000 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.00 | 0.0% |
| 3 | 3.1a | 3 | 9 | 22.59 | | | 22.59 | 0.00 | 0.00 | 0.00 | 4.00 | 0.314 | 0.000 | 0.000 | 0.314 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.27 | 1.4% |
| | 3.1b | 3 | 3 | 7.53 | | | 30.12 | 0.00 | 0.00 | 0.00 | 4.00 | 0.418 | 0.000 | 0.000 | 0.418 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.29 | 1.8% |
| 4 | 4.1a | 4 | 4 | 10.04 | | | 10.04 | 0.00 | 0.00 | 0.00 | 4.00 | 0.139 | 0.000 | 0.000 | 0.139 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.21 | 0.6% |
| | 4.1b | 4 | 10 | 25.1 | | | 35.14 | 0.00 | 0.00 | 0.00 | 4.00 | 0.488 | 0.000 | 0.000 | 0.488 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.30 | 2.1% |
| Main (Proposed) | | | | | | | 0.00 | 0.00 | 0.00 | 0.00 | 4.00 | 0.000 | 0.000 | 0.000 | 0.000 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.00 | 0.0% |
| | 1 | 2 | 5 | 12.55 | | | 12.55 | 0.00 | 0.00 | 0.00 | 4.00 | 0.174 | 0.000 | 0.000 | 0.174 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.23 | 0.8% |
| | 2 | 3 | 43 | 107.93 | | | 120.48 | 0.00 | 0.00 | 0.00 | 4.00 | 1.673 | 0.000 | 0.000 | 1.673 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.42 | 7.2% |
| | 3 | 4 | 25 | 62.75 | | | 183.23 | 0.00 | 0.00 | 0.00 | 4.00 | 2.545 | 0.000 | 0.000 | 2.545 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.47 | 11.0% |
| | 4 | PS | 14 | 35.14 | 16.80 | | 218.37 | 16.80 | 0.00 | 16.80 | 4.00 | 3.033 | 0.000 | 0.840 | 3.873 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.52 | 16.7% |
| 2 | 2.1 | 2 | 40 | 100.4 | | | 100.40 | 0.00 | 0.00 | 0.00 | 4.00 | 1.394 | 0.000 | 0.000 | 1.394 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.40 | 6.0% |
| 3 | 3.1a | 3 | 9 | 22.59 | | | 22.59 | 0.00 | 0.00 | 0.00 | 4.00 | 0.314 | 0.000 | 0.000 | 0.314 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.27 | 1.4% |
| | 3.1b | 3 | 3 | 7.53 | | | 30.12 | 0.00 | 0.00 | 0.00 | 4.00 | 0.418 | 0.000 | 0.000 | 0.418 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.29 | 1.8% |
| 4 | 4.1a | 4 | 4 | 10.04 | | | 10.04 | 0.00 | 0.00 | 0.00 | 4.00 | 0.139 | 0.000 | 0.000 | 0.139 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.21 | 0.6% |
| | 4.1b | 4 | 10 | 25.1 | | | 35.14 | 0.00 | 0.00 | 0.00 | 4.00 | 0.488 | 0.000 | 0.000 | 0.488 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.30 | 2.1% |

# PS 4 SANITARY SEWER DESIGN SHEET

| | | | |
|---|---|---|---|
| q = average per capita daily flow (Existing) | 300 | L/cap.d | |
| q = average per capita daily flow | 300 | L/cap.d | |
| c = unit of commercial/institutional flow | 28.00 | $m^3$/ha.d | |
| ic = unit of peak extraneous flow | 0.05 | L/ha.s | |
| p = unit of population density | 2.51 | ppu | |

Q(p) = peak population flow (L/s)
Q(i) = i x A = peak extraneous flow (L/s)
Q(c) = c x A / 86400 = peak commercial flow (L/s)
Q(d) = Q(p) + Q(i) = peak design flow (L/s)

P = population
M = peaking factor (Harmon)
P = p x # units / 1000
M = 1 + 14 / (4 + $P^{1/2}$) , maximum of 4.0, minimum of 2.0
Q = (P x q x M) / 86.4
M Min = 1.5
M Max = 4

DATE:
DESIGNED:
CHECKED:
FILE No.: 1
PROJECT:
SHEET No.: 1 OF 1

| Nominal Sizing (mm) | |
|---|---|
| 200 | 600 |
| 250 | 675 |
| 300 | 750 |
| 375 | 900 |
| 450 | 1050 |
| 525 | |

| LOCATION | | | INDIVIDUAL | | | | CUMULATIVE | | | | | | | | | PROPOSED SANITARY SEWER | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STREET | MH | MH | UNITS | POP | (ha) | AREA | POP | (ha) | AREA | (ha) | FACTOR | FLOW, Q(p) | FLOWS | Q(i) | Q(d) | (m) | DIAMETER | (%) | MANNING'S n | (L/s) | VELOCITY | VELOCITY | FULL |
| Main (Existing) | | | | | | | | | | | | | | | | | | | | | | | |
| | 1 | 2 | 49 | 122.99 | | | 122.99 | 0.00 | 0.00 | 0.00 | 4.00 | 1.708 | 0.000 | 0.000 | 1.708 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.42 | 7.4% |
| | 2 | PS | 9 | 22.59 | 13.60 | | 145.58 | 13.60 | 0.00 | 13.60 | 4.00 | 2.022 | 0.000 | 0.680 | 2.702 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.48 | 11.7% |
| 2 | 2.1 | 2 | 9 | 22.59 | | | 22.59 | 0.00 | 0.00 | 0.00 | 4.00 | 0.314 | 0.000 | 0.000 | 0.314 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.27 | 1.4% |
| Main (Future) | | | | | | | | | | | | | | | | | | | | | | | |
| | 1 | 2 | 119 | 298.69 | | | 298.69 | 0.00 | 0.00 | 0.00 | 4.00 | 4.148 | 0.000 | 0.000 | 4.148 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.53 | 17.9% |
| | 2 | PS | 9 | 22.59 | 53.00 | | 321.28 | 53.00 | 0.00 | 53.00 | 4.00 | 4.462 | 0.000 | 2.650 | 7.112 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.62 | 30.7% |
| 2 | 2.1 | 2 | 9 | 22.59 | | | 22.59 | 0.00 | 0.00 | 0.00 | 4.00 | 0.314 | 0.000 | 0.000 | 0.314 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.27 | 1.4% |
| 1 | 1.1 | 1 | 70 | 175.7 | | | 175.70 | 0.00 | 0.00 | 0.00 | 4.00 | 2.440 | 0.000 | 0.000 | 2.440 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.46 | 10.5% |

## PS 5 SANITARY SEWER DESIGN SHEET

q = average per capita daily flow (Existing) 300 L/cap.d
q = average per capita daily flow 300 L/cap.d
c = unit of commercial/institutional flow 28.00 $m^3$/ha.d
ic = unit of peak extraneous flow 0.05 L/ha.s
p = unit of population density 2.51 ppu

Q(p) = peak population flow (L/s)
Q(i) = i x A = peak extraneous flow (L/s)
Q(c) = c x A / 86400 = peak commercial flow (L/s)
Q(d) = Q(p) + Q(i) = peak design flow (L/s)

P = population
M = peaking factor (Harmon)
P = p x # units / 1000
$M = 1 + 14 / (4 + P^{1/2})$ , maximum of 4.0, minimum of 2.0
Q = (P x q x M) / 86.4
M Min = 1.5
M Max = 4

DATE:
DESIGNED:
CHECKED:
FILE No.: 1
PROJECT:
SHEET No.: 1 OF 1

| Nominal Sizing (mm) | |
|---|---|
| 200 | 600 |
| 250 | 675 |
| 300 | 750 |
| 375 | 900 |
| 450 | 1050 |
| 525 | |

| LOCATION | | | INDIVIDUAL | | | | CUMULATIVE | | | | | | | | | PROPOSED SANITARY SEWER | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STREET | MH | MH | UNITS | POP | (ha) | AREA | POP | (ha) | AREA | (ha) | FACTOR | FLOW, Q(p) | FLOWS | Q(i) | Q(d) | (m) | DIAMETER | (%) | MANNING'S n | (L/s) | VELOCITY | VELOCITY | FULL |
| Main (Existing) | PS4 | 5.1 | | 145.58 | 13.60 | | | | | | | | | | | | | | | | | | |
| | 1 | 2 | 0 | 0 | | | 0.00 | 0.00 | 0.00 | 0.00 | 4.00 | 0.000 | 0.000 | 0.000 | 0.000 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.00 | 0.0% |
| | 2 | 3 | 0 | 0 | | | 0.00 | 0.00 | 0.00 | 0.00 | 4.00 | 0.000 | 0.000 | 0.000 | 0.000 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.00 | 0.0% |
| | 3 | 4 | 0 | 0 | | | 0.00 | 0.00 | 0.00 | 0.00 | 4.00 | 0.000 | 0.000 | 0.000 | 0.000 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.00 | 0.0% |
| | 4 | 5 | 43 | 107.93 | | | 107.93 | 0.00 | 0.00 | 0.00 | 4.00 | 1.499 | 0.000 | 0.000 | 1.499 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.41 | 6.5% |
| | 5 | PS | 15 | 183.23 | 28.40 | | 291.16 | 28.40 | 0.00 | 28.40 | 4.00 | 4.044 | 0.000 | 1.420 | 5.464 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.57 | 23.6% |
| 2 | 2.1 | 2 | 0 | 0 | | | 0.00 | 0.00 | 0.00 | 0.00 | 4.00 | 0.000 | 0.000 | 0.000 | 0.000 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.00 | 0.0% |
| 3 | 3.1 | 3 | 0 | 0 | | | 0.00 | 0.00 | 0.00 | 0.00 | 4.00 | 0.000 | 0.000 | 0.000 | 0.000 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.00 | 0.0% |
| 4 | 4.1 | 4 | 34 | 85.34 | | | 85.34 | 0.00 | 0.00 | 0.00 | 4.00 | 1.185 | 0.000 | 0.000 | 1.185 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.38 | 5.1% |
| 5 | 5.1 | 5 | 15 | 183.23 | 13.60 | | 183.23 | 13.60 | 0.00 | 13.60 | 4.00 | 2.545 | 0.000 | 0.680 | 3.225 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.50 | 13.9% |
| Main (Future) | PS4 | 5.1 | | 321.28 | 53.00 | | | | | | | | | | | | | | | | | | |
| | 1 | 2 | 0 | 0 | | | 0.00 | 0.00 | 0.00 | 0.00 | 4.00 | 0.000 | 0.000 | 0.000 | 0.000 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.00 | 0.0% |
| | 2 | 3 | 181 | 454.31 | | | 454.31 | 0.00 | 0.00 | 0.00 | 4.00 | 6.302 | 0.000 | 0.000 | 6.302 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.60 | 27.2% |
| | 3 | 4 | 35 | 87.85 | | | 542.16 | 0.00 | 0.00 | 0.00 | 3.96 | 7.447 | 0.000 | 0.000 | 7.447 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.62 | 32.1% |
| | 4 | 5 | 44 | 110.44 | | | 652.60 | 0.00 | 0.00 | 0.00 | 3.91 | 8.864 | 0.000 | 0.000 | 8.864 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.65 | 38.2% |
| | 5 | PS | 15 | 358.93 | 105.50 | | 1011.53 | 105.50 | 0.00 | 105.50 | 3.80 | 13.335 | 0.000 | 5.275 | 18.610 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.79 | 44.3% |
| 2 | 2.1 | 2 | 181 | 454.31 | | | 454.31 | 0.00 | 0.00 | 0.00 | 4.00 | 6.302 | 0.000 | 0.000 | 6.302 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.60 | 27.2% |
| 3 | 3.1 | 3 | 35 | 87.85 | | | 87.85 | 0.00 | 0.00 | 0.00 | 4.00 | 1.220 | 0.000 | 0.000 | 1.220 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.38 | 5.3% |
| 4 | 4.1 | 4 | 35 | 87.85 | | | 87.85 | 0.00 | 0.00 | 0.00 | 4.00 | 1.220 | 0.000 | 0.000 | 1.220 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.38 | 5.3% |
| 5 | 5.1 | 5 | 15 | 358.93 | 53.00 | | 358.93 | 53.00 | 0.00 | 53.00 | 4.00 | 4.985 | 0.000 | 2.650 | 7.635 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.63 | 32.9% |

## PS 6 SANITARY SEWER DESIGN SHEET

q = average per capita daily flow (Existing) 300 L/cap.d
q = average per capita daily flow 300 L/cap.d
c = unit of commercial/institutional flow 28.00 $m^3$/ha.d
ic = unit of peak extraneous flow 0.05 L/ha.s
p = unit of population density 2.51 ppu

Q(p) = peak population flow (L/s)
Q(i) = i x A = peak extraneous flow (L/s)
Q(c) = c x A / 86400 = peak commercial flow (L/s)
Q(d) = Q(p) + Q(i) = peak design flow (L/s)

P = population
M = peaking factor (Harmon)
P = p x # units / 1000
M = 1 + 14 / (4 + $P^{1/2}$) , maximum of 4.0, minimum of 2.0
Q = (P x q x M) / 86.4
M Min = 1.5
M Max = 4

DATE:
DESIGNED:
CHECKED:
FILE No.: 1
PROJECT:
SHEET No.: 1 OF 1

| Nominal Sizing (mm) | |
|---|---|
| 200 | 600 |
| 250 | 675 |
| 300 | 750 |
| 375 | 900 |
| 450 | 1050 |
| 525 | |

| LOCATION | | | INDIVIDUAL | | | | CUMULATIVE | | | | | | | | | PROPOSED SANITARY SEWER | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STREET | MH | MH | UNITS | POP | (ha) | AREA | POP | (ha) | AREA | (ha) | FACTOR | FLOW, Q(p) | FLOWS | Q(i) | Q(d) | (m) | DIAMETER | (%) | MANNING'S n | (L/s) | VELOCITY | VELOCITY | FULL |
| Main (Existing) | PS5 | 6.1a | | 291.16 | 28.40 | | | | | | | | | | | | | | | | | | |
| | 1 | 2 | 3 | 7.53 | | | 7.53 | 0.00 | 0.00 | 0.00 | 4.00 | 0.105 | 0.000 | 0.000 | 0.105 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.20 | 0.2% |
| | 2 | 3 | 11 | 27.61 | | | 35.14 | 0.00 | 0.00 | 0.00 | 4.00 | 0.488 | 0.000 | 0.000 | 0.488 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.30 | 1.2% |
| | 3 | 4 | 10 | 25.1 | | | 60.24 | 0.00 | 0.00 | 0.00 | 4.00 | 0.837 | 0.000 | 0.000 | 0.837 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.34 | 2.0% |
| | 4 | 5 | 10 | 25.1 | | | 85.34 | 0.00 | 0.00 | 0.00 | 4.00 | 1.185 | 0.000 | 0.000 | 1.185 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.38 | 2.8% |
| | 5 | 6 | 16 | 40.16 | | | 125.50 | 0.00 | 0.00 | 0.00 | 4.00 | 1.743 | 0.000 | 0.000 | 1.743 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.42 | 4.1% |
| | 6 | PS | 111 | 569.77 | 47.40 | | 695.27 | 47.40 | 0.00 | 47.40 | 3.90 | 9.406 | 0.000 | 2.370 | 11.776 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.70 | 28.0% |
| 2 | 2.1 | 2 | 6 | 15.06 | | | 15.06 | 0.00 | 0.00 | 0.00 | 4.00 | 0.209 | 0.000 | 0.000 | 0.209 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.24 | 0.9% |
| 3 | 3.1 | 3 | 4 | 10.04 | | | 10.04 | 0.00 | 0.00 | 0.00 | 4.00 | 0.139 | 0.000 | 0.000 | 0.139 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.21 | 0.6% |
| 5 | 5.1 | 5 | 5 | 12.55 | | | 12.55 | 0.00 | 0.00 | 0.00 | 4.00 | 0.174 | 0.000 | 0.000 | 0.174 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.23 | 0.8% |
| 6 | 6.1a | 6 | 83 | 499.49 | 28.40 | | 499.49 | 28.40 | 0.00 | 28.40 | 3.97 | 6.893 | 0.000 | 1.420 | 8.313 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.64 | 35.8% |
| | 6.1b | 6 | 28 | 70.28 | | | 569.77 | 28.40 | 0.00 | 28.40 | 3.94 | 7.803 | 0.000 | 1.420 | 9.223 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.66 | 39.8% |
| Main (Future) | PS | | | 1011.53 | 105.50 | | | | | | | | | | | | | | | | | | |
| | 1 | 2 | 3 | 7.53 | | | 7.53 | 0.00 | 0.00 | 0.00 | 4.00 | 0.105 | 0.000 | 0.000 | 0.105 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.20 | 0.2% |
| | 2 | 3 | 11 | 27.61 | | | 35.14 | 0.00 | 0.00 | 0.00 | 4.00 | 0.488 | 0.000 | 0.000 | 0.488 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.30 | 1.2% |
| | 3 | 4 | 10 | 25.1 | | | 60.24 | 0.00 | 0.00 | 0.00 | 4.00 | 0.837 | 0.000 | 0.000 | 0.837 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.34 | 2.0% |
| | 4 | 5 | 10 | 25.1 | | | 85.34 | 0.00 | 0.00 | 0.00 | 4.00 | 1.185 | 0.000 | 0.000 | 1.185 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.38 | 2.8% |
| | 5 | 6 | 16 | 40.16 | | | 125.50 | 0.00 | 0.00 | 0.00 | 4.00 | 1.743 | 0.000 | 0.000 | 1.743 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.42 | 4.1% |
| | 6 | PS | 111 | 1290.14 | 124.50 | | 1415.64 | 124.50 | 0.00 | 124.50 | 3.70 | 18.175 | 0.000 | 6.225 | 24.400 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.85 | 58.0% |
| 2 | 2.1 | 2 | 6 | 15.06 | | | 15.06 | 0.00 | 0.00 | 0.00 | 4.00 | 0.209 | 0.000 | 0.000 | 0.209 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.24 | 0.9% |
| 3 | 3.1 | 3 | 4 | 10.04 | | | 10.04 | 0.00 | 0.00 | 0.00 | 4.00 | 0.139 | 0.000 | 0.000 | 0.139 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.21 | 0.6% |
| 5 | 5.1 | 5 | 5 | 12.55 | | | 12.55 | 0.00 | 0.00 | 0.00 | 4.00 | 0.174 | 0.000 | 0.000 | 0.174 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.23 | 0.8% |
| 6 | 6.1a | 6 | 83 | 1219.86 | 105.50 | | 1219.86 | 105.50 | 0.00 | 105.50 | 3.74 | 15.853 | 0.000 | 5.275 | 21.128 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.82 | 50.2% |
| | 6.1b | 6 | 28 | 70.28 | | | 70.28 | 0.00 | 0.00 | 0.00 | 4.00 | 0.976 | 0.000 | 0.000 | 0.976 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.36 | 4.2% |

# PS 7 SANITARY SEWER DESIGN SHEET

q = average per capita daily flow (Existing) 300 L/cap.d
q = average per capita daily flow 300 L/cap.d
c = unit of commercial/institutional flow 28.00 $m^3$/ha.d
ic = unit of peak extraneous flow 0.05 L/ha.s
p = unit of population density 2.51 ppu

Q(p) = peak population flow (L/s)
Q(i) = i x A = peak extraneous flow (L/s)
Q(c) = $\frac{c \times A}{86400}$ = peak commercial flow (L/s)
Q(d) = Q(p) + Q(i) = peak design flow (L/s)

P = population
M = peaking factor (Harmon)
P = p x # units / 1000
$M = 1 + 14 / (4 + P^{1/2})$ , maximum of 4.0, minimum of 2.0
Q = (P x q x M) / 86.4
M Min = 1.5
M Max = 4

DATE:
DESIGNED:
CHECKED:
FILE No.: 1
PROJECT:

SHEET No.: 1 OF 1

| Nominal Sizing (mm) | |
|---|---|
| 200 | 600 |
| 250 | 675 |
| 300 | 750 |
| 375 | 900 |
| 450 | 1050 |
| 525 | |

| LOCATION | | | INDIVIDUAL | | | | CUMULATIVE | | | | | | | | | PROPOSED SANITARY SEWER | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STREET | MH | MH | UNITS | POP | (ha) | AREA | POP | (ha) | AREA | (ha) | FACTOR | FLOW, Q(p) | FLOWS | Q(i) | Q(d) | (m) | DIAMETER | (%) | MANNING'S n | (L/s) | VELOCITY | VELOCITY | FULL |
| Main (Existing) | | | | | | | | | | | | | | | | | | | | | | | |
| | 1 | 2 | 15 | 37.65 | | | 37.65 | 0.00 | 0.00 | 0.00 | 4.00 | 0.523 | 0.000 | 0.000 | 0.523 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.30 | 2.3% |
| | 2 | 3 | 13 | 32.63 | 0.00 | | 70.28 | 0.00 | 0.00 | 0.00 | 4.00 | 0.976 | 0.000 | 0.000 | 0.976 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.36 | 4.2% |
| | 3 | 4 | 16 | 40.16 | | | 110.44 | 0.00 | 0.00 | 0.00 | 4.00 | 1.534 | 0.000 | 0.000 | 1.534 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.41 | 6.6% |
| | 4 | 5 | 21 | 52.71 | | | 163.15 | 0.00 | 0.00 | 0.00 | 4.00 | 2.266 | 0.000 | 0.000 | 2.266 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.45 | 9.8% |
| | 5 | 6 | 27 | 67.77 | | | 230.92 | 0.00 | 0.00 | 0.00 | 4.00 | 3.207 | 0.000 | 0.000 | 3.207 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.50 | 13.8% |
| | 6 | 7 | 52 | 130.52 | | | 361.44 | 0.00 | 0.00 | 0.00 | 4.00 | 5.020 | 0.000 | 0.000 | 5.020 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.55 | 11.9% |
| | 7 | PS | 31 | 77.81 | 24.80 | | 439.25 | 24.80 | 0.00 | 24.80 | 4.00 | 6.101 | 0.000 | 1.240 | 7.341 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.61 | 17.5% |
| 3 | 3.1 | 3 | 9 | 22.59 | | | 22.59 | 0.00 | 0.00 | 0.00 | 4.00 | 0.314 | 0.000 | 0.000 | 0.314 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.27 | 1.4% |
| 4 | 4.1 | 4 | 13 | 32.63 | | | 32.63 | 0.00 | 0.00 | 0.00 | 4.00 | 0.453 | 0.000 | 0.000 | 0.453 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.29 | 2.0% |
| 5 | 5.1 | 5 | 17 | 42.67 | | | 42.67 | 0.00 | 0.00 | 0.00 | 4.00 | 0.593 | 0.000 | 0.000 | 0.593 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.32 | 2.6% |
| 6 | 6.1 | 6 | 20 | 50.2 | | | 50.20 | 0.00 | 0.00 | 0.00 | 4.00 | 0.697 | 0.000 | 0.000 | 0.697 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.33 | 3.0% |
| 7 | 7.1 | 7 | 31 | 77.81 | | | 77.81 | 0.00 | 0.00 | 0.00 | 4.00 | 1.081 | 0.000 | 0.000 | 1.081 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.37 | 4.7% |
| Main (Proposed) | | | | | | | | | | | | | | | | | | | | | | | |
| | 1 | 2 | 15 | 37.65 | | | 37.65 | 0.00 | 0.00 | 0.00 | 4.00 | 0.523 | 0.000 | 0.000 | 0.523 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.30 | 2.3% |
| | 2 | 3 | 13 | 32.63 | 0.00 | | 70.28 | 0.00 | 0.00 | 0.00 | 4.00 | 0.976 | 0.000 | 0.000 | 0.976 | | 350 | 0.50% | 0.013 | 103.1 | 1.07 | 0.35 | 0.9% |
| | 3 | 4 | 16 | 40.16 | | | 110.44 | 0.00 | 0.00 | 0.00 | 4.00 | 1.534 | 0.000 | 0.000 | 1.534 | | 350 | 0.50% | 0.013 | 103.1 | 1.07 | 0.40 | 1.5% |
| | 4 | 5 | 21 | 52.71 | | | 163.15 | 0.00 | 0.00 | 0.00 | 4.00 | 2.266 | 0.000 | 0.000 | 2.266 | | 350 | 0.50% | 0.013 | 103.1 | 1.07 | 0.44 | 2.2% |
| | 5 | 6 | 27 | 67.77 | | | 230.92 | 0.00 | 0.00 | 0.00 | 4.00 | 3.207 | 0.000 | 0.000 | 3.207 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.50 | 13.8% |
| | 6 | 7 | 52 | 130.52 | | | 361.44 | 0.00 | 0.00 | 0.00 | 4.00 | 5.020 | 0.000 | 0.000 | 5.020 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.56 | 21.6% |
| | 7 | PS | 31 | 77.81 | 24.80 | | 439.25 | 24.80 | 0.00 | 24.80 | 4.00 | 6.101 | 0.000 | 1.240 | 7.341 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.62 | 31.7% |
| 3 | 3.1 | 3 | 9 | 22.59 | | | 22.59 | 0.00 | 0.00 | 0.00 | 4.00 | 0.314 | 0.000 | 0.000 | 0.314 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.27 | 1.4% |
| 4 | 4.1 | 4 | 13 | 32.63 | | | 32.63 | 0.00 | 0.00 | 0.00 | 4.00 | 0.453 | 0.000 | 0.000 | 0.453 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.29 | 2.0% |
| 5 | 5.1 | 5 | 17 | 42.67 | | | 42.67 | 0.00 | 0.00 | 0.00 | 4.00 | 0.593 | 0.000 | 0.000 | 0.593 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.32 | 2.6% |
| 6 | 6.1 | 6 | 20 | 50.2 | | | 50.20 | 0.00 | 0.00 | 0.00 | 4.00 | 0.697 | 0.000 | 0.000 | 0.697 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.33 | 3.0% |
| 7 | 7.1 | 7 | 31 | 77.81 | | | 77.81 | 0.00 | 0.00 | 0.00 | 4.00 | 1.081 | 0.000 | 0.000 | 1.081 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.37 | 4.7% |

## PS 8 SANITARY SEWER DESIGN SHEET

q = average per capita daily flow (Existing) 300 L/cap.d
q = average per capita daily flow 300 L/cap.d
c = unit of commercial/institutional flow 28.00 $m^3$/ha.d
ic = unit of peak extraneous flow 0.05 L/ha.s
p = unit of population density 2.51 ppu

Q(p) = peak population flow (L/s)
Q(i) = i x A = peak extraneous flow (L/s)
Q(c) = c x A / 86400 = peak commercial flow (L/s)
Q(d) = Q(p) + Q(i) = peak design flow (L/s)

P = population
M = peaking factor (Harmon)
P = p x # units / 1000
M = 1 + 14 / (4 + $P^{1/2}$) , maximum of 4.0, minimum of 2.0
Q = (P x q x M) / 86.4
M Min = 1.5
M Max = 4

DATE:
DESIGNED:
CHECKED:
FILE No.: 1
PROJECT:

SHEET No.: 1 OF 1

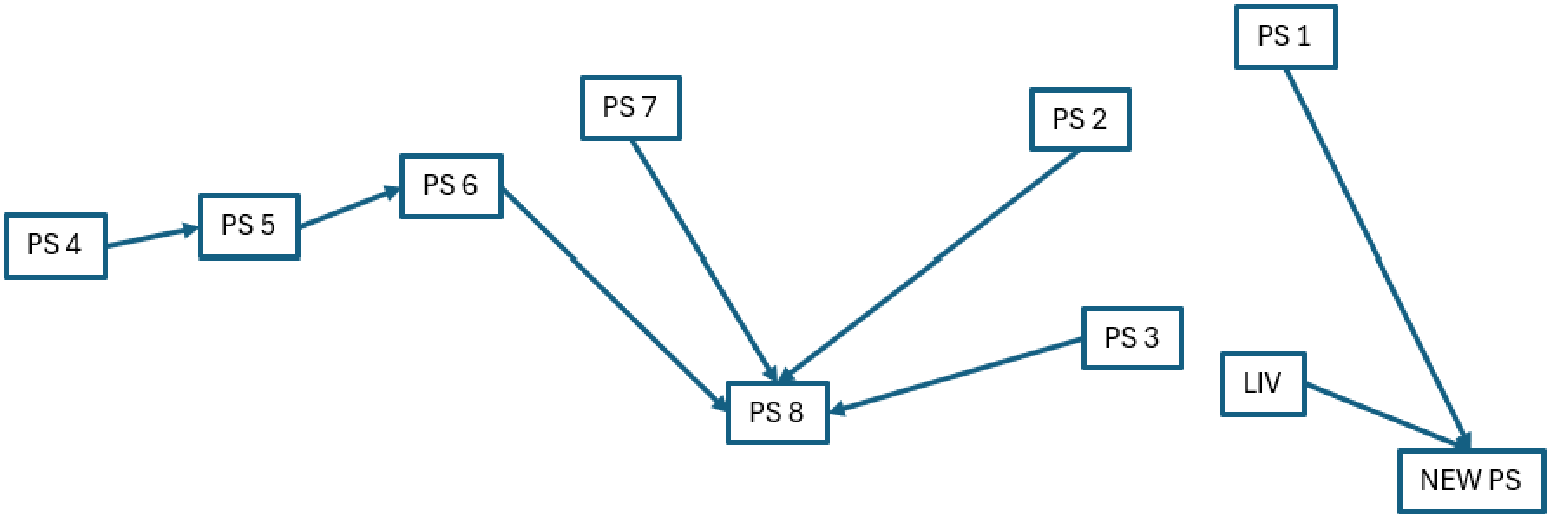
| Nominal Sizing (mm) | |
|---|---|
| 200 | 600 |
| 250 | 675 |
| 300 | 750 |
| 375 | 900 |
| 450 | 1050 |
| 525 | |

| LOCATION | | | INDIVIDUAL | | | | CUMULATIVE | | | | | | | | | PROPOSED SANITARY SEWER | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STREET | MH | MH | UNITS | POP | (ha) | AREA | POP | (ha) | AREA | (ha) | FACTOR | FLOW, Q(p) | FLOWS | Q(i) | Q(d) | (m) | DIAMETER | (%) | MANNING'S n | (L/s) | VELOCITY | VELOCITY | FULL |
| Main (Existing) | PS2 | 7.1 | | 956.31 | 87.50 | | | | | | | | | | | | | | | | | | |
| | PS3 | 7.1 | | 117.97 | 11.00 | | | | | | | | | | | | | | | | | | |
| | PS6 | 2 | | 695.27 | 47.40 | | | | | | | | | | | | | | | | | | |
| | PS7 | 3.1a | | 439.25 | 24.80 | | | | | | | | | | | | | | | | | | |
| | 1 | 2 | 4 | 10.04 | | | 10.04 | 0.00 | 0.00 | 0.00 | 4.00 | 0.139 | 0.000 | 0.000 | 0.139 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.21 | 0.3% |
| | 2 | 3 | 22 | 750.49 | 47.40 | | 760.53 | 47.40 | 0.00 | 47.40 | 3.87 | 10.229 | 0.000 | 2.370 | 12.599 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.71 | 30.0% |
| | 3 | 4 | 37 | 532.12 | 24.80 | | 1292.65 | 72.20 | 0.00 | 72.20 | 3.73 | 16.721 | 0.000 | 3.610 | 20.331 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.81 | 48.4% |
| school (100 unit eq) | 4 | 5 | 50.00 | 125.5 | | | 1418.15 | 72.20 | 0.00 | 72.20 | 3.70 | 18.205 | 0.000 | 3.610 | 21.815 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.83 | 51.9% |
| | 5 | 6 | 34 | 85.34 | | | 1503.49 | 72.20 | 0.00 | 72.20 | 3.68 | 19.205 | 0.000 | 3.610 | 22.815 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.84 | 54.3% |
| | 6 | 7 | 38 | 95.38 | | | 1598.87 | 72.20 | 0.00 | 72.20 | 3.66 | 20.315 | 0.000 | 3.610 | 23.925 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.85 | 56.9% |
| | 7 | PS | 35 | 1162.13 | 130.10 | | 2761.00 | 202.30 | 0.00 | 202.30 | 3.47 | 33.293 | 0.000 | 10.115 | 43.408 | | 375 | 0.50% | 0.013 | 124.0 | 1.12 | 0.97 | 35.0% |
| 2a | 2.1a | 2 | 4 | 10.04 | | | 10.04 | 0.00 | 0.00 | 0.00 | 4.00 | 0.139 | 0.000 | 0.000 | 0.139 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.21 | 0.6% |
| 2b | 2.1b | 2 | 14 | 35.14 | | | 45.18 | 0.00 | 0.00 | 0.00 | 4.00 | 0.628 | 0.000 | 0.000 | 0.628 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.32 | 2.7% |
| 3a | 3.1a | 3 | 20 | 489.45 | 24.80 | | 489.45 | 24.80 | 0.00 | 24.80 | 3.98 | 6.762 | 0.000 | 1.240 | 8.002 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.64 | 34.5% |
| 3b | 3.1b | 3 | 15 | 37.65 | | | 527.10 | 24.80 | 0.00 | 24.80 | 3.96 | 7.252 | 0.000 | 1.240 | 8.492 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.65 | 36.6% |
| 4 | 4.1 | 4 | 28.00 | 70.28 | | | 70.28 | 0.00 | 0.00 | 0.00 | 4.00 | 0.976 | 0.000 | 0.000 | 0.976 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.36 | 4.2% |
| 5 | 5.1 | 5 | 32 | 80.32 | | | 80.32 | 0.00 | 0.00 | 0.00 | 4.00 | 1.116 | 0.000 | 0.000 | 1.116 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.37 | 4.8% |
| 6 | 6.1 | 6 | 36 | 90.36 | | | 90.36 | 0.00 | 0.00 | 0.00 | 4.00 | 1.255 | 0.000 | 0.000 | 1.255 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.39 | 5.4% |
| 7 | 7.1 | 7 | 35 | 1162.13 | 98.50 | | 1162.13 | 98.50 | 0.00 | 98.50 | 3.76 | 15.160 | 0.000 | 4.925 | 20.085 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.81 | 47.8% |
| Main (Future) | PS2 | 7.1 | | 2831.28 | 92.60 | | | | | | | | | | | | | | | | | | |
| | PS3 | 7.1 | | 218.37 | 16.80 | | | | | | | | | | | | | | | | | | |
| | PS6 | 4 | | 1415.64 | 124.50 | | | | | | | | | | | | | | | | | | |
| | PS7 | 3.1a | | 439.25 | 24.80 | | | | | | | | | | | | | | | | | | |
| | 1 | 2 | 4 | 10.04 | | | 10.04 | 0.00 | 0.00 | 0.00 | 4.00 | 0.139 | 0.000 | 0.000 | 0.139 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.21 | 0.3% |
| | 2 | 3 | 22 | 55.22 | | | 65.26 | 0.00 | 0.00 | 0.00 | 4.00 | 0.906 | 0.000 | 0.000 | 0.906 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.35 | 2.2% |
| | 3 | 4 | 17 | 1127.1 | 24.80 | | 1192.36 | 24.80 | 0.00 | 24.80 | 3.75 | 15.523 | 0.000 | 1.240 | 16.763 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.77 | 39.9% |
| school (100 unit eq) | 4 | 5 | 50.00 | 1541.14 | 124.50 | | 2733.50 | 149.30 | 0.00 | 149.30 | 3.48 | 32.996 | 0.000 | 7.465 | 40.461 | | 375 | 0.50% | 0.013 | 124.0 | 1.12 | 0.95 | 32.6% |
| | 5 | 6 | 34 | 85.34 | | | 2818.84 | 149.30 | 0.00 | 149.30 | 3.47 | 33.917 | 0.000 | 7.465 | 41.382 | | 375 | 0.50% | 0.013 | 124.0 | 1.12 | 0.96 | 33.4% |
| | 6 | 7 | 38 | 95.38 | | | 2914.22 | 149.30 | 0.00 | 149.30 | 3.45 | 34.941 | 0.000 | 7.465 | 42.406 | | 375 | 0.50% | 0.013 | 124.0 | 1.12 | 0.97 | 34.2% |
| | 7 | PS | 35 | 3137.5 | 165.80 | | 6051.72 | 315.10 | 0.00 | 315.10 | 3.17 | 66.552 | 0.000 | 15.755 | 82.307 | | 450 | 0.50% | 0.013 | 201.6 | 1.27 | 1.14 | 40.8% |
| 2a | 2.1a | 2 | 4 | 10.04 | | | 10.04 | 0.00 | 0.00 | 0.00 | 4.00 | 0.139 | 0.000 | 0.000 | 0.139 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.21 | 0.6% |
| 2b | 2.1b | 2 | 14 | 35.14 | | | 45.18 | 0.00 | 0.00 | 0.00 | 4.00 | 0.628 | 0.000 | 0.000 | 0.628 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.32 | 2.7% |
| 3a | 3.1a | 3 | 20 | 489.45 | 24.80 | | 489.45 | 24.80 | 0.00 | 24.80 | 3.98 | 6.762 | 0.000 | 1.240 | 8.002 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.64 | 34.5% |
| 3b | 3.1b | 3 | 15 | 37.65 | | | 527.10 | 24.80 | 0.00 | 24.80 | 3.96 | 7.252 | 0.000 | 1.240 | 8.492 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.65 | 36.6% |
| 4 | 4.1 | 4 | 28.00 | 70.28 | | | 70.28 | 0.00 | 0.00 | 0.00 | 4.00 | 0.976 | 0.000 | 0.000 | 0.976 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.36 | 4.2% |
| 5 | 5.1 | 5 | 32 | 80.32 | | | 80.32 | 0.00 | 0.00 | 0.00 | 4.00 | 1.116 | 0.000 | 0.000 | 1.116 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.37 | 2.7% |
| 6 | 6.1 | 6 | 36 | 90.36 | | | 90.36 | 0.00 | 0.00 | 0.00 | 4.00 | 1.255 | 0.000 | 0.000 | 1.255 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.39 | 5.4% |
| 7 | 7.1 | 7 | 35 | 3137.5 | 109.40 | | 3137.50 | 109.40 | 0.00 | 109.40 | 3.43 | 37.321 | 0.000 | 5.470 | 42.791 | | 375 | 0.50% | 0.013 | 124.0 | 1.12 | 0.97 | 34.5% |

| | | | Forecast Peak Flows | | | | | Wet Well | | | | Pump Information | | | | | Forcemain | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Population | Area | PF | Average day flow (m3/d) | Peak flow (l/s) | diameter (m) | HL (m) | LL (m) | operating Volume (m3) | Lead Pump Capacity (l/s) | delta to design peak flow | TDH (m) | ADF Run Time (min) | ADF cycles per hr (max 30) | Diameter (mm) | Velocity (m/s) (Max 3.5 m/s) | Head Loss per 100m (m) | FM Length (m) | TDH Required (m) |
| PS1 | Wood Ave PS (3739 Wood Ave.) | Existing | 537 | 27 | 4.0 | 161 | 8.7 | 1.524 | 214.377 | 213.710 | 1.2 | 13.0 | 4.3 | 3.4 | 1.8 | 4.7 | 150 | 0.18 | 0.704 | | |
| | | Future | 901 | 32 | 3.8 | 270 | 13.6 | 1.524 | 214.377 | 213.710 | 1.2 | 13.6 | 0.0 | 3.4 | 1.8 | 7.2 | 150 | 0.19 | 0.766 | | |
| PS2 | Bayou Park PS (3575 Bayou Park) | Existing | 956 | 87.5 | 3.8 | 287 | 17.0 | 1.524 | 214.245 | 212.745 | 2.7 | 11.0 | -6.0 | 13.0 | 5.4 | 3.1 | 150 | 0.16 | 0.517 | | |
| | | Future | 2831 | 92.6 | 3.5 | 849 | 38.7 | 1.524 | 214.245 | 212.745 | 2.7 | 38.7 | 0.0 | 13.0 | 1.5 | 9.8 | 250 | 0.20 | 0.440 | | |
| PS3 | Timberline PS (3530 Shadow Creek) | Existing | 118 | 11.0 | 4.0 | 35 | 2.2 | 1.524 | 214.245 | 212.745 | 2.7 | 4.3 | 2.1 | 9.3 | 11.6 | 0.5 | 100 | 0.14 | 0.655 | | |
| | | Future | 218 | 16.8 | 4.0 | 66 | 3.9 | 1.524 | 214.245 | 212.745 | 2.7 | 3.9 | 0.0 | 9.3 | 14.1 | 0.8 | 100 | 0.12 | 0.540 | | |
| PS4 | Aldershott PS (3300 Aldershott Place) | Existing | 146 | 13.6 | 4.0 | 44 | 2.7 | 1.524 | 214.960 | 214.310 | 1.2 | 6.5 | 3.8 | 16.7 | 3.3 | 1.4 | 100 | 0.21 | 1.408 | | |
| | | Future | 321 | 53.0 | 4.0 | 96 | 7.1 | 1.524 | 214.960 | 214.310 | 1.2 | 7.1 | 0.0 | 16.7 | 3.2 | 2.9 | 100 | 0.23 | 1.663 | | |
| PS5 | Grayshott PS (3410 Grayshott Dr.) | Existing | 291 | 28.4 | 4.0 | 87 | 5.5 | 1.800 | 215.650 | 214.550 | 2.8 | 16.0 | 10.5 | 16.7 | 3.1 | 1.2 | 100 | 0.51 | 7.451 | | |
| | | Future | 1012 | 105.5 | 3.8 | 303 | 18.6 | 1.800 | 215.650 | 214.550 | 2.8 | 18.6 | 0.0 | 16.7 | 3.0 | 3.7 | 100 | 0.59 | 9.855 | | |
| PS6 | Bramshott PS (3014 Lakeside Dr) | Existing | 695 | 47.4 | 3.9 | 209 | 11.8 | 1.524 | 218.180 | 216.780 | 2.6 | 11.5 | -0.3 | 6.3 | 4.5 | 2.7 | 150 | 0.16 | 0.561 | | |
| | | Future | 1416 | 124.5 | 3.7 | 425 | 24.4 | 1.524 | 218.180 | 216.780 | 2.6 | 24.4 | 0.0 | 6.3 | 2.1 | 5.6 | 150 | 0.35 | 2.258 | | |
| PS7 | Lakeside PS (2779 Lakeside Dr) | Existing | 439 | 24.8 | 4.0 | 132 | 7.3 | 1.524 | 217.600 | 216.520 | 2.0 | 3.5 | -3.8 | 4.2 | 13.5 | 1.7 | 150 | 0.05 | 0.062 | | |
| | | Future | 439 | 24.8 | 4.0 | 132 | 7.3 | 1.524 | 217.600 | 216.520 | 2.0 | 7.3 | 0.0 | 3.4 | 5.4 | 2.2 | 150 | 0.10 | 0.245 | | |
| PS8 | Main PS (2700n Cumberland RD | Existing | 2761 | 202.3 | 3.5 | 828 | 43.4 | 2.400 | 215.820 | 215.220 | 2.7 | 45.2 | 1.8 | 12.5 | 1.2 | 10.1 | 250 | 0.23 | 0.587 | | |
| | | Future | 6052 | 315.1 | 3.2 | 1,816 | 82.3 | 2.400 | 215.820 | 215.220 | 2.7 | 82.3 | 0.0 | 12.5 | 0.7 | 21.1 | 350 | 0.21 | 0.346 | | |

| | | | | delta |
|---|---|---|---|---|
| Pop Verify expected | Existing | 2749 | 2761 | 12 |
| | Future | 5889 | 6052 | 163 |

Part 3B- Westshore Option 2 Pumping Station Analysis



# PS 1 SANITARY SEWER DESIGN SHEET

q = average per capita daily flow (Existing) 300 L/cap.d
q = average per capita daily flow 300 L/cap.d
c = unit of commercial/institutional flow 28.00 $m^3$/ha.d
ic = unit of peak extraneous flow 0.05 L/ha.s
p = unit of population density 2.51 ppu

Q(p) = peak population flow (L/s)
Q(i) = i x A = peak extraneous flow (L/s)
Q(c) = c x A / 86400 = peak commercial flow (L/s)
0
Q(d) = Q(p) + Q(i) = peak design flow (L/s)

P = population
M = peaking factor (Harmon)
P = p x # units / 1000
M = 1 + 14 / (4 + $P^{1/2}$) , maximum of 4.0, minimum of 2.0
Q = (P x q x M) / 86.4
M Min = 1.5
M Max = 4

DATE:
DESIGNED:
CHECKED:
FILE No.:
PROJECT:

SHEET No.: 1 OF 1

| Nominal Sizing (mm) | |
|---|---|
| 200 | 600 |
| 250 | 675 |
| 300 | 750 |
| 375 | 900 |
| 450 | 1050 |
| 525 | |

| LOCATION | | | INDIVIDUAL | | | | CUMULATIVE | | | | | | | | | PROPOSED SANITARY SEWER | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STREET | MH | MH | UNITS | POP | (ha) | AREA | POP | (ha) | AREA | (ha) | FACTOR | FLOW, Q(p) | FLOWS | Q(i) | Q(d) | (m) | DIAMETER | (%) | MANNING'S n | (L/s) | VELOCITY | VELOCITY | FULL |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| Menoke Sub area | | | | | | | | | | | | | | | | | | | | | | | |
| Main (Existing) | 1 | 2 | 22 | 55.22 | | | 55.22 | 0.00 | 0.00 | 0.00 | 4.00 | 0.767 | 0.000 | 0.000 | 0.767 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.34 | 3.3% |
| | 2 | 3 | 29 | 72.79 | | | 128.01 | 0.00 | 0.00 | 0.00 | 4.00 | 1.778 | 0.000 | 0.000 | 1.778 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.42 | 7.7% |
| | 3 | 4 | 40 | 100.4 | | | 228.41 | 0.00 | 0.00 | 0.00 | 4.00 | 3.172 | 0.000 | 0.000 | 3.172 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.50 | 13.7% |
| | 4 | 5 | 40 | 100.4 | | | 328.81 | 0.00 | 0.00 | 0.00 | 4.00 | 4.567 | 0.000 | 0.000 | 4.567 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.55 | 19.7% |
| | 5 | 6 | 83 | 208.33 | 27.30 | | 537.14 | 27.30 | 0.00 | 27.30 | 3.96 | 7.382 | 0.000 | 1.365 | 8.747 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.65 | 37.7% |
| | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | 2.1 | 2 | 25 | 62.75 | | | 62.75 | 0.00 | 0.00 | 0.00 | 4.00 | 0.872 | 0.000 | 0.000 | 0.872 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.35 | 3.8% |
| | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 3.1 | 3 | 30 | 75.3 | | | 75.30 | 0.00 | 0.00 | 0.00 | 4.00 | 1.046 | 0.000 | 0.000 | 1.046 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.37 | 4.5% |
| | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | 4.1 | 4 | 40 | 100.4 | | | 100.40 | 0.00 | 0.00 | 0.00 | 4.00 | 1.394 | 0.000 | 0.000 | 1.394 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.40 | 6.0% |
| | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | 5.1 | 5 | 60 | 150.6 | | | 150.60 | 0.00 | 0.00 | 0.00 | 4.00 | 2.092 | 0.000 | 0.000 | 2.092 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.44 | 9.0% |
| | | | | | | | | | | | | | | | | | | | | | | | |
| Main (Buildout) | 1 | 2 | 23 | 57.73 | | | 57.73 | 0.00 | 0.00 | 0.00 | 4.00 | 0.802 | 0.000 | 0.000 | 0.802 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.34 | 3.5% |
| | 2 | 3 | 29 | 72.79 | | | 130.52 | 0.00 | 0.00 | 0.00 | 4.00 | 1.813 | 0.000 | 0.000 | 1.813 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.43 | 7.8% |
| | 3 | 4 | 40 | 100.4 | | | 230.92 | 0.00 | 0.00 | 0.00 | 4.00 | 3.207 | 0.000 | 0.000 | 3.207 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.50 | 13.8% |
| | 4 | 5 | 40 | 100.4 | | | 331.32 | 0.00 | 0.00 | 0.00 | 4.00 | 4.602 | 0.000 | 0.000 | 4.602 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.55 | 19.8% |
| | 5 | 6 | 227 | 569.77 | 32.40 | | 901.09 | 32.40 | 0.00 | 32.40 | 3.83 | 11.979 | 0.000 | 1.620 | 13.599 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.73 | 58.6% |
| | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | 2.1 | 2 | 25 | 62.75 | | | 62.75 | 0.00 | 0.00 | 0.00 | 4.00 | 0.872 | 0.000 | 0.000 | 0.872 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.35 | 3.8% |
| | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 3.1 | 3 | 30 | 75.3 | | | 75.30 | 0.00 | 0.00 | 0.00 | 4.00 | 1.046 | 0.000 | 0.000 | 1.046 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.37 | 4.5% |
| | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | 4.1 | 4 | 40 | 100.4 | | | 100.40 | 0.00 | 0.00 | 0.00 | 4.00 | 1.394 | 0.000 | 0.000 | 1.394 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.40 | 6.0% |
| | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | 5.1 | 5 | 60 | 150.6 | | | 150.60 | 0.00 | 0.00 | 0.00 | 4.00 | 2.092 | 0.000 | 0.000 | 2.092 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.44 | 9.0% |
| | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | 6.1 | 6 | 144 | 361.44 | | | 361.44 | 0.00 | 0.00 | 0.00 | 4.00 | 5.020 | 0.000 | 0.000 | 5.020 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.56 | 21.6% |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |

## PS 2 SANITARY SEWER DESIGN SHEET

q = average per capita daily flow (Existing) 300 L/cap.d
q = average per capita daily flow 300 L/cap.d
c = unit of commercial/institutional flow 28.00 $m^3$/ha.d
ic = unit of peak extraneous flow 0.05 L/ha.s
p = unit of population density 2.51 ppu

Q(p) = peak population flow (L/s)
Q(i) = i x A = peak extraneous flow (L/s)
Q(c) = c x A / 86400 = peak commercial flow (L/s)
Q(d) = Q(p) + Q(i) = peak design flow (L/s)

P = population
M = peaking factor (Harmon)
P = p x # units / 1000
M = 1 + 14 / (4 + $P^{1/2}$) , maximum of 4.0, minimum of 2.0
Q = (P x q x M) / 86.4
M Min = 1.5
M Max = 4

DATE:
DESIGNED:
CHECKED:
FILE No.: 1
PROJECT:
SHEET No.: 1 OF 1

| Nominal Sizing (mm) | |
|---|---|
| 200 | 600 |
| 250 | 675 |
| 300 | 750 |
| 375 | 900 |
| 450 | 1050 |
| 525 | |

| LOCATION | | | INDIVIDUAL | | | | CUMULATIVE | | | | | | | | | PROPOSED SANITARY SEWER | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STREET | FROM MH | TO MH | No. RESIDENTIAL UNITS | POP | RES. AREA (ha) | COM./INST. AREA (ha) | POP | RES. AREA (ha) | COM./INST. AREA (ha) | TOTAL AREA (ha) | PEAKING FACTOR (M) | POPULATION FLOW, Q(p) (L/s) | CUMULATIVE COM./INST. FLOWS (L/s) | PEAK EXTRANEOUS FLOW, Q(i) (L/s) | PEAK DESIGN FLOW, Q(d) (L/s) | LENGTH (m) | PIPE SIZE DIAMETER (mm) | GRADE (%) | MANNING'S n | CAPACITY (L/s) | FULL FLOW VELOCITY (m/s) | ACTUAL VELOCITY (m/s) | PERCENT FULL |
| Main (Existing) | From PS1 | 3.2 | | 537.14 | 27.30 | | | | | | | | | | | | | | | | | | |
| | 1 | 2 | 19 | 47.69 | | | 47.69 | 0.00 | 0.00 | 0.00 | 4.00 | 0.662 | 0.000 | 0.000 | 0.662 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.33 | 2.9% |
| | 2 | 3 | 44 | 110.44 | | | 158.13 | 0.00 | 0.00 | 0.00 | 4.00 | 2.196 | 0.000 | 0.000 | 2.196 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.45 | 9.5% |
| | 3 | 4 | 84 | 838.34 | 87.50 | | 996.47 | 87.50 | 0.00 | 87.50 | 3.80 | 13.151 | 0.000 | 4.375 | 17.526 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.78 | 41.7% |
| | 4 | PS | 28 | 70.28 | | | 1066.75 | 87.50 | 0.00 | 87.50 | 3.78 | 14.008 | 0.000 | 4.375 | 18.383 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.79 | 43.7% |
| 2 | 2.1 | 2 | 10 | 25.1 | | | 25.10 | 0.00 | 0.00 | 0.00 | 4.00 | 0.349 | 0.000 | 0.000 | 0.349 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.27 | 1.5% |
| 3 | 3.2 | 3.1 | 25 | 62.75 | 27.30 | | 62.75 | 27.30 | 0.00 | 27.30 | 4.00 | 0.872 | 0.000 | 1.365 | 2.237 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.45 | 9.6% |
| | 3.1 | 3 | 51 | 665.15 | | | 727.90 | 27.30 | 0.00 | 27.30 | 3.88 | 9.818 | 0.000 | 1.365 | 11.183 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.69 | 26.6% |
| 3.1a | 3.1a | 3.1 | 18 | 45.18 | | | 45.18 | 0.00 | 0.00 | 0.00 | 4.00 | 0.628 | 0.000 | 0.000 | 0.628 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.32 | 2.7% |
| 3.1b | 3.1b | 3.1 | 18 | 45.18 | | | 45.18 | 0.00 | 0.00 | 0.00 | 4.00 | 0.628 | 0.000 | 0.000 | 0.628 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.32 | 2.7% |
| PS | 4.1 | 4 | 28 | 70.28 | | | 70.28 | 0.00 | 0.00 | 0.00 | 4.00 | 0.976 | 0.000 | 0.000 | 0.976 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.36 | 4.2% |
| Main (Future) | | | | | | | | | | | | | | | | | | | | | | | |
| | 1 | 2 | 19 | 47.69 | | | 47.69 | 0.00 | 0.00 | 0.00 | 4.00 | 0.662 | 0.000 | 0.000 | 0.662 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.33 | 2.9% |
| | 2 | 3 | 44 | 110.44 | | | 158.13 | 0.00 | 0.00 | 0.00 | 4.00 | 2.196 | 0.000 | 0.000 | 2.196 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.45 | 9.5% |
| | 3 | 4 | 92 | 210.84 | | | 368.97 | 0.00 | 0.00 | 0.00 | 4.00 | 5.125 | 0.000 | 0.000 | 5.125 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.56 | 12.2% |
| | 4 | PS | 28 | 70.28 | 60.20 | | 439.25 | 60.20 | 0.00 | 60.20 | 4.00 | 6.101 | 0.000 | 3.010 | 9.111 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.65 | 21.7% |
| 2 | 2.1 | 2 | 10 | 25.1 | | | 25.10 | 0.00 | 0.00 | 0.00 | 4.00 | 0.349 | 0.000 | 0.000 | 0.349 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.27 | 1.5% |
| 3 | 3.2 | 3.1 | 25 | 62.75 | 0.00 | | 62.75 | 0.00 | 0.00 | 0.00 | 4.00 | 0.872 | 0.000 | 0.000 | 0.872 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.35 | 3.8% |
| | 3.1 | 3 | 59 | 148.09 | | | 210.84 | 0.00 | 0.00 | 0.00 | 4.00 | 2.928 | 0.000 | 0.000 | 2.928 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.48 | 7.0% |
| 3.1 | 3.1a | 3.1 | 22 | 55.22 | | | 55.22 | 0.00 | 0.00 | 0.00 | 4.00 | 0.767 | 0.000 | 0.000 | 0.767 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.34 | 3.3% |
| 3.1 | 3.1b | 3.1 | 22 | 55.22 | | | 55.22 | 0.00 | 0.00 | 0.00 | 4.00 | 0.767 | 0.000 | 0.000 | 0.767 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.34 | 3.3% |
| 2 | 2.1.1 | 2 | | 0 | | | 0.00 | 0.00 | 0.00 | 0.00 | 4.00 | 0.000 | 0.000 | 0.000 | 0.000 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.00 | 0.0% |
| PS | 4.1 | 4 | 28 | 70.28 | | | 70.28 | 0.00 | 0.00 | 0.00 | 4.00 | 0.976 | 0.000 | 0.000 | 0.976 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.36 | 4.2% |

# PS 3 SANITARY SEWER DESIGN SHEET

q = average per capita daily flow (Existing) 300 L/cap.d
q = average per capita daily flow 300 L/cap.d
c = unit of commercial/institutional flow 28.00 $m^3$/ha.d
ic = unit of peak extraneous flow 0.05 L/ha.s
p = unit of population density 2.51 ppu

Q(p) = peak population flow (L/s)
Q(i) = i x A = peak extraneous flow (L/s)
Q(c) = $\frac{c \times A}{86400}$ = peak commercial flow (L/s)
Q(d) = Q(p) + Q(i) = peak design flow (L/s)

P = population
M = peaking factor (Harmon)
P = p x # units / 1000
M = 1 + 14 / (4 + $P^{1/2}$) , maximum of 4.0, minimum of 2.0
Q = (P x q x M) / 86.4
M Min = 1.5
M Max = 4

| Nominal Sizing (mm) | |
|---|---|
| 200 | 600 |
| 250 | 675 |
| 300 | 750 |
| 375 | 900 |
| 450 | 1050 |
| 525 | |

DATE:
DESIGNED:
CHECKED:
FILE No.: 1
PROJECT:

SHEET No.: 1 OF 1

| LOCATION | | | INDIVIDUAL | | | | CUMULATIVE | | | | | | | | | PROPOSED SANITARY SEWER | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STREET | MH | MH | UNITS | POP | (ha) | AREA | POP | (ha) | AREA | (ha) | FACTOR | FLOW, Q(p) | FLOWS | Q(i) | Q(d) | (m) | DIAMETER | (%) | MANNING'S n | (L/s) | VELOCITY | VELOCITY | FULL |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| Main (Existing) | | | | | | | 0.00 | 0.00 | 0.00 | 0.00 | 4.00 | 0.000 | 0.000 | 0.000 | 0.000 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.00 | 0.0% |
| | 1 | 2 | 5 | 12.55 | | | 12.55 | 0.00 | 0.00 | 0.00 | 4.00 | 0.174 | 0.000 | 0.000 | 0.174 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.23 | 0.8% |
| | 2 | 3 | 3 | 7.53 | | | 20.08 | 0.00 | 0.00 | 0.00 | 4.00 | 0.279 | 0.000 | 0.000 | 0.279 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.26 | 1.2% |
| | 3 | 4 | 25 | 62.75 | | | 82.83 | 0.00 | 0.00 | 0.00 | 4.00 | 1.150 | 0.000 | 0.000 | 1.150 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.38 | 5.0% |
| | 4 | PS | 14 | 35.14 | 11.00 | | 117.97 | 11.00 | 0.00 | 11.00 | 4.00 | 1.638 | 0.000 | 0.550 | 2.188 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.45 | 9.4% |
| | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | 2.1 | 2 | 0 | 0 | | | 0.00 | 0.00 | 0.00 | 0.00 | 4.00 | 0.000 | 0.000 | 0.000 | 0.000 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.00 | 0.0% |
| | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 3.1a | 3 | 9 | 22.59 | | | 22.59 | 0.00 | 0.00 | 0.00 | 4.00 | 0.314 | 0.000 | 0.000 | 0.314 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.27 | 1.4% |
| | 3.1b | 3 | 3 | 7.53 | | | 30.12 | 0.00 | 0.00 | 0.00 | 4.00 | 0.418 | 0.000 | 0.000 | 0.418 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.29 | 1.8% |
| | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | 4.1a | 4 | 4 | 10.04 | | | 10.04 | 0.00 | 0.00 | 0.00 | 4.00 | 0.139 | 0.000 | 0.000 | 0.139 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.21 | 0.6% |
| | 4.1b | 4 | 10 | 25.1 | | | 35.14 | 0.00 | 0.00 | 0.00 | 4.00 | 0.488 | 0.000 | 0.000 | 0.488 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.30 | 2.1% |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| Main (Proposed) | | | | | | | 0.00 | 0.00 | 0.00 | 0.00 | 4.00 | 0.000 | 0.000 | 0.000 | 0.000 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.00 | 0.0% |
| | 1 | 2 | 5 | 12.55 | | | 12.55 | 0.00 | 0.00 | 0.00 | 4.00 | 0.174 | 0.000 | 0.000 | 0.174 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.23 | 0.8% |
| | 2 | 3 | 43 | 107.93 | | | 120.48 | 0.00 | 0.00 | 0.00 | 4.00 | 1.673 | 0.000 | 0.000 | 1.673 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.42 | 7.2% |
| | 3 | 4 | 25 | 62.75 | | | 183.23 | 0.00 | 0.00 | 0.00 | 4.00 | 2.545 | 0.000 | 0.000 | 2.545 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.47 | 11.0% |
| | 4 | PS | 14 | 35.14 | 16.80 | | 218.37 | 16.80 | 0.00 | 16.80 | 4.00 | 3.033 | 0.000 | 0.840 | 3.873 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.52 | 16.7% |
| | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | 2.1 | 2 | 40 | 100.4 | | | 100.40 | 0.00 | 0.00 | 0.00 | 4.00 | 1.394 | 0.000 | 0.000 | 1.394 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.40 | 6.0% |
| | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 3.1a | 3 | 9 | 22.59 | | | 22.59 | 0.00 | 0.00 | 0.00 | 4.00 | 0.314 | 0.000 | 0.000 | 0.314 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.27 | 1.4% |
| | 3.1b | 3 | 3 | 7.53 | | | 30.12 | 0.00 | 0.00 | 0.00 | 4.00 | 0.418 | 0.000 | 0.000 | 0.418 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.29 | 1.8% |
| | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | 4.1a | 4 | 4 | 10.04 | | | 10.04 | 0.00 | 0.00 | 0.00 | 4.00 | 0.139 | 0.000 | 0.000 | 0.139 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.21 | 0.6% |
| | 4.1b | 4 | 10 | 25.1 | | | 35.14 | 0.00 | 0.00 | 0.00 | 4.00 | 0.488 | 0.000 | 0.000 | 0.488 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.30 | 2.1% |
| | | | | | | | | | | | | | | | | | | | | | | | |

# PS 4 SANITARY SEWER DESIGN SHEET

q = average per capita daily flow (Existing) 300 L/cap.d
q = average per capita daily flow 300 L/cap.d
c = unit of commercial/institutional flow 28.00 $m^3$/ha.d
ic = unit of peak extraneous flow 0.05 L/ha.s
p = unit of population density 2.51 ppu

Q(p) = peak population flow (L/s)
Q(i) = i x A = peak extraneous flow (L/s)
Q(c) = $\frac{c \times A}{86400}$ = peak commercial flow (L/s)
Q(d) = Q(p) + Q(i) = peak design flow (L/s)

P = population
M = peaking factor (Harmon)
P = p x # units / 1000
M = 1 + 14 / (4 + $P^{1/2}$) , maximum of 4.0, minimum of 2.0
Q = (P x q x M) / 86.4
M Min = 1.5
M Max = 4

DATE:
DESIGNED:
CHECKED:

FILE No.: 1
PROJECT:

SHEET No.: 1 OF 1

| Nominal Sizing (mm) | |
|---|---|
| 200 | 600 |
| 250 | 675 |
| 300 | 750 |
| 375 | 900 |
| 450 | 1050 |
| 525 | |

| LOCATION | | | INDIVIDUAL | | | | CUMULATIVE | | | | | | | | | PROPOSED SANITARY SEWER | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STREET | MH | MH | UNITS | POP | (ha) | AREA | POP | (ha) | AREA | (ha) | FACTOR | FLOW, Q(p) | FLOWS | Q(i) | Q(d) | (m) | DIAMETER | (%) | MANNING'S n | (L/s) | VELOCITY | VELOCITY | FULL |
| Main (Existing) | | | | | | | | | | | | | | | | | | | | | | | |
| | 1 | 2 | 49 | 122.99 | | | 122.99 | 0.00 | 0.00 | 0.00 | 4.00 | 1.708 | 0.000 | 0.000 | 1.708 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.42 | 7.4% |
| | 2 | PS | 9 | 22.59 | 13.60 | | 145.58 | 13.60 | 0.00 | 13.60 | 4.00 | 2.022 | 0.000 | 0.680 | 2.702 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.48 | 11.7% |
| 2 | 2.1 | 2 | 9 | 22.59 | | | 22.59 | 0.00 | 0.00 | 0.00 | 4.00 | 0.314 | 0.000 | 0.000 | 0.314 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.27 | 1.4% |
| Main (Future) | | | | | | | | | | | | | | | | | | | | | | | |
| | 1 | 2 | 119 | 298.69 | | | 298.69 | 0.00 | 0.00 | 0.00 | 4.00 | 4.148 | 0.000 | 0.000 | 4.148 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.53 | 17.9% |
| | 2 | PS | 9 | 22.59 | 53.00 | | 321.28 | 53.00 | 0.00 | 53.00 | 4.00 | 4.462 | 0.000 | 2.650 | 7.112 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.62 | 30.7% |
| 2 | 2.1 | 2 | 9 | 22.59 | | | 22.59 | 0.00 | 0.00 | 0.00 | 4.00 | 0.314 | 0.000 | 0.000 | 0.314 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.27 | 1.4% |
| 1 | 1.1 | 1 | 70 | 175.7 | | | 175.70 | 0.00 | 0.00 | 0.00 | 4.00 | 2.440 | 0.000 | 0.000 | 2.440 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.46 | 10.5% |

## PS 5 SANITARY SEWER DESIGN SHEET

q = average per capita daily flow (Existing) 300 L/cap.d
q = average per capita daily flow 300 L/cap.d
c = unit of commercial/institutional flow 28.00 $m^3$/ha.d
ic = unit of peak extraneous flow 0.05 L/ha.s
p = unit of population density 2.51 ppu

Q(p) = peak population flow (L/s)
Q(i) = i x A = peak extraneous flow (L/s)
Q(c) = c x A / 86400 = peak commercial flow (L/s)
Q(d) = Q(p) + Q(i) = peak design flow (L/s)

P = population
M = peaking factor (Harmon)
P = p x # units / 1000
M = 1 + 14 / (4 + $P^{1/2}$) , maximum of 4.0, minimum of 2.0
Q = (P x q x M) / 86.4
M Min = 1.5
M Max = 4

DATE:
DESIGNED:
CHECKED:
FILE No.: 1
PROJECT:

| Nominal Sizing (mm) | |
|---|---|
| 200 | 600 |
| 250 | 675 |
| 300 | 750 |
| 375 | 900 |
| 450 | 1050 |
| 525 | |

SHEET No.: 1 OF 1

| LOCATION | | | INDIVIDUAL | | | | CUMULATIVE | | | | | | | | | PROPOSED SANITARY SEWER | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STREET | MH | MH | UNITS | POP | (ha) | AREA | POP | (ha) | AREA | (ha) | FACTOR | FLOW, Q(p) | FLOWS | Q(i) | Q(d) | (m) | DIAMETER | (%) | MANNING'S n | (L/s) | VELOCITY | VELOCITY | FULL |
| Main (Existing) | PS4 | 5.1 | | 145.58 | 13.60 | | | | | | | | | | | | | | | | | | |
| | 1 | 2 | 0 | 0 | | | 0.00 | 0.00 | 0.00 | 0.00 | 4.00 | 0.000 | 0.000 | 0.000 | 0.000 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.00 | 0.0% |
| | 2 | 3 | 0 | 0 | | | 0.00 | 0.00 | 0.00 | 0.00 | 4.00 | 0.000 | 0.000 | 0.000 | 0.000 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.00 | 0.0% |
| | 3 | 4 | 0 | 0 | | | 0.00 | 0.00 | 0.00 | 0.00 | 4.00 | 0.000 | 0.000 | 0.000 | 0.000 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.00 | 0.0% |
| | 4 | 5 | 43 | 107.93 | | | 107.93 | 0.00 | 0.00 | 0.00 | 4.00 | 1.499 | 0.000 | 0.000 | 1.499 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.41 | 6.5% |
| | 5 | PS | 15 | 183.23 | 28.40 | | 291.16 | 28.40 | 0.00 | 28.40 | 4.00 | 4.044 | 0.000 | 1.420 | 5.464 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.57 | 23.6% |
| 2 | 2.1 | 2 | 0 | 0 | | | 0.00 | 0.00 | 0.00 | 0.00 | 4.00 | 0.000 | 0.000 | 0.000 | 0.000 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.00 | 0.0% |
| 3 | 3.1 | 3 | 0 | 0 | | | 0.00 | 0.00 | 0.00 | 0.00 | 4.00 | 0.000 | 0.000 | 0.000 | 0.000 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.00 | 0.0% |
| 4 | 4.1 | 4 | 34 | 85.34 | | | 85.34 | 0.00 | 0.00 | 0.00 | 4.00 | 1.185 | 0.000 | 0.000 | 1.185 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.38 | 5.1% |
| 5 | 5.1 | 5 | 15 | 183.23 | 13.60 | | 183.23 | 13.60 | 0.00 | 13.60 | 4.00 | 2.545 | 0.000 | 0.680 | 3.225 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.50 | 13.9% |
| Main (Future) | PS4 | 5.1 | | 321.28 | 53.00 | | | | | | | | | | | | | | | | | | |
| | 1 | 2 | 0 | 0 | | | 0.00 | 0.00 | 0.00 | 0.00 | 4.00 | 0.000 | 0.000 | 0.000 | 0.000 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.00 | 0.0% |
| | 2 | 3 | 181 | 454.31 | | | 454.31 | 0.00 | 0.00 | 0.00 | 4.00 | 6.302 | 0.000 | 0.000 | 6.302 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.60 | 27.2% |
| | 3 | 4 | 35 | 87.85 | | | 542.16 | 0.00 | 0.00 | 0.00 | 3.96 | 7.447 | 0.000 | 0.000 | 7.447 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.62 | 32.1% |
| | 4 | 5 | 43 | 107.93 | | | 650.09 | 0.00 | 0.00 | 0.00 | 3.91 | 8.832 | 0.000 | 0.000 | 8.832 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.65 | 38.1% |
| | 5 | PS | 15 | 358.93 | 105.50 | | 1009.02 | 105.50 | 0.00 | 105.50 | 3.80 | 13.305 | 0.000 | 5.275 | 18.580 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.79 | 44.2% |
| 2 | 2.1 | 2 | 181 | 454.31 | | | 454.31 | 0.00 | 0.00 | 0.00 | 4.00 | 6.302 | 0.000 | 0.000 | 6.302 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.60 | 27.2% |
| 3 | 3.1 | 3 | 35 | 87.85 | | | 87.85 | 0.00 | 0.00 | 0.00 | 4.00 | 1.220 | 0.000 | 0.000 | 1.220 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.38 | 5.3% |
| 4 | 4.1 | 4 | 35 | 87.85 | | | 87.85 | 0.00 | 0.00 | 0.00 | 4.00 | 1.220 | 0.000 | 0.000 | 1.220 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.38 | 5.3% |
| 5 | 5.1 | 5 | 15 | 358.93 | 53.00 | | 358.93 | 53.00 | 0.00 | 53.00 | 4.00 | 4.985 | 0.000 | 2.650 | 7.635 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.63 | 32.9% |

## PS 6 SANITARY SEWER DESIGN SHEET

q = average per capita daily flow (Existing) 300 L/cap.d
q = average per capita daily flow 300 L/cap.d
c = unit of commercial/institutional flow 28.00 $m^3$/ha.d
ic = unit of peak extraneous flow 0.05 L/ha.s
p = unit of population density 2.51 ppu

Q(p) = peak population flow (L/s)
Q(i) = i x A = peak extraneous flow (L/s)
Q(c) = c x A / 86400 = peak commercial flow (L/s)
Q(d) = Q(p) + Q(i) = peak design flow (L/s)

P = population
M = peaking factor (Harmon)
P = p x # units / 1000
$M = 1 + 14 / (4 + P^{1/2})$ , maximum of 4.0, minimum of 2.0
Q = (P x q x M) / 86.4
M Min = 1.5
M Max = 4

DATE:
DESIGNED:
CHECKED:
FILE No.: 1
PROJECT:

SHEET No.: 1 OF 1

| Nominal Sizing (mm) | |
|---|---|
| 200 | 600 |
| 250 | 675 |
| 300 | 750 |
| 375 | 900 |
| 450 | 1050 |
| 525 | |

| LOCATION | | | INDIVIDUAL | | | | CUMULATIVE | | | | | | | | | PROPOSED SANITARY SEWER | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STREET | MH | MH | UNITS | POP | (ha) | AREA | POP | (ha) | AREA | (ha) | FACTOR | FLOW, Q(p) | FLOWS | Q(i) | Q(d) | (m) | DIAMETER | (%) | MANNING'S n | (L/s) | VELOCITY | VELOCITY | FULL |
| Main (Existing) | PS5 | 6.1a | | 291.16 | 28.40 | | | | | | | | | | | | | | | | | | |
| | 1 | 2 | 3 | 7.53 | | | 7.53 | 0.00 | 0.00 | 0.00 | 4.00 | 0.105 | 0.000 | 0.000 | 0.105 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.20 | 0.2% |
| | 2 | 3 | 11 | 27.61 | | | 35.14 | 0.00 | 0.00 | 0.00 | 4.00 | 0.488 | 0.000 | 0.000 | 0.488 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.30 | 1.2% |
| | 3 | 4 | 10 | 25.1 | | | 60.24 | 0.00 | 0.00 | 0.00 | 4.00 | 0.837 | 0.000 | 0.000 | 0.837 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.34 | 2.0% |
| | 4 | 5 | 10 | 25.1 | | | 85.34 | 0.00 | 0.00 | 0.00 | 4.00 | 1.185 | 0.000 | 0.000 | 1.185 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.38 | 2.8% |
| | 5 | 6 | 16 | 40.16 | | | 125.50 | 0.00 | 0.00 | 0.00 | 4.00 | 1.743 | 0.000 | 0.000 | 1.743 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.42 | 4.1% |
| | 6 | PS | 111 | 569.77 | 47.40 | | 695.27 | 47.40 | 0.00 | 47.40 | 3.90 | 9.406 | 0.000 | 2.370 | 11.776 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.70 | 28.0% |
| 2 | 2.1 | 2 | 6 | 15.06 | | | 15.06 | 0.00 | 0.00 | 0.00 | 4.00 | 0.209 | 0.000 | 0.000 | 0.209 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.24 | 0.9% |
| 3 | 3.1 | 3 | 4 | 10.04 | | | 10.04 | 0.00 | 0.00 | 0.00 | 4.00 | 0.139 | 0.000 | 0.000 | 0.139 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.21 | 0.6% |
| 5 | 5.1 | 5 | 5 | 12.55 | | | 12.55 | 0.00 | 0.00 | 0.00 | 4.00 | 0.174 | 0.000 | 0.000 | 0.174 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.23 | 0.8% |
| 6 | 6.1a | 6 | 83 | 499.49 | 28.40 | | 499.49 | 28.40 | 0.00 | 28.40 | 3.97 | 6.893 | 0.000 | 1.420 | 8.313 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.64 | 35.8% |
| | 6.1b | 6 | 28 | 70.28 | | | 569.77 | 28.40 | 0.00 | 28.40 | 3.94 | 7.803 | 0.000 | 1.420 | 9.223 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.66 | 39.8% |
| Main (Future) | PS | | | 1009.02 | 105.50 | | | | | | | | | | | | | | | | | | |
| | 1 | 2 | 3 | 7.53 | | | 7.53 | 0.00 | 0.00 | 0.00 | 4.00 | 0.105 | 0.000 | 0.000 | 0.105 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.20 | 0.2% |
| | 2 | 3 | 11 | 27.61 | | | 35.14 | 0.00 | 0.00 | 0.00 | 4.00 | 0.488 | 0.000 | 0.000 | 0.488 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.30 | 1.2% |
| | 3 | 4 | 10 | 25.1 | | | 60.24 | 0.00 | 0.00 | 0.00 | 4.00 | 0.837 | 0.000 | 0.000 | 0.837 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.34 | 2.0% |
| | 4 | 5 | 10 | 25.1 | | | 85.34 | 0.00 | 0.00 | 0.00 | 4.00 | 1.185 | 0.000 | 0.000 | 1.185 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.38 | 2.8% |
| | 5 | 6 | 16 | 40.16 | | | 125.50 | 0.00 | 0.00 | 0.00 | 4.00 | 1.743 | 0.000 | 0.000 | 1.743 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.42 | 4.1% |
| | 6 | PS | 111 | 1287.63 | 124.50 | | 1413.13 | 124.50 | 0.00 | 124.50 | 3.70 | 18.146 | 0.000 | 6.225 | 24.371 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.85 | 58.0% |
| 2 | 2.1 | 2 | 6 | 15.06 | | | 15.06 | 0.00 | 0.00 | 0.00 | 4.00 | 0.209 | 0.000 | 0.000 | 0.209 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.24 | 0.9% |
| 3 | 3.1 | 3 | 4 | 10.04 | | | 10.04 | 0.00 | 0.00 | 0.00 | 4.00 | 0.139 | 0.000 | 0.000 | 0.139 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.21 | 0.6% |
| 5 | 5.1 | 5 | 5 | 12.55 | | | 12.55 | 0.00 | 0.00 | 0.00 | 4.00 | 0.174 | 0.000 | 0.000 | 0.174 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.23 | 0.8% |
| 6 | 6.1a | 6 | 83 | 1217.35 | 105.50 | | 1217.35 | 105.50 | 0.00 | 105.50 | 3.74 | 15.823 | 0.000 | 5.275 | 21.098 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.82 | 50.2% |
| | 6.1b | 6 | 28 | 70.28 | | | 70.28 | 0.00 | 0.00 | 0.00 | 4.00 | 0.976 | 0.000 | 0.000 | 0.976 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.36 | 4.2% |

## PS 7 SANITARY SEWER DESIGN SHEET

q = average per capita daily flow (Existing) 300 L/cap.d
q = average per capita daily flow 300 L/cap.d
c = unit of commercial/institutional flow 28.00 $m^3$/ha.d
ic = unit of peak extraneous flow 0.05 L/ha.s
p = unit of population density 2.51 ppu

Q(p) = peak population flow (L/s)
Q(i) = i x A = peak extraneous flow (L/s)
Q(c) = $\frac{c \times A}{86400}$ = peak commercial flow (L/s)
Q(d) = Q(p) + Q(i) = peak design flow (L/s)

P = population
M = peaking factor (Harmon)
P = p x # units / 1000
$M = 1 + 14 / (4 + P^{1/2})$, maximum of 4.0, minimum of 2.0
Q = (P x q x M) / 86.4
M Min = 1.5
M Max = 4

DATE:
DESIGNED:
CHECKED:
FILE No.: 1
PROJECT:

SHEET No.: 1 OF 1

| Nominal Sizing (mm) | |
|---|---|
| 200 | 600 |
| 250 | 675 |
| 300 | 750 |
| 375 | 900 |
| 450 | 1050 |
| 525 | |

| LOCATION | | | INDIVIDUAL | | | | CUMULATIVE | | | | | | | | | PROPOSED SANITARY SEWER | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STREET | MH | MH | UNITS | POP | (ha) | AREA | POP | (ha) | AREA | (ha) | FACTOR | FLOW, Q(p) | FLOWS | Q(i) | Q(d) | (m) | DIAMETER | (%) | MANNING'S n | (L/s) | VELOCITY | VELOCITY | FULL |
| Main (Existing) | | | | | | | | | | | | | | | | | | | | | | | |
| | 1 | 2 | 15 | 37.65 | | | 37.65 | 0.00 | 0.00 | 0.00 | 4.00 | 0.523 | 0.000 | 0.000 | 0.523 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.30 | 2.3% |
| | 2 | 3 | 13 | 32.63 | 0.00 | | 70.28 | 0.00 | 0.00 | 0.00 | 4.00 | 0.976 | 0.000 | 0.000 | 0.976 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.36 | 4.2% |
| | 3 | 4 | 16 | 40.16 | | | 110.44 | 0.00 | 0.00 | 0.00 | 4.00 | 1.534 | 0.000 | 0.000 | 1.534 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.41 | 6.6% |
| | 4 | 5 | 21 | 52.71 | | | 163.15 | 0.00 | 0.00 | 0.00 | 4.00 | 2.266 | 0.000 | 0.000 | 2.266 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.45 | 9.8% |
| | 5 | 6 | 27 | 67.77 | | | 230.92 | 0.00 | 0.00 | 0.00 | 4.00 | 3.207 | 0.000 | 0.000 | 3.207 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.50 | 13.8% |
| | 6 | 7 | 52 | 130.52 | | | 361.44 | 0.00 | 0.00 | 0.00 | 4.00 | 5.020 | 0.000 | 0.000 | 5.020 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.55 | 11.9% |
| | 7 | PS | 31 | 77.81 | 24.80 | | 439.25 | 24.80 | 0.00 | 24.80 | 4.00 | 6.101 | 0.000 | 1.240 | 7.341 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.61 | 17.5% |
| 3 | 3.1 | 3 | 9 | 22.59 | | | 22.59 | 0.00 | 0.00 | 0.00 | 4.00 | 0.314 | 0.000 | 0.000 | 0.314 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.27 | 1.4% |
| 4 | 4.1 | 4 | 13 | 32.63 | | | 32.63 | 0.00 | 0.00 | 0.00 | 4.00 | 0.453 | 0.000 | 0.000 | 0.453 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.29 | 2.0% |
| 5 | 5.1 | 5 | 17 | 42.67 | | | 42.67 | 0.00 | 0.00 | 0.00 | 4.00 | 0.593 | 0.000 | 0.000 | 0.593 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.32 | 2.6% |
| 6 | 6.1 | 6 | 20 | 50.2 | | | 50.20 | 0.00 | 0.00 | 0.00 | 4.00 | 0.697 | 0.000 | 0.000 | 0.697 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.33 | 3.0% |
| 7 | 7.1 | 7 | 31 | 77.81 | | | 77.81 | 0.00 | 0.00 | 0.00 | 4.00 | 1.081 | 0.000 | 0.000 | 1.081 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.37 | 4.7% |
| Main (Proposed) | | | | | | | | | | | | | | | | | | | | | | | |
| | 1 | 2 | 15 | 37.65 | | | 37.65 | 0.00 | 0.00 | 0.00 | 4.00 | 0.523 | 0.000 | 0.000 | 0.523 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.30 | 2.3% |
| | 2 | 3 | 13 | 32.63 | 0.00 | | 70.28 | 0.00 | 0.00 | 0.00 | 4.00 | 0.976 | 0.000 | 0.000 | 0.976 | | 350 | 0.50% | 0.013 | 103.1 | 1.07 | 0.35 | 0.9% |
| | 3 | 4 | 16 | 40.16 | | | 110.44 | 0.00 | 0.00 | 0.00 | 4.00 | 1.534 | 0.000 | 0.000 | 1.534 | | 350 | 0.50% | 0.013 | 103.1 | 1.07 | 0.40 | 1.5% |
| | 4 | 5 | 21 | 52.71 | | | 163.15 | 0.00 | 0.00 | 0.00 | 4.00 | 2.266 | 0.000 | 0.000 | 2.266 | | 350 | 0.50% | 0.013 | 103.1 | 1.07 | 0.44 | 2.2% |
| | 5 | 6 | 27 | 67.77 | | | 230.92 | 0.00 | 0.00 | 0.00 | 4.00 | 3.207 | 0.000 | 0.000 | 3.207 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.50 | 13.8% |
| | 6 | 7 | 52 | 130.52 | | | 361.44 | 0.00 | 0.00 | 0.00 | 4.00 | 5.020 | 0.000 | 0.000 | 5.020 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.56 | 21.6% |
| | 7 | PS | 31 | 77.81 | 24.80 | | 439.25 | 24.80 | 0.00 | 24.80 | 4.00 | 6.101 | 0.000 | 1.240 | 7.341 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.62 | 31.7% |
| 3 | 3.1 | 3 | 9 | 22.59 | | | 22.59 | 0.00 | 0.00 | 0.00 | 4.00 | 0.314 | 0.000 | 0.000 | 0.314 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.27 | 1.4% |
| 4 | 4.1 | 4 | 13 | 32.63 | | | 32.63 | 0.00 | 0.00 | 0.00 | 4.00 | 0.453 | 0.000 | 0.000 | 0.453 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.29 | 2.0% |
| 5 | 5.1 | 5 | 17 | 42.67 | | | 42.67 | 0.00 | 0.00 | 0.00 | 4.00 | 0.593 | 0.000 | 0.000 | 0.593 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.32 | 2.6% |
| 6 | 6.1 | 6 | 20 | 50.2 | | | 50.20 | 0.00 | 0.00 | 0.00 | 4.00 | 0.697 | 0.000 | 0.000 | 0.697 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.33 | 3.0% |
| 7 | 7.1 | 7 | 31 | 77.81 | | | 77.81 | 0.00 | 0.00 | 0.00 | 4.00 | 1.081 | 0.000 | 0.000 | 1.081 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.37 | 4.7% |

## PS 8 SANITARY SEWER DESIGN SHEET

q = average per capita daily flow (Existing) 300 L/cap.d
q = average per capita daily flow 300 L/cap.d
c = unit of commercial/institutional flow 28.00 $m^3$/ha.d
ic = unit of peak extraneous flow 0.05 L/ha.s
p = unit of population density 2.51 ppu

Q(p) = peak population flow (L/s)
Q(i) = i x A = peak extraneous flow (L/s)
Q(c) = $\frac{c \times A}{86400}$ = peak commercial flow (L/s)
Q(d) = Q(p) + Q(i) = peak design flow (L/s)

P = population
M = peaking factor (Harmon)
P = p x # units / 1000
M = 1 + 14 / (4 + $P^{1/2}$) , maximum of 4.0, minimum of 2.0
Q = (P x q x M) / 86.4
M Min = 1.5
M Max = 4

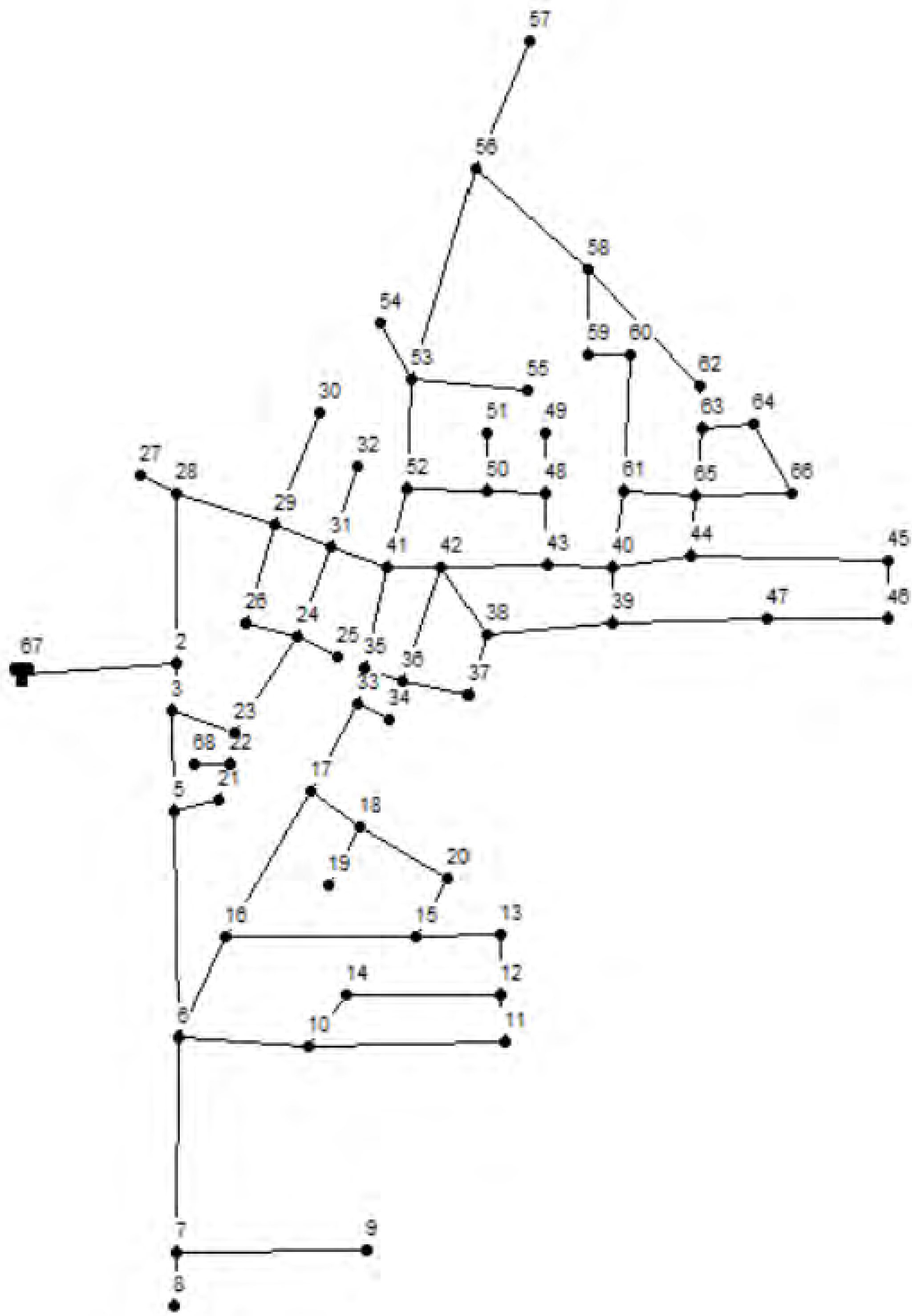
DATE:
DESIGNED:
CHECKED:
FILE No.: 1
PROJECT:
SHEET No.: 1 OF 1

| Nominal Sizing (mm) | |
|---|---|
| 200 | 600 |
| 250 | 675 |
| 300 | 750 |
| 375 | 900 |
| 450 | 1050 |
| 525 | |

| LOCATION | | | INDIVIDUAL | | | | CUMULATIVE | | | | | | | | | PROPOSED SANITARY SEWER | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STREET | MH | MH | UNITS | POP | (ha) | AREA | POP | (ha) | AREA | (ha) | FACTOR | FLOW, Q(p) | FLOWS | Q(i) | Q(d) | (m) | DIAMETER | (%) | MANNING'S n | (L/s) | VELOCITY | VELOCITY | FULL |
| Main (Existing) | PS2 | 7.1 | | 1066.75 | 87.50 | | | | | | | | | | | | | | | | | | |
| | PS3 | 7.1 | | 117.97 | 11.00 | | | | | | | | | | | | | | | | | | |
| | PS6 | 2 | | 695.27 | 47.40 | | | | | | | | | | | | | | | | | | |
| | PS7 | 3.1a | | 439.25 | 24.80 | | | | | | | | | | | | | | | | | | |
| | 1 | 2 | 4 | 10.04 | | | 10.04 | 0.00 | 0.00 | 0.00 | 4.00 | 0.139 | 0.000 | 0.000 | 0.139 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.21 | 0.3% |
| | 2 | 3 | 22 | 750.49 | 47.40 | | 760.53 | 47.40 | 0.00 | 47.40 | 3.87 | 10.229 | 0.000 | 2.370 | 12.599 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.71 | 30.0% |
| | 3 | 4 | 37 | 532.12 | 24.80 | | 1292.65 | 72.20 | 0.00 | 72.20 | 3.73 | 16.721 | 0.000 | 3.610 | 20.331 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.81 | 48.4% |
| school (100 unit eq) | 4 | 5 | 50.00 | 125.5 | | | 1418.15 | 72.20 | 0.00 | 72.20 | 3.70 | 18.205 | 0.000 | 3.610 | 21.815 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.83 | 51.9% |
| | 5 | 6 | 34 | 85.34 | | | 1503.49 | 72.20 | 0.00 | 72.20 | 3.68 | 19.205 | 0.000 | 3.610 | 22.815 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.84 | 54.3% |
| | 6 | 7 | 38 | 95.38 | | | 1598.87 | 72.20 | 0.00 | 72.20 | 3.66 | 20.315 | 0.000 | 3.610 | 23.925 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.85 | 56.9% |
| | 7 | PS | 35 | 1272.57 | 130.10 | | 2871.44 | 202.30 | 0.00 | 202.30 | 3.46 | 34.482 | 0.000 | 10.115 | 44.597 | | 375 | 0.50% | 0.013 | 124.0 | 1.12 | 0.98 | 36.0% |
| 2a | 2.1a | 2 | 4 | 10.04 | | | 10.04 | 0.00 | 0.00 | 0.00 | 4.00 | 0.139 | 0.000 | 0.000 | 0.139 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.21 | 0.6% |
| 2b | 2.1b | 2 | 14 | 35.14 | | | 45.18 | 0.00 | 0.00 | 0.00 | 4.00 | 0.628 | 0.000 | 0.000 | 0.628 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.32 | 2.7% |
| 3a | 3.1a | 3 | 20 | 489.45 | 24.80 | | 489.45 | 24.80 | 0.00 | 24.80 | 3.98 | 6.762 | 0.000 | 1.240 | 8.002 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.64 | 34.5% |
| 3b | 3.1b | 3 | 15 | 37.65 | | | 527.10 | 24.80 | 0.00 | 24.80 | 3.96 | 7.252 | 0.000 | 1.240 | 8.492 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.65 | 36.6% |
| 4 | 4.1 | 4 | 28.00 | 70.28 | | | 70.28 | 0.00 | 0.00 | 0.00 | 4.00 | 0.976 | 0.000 | 0.000 | 0.976 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.36 | 4.2% |
| 5 | 5.1 | 5 | 32 | 80.32 | | | 80.32 | 0.00 | 0.00 | 0.00 | 4.00 | 1.116 | 0.000 | 0.000 | 1.116 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.37 | 4.8% |
| 6 | 6.1 | 6 | 36 | 90.36 | | | 90.36 | 0.00 | 0.00 | 0.00 | 4.00 | 1.255 | 0.000 | 0.000 | 1.255 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.39 | 5.4% |
| 7 | 7.1 | 7 | 35 | 1272.57 | 98.50 | | 1272.57 | 98.50 | 0.00 | 98.50 | 3.73 | 16.482 | 0.000 | 4.925 | 21.407 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.82 | 50.9% |
| Main (Future) | PS2 | 7.1 | | 439.25 | 60.20 | | | | | | | | | | | | | | | | | | |
| | PS3 | 7.1 | | 218.37 | 16.80 | | | | | | | | | | | | | | | | | | |
| | PS6 | 4 | | 1413.13 | 124.50 | | | | | | | | | | | | | | | | | | |
| | PS7 | 3.1a | | 439.25 | 24.80 | | | | | | | | | | | | | | | | | | |
| | 1 | 2 | 4 | 10.04 | | | 10.04 | 0.00 | 0.00 | 0.00 | 4.00 | 0.139 | 0.000 | 0.000 | 0.139 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.21 | 0.3% |
| | 2 | 3 | 22 | 55.22 | | | 65.26 | 0.00 | 0.00 | 0.00 | 4.00 | 0.906 | 0.000 | 0.000 | 0.906 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.35 | 2.2% |
| | 3 | 4 | 17 | 1127.1 | 24.80 | | 1192.36 | 24.80 | 0.00 | 24.80 | 3.75 | 15.523 | 0.000 | 1.240 | 16.763 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.77 | 39.9% |
| school (100 unit eq) | 4 | 5 | 50.00 | 1538.63 | 124.50 | | 2730.99 | 149.30 | 0.00 | 149.30 | 3.48 | 32.969 | 0.000 | 7.465 | 40.434 | | 375 | 0.50% | 0.013 | 124.0 | 1.12 | 0.95 | 32.6% |
| | 5 | 6 | 34 | 85.34 | | | 2816.33 | 149.30 | 0.00 | 149.30 | 3.47 | 33.890 | 0.000 | 7.465 | 41.355 | | 375 | 0.50% | 0.013 | 124.0 | 1.12 | 0.96 | 33.4% |
| | 6 | 7 | 38 | 95.38 | | | 2911.71 | 149.30 | 0.00 | 149.30 | 3.45 | 34.914 | 0.000 | 7.465 | 42.379 | | 375 | 0.50% | 0.013 | 124.0 | 1.12 | 0.97 | 34.2% |
| | 7 | PS | 35 | 745.47 | 133.40 | | 3657.18 | 282.70 | 0.00 | 282.70 | 3.37 | 42.768 | 0.000 | 14.135 | 56.903 | | 375 | 0.50% | 0.013 | 124.0 | 1.12 | 1.05 | 45.9% |
| 2a | 2.1a | 2 | 4 | 10.04 | | | 10.04 | 0.00 | 0.00 | 0.00 | 4.00 | 0.139 | 0.000 | 0.000 | 0.139 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.21 | 0.6% |
| 2b | 2.1b | 2 | 14 | 35.14 | | | 45.18 | 0.00 | 0.00 | 0.00 | 4.00 | 0.628 | 0.000 | 0.000 | 0.628 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.32 | 2.7% |
| 3a | 3.1a | 3 | 20 | 489.45 | 24.80 | | 489.45 | 24.80 | 0.00 | 24.80 | 3.98 | 6.762 | 0.000 | 1.240 | 8.002 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.64 | 34.5% |
| 3b | 3.1b | 3 | 15 | 37.65 | | | 527.10 | 24.80 | 0.00 | 24.80 | 3.96 | 7.252 | 0.000 | 1.240 | 8.492 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.65 | 36.6% |
| 4 | 4.1 | 4 | 28.00 | 70.28 | | | 70.28 | 0.00 | 0.00 | 0.00 | 4.00 | 0.976 | 0.000 | 0.000 | 0.976 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.36 | 4.2% |
| 5 | 5.1 | 5 | 32 | 80.32 | | | 80.32 | 0.00 | 0.00 | 0.00 | 4.00 | 1.116 | 0.000 | 0.000 | 1.116 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.37 | 2.7% |
| 6 | 6.1 | 6 | 36 | 90.36 | | | 90.36 | 0.00 | 0.00 | 0.00 | 4.00 | 1.255 | 0.000 | 0.000 | 1.255 | | 200 | 0.50% | 0.013 | 23.2 | 0.74 | 0.39 | 5.4% |
| 7 | 7.1 | 7 | 35 | 745.47 | 77.00 | | 745.47 | 77.00 | 0.00 | 77.00 | 3.88 | 10.040 | 0.000 | 3.850 | 13.890 | | 250 | 0.50% | 0.013 | 42.0 | 0.86 | 0.73 | 33.0% |

# Appendix C Water System Analysis

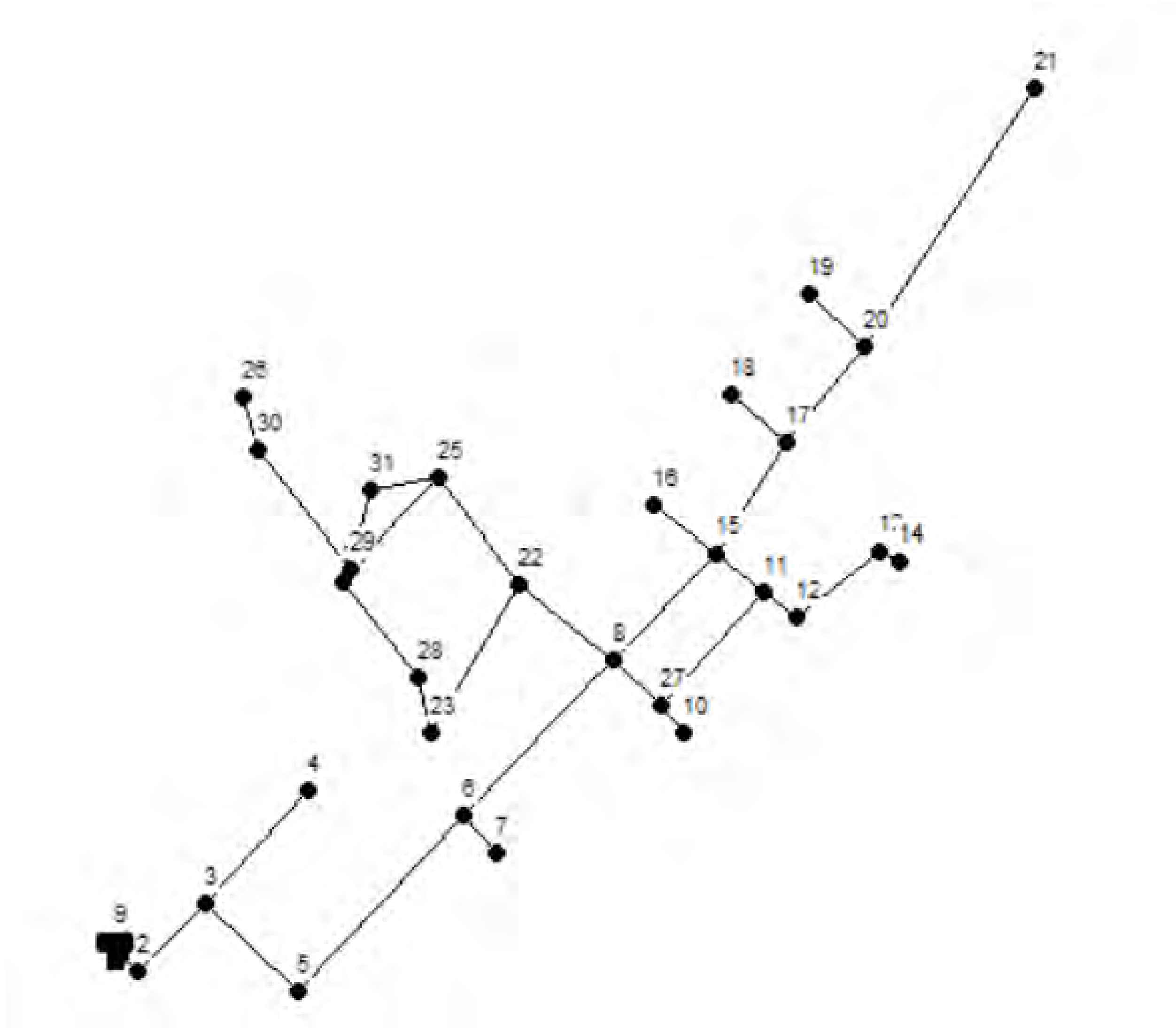
## Part 1 Coldwater System



| | | |
|---|---|---|
| 2023 coonsumption | | |
| ADF (m3/d) | 410 | |
| l/c/d (calc) | 300 | (From pop and flow analysis file and adjusted for school demand) |

| [JUNCTIONS] | | Base Case | | | | | Ultimate Pop Case | | |
|---|---|---|---|---|---|---|---|---|---|
| ;ID | units | pop | ADF l/s | MDF l/s | additional units | Existing Units | pop | ADF l/s | MDF l/s |
| 2 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | 0 |
| 3 | 4 | 10.04 | 0.035 | 0.069722 | | 4 | 10.04 | 0.034861 | 0.069722 |
| 5 | 1 | 2.51 | 0.009 | 0.017431 | 59 | 1 | 161.81 | 0.746215 | 1.492431 |
| 6 | 5 | 12.55 | 0.044 | 0.087153 | | 5 | 12.55 | 0.043576 | 0.087153 |
| 7 | 5 | 12.55 | 0.044 | 0.087153 | 50 | 5 | 147.55 | 0.668576 | 1.337153 |
| 8 | 5 | 12.55 | 0.044 | 0.087153 | | 5 | 12.55 | 0.043576 | 0.087153 |
| 9 | 5 | 12.55 | 0.044 | 0.087153 | | 5 | 12.55 | 0.043576 | 0.087153 |
| 10 | 0 | 0 | 0.000 | 0 | 85 | 0 | 229.5 | 1.0625 | 2.125 |
| 11 | 0 | 0 | 0.000 | 0 | | 0 | 0 | 0 | 0 |
| 12 | 0 | 0 | 0.000 | 0 | | 0 | 0 | 0 | 0 |
| 13 | 0 | 0 | 0.000 | 0 | | 0 | 0 | 0 | 0 |
| 14 | 0 | 0 | 0.000 | 0 | 73 | 0 | 197.1 | 0.9125 | 1.825 |
| 15 | 10 | 25.1 | 0.087 | 0.174306 | 73 | 10 | 222.2 | 0.999653 | 1.999306 |
| 16 | 0 | 0 | 0.000 | 0 | | 0 | 0 | 0 | 0 |
| 17 | 12 | 30.12 | 0.105 | 0.209167 | | 12 | 30.12 | 0.104583 | 0.209167 |
| 18 | 4 | 10.04 | 0.035 | 0.069722 | | 4 | 10.04 | 0.034861 | 0.069722 |
| 19 | 11 | 27.61 | 0.096 | 0.191736 | | 11 | 27.61 | 0.095868 | 0.191736 |
| 20 | 12 | 30.12 | 0.105 | 0.209167 | | 12 | 30.12 | 0.104583 | 0.209167 |
| 21 | 8 | 20.08 | 0.070 | 0.139444 | | 8 | 20.08 | 0.069722 | 0.139444 |
| 22 | 7 | 17.57 | 0.061 | 0.122014 | | 7 | 17.57 | 0.061007 | 0.122014 |
| 23 | 3 | 7.53 | 0.026 | 0.052292 | | 3 | 7.53 | 0.026146 | 0.052292 |
| 24 | 20 | 50.2 | 0.174 | 0.348611 | | 20 | 50.2 | 0.174306 | 0.348611 |
| 25 | 4 | 10.04 | 0.035 | 0.069722 | | 4 | 10.04 | 0.034861 | 0.069722 |
| 26 | 25 | 62.75 | 0.218 | 0.435764 | | 25 | 62.75 | 0.217882 | 0.435764 |
| 27 | 1 | 2.51 | 0.009 | 0.017431 | | 1 | 2.51 | 0.008715 | 0.017431 |
| 28 | 0 | 0 | 0.000 | 0 | 11 | 0 | 29.7 | 0.1375 | 0.275 |
| 29 | 5 | 12.55 | 0.044 | 0.087153 | | 5 | 12.55 | 0.043576 | 0.087153 |
| 30 | 16 | 40.16 | 0.139 | 0.278889 | | 16 | 40.16 | 0.139444 | 0.278889 |
| 31 | 2 | 5.02 | 0.017 | 0.034861 | | 2 | 5.02 | 0.017431 | 0.034861 |
| 32 | 10 | 25.1 | 0.087 | 0.174306 | | 10 | 25.1 | 0.087153 | 0.174306 |
| 33 | 0 | 0 | 0.000 | 0 | | 0 | 0 | 0 | 0 |
| 34 | 30 | 75.3 | 0.261 | 0.522917 | | 30 | 75.3 | 0.261458 | 0.522917 |
| 35 | 20 | 50.2 | 0.174 | 0.348611 | | 20 | 50.2 | 0.174306 | 0.348611 |
| 36 | 30 | 75.3 | 0.261 | 0.522917 | 15 | 30 | 115.8 | 0.448958 | 0.897917 |
| 37 | 30 | 75.3 | 0.261 | 0.522917 | | 30 | 75.3 | 0.261458 | 0.522917 |
| 38 | 5 | 12.55 | 0.044 | 0.087153 | | 5 | 12.55 | 0.043576 | 0.087153 |
| 39 | 18 | 45.18 | 0.157 | 0.31375 | 40 | 18 | 153.18 | 0.656875 | 1.31375 |
| 40 | 9 | 22.59 | 0.078 | 0.156875 | | 9 | 22.59 | 0.078438 | 0.156875 |
| 41 | 0 | 0 | 0.000 | 0 | | 0 | 0 | 0 | 0 |
| 42 | 4 | 10.04 | 0.035 | 0.069722 | 15 | 4 | 50.54 | 0.222361 | 0.444722 |
| 43 | 14 | 35.14 | 0.122 | 0.244028 | | 14 | 35.14 | 0.122014 | 0.244028 |
| 44 | 20 | 50.2 | 0.174 | 0.348611 | | 20 | 50.2 | 0.174306 | 0.348611 |
| 45 | 21 | 52.71 | 0.183 | 0.366042 | | 21 | 52.71 | 0.183021 | 0.366042 |
| 46 | 4 | 10.04 | 0.035 | 0.069722 | | 4 | 10.04 | 0.034861 | 0.069722 |
| 47 | 15 | 37.65 | 0.131 | 0.261458 | 42 | 15 | 151.05 | 0.655729 | 1.311458 |
| 48 | 6 | 15.06 | 0.052 | 0.104583 | | 6 | 15.06 | 0.052292 | 0.104583 |
| 49 | 7 | 17.57 | 0.061 | 0.122014 | | 7 | 17.57 | 0.061007 | 0.122014 |
| 50 | 10 | 25.1 | 0.087 | 0.174306 | | 10 | 25.1 | 0.087153 | 0.174306 |
| 51 | 11 | 27.61 | 0.096 | 0.191736 | | 11 | 27.61 | 0.095868 | 0.191736 |
| 52 | 3 | 7.53 | 0.026 | 0.052292 | | 3 | 7.53 | 0.026146 | 0.052292 |
| 53 | 9 | 22.59 | 0.078 | 0.156875 | 98 | 9 | 287.19 | 1.303438 | 2.606875 |
| 54 | 17 | 42.67 | 0.148 | 0.296319 | | 17 | 42.67 | 0.14816 | 0.296319 |
| 55 | 13 | 32.63 | 0.113 | 0.226597 | | 13 | 32.63 | 0.113299 | 0.226597 |
| 56 | 17 | 42.67 | 0.148 | 0.296319 | | 17 | 42.67 | 0.14816 | 0.296319 |
| 57 | 10 | 25.1 | 0.087 | 0.174306 | | 10 | 25.1 | 0.087153 | 0.174306 |
| 58 | 39 | 97.89 | 0.340 | 0.679792 | | 39 | 97.89 | 0.339896 | 0.679792 |
| 59 | 6 | 15.06 | 0.052 | 0.104583 | | 6 | 15.06 | 0.052292 | 0.104583 |
| 60 | 10 | 25.1 | 0.087 | 0.174306 | 7 | 10 | 44 | 0.174653 | 0.349306 |
| 61 | 9 | 22.59 | 0.078 | 0.156875 | | 9 | 22.59 | 0.078438 | 0.156875 |
| 62 | 5 | 12.55 | 0.044 | 0.087153 | | 5 | 12.55 | 0.043576 | 0.087153 |
| 63 | 5 | 12.55 | 0.044 | 0.087153 | | 5 | 12.55 | 0.043576 | 0.087153 |
| 64 | 8 | 20.08 | 0.070 | 0.139444 | 20 | 8 | 74.08 | 0.319722 | 0.639444 |
| 65 | 8 | 20.08 | 0.070 | 0.139444 | | 8 | 20.08 | 0.069722 | 0.139444 |
| 66 | 7 | 17.57 | 0.061 | 0.122014 | 11 | 7 | 47.27 | 0.198507 | 0.397014 |
| 68 | 8 | 20.08 | 0.070 | 0.139444 | | 8 | 20.08 | 0.069722 | 0.139444 |
| Total | | 1513.53 | 5.255313 | 10.51063 l/s | 599 | 603 | 3130.83 | 12.74281 | 25.48563 l/s |
| | | | 454.1 | 908.1 m3/d | | | | 1101.0 | 2202.0 m3/d |
| | 2021 pop tar | 1500 | | | | 2051 pop target | 2816 | | |

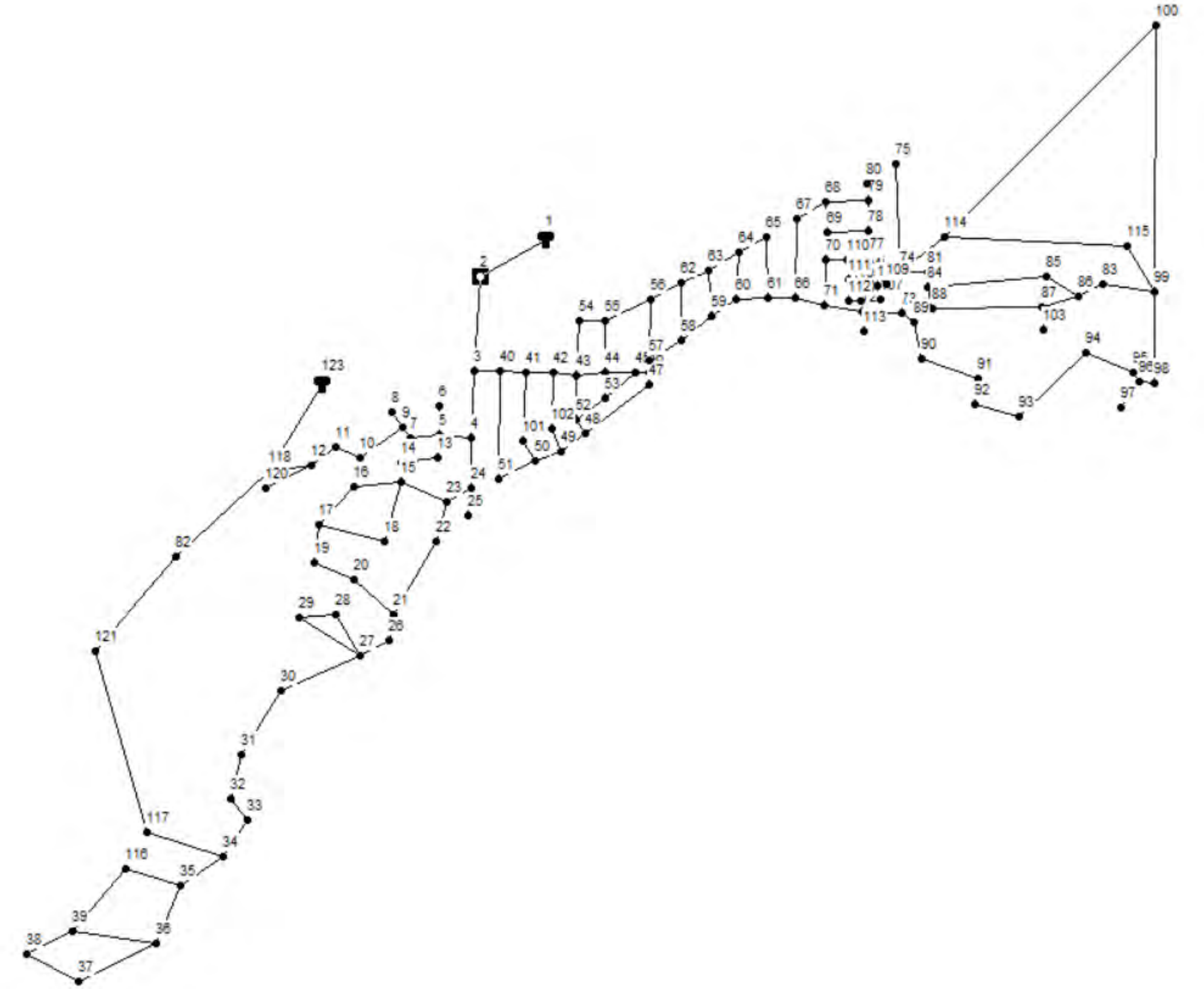
Part 2 Washago System



2023 coonsumption
ADF (m3/d) 410
l/c/d (calc) 300 (From pop and flow analysis file and adjusted for school demand)

| [JUNCTIONS] | | Base Case | | | | | | Ultimate Pop Case | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ;ID | units | pop | ADF l/s | MDF l/s | | additional unita | Existing Units | pop | ADF l/s | MDF l/s | |
| 1 | 0 | 0 | 0.000 | 0 | | | 0 | 0 | 0 | 0 | |
| 2 | 0 | 0 | 0.000 | 0 | | | 0 | 0 | 0 | 0 | |
| 3 | 0 | 0 | 0.000 | 0 | | | 0 | 0 | 0 | 0 | |
| 4 | 12 | 30.12 | 0.105 | 0.209167 | | | 12 | 30.12 | 0.104583 | 0.209167 | |
| 5 | 0 | 0 | 0.000 | 0 | | | 0 | 0 | 0 | 0 | |
| 6 | 14 | 35.14 | 0.122 | 0.244028 | | | 14 | 35.14 | 0.122014 | 0.244028 | |
| 7 | 0 | 0 | 0.000 | 0 | | | 0 | 0 | 0 | 0 | |
| 8 | 36 | 90.36 | 0.314 | 0.6275 | | | 36 | 90.36 | 0.31375 | 0.6275 | |
| 10 | 2 | 5.02 | 0.017 | 0.034861 | | | 2 | 5.02 | 0.017431 | 0.034861 | |
| 11 | 10 | 25.1 | 0.087 | 0.174306 | | | 10 | 25.1 | 0.087153 | 0.174306 | |
| 12 | 0 | 0 | 0.000 | 0 | | | 0 | 0 | 0 | 0 | |
| 13 | 14 | 35.14 | 0.122 | 0.244028 | | | 14 | 35.14 | 0.122014 | 0.244028 | |
| 14 | 6 | 15.06 | 0.052 | 0.104583 | | | 6 | 15.06 | 0.052292 | 0.104583 | |
| 15 | 15 | 37.65 | 0.131 | 0.261458 | | | 15 | 37.65 | 0.130729 | 0.261458 | |
| 16 | 5 | 12.55 | 0.044 | 0.087153 | | | 5 | 12.55 | 0.043576 | 0.087153 | |
| 17 | 6 | 15.06 | 0.052 | 0.104583 | | | 6 | 15.06 | 0.052292 | 0.104583 | |
| 18 | 5 | 12.55 | 0.044 | 0.087153 | | | 5 | 12.55 | 0.043576 | 0.087153 | |
| 19 | 4 | 10.04 | 0.035 | 0.069722 | | | 4 | 10.04 | 0.034861 | 0.069722 | |
| 20 | 10 | 25.1 | 0.087 | 0.174306 | | | 10 | 25.1 | 0.087153 | 0.174306 | |
| 21 | 15 | 37.65 | 0.131 | 0.261458 | | | 15 | 37.65 | 0.130729 | 0.261458 | |
| 22 | 5 | 12.55 | 0.044 | 0.087153 | | 8 | 5 | 34.15 | 0.143576 | 0.287153 | |
| 23 | 4 | 10.04 | 0.035 | 0.069722 | | | 4 | 10.04 | 0.034861 | 0.069722 | |
| 24 | 2 | 5.02 | 0.017 | 0.034861 | | | 2 | 5.02 | 0.017431 | 0.034861 | |
| 25 | 0 | 0 | 0.000 | 0 | | 22 | 0 | 59.4 | 0.275 | 0.55 | |
| 26 | 7 | 17.57 | 0.061 | 0.122014 | | | 7 | 17.57 | 0.061007 | 0.122014 | |
| 27 | 1 | 2.51 | 0.009 | 0.017431 | | | 1 | 2.51 | 0.008715 | 0.017431 | |
| 28 | 0 | 0 | 0.000 | 0 | | | 0 | 0 | 0 | 0 | |
| 29 | 0 | 0 | 0.000 | 0 | | 4 | 0 | 10.8 | 0.05 | 0.1 | |
| 30 | 0 | 0 | 0.000 | 0 | | | 0 | 0 | 0 | 0 | |
| Total | 173 | 434.23 | 1.507743 | 3.015486 | l/s | 34 | 173 | 526.03 | 1.932743 | 3.865486 | l/s |
| | | | 130.3 | 260.5 | m3/d | | | | 167.0 | 334.0 | m3/d |
| | 2021 pop tar | 304 | | | | | 2051 pop target | 304 | | | |

## Part 3 Westshore System



2023 coonsumption
ADF (m3/d) 672
l/c/d (calc) 240 (From pop and flow analysis file and adjusted for school demand)

| [DEMANDS] | Base Case | | | | Ultimate Pop Case | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ;Junction | homes (est count) | pop | ADF l/s | MDF l/s | units | pop | ADF l/s | MDF l/s | |
| 2 | 0 | 0 | 0.000 | 0.000 | 0 | 0 | 0.000 | 0.000 | |
| 3 | 0 | 0 | 0.000 | 0.000 | 0 | 0 | 0.000 | 0.000 | |
| 4 | 18 | 45.18 | 0.126 | 0.251 | 18 | 45.18 | 0.126 | 0.251 | |
| 5 | 4 | 10.04 | 0.028 | 0.056 | 4 | 10.04 | 0.028 | 0.056 | |
| 6 | 10 | 25.1 | 0.070 | 0.139 | 10 | 25.1 | 0.070 | 0.139 | |
| 7 | 2 | 5.02 | 0.014 | 0.028 | 2 | 5.02 | 0.014 | 0.028 | |
| 8 | 3 | 7.53 | 0.021 | 0.042 | 3 | 7.53 | 0.021 | 0.042 | |
| 9 | 3 | 7.53 | 0.021 | 0.042 | 3 | 7.53 | 0.021 | 0.042 | |
| 10 | 0 | 0 | 0.000 | 0.000 | 0 | 0 | 0.000 | 0.000 | |
| 11 | 0 | 0 | 0.000 | 0.000 | 0 | 0 | 0.000 | 0.000 | |
| 12 | 25 | 62.75 | 0.174 | 0.349 | 25 | 62.75 | 0.174 | 0.349 | |
| 13 | 2 | 5.02 | 0.014 | 0.028 | 2 | 5.02 | 0.014 | 0.028 | |
| 14 | 7 | 17.57 | 0.049 | 0.098 | 7 | 17.57 | 0.049 | 0.098 | |
| 15 | 2 | 5.02 | 0.014 | 0.028 | 2 | 5.02 | 0.014 | 0.028 | |
| 16 | 10 | 25.1 | 0.070 | 0.139 | 10 | 25.1 | 0.070 | 0.139 | |
| 17 | 11 | 27.61 | 0.077 | 0.153 | 11 | 27.61 | 0.077 | 0.153 | |
| 18 | 27 | 67.77 | 0.188 | 0.377 | 27 | 67.77 | 0.188 | 0.377 | |
| 19 | 18 | 45.18 | 0.126 | 0.251 | 18 | 45.18 | 0.126 | 0.251 | |
| 20 | 12 | 30.12 | 0.084 | 0.167 | 12 | 30.12 | 0.084 | 0.167 | |
| 21 | 20 | 50.2 | 0.139 | 0.279 | 20 | 50.2 | 0.139 | 0.279 | |
| 22 | 8 | 20.08 | 0.056 | 0.112 | 8 | 20.08 | 0.056 | 0.112 | |
| 23 | 6 | 15.06 | 0.042 | 0.084 | 6 | 15.06 | 0.042 | 0.084 | |
| 24 | 8 | 20.08 | 0.056 | 0.112 | 8 | 20.08 | 0.056 | 0.112 | |
| 25 | 3 | 7.53 | 0.021 | 0.042 | 3 | 7.53 | 0.021 | 0.042 | |
| 26 | 5 | 12.55 | 0.035 | 0.070 | 5 | 12.55 | 0.035 | 0.070 | |
| 27 | 4 | 10.04 | 0.028 | 0.056 | 4 | 10.04 | 0.028 | 0.056 | |
| 28 | 20 | 50.2 | 0.139 | 0.279 | 20 | 50.2 | 0.139 | 0.279 | |
| 29 | 20 | 50.2 | 0.139 | 0.279 | 20 | 50.2 | 0.139 | 0.279 | |
| 30 | 7 | 17.57 | 0.049 | 0.098 | 7 | 17.57 | 0.049 | 0.098 | |
| 31 | 7 | 17.57 | 0.049 | 0.098 | 7 | 17.57 | 0.049 | 0.098 | |
| 32 | 9 | 22.59 | 0.063 | 0.126 | 9 | 22.59 | 0.063 | 0.126 | |
| 33 | 2 | 5.02 | 0.014 | 0.028 | 2 | 5.02 | 0.014 | 0.028 | |
| 34 | 12 | 30.12 | 0.084 | 0.167 | 12 | 30.12 | 0.084 | 0.167 | |
| 35 | 22 | 55.22 | 0.153 | 0.307 | 22 | 55.22 | 0.153 | 0.307 | |
| 36 | 24 | 60.24 | 0.167 | 0.335 | 24 | 60.24 | 0.167 | 0.335 | |
| 37 | 15 | 37.65 | 0.105 | 0.209 | 15 | 37.65 | 0.105 | 0.209 | |
| 38 | 21 | 52.71 | 0.146 | 0.293 | 21 | 52.71 | 0.146 | 0.293 | |
| 39 | 0 | 0 | 0.000 | 0.000 | 0 | 0 | 0.000 | 0.000 | |
| 40 | 2 | 5.02 | 0.014 | 0.028 | 2 | 5.02 | 0.014 | 0.028 | |
| 41 | 2 | 5.02 | 0.014 | 0.028 | 2 | 5.02 | 0.014 | 0.028 | |
| 42 | 50 | 125.5 | 0.349 | 0.697 | 50 | 125.5 | 0.349 | 0.697 | |
| 43 | 2 | 5.02 | 0.014 | 0.028 | 2 | 5.02 | 0.014 | 0.028 | |
| 44 | 3 | 7.53 | 0.021 | 0.042 | 3 | 7.53 | 0.021 | 0.042 | |
| 45 | 4 | 10.04 | 0.028 | 0.056 | 4 | 10.04 | 0.028 | 0.056 | |
| 46 | 1 | 2.51 | 0.007 | 0.014 | 1 | 2.51 | 0.007 | 0.014 | |
| 47 | 35 | 87.85 | 0.244 | 0.488 | 35 | 87.85 | 0.244 | 0.488 | |
| 48 | 10 | 25.1 | 0.070 | 0.139 | 10 | 25.1 | 0.070 | 0.139 | |
| 49 | 12 | 30.12 | 0.084 | 0.167 | 12 | 30.12 | 0.084 | 0.167 | |
| 50 | 20 | 50.2 | 0.139 | 0.279 | 20 | 50.2 | 0.139 | 0.279 | |
| 51 | 35 | 87.85 | 0.244 | 0.488 | 35 | 87.85 | 0.244 | 0.488 | |
| 52 | 18 | 45.18 | 0.126 | 0.251 | 18 | 45.18 | 0.126 | 0.251 | |
| 53 | 14 | 35.14 | 0.098 | 0.195 | 14 | 35.14 | 0.098 | 0.195 | |
| 54 | 15 | 37.65 | 0.105 | 0.209 | 15 | 37.65 | 0.105 | 0.209 | |
| 55 | 13 | 32.63 | 0.091 | 0.181 | 13 | 32.63 | 0.091 | 0.181 | |
| 56 | 21 | 52.71 | 0.146 | 0.293 | 21 | 52.71 | 0.146 | 0.293 | |
| 57 | 0 | 0 | 0.000 | 0.000 | 0 | 0 | 0.000 | 0.000 | |
| 58 | 10 | 25.1 | 0.070 | 0.139 | 10 | 25.1 | 0.070 | 0.139 | |
| 59 | 10 | 25.1 | 0.070 | 0.139 | 10 | 25.1 | 0.070 | 0.139 | |
| 60 | 5 | 12.55 | 0.035 | 0.070 | 5 | 12.55 | 0.035 | 0.070 | |
| 61 | 12 | 30.12 | 0.084 | 0.167 | 12 | 30.12 | 0.084 | 0.167 | |
| 62 | 22 | 55.22 | 0.153 | 0.307 | 22 | 55.22 | 0.153 | 0.307 | |
| 63 | 15 | 37.65 | 0.105 | 0.209 | 15 | 37.65 | 0.105 | 0.209 | |
| 64 | 13 | 32.63 | 0.091 | 0.181 | 13 | 32.63 | 0.091 | 0.181 | |
| 65 | 14 | 35.14 | 0.098 | 0.195 | 14 | 35.14 | 0.098 | 0.195 | |
| 66 | 9 | 22.59 | 0.063 | 0.126 | 9 | 22.59 | 0.063 | 0.126 | |
| 67 | 22 | 55.22 | 0.153 | 0.307 | 22 | 55.22 | 0.153 | 0.307 | |
| 68 | 6 | 15.06 | 0.042 | 0.084 | 6 | 15.06 | 0.042 | 0.084 | |
| 69 | 7 | 17.57 | 0.049 | 0.098 | 7 | 17.57 | 0.049 | 0.098 | |
| 70 | 14 | 35.14 | 0.098 | 0.195 | 14 | 35.14 | 0.098 | 0.195 | |
| 71 | 8 | 20.08 | 0.056 | 0.112 | 8 | 20.08 | 0.056 | 0.112 | |
| 72 | 10 | 25.1 | 0.070 | 0.139 | 10 | 25.1 | 0.070 | 0.139 | |
| 73 | 5 | 12.55 | 0.035 | 0.070 | 5 | 12.55 | 0.035 | 0.070 | |
| 74 | 10 | 25.1 | 0.070 | 0.139 | 10 | 25.1 | 0.070 | 0.139 | |
| 75 | 25 | 62.75 | 0.174 | 0.349 | 25 | 62.75 | 0.174 | 0.349 | |
| 76 | 0 | 0 | 0.000 | 0.000 | 0 | 0 | 0.000 | 0.000 | |
| 77 | 5 | 12.55 | 0.035 | 0.070 | 5 | 12.55 | 0.035 | 0.070 | |
| 78 | 16 | 40.16 | 0.112 | 0.223 | 16 | 40.16 | 0.112 | 0.223 | |
| 79 | 16 | 40.16 | 0.112 | 0.223 | 16 | 40.16 | 0.112 | 0.223 | |
| 80 | 5 | 12.55 | 0.035 | 0.070 | 5 | 12.55 | 0.035 | 0.070 | |
| 81 | 0 | 0 | 0.000 | 0.000 | 0 | 0 | 0.000 | 0.000 | |
| 83 | 0 | 0 | 0.000 | 0.000 | 0 | 0 | 0.000 | 0.000 | |
| 84 | 0 | 0 | 0.000 | 0.000 | 0 | 0 | 0.000 | 0.000 | |
| 85 | 0 | 0 | 0.000 | 0.000 | 0 | 0 | 0.000 | 0.000 | |
| 86 | 0 | 0 | 0.000 | 0.000 | 0 | 0 | 0.000 | 0.000 | |
| 87 | 0 | 0 | 0.000 | 0.000 | 0 | 0 | 0.000 | 0.000 | |
| 88 | 0 | 0 | 0.000 | 0.000 | 0 | 0 | 0.000 | 0.000 | |
| 89 | 0 | 0 | 0.000 | 0.000 | 0 | 0 | 0.000 | 0.000 | |
| 90 | 5 | 12.55 | 0.035 | 0.070 | 5 | 12.55 | 0.035 | 0.070 | |
| 91 | 3 | 7.53 | 0.021 | 0.042 | 3 | 7.53 | 0.021 | 0.042 | |
| 92 | 5 | 12.55 | 0.035 | 0.070 | 5 | 12.55 | 0.035 | 0.070 | |
| 93 | 3 | 7.53 | 0.021 | 0.042 | 3 | 7.53 | 0.021 | 0.042 | |
| 94 | 6 | 15.06 | 0.042 | 0.084 | 6 | 15.06 | 0.042 | 0.084 | |
| 95 | 6 | 15.06 | 0.042 | 0.084 | 6 | 15.06 | 0.042 | 0.084 | |
| 96 | 7 | 17.57 | 0.049 | 0.098 | 7 | 17.57 | 0.049 | 0.098 | |
| 97 | 3 | 7.53 | 0.021 | 0.042 | 3 | 7.53 | 0.021 | 0.042 | |
| 98 | 8 | 20.08 | 0.056 | 0.112 | 8 | 20.08 | 0.056 | 0.112 | |
| 99 | 0 | 0 | 0.000 | 0.000 | 0 | 0 | 0.000 | 0.000 | |
| 100 | 14 | 35.14 | 0.098 | 0.195 | 14 | 35.14 | 0.098 | 0.195 | |
| 101 | 42 | 105.42 | 0.293 | 0.586 | 42 | 105.42 | 0.293 | 0.586 | |
| 102 | 30 | 75.3 | 0.209 | 0.418 | 30 | 75.3 | 0.209 | 0.418 | |
| 103 | 0 | 0 | 0.000 | 0.000 | 0 | 0 | 0.000 | 0.000 | |
| 104 | 0 | 0 | 0.000 | 0.000 | 0 | 0 | 0.000 | 0.000 | |
| 105 | 9 | 22.59 | 0.063 | 0.126 | 9 | 22.59 | 0.063 | 0.126 | |
| 106 | 10 | 25.1 | 0.070 | 0.139 | 10 | 25.1 | 0.070 | 0.139 | |
| 107 | 3 | 7.53 | 0.021 | 0.042 | 3 | 7.53 | 0.021 | 0.042 | |
| 108 | 0 | 0 | 0.000 | 0.000 | 0 | 0 | 0.000 | 0.000 | |
| 109 | 16 | 40.16 | 0.112 | 0.223 | 16 | 40.16 | 0.112 | 0.223 | |
| 110 | 2 | 5.02 | 0.014 | 0.028 | 2 | 5.02 | 0.014 | 0.028 | |
| 111 | 13 | 32.63 | 0.091 | 0.181 | 13 | 32.63 | 0.091 | 0.181 | |
| 112 | 15 | 37.65 | 0.105 | 0.209 | 15 | 37.65 | 0.105 | 0.209 | |
| 113 | 4 | 10.04 | 0.028 | 0.056 | 4 | 10.04 | 0.028 | 0.056 | |
| Growth Node 114 | | | | | 125 | 337.5 | 1.563 | 3.125 | 251 units s\| |
| Growth Node 115 | | | | | 126 | 340.2 | 1.575 | 3.150 | 251 units s\| |
| Growth Node 116 | | | | | 148 | 399.6 | 1.850 | 3.700 | Picture |
| Growth Node 117 | | | | | 441 | 1190.7 | 5.513 | 11.025 | |
| Growth Node 118 | | | | | 297 | 801.9 | 3.713 | 7.425 | |
| Growth Node 119 | | | | | 40 | 108 | 0.500 | 1.000 |  |
| Growth Node 120 | | | | | 0 | 0 | 0.000 | 0.000 | |
| Total | | 2728.37 | 7.6 | 15.2 l/s | | 5906.27 | 22.291 | 44.583 l/s | |
| | | | 654.8 | 1309.6 m3/d | | | 1926.0 | 3851.938 m3/d | |

2021 pop target 2749

# Appendix D Stakeholder Engagement

Emails notices sent to the Stakeholder List below on Mon 2023-10-02. With directions to subscribe to the project page www.severn.ca

| | | | |
|---|---|---|---|
| Service providers, technical agencies | Peter Dorton, Project Manager | Ministry of Transportation | peter.dorton@ontario.ca |
| Service providers, technical agencies | | Ministry of Natural Resources and Forestry | dan.l.thompson@ontario.ca |
| Service providers, technical agencies | | Ministry of Environment, Barrie Office | chris.hyde@ontario.ca |
| Service providers, technical agencies | | TransCanada Pipelines Limited c/o MHBC Planning | TCEnergy@mhbcplan.com |
| Service providers, technical agencies | Alanna Boulton | Parks Canada, Trent Severn Waterway | Alanna.Boulton@pc.gc.ca |
| Service providers, technical agencies | | Ministry of Municipal Affairs and Housing | laurie.miller@ontario.ca |
| Service providers, technical agencies | | Canadian Pacific Railway | Real_EstateCanada@cpr.ca |
| Service providers, technical agencies | | Infrastructure Ontario | noticereview@infrastructureontario.ca |
| Service providers, technical agencies | | Hydro One | Landuseplanning@hydroone.com |
| Service providers, technical agencies | | Ontario Power Generation | executivevp.lawanddevelopment@opg.com |
| Service providers, technical agencies | | Union Gas Ltd. | kim.vester@enbridge.com |
| Service providers, technical agencies | | Enbridge Gas Distribution Inc. | MunicipalPlanning@enbridge.com |
| Service providers, technical agencies | | Simcoe Muskoka District Health Unit | charles.gardner@smdhu.org |
| Community leaders and/or partners | Wendy Timpano, General Manager | Orillia Community Development Corporation | wtimpano@orilliacdc.com |
| Community leaders and/or partners | Lisa Buck, Manager and Executive Director | SegBay Chamber of Commerce | info@segbay.ca |
| Community leaders and/or partners | Ryan Lay, Manager of Economic Development, Business Development, Culture, and Tourism Department | City of Orillia | rlay@orillia.ca |

| | | | |
|---|---|---|---|
| Community leaders and/or partners | Murray Lovering | Community member | murraylovering@gmail.com |
| Community leaders and/or partners | Grace Smith, Chair | Culture and Recreation Advisory Committee | smith123@amtelecom.ne |
| Community leaders and/or partners | Mark Missen, Chair | Coldwater BIA | markmissen@gmail.com |
| Community leaders and/or partners | Mary Russell | Matchedash Community Heritage Centre | 777mtr@gmail.com |
| Community leaders and/or partners | Allan Lafontaine, Executive Director | Orillia District Chamber of Commerce | ed@orillia.com |
| Community leaders and/or partners | Roni Carli | SegBay Chamber of Commerce, Director; owner of Port Severn General Store | roni@cottage-closet.store |
| Community leaders and/or partners | Julie Cayley, Executive Director | Severn Sound Environmental Association | jcayley@severnsound.ca |
| Community leaders and/or partners | Jon Main, Climate Change Coordinator | Severn Sound Environmental Association | sustainable@severnsound.ca |
| Community leaders and/or partners | Adah Silk, Chair | Severn Township Public Library | adahsilk@hotmail.com, library@severn.ca |
| Community leaders and/or partners | Jiun Liao, Publisher | The Villager | thevillagerpress@rogers.com |
| Community leaders and/or partners | Marylynne White | Washago and Area Seniors / Green River Book Club, choir | williamwhite@rogers.com |
| Community leaders and/or partners | Paula McFadden | Washago and District Lions Club | picsnels@icloud.com |
| Community leaders and/or partners | Cheryl Lawder | Washago Art Club | rivertreat@gmail.com |
| Indigenous representatives | Ted Williams, Chief | Chippewas of Rama First Nation | tedw@ramafirstnation.ca |
| Indigenous representatives | Mary-Anne Willsey, General Manager of Business Operations, Economic Development | Chippewas of Rama First Nation | maryanne@ramafirstnation.ca> |
| Indigenous representatives | Metis Nation of Ontario | Metis Nation of Ontario | consultations@metisnation.org |
| Indigenous representatives | Georgian Bay Native Friendship Centre | Georgian Bay Native Friendship Centre | gbnfc@gbnfc.com |
| Community groups, road associations, etc. | Lance Brown | Bayou Park Ratepayers Association | maxbrown82@hotmail.com |

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| Community groups, road associations, etc. | Claire Lysnes | Bayou Park Ratepayers Association | President@bayoupark.org |
| Community groups, road associations, etc. | Matt Murray, President | Coldwater and District Agriculture Society / Coldwater Fall Fair | mattmurray1@gmail.com |
| Community groups, road associations, etc. | Tom Smith | Community member | thomas1942smith@gmail.com |
| Community groups, road associations, etc. | Nadine | Couchiching Shores Ratepayers Association | csraboard@hotmail.com |
| Community groups, road associations, etc. | Cheryl Elliot-Fraser | Gloucester Pool Cottagers' Association | celliotfraser@gmail.com |
| Community groups, road associations, etc. | Mike Drumm | Lake Simcoe Regional Airport, Airport Manager | mike.drumm@simcoe.ca |
| Community groups, road associations, etc. | Barry McIlravey | Lake St. George Community Centre | severnsnoopers@sympatico.ca |
| Community groups, road associations, etc. | Jessica Standish-Leigh and Ellen Denny | Marchmont Ratepayers Association | Ellendenny8@gmail.com, jessicajoyfox@gmail.com |
| Community groups, road associations, etc. | Adam Chambers | MP | ryan.ouderkirk.500@parl.gc.ca, adam@adamchambersmp.ca |
| Community groups, road associations, etc. | Jill Dunlop | MPP | jacqueline.bayley@pc.ola.org, jill.dunlopco@pc.ola.org |
| Community groups, road associations, etc. | n/a | ODAS Park (Orillia and District Agricultural Society) | odaspark@gmail.com |
| Community groups, road associations, etc. | Norm Marion | Royal Canadian Legion Coldwater Branch 270 | 270@rogers.com, norm.marion@amtelecom.net, branch270@rogers.com |
| Community groups, road associations, etc. | Jack Nolan | Severn Falls Chapel | severnfallschapel@gmail.com |
| Community groups, road associations, etc. | n/a | Severn River Association of Property Owners | Srapoinfo@gmail.com |

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| Community groups, road associations, etc. | Sara Clipsham | Sparrow Lake Historical Society | saraclipsham@gmail.com |
| Community groups, road associations, etc. | Rev. John Giurin | St. Andrew's Presbyterian Church | st.andrews.coldwater@gmail.com |
| Community groups, road associations, etc. | Dorthea Hangaard | The Couchiching Conservancy | dorthea@couchconservancy.ca |
| Community groups, road associations, etc. | Anothony Broeder | Bayou Park Recreation | |
| Community groups, road associations, etc. | Jesse Schrag | Tea Lake Association | tealakeassociation@gmail.com |
| Community groups, road associations, etc. | | East Burrows Bay Road Association | petrasidon@gmail.com |
| School Boards | Principal Cindy McNeice | Marchmont Public School | cmcneice@scdsb.on.ca |
| School Boards | Principal James Langner | Severn Shores Public School | jlangner@scdsb.on.ca |
| School Boards | | Simcoe County District School Board | kbondarchuk@scdsb.on.ca |
| School Boards | | Simcoe Muskoka Catholic School Board | planningdept@smcdsb.on.ca |
| School Boards | | Conseil scolarie de district catholique Centre-sud | ablais@cscmonavenir.ca |
| School Boards | Principal Kelly Cox | Coldwater/Moonstone Elementary | kcox@scdsb.on.ca |
| Municipalities | Amy Back, District Clerk | District of Muskoka | Amy.back@muskoka.on.ca |
| Municipalities | Kristine Preston, Deputy Clerk | City of Orillia | clerks@orillia.ca, planning@orillia.ca |
| Municipalities | | County of Simcoe | Planning.notices@simcoe.ca |
| Municipalities | | County of Simcoe | Building.notices@simcoe.ca |
| Municipalities | Jennifer Connor, Clerk | Township of Ramara | jconnor@ramara.ca |
| Municipalities | Janette Teeter, Deputy Clerk | Township of Oro-Medonte | jteeter@oro-medonte.ca |
| Municipalities | Cheryl Hollows, Clerk | Muskoka Lakes | chollows@muskokalakes.ca |
| Municipalities | Cyndi Bonneville | Township of Tay | cbonneville@tay.ca |

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| Municipalities | Shawn Berriault, General Manager, Operational Services, Manager of Engineering Services | Township of Tay | sberriault@tay.ca |
| Municipalities | Melissa Halford, Director of Community Growth and Development | Town of Gravenhurst | mhalford@gravenhurst.ca |
| Municipalities | Adam Ager, Manager of Planning Services | Town of Gravenhurst | aager@gravenhurst.ca |
| Municipalities | Amy Taylor, Manager of Economic Development | Town of Gravenhurst | ataylor@gravenhurst.ca |
| Municipalities | Andrew Stacey, Director of Infrastructure Services | Town of Gravenhurst | astacey@gravenhurst.ca |
| Municipalities | Karen Way, Director of Corporate Services/Clerk' | Township of Georgian Bay | kway@gbtownship.ca |
| Municipalities | Brad Sokach, of Operations | Township of Georgian Bay | bsokach@gbtownship.ca |
| Municipalities | Jennifer Schnier, Director of Sustainability | Township of Georgian Bay | jschnier@gbtownship.ca |
| Media | | Orillia Matters | tyler@orilliamatters.com, dave@orilliamatters.com |
| Media | | Simcoe.com | FMatys@simcoe.com |

## Appendix D – Continued - Stakeholder Engagement

Additional participants were added throughout the process:

Nikash K. Persaud, npersaud@rvanderson.com, requested to be added to the stakeholders list on 2023-10-19

Benjamin Jones <bjones@livhere.ca requested to be added to the stakeholders list on 2023-11-28. LIV Communities Stakeholder Engagement meeting held 2024-02-08.

Chris Chapman - 5 Woodland Place, Coldwater, ON, L0K 1E0 - requested to be added to the stakeholders list on 2024-02-08. Comments regarding extended water services to reach the homes on Leisure Court.

Released News on 2023-11-02: Township of Severn News - Have your say on the Servicing Master Plan at the December 5 Public Meeting.

PIC 1 circulated to all stakeholders