Municipality of Northern Bruce Peninsula

Lion's Head Water and Wastewater Master Plan

Final Report

September 11, 2026 Confidential



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Final Report

Municipality of Northern Bruce Peninsula

Confidential

Project No.: 221-09586-00
Client Ref: BRUPNY1000-2161
Date: September 11, 2026

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Confidential

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Attention: Lisa Babel, P. Eng

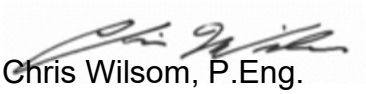
Dear Madam:

Subject: Master Plan Report Submission - Final

WSP is pleased to submit our final version of the Lion's Head Water & Wastewater Master Plan. This final master plan report includes updates based on comments received from the Municipality and OCWA, through their review of the final draft. The report has been updated to an AODA format.

Please do not hesitate to contact the undersigned should you have any comments or questions.

Yours sincerely,



Chris Wilsom, P.Eng.
Project Manager, Land Development & Municipal Engineering

CW/cw
Encl.
cc: Peggy Van Mierlo-West, Troy Cameron, Leo-Paul Frigault
WSP ref.: 221-09586-00

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Signatures

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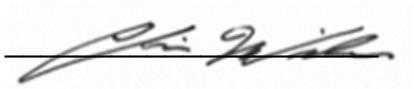

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TABLE OF CONTENTS

1 INTRODUCTION 1

1.1 Study Purpose 1

1.2 Scope of the Master Plan 1

1.3 Municipal Class Environmental Assessment Process 2

1.3.1 Environmental Assessment Act 2

1.3.2 Principles of Environmental Planning 2

1.3.3 Municipal Class Environment Assessment 3

1.3.4 Master Planning 6

1.4 Problem Statement 7

1.5 Public and Stakeholder Consultation 8

1.5.1 Notice of Study Commencement and Public Information Centre 8

1.5.2 Public Information Centre 9

1.5.3 Agency and Public Comments and Responses 9

1.5.4 Notice of Master Plan Completion 9

2 BACKGROUND 10

2.1 Study Area 10

2.2 Land Use 10

2.3 Regulatory Framework 12

2.3.1 Federal Legislation 12

2.3.2 Provincial Regulatory Requirements 13

2.3.3 Relevant Municipality Studies 19

2.4 Data Provided 20

2.4.1 Lion’s Head Drinking Water System Annual Report (2020) 20

2.4.2 Lion’s Head Drinking Water System Inspection Report (2021) 20

2.4.3 Municipal Drinking Water License (MDWL) (2020) 20

2.4.4 Lion’s Head Waterworks Issued for Construction Set (2012) 21

2.4.5 Lion's Head Waterworks Site Plan (2015) 21
2.4.6 Lion's Head Water Treatment Plant Process Flow Diagram (2017) 21
2.4.7 Energy Audit Reports (2022) 21
2.4.8 Pump Curves (2004) 21
2.4.9 Pump Startup Report (2005) 21
2.4.10 Lion's Head Drinking Water System Financial Plan (2020) 21
2.4.11 Lion's Head DWS WISKI Data (2015-2022) 21
2.4.12 Asset Management Plan (2020) 22
2.4.13 Census Profile, Census of Population, Lion's Head, Ontario (2021) 22
2.5 Municipal Drinking Water System Overview 22
2.5.1 Historical Flows 23
2.5.2 Water Treatment Plant 24
2.5.3 Water Distribution System 26
2.5.4 Lion's head WTP Source and Treated Water Data 26
2.6 Municipal Wastewater System Overview 27
2.6.1 Wastewater Collection System 27
2.6.2 Wastewater Treatment System 27
2.6.3 Wastewater Generation and Quality Data 27
3 GROWTH AND SERVICING PROJECTIONS 28
3.1 Growth Scenarios 30
3.2 Water: Level of Service Criteria 31
3.2.1 Water Treatment 31
3.2.2 Water Storage 31
3.2.3 Distribution 32
3.3 Wastewater: Level of Service Criteria 33
3.3.1 Gravity Sewers 34
3.3.2 Pumping Stations and Forcemains 35
3.3.3 Wastewater Treatment 36

4 GAP ANALYSIS 38

4.1 Gap Analysis 38

4.2 Modelling Methodology 38

5 ALTERNATIVE SOLUTIONS 41

5.1 Proposed Water Servicing Alternatives 41

5.1.1 Alternative DWS1 – Maintain Existing Level of Service .41

5.1.2 Alternative DWS2 – Expand Water to Service New Growth in Lion's Head and Provide Sufficient Volume for Fire Flow 41

5.1.3 Alternative DWS3 – Expand Water to Send to Ferndale (Including Expanding Water to Service New Growth in Lion's Head and Provide Sufficient Volume for Fire Flow) 42

5.1.4 Alternative DWS4 – Expand Water to Send to Isthmus Bay and Barrow Bay (Including Expanding Water to Service New Growth in Lion's Head and Provide Sufficient Volume for Fire Flow) 45

5.2 Proposed Wastewater Servicing Alternatives 50

5.2.1 Alternative WWS1 – Maintain Existing Level of Service 50

5.2.2 Alternative WWS2 – Construct New Wastewater Treatment Facility and Provide Wastewater Servicing to Downtown Lion's Head 51

6 EVALUATION OF ALTERNATIVE SOLUTIONS 52

6.1 Evaluation Approach and Criteria 52

6.1.1 Infrastructure Evaluation Approach 52

6.1.2 Infrastructure Evaluation Criteria 52

6.1.3 Evaluation Matrix 54

6.1.4 Water System Alternative Solutions Evaluation 55

6.1.5 Wastewater system Alternative Solutions Evaluation 62

7 RECOMMENDED SOLUTIONS 65

7.1 Water Infrastructure Servicing Options 65

7.1.1 Water option 1: Expanded Water Distribution System and Upgraded Existing Water Treatment Plant with New Water Storage On-Site 65
7.1.2 Water Option 2: Expanded Water Distribution System, Upgraded Existing Water Treatment Plant, and New Water Storage on Separate Property....66
7.2 Wastewater Infrastructure Options 68
7.2.1 Wastewater option 1: New Wastewater Collection System and Wastewater Treatment Plant New Lion's Head 69
7.2.2 Wastewater Option 2: Phased Wastewater Treatment Plant Aligned with Demand Growth Outside of Lion's Head 70

8 MASTER PLAN IMPLEMENTATION AND PHASING....72

8.1 Implementation: Projects and Phasing....72
8.1.1 Water Projects 73
8.1.2 Wastewater Projects....73
8.2 Cost Estimation Summary 73

9 CLOSURE....75

9.1 Additional Studies....75
9.2 Master Plan Approval and Completion....75
9.3 Recommendations....76

Tables

Table 2-1: Lion's Head Historical Water Flow Data 23
Table 2-2: Lion's Head WTP Process Component Details 25
Table 3-1: Population Growth 28
Table 3-2: Employment Growth 29
Table 3-3: Required Area for New Growth 29
Table 3-4: Existing Water Storage Summary 32
Table 3-5: Peaking Factors 33
Table 3-6: Design Pressures 33
Table 3-7: Existing Water Servicing Requirements 33
Table 3-8: Gravity Sewers Hydraulic Condition 34
Table 3-9: Gravity Sewers Level of Service 35
Table 3-10: Sanitary Pump Station Hydraulic Condition 35
Table 3-11: Sanitary Pump Station Recommended Level of Service 36
Table 3-12: WWTP Design Basis Requirements (MECP Design Guidelines for Sewage Works, 2008) 37
Table 5-1: Alternative DWS2 Water Servicing and Growth 42
Table 5-2: Alternative DWS3 Water Servicing and Growth 43
Table 5-3: Alternative DWS4 Water Servicing and Growth 46
Table 5-4: Alternative WWS2 Wastewater Servicing Growth 51
Table 6-1: Evaluation Criteria Description 53
Table 6-2: Comparative Evaluation of Water Servicing Alternatives 55
Table 6-3: Comparative Evaluation of Wastewater Servicing Alternatives 62
Table 8-1: Water and Wastewater Phasing Projects 72
Table 8-2: Water System Projects Capital Costs 74
Table 8-3: Wastewater System Projects Capital Costs . 74

Figures

Figure 1-1: Municipal Class EA Process 5
Figure 2-1: Lion's Head Study Area 10
Figure 2-2: Existing Land Use and Contours for Lion's Head 11
Figure 2-3: Existing Land Use and Contours for Surrounding Area 12
Figure 2-4: Lion's Head Existing Drinking Water System 23
Figure 2-5: Water Treatment Process 26
Figure 3-1: Potential New Growth in Lion's Head 30
Figure 4-1: Combined Modelling Approach 38
Figure 5-1: Alternative DWS3 – Extend Water Service to Ferndale 44
Figure 5-2: Alternative DWS3 - Ferndale Building and Contour Data 45
Figure 5-3: Alternative DWS4 - Extend Water to Isthmus Bay 47
Figure 5-4: Alternative DWS4 - Isthmus Bay Building and Contour Data 48
Figure 5-5: Alternative DWS4 - Extend Water to Barrow Bay 49
Figure 5-6: Alternative DWS4 - Barrow Bay Building and Contour Data 50
Figure 7-1: Upgraded Existing WTP with On-Site Water Storage 66
Figure 7-2: Upgraded Existing WTP with Off-Site Water Storage 68
Figure 7-3: New Centralized WWTP and New SPS 70
Figure 7-4: New WWTP Located Outside of Community Boundary and New SPS 71

Appendices

A PUBLIC CONSULTATION

B CALCULATIONS

C EVALUATION MATRIX

D CLIMATE CHANGE MEMO

E CAPITAL COSTS

1 INTRODUCTION

1.1 Study Purpose

The Municipality of Northern Bruce Peninsula has partnered with the Ontario Clean Water Agency (OCWA) and retained WSP Canada Inc. (WSP) to undertake the development of a Water and Wastewater Master Plan for Lion's Head.

The objective of the Master Plan is to develop a preferred strategy to provide accessible and reliable drinking water and wastewater services in Lion's Head to meet current and future needs, to 2046 and beyond. The Master Plan takes into consideration climate change and social and economic impacts, as well as current limitations to Lion's Head's growth, given the existing infrastructure.

The Master Plan is being conducted in accordance with the Class Environmental Assessment (Class EA) process. The requirements for undertaking a Class EA are described in the document Municipal Class Environmental Assessment (MCEA) prepared by the Municipal Engineers Association (MEA) (October 2000, as amended in 2007, 2011, 2015, 2023 & 2024). **Approach # 1** was adopted for the completion of this Master Plan (refer to Section 1.3.4 for more details).

It should be noted that the scope of the project did not include an assessment of repair, rehabilitation or replacement needs related to infrastructure assets reaching the end of their expected service lives.

1.2 Scope of the Master Plan

Master Plans are long range plans, which integrate infrastructure requirements for existing and future land use with environmental assessment planning principles. These plans examine an infrastructure system(s) or group of related projects to outline a framework for planning for subsequent projects and/or developments (MEA).

The following are distinguishing features of Master Plans (MEA):

1. The scope of Master Plans is broad and usually includes an analysis of the system in order to outline a framework for future works and developments. Master Plans are not typically undertaken to address a site-specific problem.
2. Master Plans typically recommend a set of works which are distributed geographically throughout the study area and which are to be implemented over an extended period of time. Master Plans provide the context for the implementation of

the specific projects, which make up the plan and satisfy, as a minimum, Phases 1 and 2 of the Class EA process. Notwithstanding that these works may be implemented as separate projects, collectively these works are part of a larger management system. Master Plan studies in essence conclude with a set of preferred alternatives and, therefore, by their nature, Master Plans will limit the scope of alternatives, which can be considered at the implementation stage.

This Water and Wastewater Servicing Master Plan documents existing conditions, forecasts infrastructure needs to service growth and evaluates alternative servicing strategies to define the preferred solution.

1.3 Municipal Class Environmental Assessment Process

1.3.1 Environmental Assessment Act

The Ontario Environmental Assessment Act (EAA) and the associated Codes of Practice require proponents to examine and document the environmental effects that might result from major projects or activities.

The Act defines the environment broadly as:

1. Air, land or water
2. Plant and animal life, including human
3. Social, economic and cultural conditions that influence the life of human or a community
4. Any building, structure, machine or other device or thing made by human
5. Any solid, liquid, gas, odour, heat, sound, vibration or radiation resulting directly or indirectly from human activities
6. Any part or combination of the foregoing and the interrelationships between any two or more of them.

The purpose of the Act is the betterment of the people of the whole or any part of Ontario by providing for the protection, conservation and wise management of the environment in the Province (RSO1990, c. 18, s.2).

1.3.2 Principles of Environmental Planning

The EAA sets a framework for a systematic, rational, and replicable environmental planning process that is based on five (5) key principles, as follows:

— Consultation with affected parties - Consultation with the public and government review agencies is an integral part of the planning process and allows the proponent to identify and address concerns cooperatively before final decisions are made. Consultation should begin as early as possible in the planning process.
— Consideration of a reasonable range of alternatives - Alternatives to include functionally different solutions to the proposed undertaking as well as alternative methods of implementing the preferred solution. The “do nothing” alternative must also be considered.
— Identification and consideration of the effects of each alternative on all aspects of the environment - This includes the natural, social, cultural, technical, and economic environments.
— Systematic evaluation of alternatives in terms of their advantages and disadvantages, to determine their net environmental effects - The evaluation shall increase in the level of detail as the study moves from the evaluation of alternatives to the proposed undertaking to the evaluation of alternative methods.
— Provision of clean and complete documentation of the planning process followed – This will allow traceability of decision-making with respect to the project. The planning process must be documented in such a way that it may be repeated with similar results.

1.3.3 Municipal Class Environment Assessment

The Class EA planning process requires the integration of sound engineering judgement, prudent long-term planning, and protection of all aspects of the environment (natural, social, economic, and cultural). This includes consultation with the public and affected agencies, to obtain comments and input, to ensure regulatory compliance and ultimately achieve acceptance for the preferred alternative. The overall result of the Class EA process is the identification of a preferred solution which results in minimal impact on the environment.

Class Environmental Assessments were approved by the Minister of the Environment in 1987 for municipal projects having predictable and preventable impacts. The Class EA streamlines the planning and approvals process for municipal infrastructure projects (including water and wastewater projects) which display the following important characteristics in common:

— Recurring
— Similar in nature
— Usually limited in scale

— Predictable range of environmental effects
— Responsive to mitigation measures

The Class EA document applies to a group of projects which are approved under the EAA, provided they are planned for according to the requirements of the Class EA. The specific requirements of the Class EA document depend on the type of project, its complexity, and the significance of potential environmental impacts.

The MCEA document outlines the procedures to be followed to satisfy Class EA requirements for water, wastewater, and road projects. The process includes five (5) phases:

— Phase 1: Problem Definition
— Phase 2: Identification and Evaluation of Alternative Solutions to Determine a Preferred Solution
— Phase 3: Examination of Alternative Methods of Implementation of the Preferred Solution
— Phase 4: Documentation of the Planning, Design and Consultation Process
— Phase 5: Implementation and Monitoring

Public and agency consultation are integral to the Class EA planning process. Projects subject to the Class EA process are classified into four possible “Schedules” depending on the degree of expected impacts. It is important to note that the Schedule assigned to a particular project is proponent driven. For example, if a project has been designated as ‘Exempt’, the proponent can decide to comply with the requirements of a Schedule B or C of the Class EA process based on the magnitude of anticipated impacts or the special public and agency consultation requirements specific to that particular project.

Agreements made or commitments given by the proponent to affected agencies or the public during the screening process must be followed through and implemented, otherwise the Class EA approval will not be granted. If an affected agency or the public has a concern that cannot be resolved by discussion and negotiation with the proponent, then they can request a proponent to comply with Part II of the EAA. Through issuance of a Part II Order, Schedule “B” and Schedule “C” projects may be elevated to an individual Class EA, requiring the proponent to comply with Part II of the EA Act. Schedule “B” projects could also be elevated to a Schedule “C”.

The Class EA process flowchart is provided in Figure 1-1.

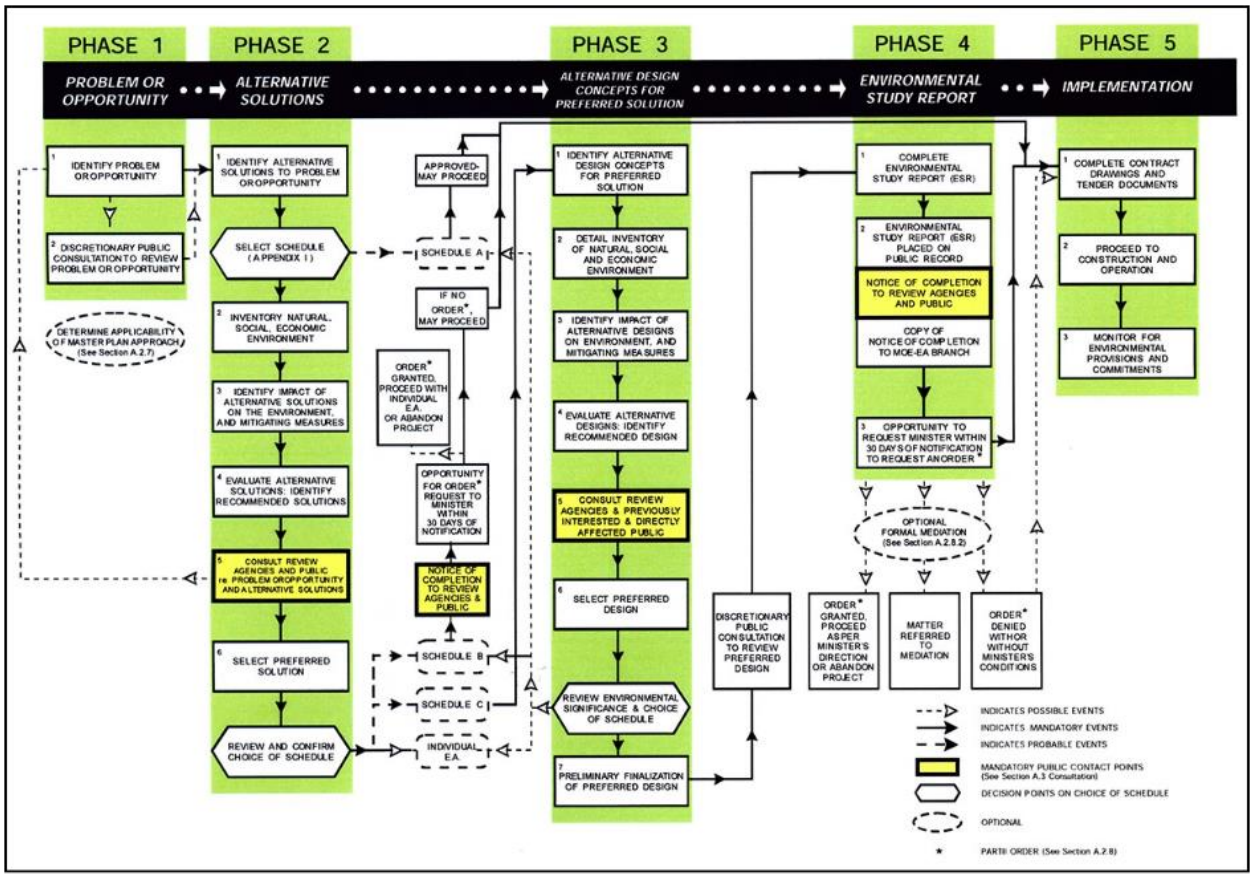

Figure 1-1: Municipal Class EA Process

Exempt Projects

Formally known as Schedule A or A+ Projects, exempt projects are minor, operational and maintenance activities and are pre-approved without the need for further assessment. Projects with this designation are typically limited in scale and have minimal adverse environmental impacts. Examples of Exempt projects include expansion of waterworks to connect to an existing system. This type of project is pre-approved, and the proponent may proceed without following the procedures set out in any other part of the Class EA process.

Schedule B Projects

Schedule B projects generally include improvements and minor expansions to existing facilities where there is potential for some adverse environmental impacts. These projects require screening of alternatives for their environmental impacts and completion of Phases 1 and 2 of the Class EA planning process. If outstanding issues remain after the public review period, any party may request that the Minister of the Environment consider a Part II Order (also known as elevating the project to a Schedule C or an Individual EA).

Provided that no significant impacts are identified and no requests for a Part II order to a Schedule C or Individual Environmental Assessment are received, Schedule B projects are approved and may proceed directly to implementation. Examples include construction of new water storage facilities and water/wastewater conveyance facilities (pumping stations), among others.

Schedule C Projects

Schedule C projects generally include the construction of new facilities and major expansions to existing facilities. These projects are typically more complex and have the potential for significant environmental effects. As a result, they proceed under full planning and documentation procedures and satisfy all five phases of the Class EA planning process. Phase 3 involves the assessment of alternative methods of carrying out the project, as well as public consultation on the preferred conceptual design. Phase 4 normally includes the preparation of an Environmental Study Report (ESR) which is filed for public review. Provided no significant impacts are identified and no requests for Part II Order or elevating to an Individual Environmental Assessment are received, Schedule C projects are then approved and may proceed to Phase 5: implementation. Some examples of a Schedule C projects are construction of a new water system including water supply and distribution system and expansion of a wastewater treatment facility.

1.3.4 Master Planning

While the planning and design process described herein is a process by which municipalities may plan municipal works on a project-by-project basis, the MCEA process allows for cases when it is beneficial to begin the planning process by considering a group of related projects, or an overall system (e.g. water, wastewater and/or roads network) or a number of integrated systems (e.g. infrastructure master plan) prior to dealing with project specific issues. By planning in this way, the need and justification for individual projects and the associated broader context are better defined.

Master Plans are long range plans which examine infrastructure systems or groups of related projects to outline a framework for planning of subsequent projects and/or developments.

The following are distinguishing features of Master Plans:

1 Their scope is broad and usually includes a system-level analysis to outline a framework for future works. Master Plans are typically not focused on a site-specific problem.

2 Master Plans typically recommend a set of works which are distributed geographically throughout the study area and which are to be implemented over an extended period of time.

3 Master Plans provide the context for the implementation of specific projects which make up the plan and satisfy, as a minimum, Phases 1 and 2 of the Class EA process. Notwithstanding that these works may be implemented as separate projects, collectively these works are part of a larger management system. Master Plan studies in essence conclude with a set of preferred alternatives and, therefore, by their nature, Master Plans limit the scope of alternatives which can be considered at the implementation stage.

Appendix 4 of the MCEA document outlines several approaches to conducting Master Plans.

Approach # 1 was adopted for the completion of this Master Plan, which involves the analysis on a regional or systems scale, which enables the Municipality to identify needs and establish broader infrastructure alternatives and solutions. This process involves the preparation of a Master Plan document at the end of Phases 1 and 2 of the MCEA process and is completed at a level of detail which would require more investigation at the project-specific level to fulfill the requirements for the specific Schedule B and C projects identified within the Master Plan. The Master Plan document is made available for public comment prior to being approved by the Municipality.

The Master Plan will become the basis for future investigations for specific Schedule B and C projects identified within it. Schedule B projects would require the filing of a Project File for review while Schedule C projects would have to fulfill Phases 3 and 4 prior to filing an ESR for public review.

1.4 Problem Statement

To service the existing and future needs of the community of Lion's Head's Water and Wastewater Systems, the following Problem Statement was adopted to guide the master planning study analysis, in accordance with the MCEA process:

"To develop an infrastructure plan for the community of Lion's Head which meets servicing needs for today and future development to 2046 and beyond, considering climate change and social and economic impacts, as well as current limitations to Lion's Head's growth due to the extents of the existing municipal drinking water service and lack of municipal water and wastewater service."

Future service requirements were identified for the study, and the Problem Statement objectives were used to guide the analysis and evaluation of infrastructure and develop alternative solutions for infrastructure improvement projects for the community.

1.5 Public and Stakeholder Consultation

The Lion's Head Water and Wastewater Master Plan falls under the requirement of a Schedule B project requiring Phase 1 and Phase 2. One requirement of Phase 2 is the need to consult with review agencies, and the public once alternative solutions have been identified. Typically, consultation involves presenting the problem or opportunity that will be addressed, the environmental considerations and potential impacts of each alternative, and the approach used for evaluating the alternatives. The comments and the input from the public and other stakeholders are taken into consideration in the identification of the preferred alternative solution.

Consultation early and throughout the process is a key feature of environmental assessment planning. The purpose of the consultation process is to notify stakeholders of the project details and provide an opportunity for interested parties to review and submit comments related to the study.

The following public and stakeholder consultation activities were completed throughout the Master Planning process.

- Indigenous Consultations – Email notifications
- Stakeholder Engagement – Email notifications
- Public Information Centre (August 27, 2025) – Municipal Website notifications
- Municipal Website (https://letstalknbp.ca) – Content uploads including all Notices, Frequently Asked Questions, Presentation to Council, etc.

Refer to Appendix A for copies of all Notices, stakeholder contact list and Public Information Centre material. This information is provided in accordance with the standards prescribed by the Class EA document, which outlines the guidelines for establishing contact with appropriate review agencies in relation to the nature of the project.

1.5.1 Notice of Study Commencement and Public Information Centre

The Notice of Study Commencement was developed to target the ministries, organizations, agencies and other stakeholders that may be affected and/or interested in the Master Plan. The Notice of Study Commencement was published on the

Municipal website on January 29, 2025. The notice briefly outlined the purpose and justification for the Study and also indicated that a Public Information Centre would be held later in 2025.

The Notice of Study Commencement can be found in **Appendix A.**

A Notice of Public Information Centre (PIC) was developed and published on the Municipal website on August 6, 2025 with the objective of informing the public and other stakeholders of the Study. The notice briefly outlined the purpose and justification for the Study. It also indicated that a PIC would be held on August 27, 2025 to present the alternative water and wastewater servicing solutions, evaluation criteria and methodology used, evaluation of the alternatives and the preferred solution.

1.5.2 Public Information Centre

The Lion's Head Water and Wastewater Master Plan PIC was held on August 27, 2025 at the Rotary Hall in Lion's Head, to present an overview of the Study, the alternative water and wastewater servicing solutions, evaluation criteria and methodology used, evaluation of the alternatives and the preferred solution. The purpose of this Public Information Centre was to communicate the process used to carry out the Study and provide an opportunity to receive comments on both the approach followed and on the preferred solution. A copy of the material presented at the PIC is included in **Appendix A,** including the attendance sign-in sheets.

1.5.3 Agency and Public Comments and Responses

Table 1-1, located in **Appendix A**, is a summary of comments received through consultation with regulatory agencies and members of the public during the Master Plan process. A copy of all notices and comments received by agencies during the study are provided in **Appendix A**. Comment sheets received during the PIC are attached as well, with personal information redacted. Email comments received from the Public, are generally summarized in Table 1-1. Copies of these emails and the responses provided are not included in **Appendix A** due to personal information and content.

1.5.4 Notice of Master Plan Completion

A Notice of Master Plan Completion will be published on the Municipal website and sent to key stakeholders upon filing of this Master Plan Report. This Notice is relevant for two reasons: it provides the public and relevant agencies with a final 30-day period to review the final conclusions of the Study, and it informs the public of the outcome of the Study and the nature of the resulting projects.

2 BACKGROUND

2.1 Study Area

The study area for the Master Plan is within the geographical boundaries of Lion's Head as shown in Figure 2-1. The Lion's Head Study Area is bounded by Lion's Head Harbour and Isthmus Bay to the northeast. The study area includes areas with municipal water servicing only, with private septic services, as well as potential growth areas.

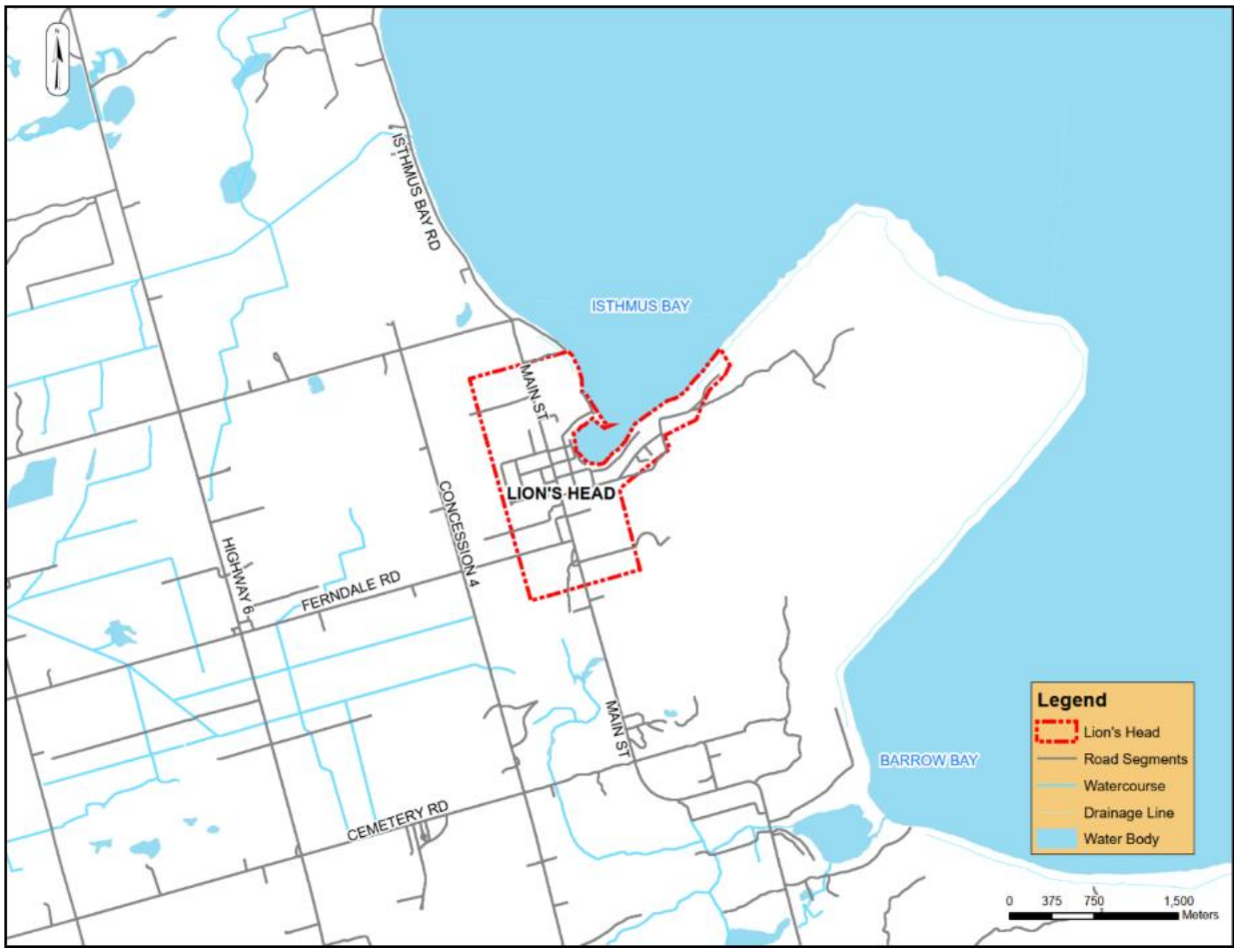

Figure 2-1: Lion's Head Study Area

2.2 Land Use

The existing land use and contour data for Lion's Head can be found in Figure 2-2. Lion's Head is primarily composed of residential, commercial, and institutional area, with

a large area also dedicated for new growth. It is surrounded by development control (DC) and rural land. The land use and contour data for the surrounding area can be found in Figure 2-3.

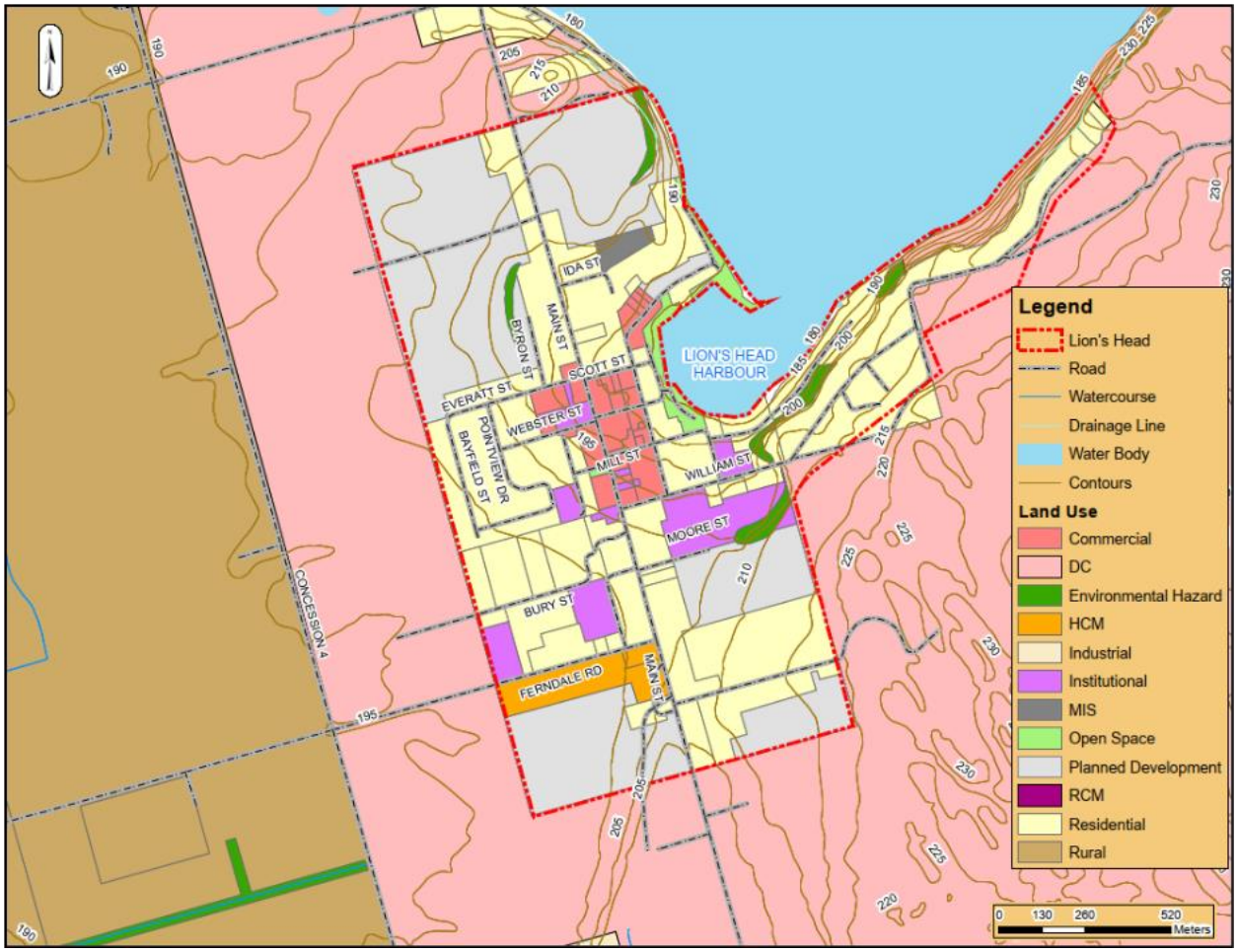

Figure 2-2: Existing Land Use and Contours for Lion's Head

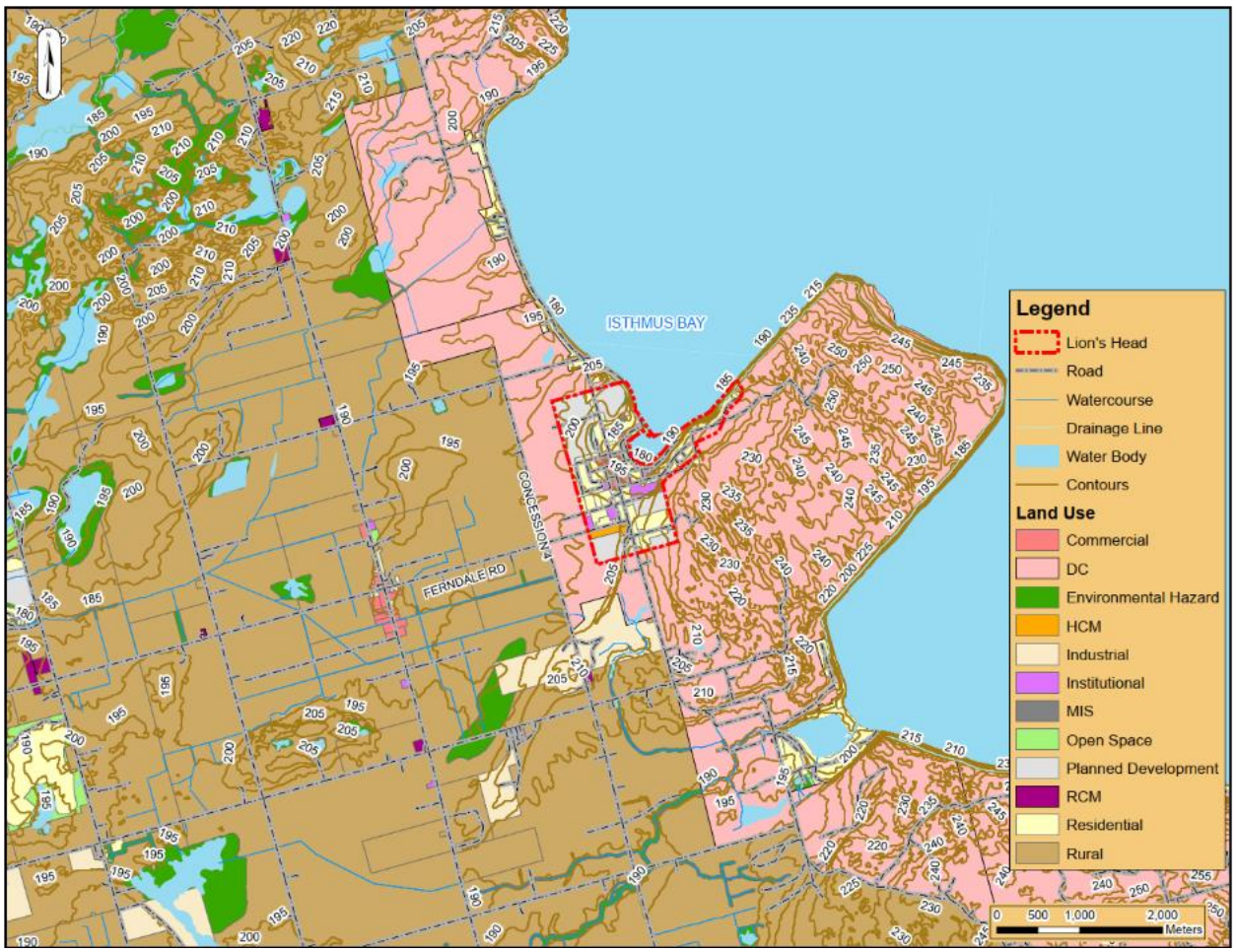

Figure 2-3: Existing Land Use and Contours for Surrounding Area

2.3 Regulatory Framework

The development of the Lion's Head Water and Wastewater Masterplan involves a clear understanding of the regulatory framework that governs the planning, design, operation, and long-term management of its municipal water and wastewater system. The following section outlines key legislation, policies, and guidelines that inform the Master Plan.

2.3.1 Federal Legislation

Canada Water Act (1985)

The Canada Water Act, passed in 1970 and revised in 1985, provides management of water resources in Canada. The purpose of the Act is to provide a framework for cooperation with the provinces and territories regarding research, planning, and implementation of programs linked to water use, conservation, and development. The

federal government has outlined regulations under the Canada Water Act including policies for fisheries, navigation, and the conduct of external affairs.

Fisheries Act (1985)

The Fisheries Act contains habitat and pollution protection provisions which are necessary for all levels of government and the public. Subsection 35(1) of this Act states “no person shall carry out any work or undertaking that results in the harmful alteration, disruption or destruction (HADD) of fish habitat” unless authorized by the Minister of Fisheries and Oceans Canada. A subsection 35(2) Fisheries Act authorization may be issued when adverse effects cannot be avoided.

Canadian Environmental Protection Act (1999)

The Canadian Environmental Protection Act is intended to provide for the protection and conservation of the natural environment, by controlling discharges to air, land, and water. Regulations made under the Act propose limits on what can be discharged to the environment and allow for fines and other penalties when unauthorized discharges occur. This Act affects how a community can dispose of materials and approach its construction activities to ensure that there are no harmful effects on the environment.

Wastewater Systems Effluent Regulations (2012)

The Wastewater Systems Effluent Regulations address the largest point source of pollution in Canadian waters. The purpose of the regulations is to reduce the threats to fish, fish habitat and human health by decreasing the amount of harmful substances deposited into waters from wastewater effluent. The regulations set national effluent quality standards that are achievable through secondary wastewater treatment. Wastewater systems that do not meet the effluent quality standards must upgrade to secondary treatment. The effluent quality standards are as follows:

- Average carbonaceous biochemical oxygen demand ($cBOD_5$) concentration must not exceed 25 mg/L;
- Average total suspended solids (TSS) concentration must not exceed 25 mg/L;
- Average total residual chlorine (TRC) concentration must not exceed 0.02 mg/L; and
- Average unionized ammonia concentration must not exceed 1.25 mg N/L.

2.3.2 Provincial Regulatory Requirements

The Planning Act (1985)

The Planning Act establishes the mechanisms and rules for land use planning in Ontario, outlining how land uses may be controlled, and who may control them. The Act

sets the basis for the preparation of Official Plans and planning policies for future development, and it provides municipalities with local autonomy to make decisions and streamline the planning process. The Act empowers local citizens to provide their input to their municipal council and, where permitted, to appeal decisions to the Ontario Municipal Board. Through the Act, the Province issues Provincial Policy Statements and plans.

Ontario Water Resources Act (1990)

The Ontario Water Resources Act was passed for the purpose of conservation, protection, and management of Ontario waters. The act identifies requirements for water works, including wells, and sewage works in relation to planning, design, siting, public notification and consultation, establishment, insurance, facilities, staffing, operation, maintenance, monitoring, and record-keeping. The Act is a general water management statute which applies to both groundwater and surface water. This Act specifies the requirements that the community must satisfy in order for the provincial government to grant approval for establishing, altering, extending, or replacing water and wastewater system components.

Ontario Planning and Development Act (1994)

The Ontario Planning and Development Act establishes the general approach by which the Minister of Municipal Affairs and Housing may cause for Development Plans to be undertaken for development planning areas. The Development Plans may include policies for economic, social and physical development with respect to the following:

- The distribution and density of population within the development area;
- The location of employment areas;
- The identification of land use areas;
- The management of land and water resources;
- The control of all forms of pollution of the natural environment;
- The location and development of servicing communication and transportation systems; and
- The development and maintenance of educational, cultural, recreational, health and other social facilities.

There can also be policies relating to the financing and programming of public development projects as well as capital works and policies to coordinate planning and development among municipalities or planning boards within an area or within separate areas, among other considerations.

In many respects, a Development Plan under the Ontario Planning and Development Act is similar to an Official Plan under the Planning Act. The primary differences are:

1. The Province is the authority for both undertaking and approving the Development Plan; and
2. The legislative requirements for the preparation and approval of a Development Plan are unique to the Ontario Planning and Development Act.

MOE Guideline F-5 (1994)

The Ontario Ministry of the Environment (MOE) (now Ministry of Environment, Conservation and Parks (MECP)) requires that municipal and private sewage treatment works, outfall structures and emergency overflow facilities be located designed, constructed, and operated so as to minimize pollution of receiving waters and interference with water uses.

The primary purpose of Guideline F-5 is to describe the levels of treatment required for municipal and private sewage treatment works discharging to surface waters. This Guideline is supported by the following Procedures:

1. Procedure F-5-1: Determination of Treatment Requirements for Municipal and Private Sewage Treatment Works Discharging to Surface Waters
2. Procedure F-5-2: Relaxation of Normal Level of Treatment for Municipal and Private Sewage Treatment Works Discharging to Surface Waters
3. Procedure F-5-3: Derivation of Sewage Treatment Works Effluent Requirements for the Incorporation of Effluent Requirements into Certificates of Approval for New or Expanded Sewage Treatment Works
4. Procedure F-5-4: Effluent Disinfection Requirements for Sewage Works Discharging to Surface Waters
5. Procedure F-5-5: Determination of Treatment Requirements for Municipal and Private Combined and Partially Separated Sewer Systems

Guideline F-5 states that the level of treatment for new or expanded sewage treatment works must be in accordance with Procedures F-5-1 and F-5-2. Effluent requirements, including both waste loadings and concentrations, must be derived in accordance with Procedure F-5-3 or those established in the Wastewater System Effluent Regulations (See Section 2.1.4), whichever are stricter.

MOE Procedure D-5 (1996)

The primary purpose of D-5 is to guide municipal planning for sewage and water servicing. It describes an approach for municipal planning for sewage and water services to ensure an acceptable quantity and quality of water supply and the proper

collection, treatment and disposal of sewage wastewater for development. It is consistent with the Provincial goal to manage growth and change to foster communities that are socially, economically, environmentally, and culturally healthy, and that make efficient use of land, new and existing infrastructure and public service facilities.

1. Procedure D-5-1: Calculating and reporting uncommitted reserve capacity at sewage and water treatment plants
2. Procedure D-5-2: Application of Municipal responsibility for communal sewage and water services
3. Procedure D-5-3: Servicing options statement
4. Procedure D-5-4: Technical guidelines for individual on-site sewage systems: Water Quality impact risk
5. Procedure D-5-5: Technical Guidelines for Private Wells; Water supply assessment

Procedure D-5-1 is used to ensure that sanitary flow generation from approved development applications will not exceed the design capacity of the sewage treatment plant(s). To ensure that capacity is not exceeded it is necessary to determine what uncommitted reserve capacity is available based on historic flows and existing development.

Safe Drinking Water Act (2002)

The Safe Drinking Water Act is in place to provide protection for human health and prevent drinking water health hazards. The Act controls and regulates drinking water systems and drinking water testing. Regulations made under the Act, such as Regulation 268/03 – Ontario Drinking Water Quality Standards, stipulate detailed requirements regarding drinking water systems, testing services, drinking water quality standards, certification of drinking water system operators and drinking water quality analysts and compliance and enforcement. This Act specifies the quality of the drinking water that any community is responsible for producing and delivering as well as how the area's drinking water treatment systems must be operated and managed.

Places to Grow Act (2005)

The Places to Grow Act provides a framework for the Provincial government to coordinate planning and decision-making for long-term growth and infrastructure renewal in Ontario. It gives the Province the authority to designate geographical growth areas, and to develop growth plans in collaboration with local officials and stakeholders to meet specific needs across the Province. Growth plans developed under the Places to Grow Act integrate and build upon other initiatives such as the Greenbelt Plan, the Niagara Escarpment Plan, the Provincial Policy Statement, the Planning Act, municipal infrastructure planning, and source water protection planning. Growth plans may include population projections and allocations, policies, goals, and criteria relating to issues

such as intensification and density, land supply, expansions and amendments to urban boundaries, location of industry and commerce, protection of sensitive and significant lands (including agricultural lands and water resources), infrastructure development, affordable housing and community design.

Municipalities are required to bring their official plans into conformity with the growth plan for their area. Decisions made under the Planning Act and Condominium Act are also required to conform to applicable growth plans.

Clean Water Act (2006)

Ontario's Clean Water Act is intended to ensure that communities are able to protect their municipal drinking water supplies through the development of collaborative, locally driven, science-based protection plans (source water protection plans). The Act requires that local communities evaluate existing and potential threats to their water source(s) and subsequently implement the required actions to reduce or eliminate these threats. The community can use this information to make choices about the size and locations of water and wastewater servicing elements (e.g. treatment plants, pumping stations, transmission mains, and collection mains).

Safeguarding and Sustaining Ontario's Water Act (2007)

The Province of Ontario passed the Safeguarding and Sustaining Ontario's Water Act to enable implementation of the Great Lakes – St. Lawrence River Basin Sustainable Water Resources Agreement and other amendments to the Permit to Take Water program.

The principles of the Great Lakes – St. Lawrence River Basin Sustainable Water Resources Agreement include the Premiers of Ontario and Quebec and the Governors of Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania, and Wisconsin. This agreement recognizes the following:

- The water of the Basin are a shared public treasure and the parties to the Agreement have a shared duty to protect, conserve and manage the waters;
- Conserving and restoring the waters and water dependent natural resources of the Basin will improve them; and
- Continued sustainable, accessible, and adequate water supplies for the people and economy of the Basin are important.

Environmental Assessment Act (2010)

The Ontario Environmental Assessment Act and the associated Codes of Practice require proponents to examine and document the environmental effects that might

result from major projects or activities. The purpose of the Act is the betterment of the people of the whole or any part of Ontario by providing for the protection, conservation and wise management of the environment in the Province (RSO1990, c. 18, s.2).

Municipal Class Environmental Assessment (2015)

The Municipal Class Environmental Assessment document (October 2000, as amended in 2015) prepared by the Municipal Engineers Association (MEA) outlines the requirements for undertaking a Class Environmental Assessment (Class EA). The purpose of the document is to provide a process by which to account for preventable and predictable impacts of infrastructure projects.

The Class EA planning process requires the integration of sound engineering judgment, sensible long-term planning, and protection of all aspects of the environment (natural, social, economic, and cultural). This includes consultation with the public and affected agencies to obtain comments and input, to ensure regulatory compliance and ultimately achieve acceptance for the preferred alternative.

Provincial Planning Statement (2024)

The Provincial Planning Statement (PPS), 2024 replaces the Provincial Planning Statement, 2020 and the Growth Plan for the Greater Golden Horseshow in a single framework. It is a key component of Ontario's policy-led planning system as it sets policy direction on matters of provincial interest concerning land use planning and development. In particular, the PPS provides guidance to municipalities regarding building strong healthy communities, wise use and management of resources, and protecting public health and safety. In addition, the PPS policies address growth management, environmental protection, climate change, and conservation of important resources such as cultural heritage and archaeology. The PPS supports an integrated long-term approach to planning by aligning development with infrastructure to build strong communities.

The PPS establishes the role of upper-tier municipalities in planning for growth, development, intensification, and redevelopment (s. 2.3). Planning for infrastructure, including sewage and water systems, must be coordinated and integrated with land use planning and growth management (s.3.1).

Municipalities are required to provide infrastructure in an efficient manner to meet current and projected needs of the community (s.3.6).

In order to protect the environment and minimize potential risks to human health and safety, the PPS indicates that municipal sewage services and municipal water services are the preferred form of servicing for settlement areas (s. 3.6). However, where

municipal sewage and water services are not available, planned, or feasible, private communal or individual on-site sewage and water services may be preferred (s. 3.6).

The policies in the PPS may be complemented by provincial plans, including the Niagara Escarpment Plan, or by locally-generated policies. In particular, municipal official plans are crucial for the implementation of the PPS policies and must be kept up to date with the PPS. All decisions related to planning matters must be consistent with the Provincial Policy Statement.

2.3.3 Relevant Municipality Studies

The Official Plan for The Tobermory and Lion's Head Secondary Urban Areas, and the Hamlet of Ferndale (2016)

The Official Plan for the Tobermory and Lion's Head Urban Areas, and the Hamlet of Ferndale summarized the intentions for the communities for the subsequent 25 years. Included was background on the communities, instructions for how to interpret the plan, policies for land uses, general development, and implementation.

As of 2010, the population of Northern Bruce Peninsula was 3744, with an estimate that 50% of that population resided in Tobermory and Lion's Head (approximately 1872), and that more than 50% of that population is seasonal.

Northern Bruce Peninsula Climate Action Plan (2022)

The Climate Action Plan presented the components of the plan for Northern Bruce Peninsula to mitigate climate change. They plan to reduce consumption of energy and fossil fuels, protect the environment to promote natural sequestration of carbon, and reduce solid waste generation.

By-Law Growth Management Amendment To The County Of Bruce Official Plan (2022)

The amendment to the County of Bruce official plan provided population projections for Bruce County, including Northern Bruce Peninsula, until 2046. The estimated existing population in 2021 was 4600 persons.

Bruce County Official Plan (2024)

The Bruce County Official Plan regulates areas within the Municipality of Northern Bruce Peninsula excluding Tobermory and Lion's Head Secondary Urban Areas and the Hamlet of Ferndale, which are regulated by the Local Official Plan.

2.4 Data Provided

The following is a list of data, reports, studies, and plans provided for use in the master plan study, supporting the design basis and evaluation of future servicing options. The Master Plan analysis and recommendations henceforth in this study are limited based on the use of the following provided data sets for the study and supporting documentation for mapping and GIS.

1. Lion's Head Drinking Water System Annual Report (2020)
2. Lion's Head Drinking Water System Inspection Report (2021)
3. Municipal Drinking Water Licence (MDWL) (2020)
4. Lion's Head Waterworks Issued for Construction Set (2012)
5. Lion's Head Waterworks Site Plan (2015)
6. Lion's Head Water Treatment Plant Process Flow Diagram (2017)
7. Energy Audit Report (2022)
8. Pump Curves (2004)
9. Pump Startup Report (2005)
10. Lion's Head Drinking Water System Financial Plan (2020)
11. Lion's Head DWS WISKI Data (2015-2022)
12. Asset Management Plan (2020)
13. Census Profile, Census of Population, Lion's Head, Ontario (2021)

2.4.1 Lion's Head Drinking Water System Annual Report (2020)

The Annual Report summarized the performance of the Lion's Head Drinking Water System for the year of 2020. Included was a description of the drinking water system and results of quality sampling and testing.

2.4.2 Lion's Head Drinking Water System Inspection Report (2021)

The Inspection Report, completed by the MECP, summarized the performance of the Lion's Head Water Treatment Plant for the year of 2021. Included were the details of the water treatment processes and results of the inspection and water quality monitoring. There were no actions to be completed.

2.4.3 Municipal Drinking Water License (MDWL) (2020)

The MDWL summarized the details of the licence for the Lion's Head Drinking Water System. Included was information on the drinking water system, general conditions, system-specific conditions, conditions for relief from regulatory requirements, and pathogen log removal/inactivation credits.

2.4.4 Lion's Head Waterworks Issued for Construction Set (2012)

The Issued for Construction Set provided a plan and profile of upgrades to the Lion's Head Waterworks. The drawings included the design of proposed watermains along Edgewood Street, Byron Street, and William Street.

2.4.5 Lion's Head Waterworks Site Plan (2015)

The Site Plan for the Lion's Head Waterworks provided a plan view of the existing water distribution system, with watermains colour coded according to diameter. It also included the locations of fire hydrants and gate and curb shutoff valves.

2.4.6 Lion's Head Water Treatment Plant Process Flow Diagram (2017)

The process flow diagram showed the treatment process for the Lion's Head Water Treatment Plant.

2.4.7 Energy Audit Reports (2022)

A series of energy audit reports were completed in 2022 for the Artist's Gallery, Eastnor Public Works Garage, Ferndale Information Centre, Friendship Club, Lion's Head Firehall and Library, Lion's Head Harbour, Rotary Hall, Stokes Bay Comm Centre, and Town Hall and Public Works Garage. The reports summarized the results of the ASHRAE Level 2 and greenhouse gas emissions audits.

2.4.8 Pump Curves (2004)

The pump curves were provided for the Lion's Head Water Treatment Plant.

2.4.9 Pump Startup Report (2005)

The pump startup report indicated that all pumps ran smoothly during the test in 2005.

2.4.10 Lion's Head Drinking Water System Financial Plan (2020)

The Financial Plan summarized the finances required for the drinking water system in Lion's Head for the year 2020. Included was a description of the system, financial operating plan, funding plan, and financial plan summary.

2.4.11 Lion's Head DWS WISKI Data (2015-2022)

The WISKI spreadsheets provided flow data for the Lion's Head water treatment plant from 2015 to 2022.

2.4.12 Asset Management Plan (2020)

The asset management plan summarized the existing assets within Northern Bruce Peninsula.

2.4.13 Census Profile, Census of Population, Lion's Head, Ontario (2021)

The 2021 census profile of Lion's Head provides a population estimate of 624 total persons within the municipality.

2.5 Municipal Drinking Water System Overview

Drinking water in Lion's Head is primarily supplied via the Lion's Head Water Treatment Plant (WTP) and distribution system. The Lion's Head water distribution and treatment systems are comprised of the WTP and a series of watermains with diameters between 50 mm and 150 mm, with a 300 mm intake pipe extending 165 m into Isthmus Bay. It is a Class II treatment and Class I distribution system. Figure 2-4 shows the extents of the existing drinking water system.

The remainder of Lion's Head and surrounding communities, such as Ferndale to the west, Isthmus Bay to the north, and Barrow Bay to the south, are completely serviced by private wells.

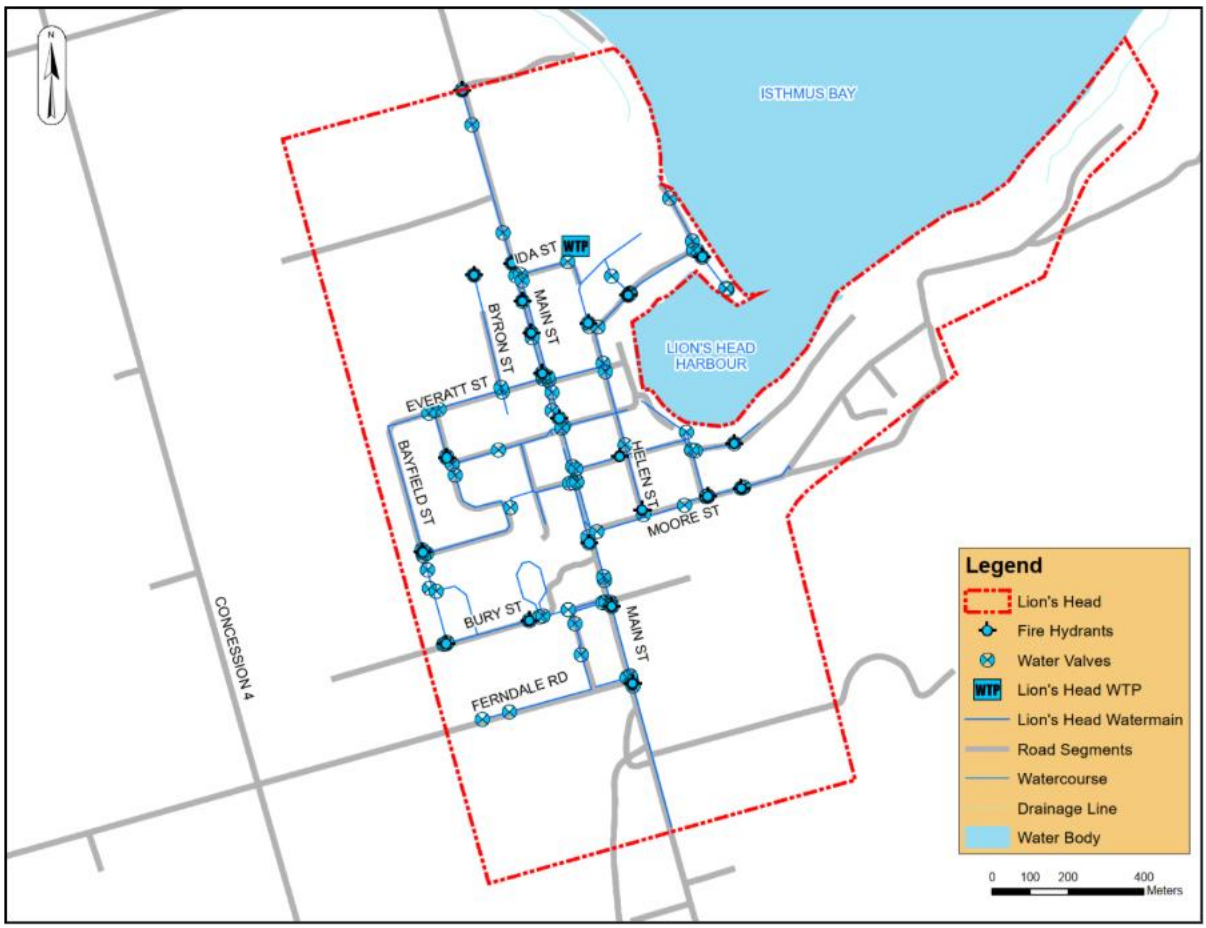

Figure 2-4: Lion's Head Existing Drinking Water System

2.5.1 Historical Flows

The historical flows produced by the water treatment plant are summarized in Table 2-1. Given the estimated existing population of 624 persons based on Statistic's Canada 2021 census, and the worse-case average day flow (ADF) for 2022, this gives an equivalent of 410 L/cap/day. The treatment plant has a capacity of 1,351 m3/day.

Table 2-1: Lion's Head Historical Water Flow Data

YEAR	AVERAGE DAY FLOW (M^3/DAY)	MAXIMUM DAY FLOW (M^3/DAY)
2022	504.50	667.00
2021	481.40	822.76
2020	419.41	583.77
2019	378.40	488.32
2018	341.17	550.48
2017	318.10	493.00
2016	349.65	522.65
2015	428.07	677.72

2.5.2 Water Treatment Plant

The WTP is located at 10 Ida Street and operates under Ontario Drinking Water License #250-101 Issue 4. The WTP is a membrane filtration plant with a rated capacity of 15.63 L/s (1351 m3/day).

Source water is retrieved from Isthmus Bay through a raw water intake pipe to the low lift station. Sodium hypochlorite is added to the raw water intake mouth for zebra mussel control. The low-lift pumps transfer water from the low lift station through one or two membrane filtration packages. The membrane systems have a membrane backwash and clean-in-place system including a hot water and compressed air system as well as sodium hypochlorite, acid and caustic injection capabilities.

Sodium hypochlorite is added to the system again at the outlet of the filters for primary disinfection. After the filters are two chlorine contact tanks and one reservoir with water flowing to a common high-lift well. Water flows to the high-lift well and then is pumped using five high-lift pumps to a 150 mm treated water header into the distribution system. WTP Treatment design component details are provided in Table 2-2, and the process diagram can be seen in Figure 2-5.

Table 2-2: Lion's Head WTP Process Component Details

PROCESS COMPONENT	PARAMETER	DESIGN VALUE
Raw Water Intake	Diameter Length	300 mm 165 m
Low Lift Pumping	Wet Well Dimensions Quantity of Pumps Capacity of Pump (each)	4.5 m length x 2.0 m wide x 3.9 m depth 3 (1 duty, 2 standby) 11.52 L/s at 31.6 m TDH
Membrane Filtration	Quantity Capacity (total)	2 (in parallel) 15.63 L/s
Sodium Hypochlorite Feed	Pump Quantity Pump Capacity (each) Tank Quantity Tank Capacity (each)	1 duty, 1 standby for zebra mussel control 1 duty, 1 standby for primary disinfection 1.6 L/min 2 200 L
Chlorine Contact Tanks	Quantity Capacity (each)	2 (in parallel) 96 m^3
Reservoir Tanks	Capacity (total)	576 m^3
High-Lift Pumping	Quantity	5
Outlet	Dimension	150 mm diameter

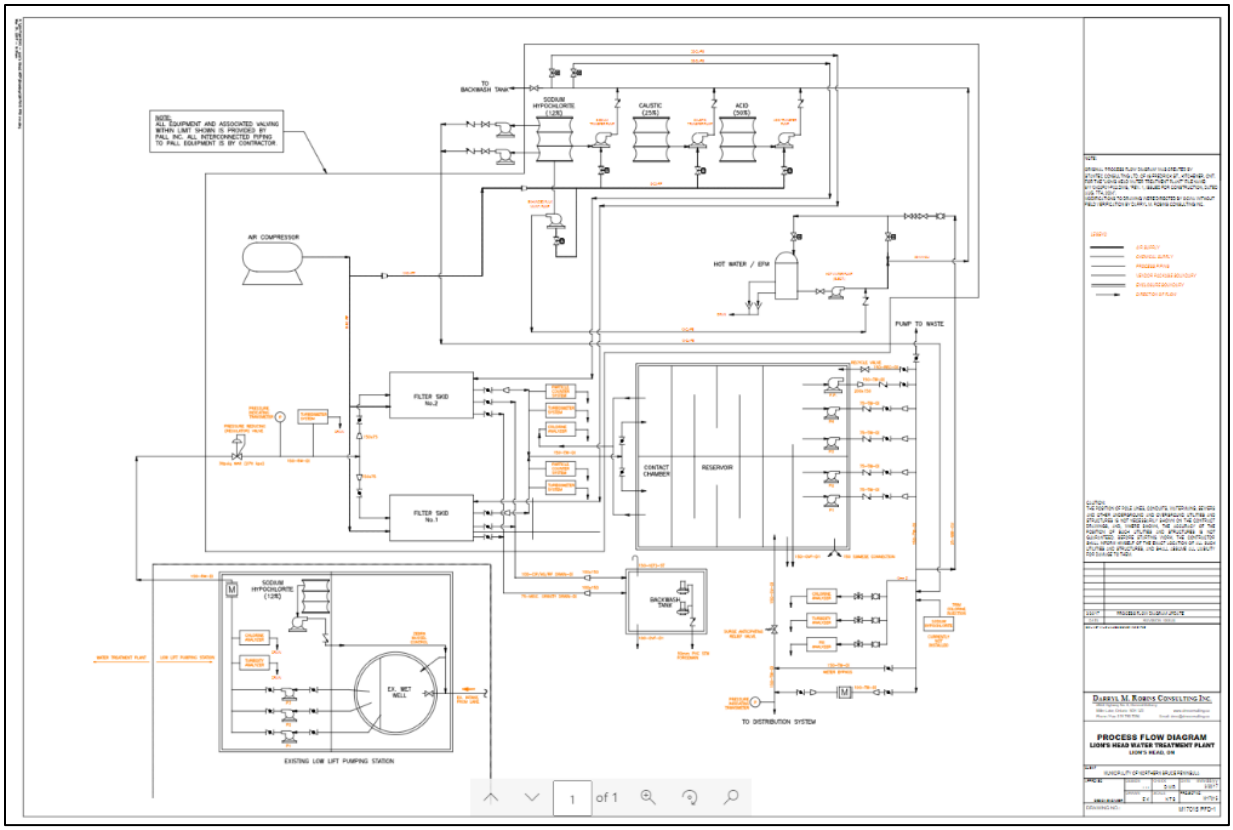

Figure 2-5: Water Treatment Process

2.5.3 Water Distribution System

Treated water from the WTP is pumped directly into the distribution system, consisting of approximately 12 km of watermain, as shown in Figure 2-4. The existing distribution system does not have any booster stations or storage tanks. The pipes that make up the distribution network are primarily of PVC material, with a small number of pipes made of HDPE. Pipe diameters range from 50 mm to 150 mm.

The distribution system has 378 service connections, 366 of which are for residential or seasonal use, and 12 for non-domestic commercial and institutional use, as well as 35 fire hydrants.

2.5.4 Lion's head WTP Source and Treated Water Data

The Lion's Head WTP Annual Operating Reports for the operational period 2020 were provided for use in the master plan study scope. The WTP annual reports summarize raw and treated water average day flow (ADF), maximum day flow (MDF), and quality data as well as chemical usage.

The 2020 Annual Performance Report for the Lion's Head WTP concluded that the facility was operated in compliance with provincial regulations. Furthermore, all treated water inorganic and organic parameters were shown to be below their exceedance limits. The rated capacity is 1351 m^3/day.

2.6 Municipal Wastewater System Overview

Wastewater servicing in Lion's Head is provided by private septic systems.

2.6.1 Wastewater Collection System

2.6.1.1 Linear Infrastructure

There is no linear infrastructure in Lion's Head designated for wastewater collection.

2.6.1.2 Pump Stations

There are no pump stations in Lion's Head.

2.6.2 Wastewater Treatment System

There is no municipal wastewater treatment system in Lion's Head.

2.6.3 Wastewater Generation and Quality Data

Due to the lack of municipal wastewater collection and treatment, there is no quality data available.

3 GROWTH AND SERVICING PROJECTIONS

In preparation for anticipated future population growth in Lion's Head, this study considered several growth scenarios to allow the Municipality to phase water and wastewater servicing improvements over the 25-year study horizon. The following growth scenarios have been developed for this Master Plan Update Study:

1. Existing Conditions – considers existing servicing
2. Near-Term Growth – considers development anticipated in the next 5-years
3. Mid-Term Growth – considers development anticipated in the next 6- to 10-years
4. Long-Term Growth – considers development anticipated in the next 11- to 20-years
5. Future Long-Term Growth – considers development anticipated in the next 21 - to 25-years

The Official Plan for the Tobermory and Lion's Head Urban Areas, and the Hamlet of Ferndale (2016) estimates that as of 2010, the population of Northern Bruce Peninsula was 3744, with an estimate that 50% of that population resided in Tobermory and Lion's Head. As of 2021, it is estimated that the population of Northern Bruce's Peninsula is 4,600 people (By-Law Growth Management, Amendment to the County of Bruce, 2022), while the population of Lion's Head is approximately 624 people (Census Profile, 2021 Census of Population, Lion's Head, Ontario, 2021).

Expected growth in the near-term (5-years), mid-term (10-years), long-term (20-years), and future long-term (25 years) is summarized in Table 3-1.This growth was calculated using growth values for Northern Bruce Peninsula, as listed in the By-Law Growth Management Amendment to the County of Bruce Official Plan, and taking the ratio of the population of Lion's Head compared to the total population of Northern Bruce Peninsula.

Table 3-1: Population Growth

TIME	NORTHERN BRUCE PENINSULA POPULATION	LION'S HEAD GROWTH	LION'S HEAD ESTIMATED POPULATION
Existing	4,600	0	624
Near-Term (5-Years)	5,000	112	736
Mid-Term (10-Years)	5,300	196	820
Long-Term (20-Years)	5,900	364	988
Future Long-Term (25-Years)	6,100	420	1,044

Employment growth in the Northern Bruce Peninsula is summarized in Table 3-2, as found in the Interim Report from the By-Law Growth Management Amendment to the County of Bruce Official Plan.

Table 3-2: Employment Growth

TIME	NORTHERN BRUCE PENINSULA EMPLOYMENT
Existing	1,570
Near-Term (5-Years)	1,690
Mid-Term (10-Years)	1,780
Long-Term (20-Years)	1,980
Future Long-Term (25-Years)	2,040

Given the expected increase in population and the trend toward single family homes, the area required for that growth can be calculated. The resulting areas are summarized in Table 3-3, assuming an average family size of 2.4 persons/family and 2 persons/household per the 2021 census for Northern Bruce Peninsula 2.2 persons/unit was selected for the analysis and a minimum lot area of 3000 m2 for Residential Zone 1.

Table 3-3: Required Area for New Growth

	POPULATION INCREASE	INCREASE IN RESIDENCES	REQUIRED AREA (HA)
Near-term	112	51	15.3
Mid-term	196	89	26.7
Long-term	364	165	49.6
Future Long-Term	420	191	57.3

Within Lion’s Head, approximately 74 ha of land is classified as Planned Development, which is sufficient to house the long-term growth option of 57.3 ha. There is additional Vacant Residential Land available. See Figure 3-1 for details.

Its to be noted that population projection estimates are based on data collected from the 2021 Census during the COVID-19 pandemic. Impacts due to changes in migration patterns since the COVID-19 pandemic is unique compared to current trends in migration, however the population estimates and assumptions that are included in the By-Law Growth Management Amendment to the County of Bruce Official Plan provide a conservative estimate suitable for the study.

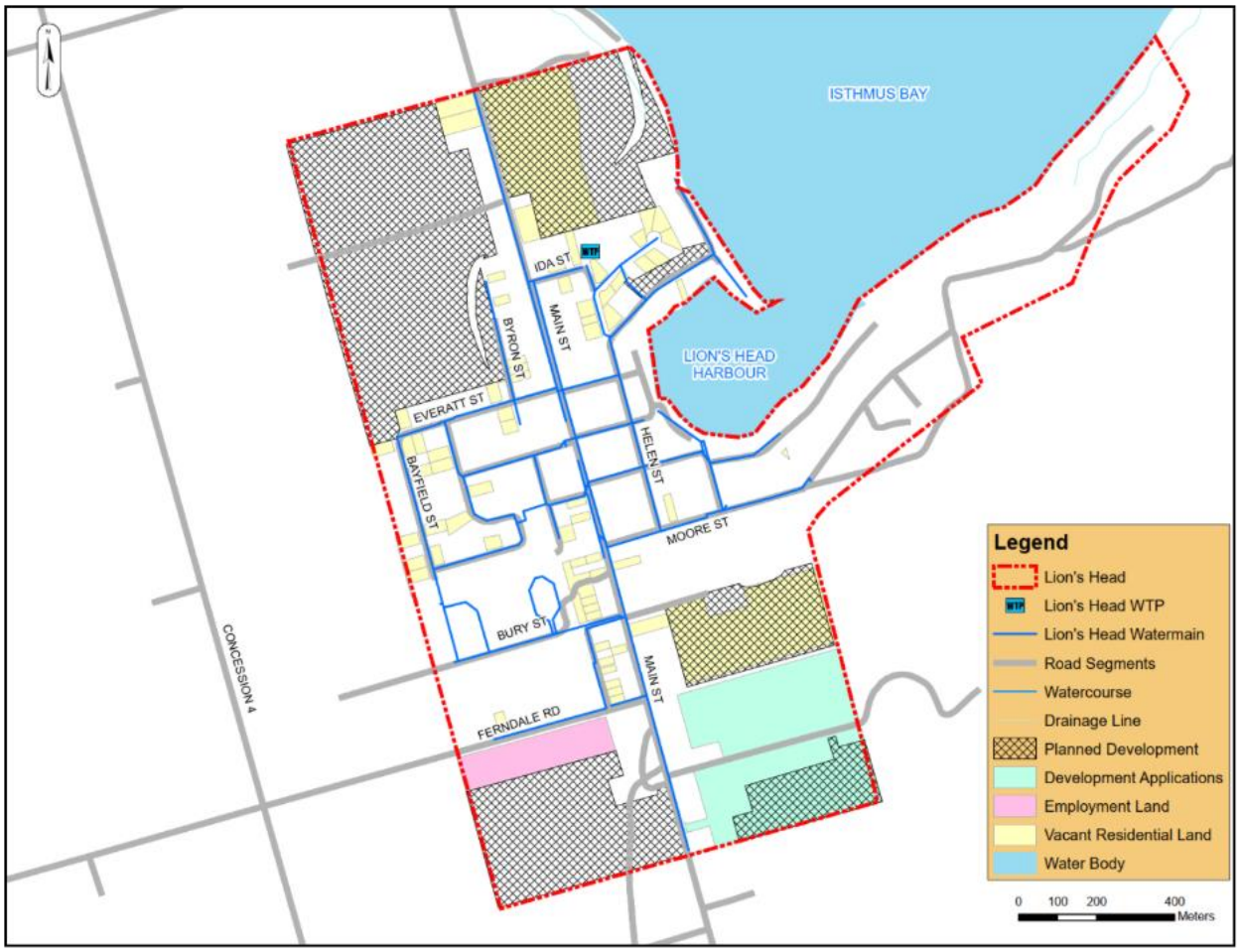

Figure 3-1: Potential New Growth in Lion's Head

3.1 Growth Scenarios

In preparation for anticipated future population growth in Lion's Head, this study considers several growth scenarios to allow the Municipality to phase water and wastewater servicing improvements over the 25-Year study horizon. The following growth scenarios have been developed for this Master Plan Study:

1. Do Nothing – maintain existing level of service
2. Expand water to service new growth in Lion's Head and provide sufficient volume for fire flow
3. Expand water to send to Ferndale
4. Expand water to send to Isthmus Bay and Barrow Bay
5. Construct new wastewater treatment facility and provide wastewater servicing to downtown Lion's Head

3.2 Water: Level of Service Criteria

The establishment of Level of Service (LOS) requirements for the water system is used to evaluate any servicing gaps in existing systems and is used to set the design basis for future proposed systems. The intent of the Level of Service criteria is to address the problem/opportunity statement to develop infrastructure to 2046 and beyond. A summary of the design criteria used for the study is included in **Appendix A**.

3.2.1 Water Treatment

Water treatment plants provide treated water to their respective distribution systems from untreated sources (lakes, wells, streams, etc.) through a variety of treatment processes. Water treatment facilities must be designed in accordance with the Procedure for Disinfection of Drinking Water in Ontario (Ontario, 2006). Drinking water treatment systems that obtain water from a surface water or groundwater under direct influence (GUDI) well must achieve an overall performance supply which provides a minimum level of treatment consisting of chemically assisted filtration and disinfection or other treatment capable of producing water of equal or better quality. This aims to provide a minimum a 2-log (99%) removal or inactivation of Cryptosporidium oocysts, 3-log (99.9%) removal or inactivation of Giardia cysts, and 4-log (99.99%) removal or inactivation of viruses prior to the water being delivered to the first customer. At a minimum, 0.5-log removal or inactivation of Giardia cysts, and 2-log removal or inactivation of viruses must be provided through disinfection, while the remaining removal may be achieved through filtration or other equivalent treatment processes.

The MECP Design Guidelines for Drinking-Water Systems (MECP, 2008) indicates that plant capacity should be greater or equal to the maximum day with an allowance for water need for plant use. Additionally, water treatment plants should be designed for a minimum of 10 years (25 years preferred). Accordingly, the MECP Design Guidelines (MECP, 2008) criterion will be adopted as the Level of Service (LOS) required for this study. The LOS refers to an acceptable servicing requirement to satisfy design criteria selected for the study or as prescribed by the MECP which account for acceptable servicing risk and meet industry standards.

3.2.2 Water Storage

The function of water storage in a drinking water system is to provide continuity of supply, maintain system pressure, and meet critical water demands during fire flow and emergency conditions. The MECP Design Guidelines for Drinking-Water Systems (MECP, 2008) outlines the requirements of the required storage. The formula for calculating the required treated water storage in the distribution system is as follows:

Total Treated Water Storage Requirements = A + B + C

Where:

A = Fire Storage

B = Equalization Storage (25% of Maximum Day Demand)

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

Fire storage is the product of the maximum fire flow required in the system and the corresponding fire duration as described herein. When the system can supply more than just the maximum day demand (but less than the peak demand), the fire storage requirements can be determined using the following formula:

$$A = (Peak\ Demand\ - Pumping\ Station\ Standby\ Capacity) \times Fire\ Duration$$

Where: Peak demand is the greater of the peak hour demand and the maximum day plus fire demand

Floating storage should be designed such that the elevation of the equalization volume (B) is able to maintain a minimum pressure of 275 kPa (40 psi) in the system under peak hour flow conditions. The fire (A) and emergency (C) volumes should be at elevations that sustain 275 kPa (40 psi) during peak hour demand conditions, and 140 kPa (20 psi) under the maximum day plus fire flow condition (MECP, 2008).

The MECP Design Guidelines (MECP, 2008) formula is recommended for the Lion's Head area LOS with the fire flows and duration indicated herein. According to the calculated flows, shown in **Appendix B**, the existing system does not have fire flow capacity and consequently will not have sufficient capacity to provide servicing for any growth scenarios under fire flow conditions. The required existing water storage can be seen in Table 3-4.

Table 3-4: Existing Water Storage Summary

SCENARIO	FIRE STORAGE (M^3)	EQUALIZATION (M^3)	EMERGENCY (M^3)	REQUIRED STORAGE (M^3)
Existing	2,520	347	717	3,584

3.2.3 Distribution

Distribution systems convey treated water from the treatment plants and booster stations to the location of the water demand. Watermains are to be sized to carry the greater of the maximum day plus fire flow or peak hour demand. The selected residential water consumption rate is 425 L/cap/day, based on the historical value of

410 L/cap/day and the MECP range of 240-450 L/cap/day for residential properties. The peaking factors for max day and peak hour are based on the MECP Design Guidelines for Waterworks (MECP, 2008) and is summarized in Table 3-5.

Table 3-5: Peaking Factors

POPULATION (PERSONS)	MAXIMUM DAY FACTOR	PEAK HOUR FACTOR
500 – 1,000	2.75	4.13
1,001 – 2,000	2.50	3.75
2,001 – 3,000	2.25	3.38

The applicable design pressures as outlined in the MECP Design Guidelines for Waterworks (MECP, 2008) is presented in Table 3-6 and recommended for use in the development and evaluation of alternative solutions.

Table 3-6: Design Pressures

	PRESSURE (KPA)	PRESSURE (PSI)
Maximum during Average Day	620	90
Minimum during Peak Hour	345	50
Minimum during Max Day + Fire Flow	140	20

The current water servicing requirements of Lion's Head, based on the existing equivalent population of 624 persons are summarized in Table 3-7.

Table 3-7: Existing Water Servicing Requirements

SCENARIO	POPULATION	ADD (M^3/DAY)	MDD (M^3/DAY)	PEAK HOUR DEMAND (M^3/DAY)	MDD + FIRE FLOW (M^3/DAY)
Existing	624	555	1,387	2,084	3,907

3.3 Wastewater: Level of Service Criteria

The level of service provided by the proposed wastewater infrastructure should be evaluated for both dry and wet weather events. There are two considerations when assigning the overall level of service; the hydraulic condition occurring in the infrastructure and the scenario during which this hydraulic condition occurs. Due to varying flow characteristics and event probabilities, the wastewater system components are measured against different benchmarks.

3.3.1 Gravity Sewers

Sanitary sewer systems should be designed with the objective of conveying all the flows to be treated at the sewage treatment plant. Overflows within the sanitary sewer systems should be designed for emergency and unavoidable conditions only (MECP, 2008). The MECP also recommends that gravity sewers be designed to less than 100% full under normal conditions. During large rain events, trunk sewers may become surcharged. Allowing these sewers to surcharge provides storage capacity thereby reducing by-pass volume however, this increase in the elevation of the hydraulic grade line in the sewer may have adverse effects depending on site-specific factors. The increase in the elevation of the hydraulic grade line is a result of capacity limitations resulting in bottlenecks and backup of the system. The two primary considerations are the amount of surcharging (elevation of hydraulic grade line) and the elevation of hydraulic grade line relative to adjacent finished ground. The identified level of service below is based on satisfying the MECP Design Guidelines (MECP, 2008) for gravity sewers and maximizing storage capacity while minimizing the risk of basement flooding. Table 3-8 presents the hydraulic condition criteria for gravity sewers and Table 3-9 presents the level of service for gravity sewers used in this study.

Table 3-8: Gravity Sewers Hydraulic Condition

Flow Condition	Hydraulic Condition of Sewers		
	Fair	Moderate	Severe
Dry Weather	Flow < 85% of pipe capacity	Flow > 85% of pipe capacity	Flow > 100% of pipe capacity
Wet Weather (up to and including 100yr return event)	HGL < 0.3m above pipe obvert and > 2 m below finished ground	HGL > 0.3 m above pipe obvert and > 2 m below finished ground	HGL within 2 m of finished ground

Table 3-9: Gravity Sewers Level of Service

Parameter	Level of Service of Sewers		
	GOOD	REVIEW	GAP
Facility Level of Service	Hydraulic grade line (HGL) from the 100yr storm is more than 2 m below the finished ground Dry weather flow is less than the sewer capacity	Hydraulic grade line (HGL) from the 25yr storm flows and larger, is within 2 m of the finished ground HGL from the 10yr storm flows and larger, is between 0.3m of the obvert of the pipe and 2m of the finished ground Dry weather flows > 85% of the sewer capacity but < 99% of the sewer capacity	HGL from the 10yrs storm flows and smaller, is within 2 m of the finished ground Cannot convey the dry weather flows without surcharging.

3.3.2 Pumping Stations and Forcemains

The MECP requires that sanitary sewer systems be able to pump the design peak instantaneous flow. Sewage pumping stations should be designed so that they can be upgraded to handle future peak flows from the ultimate tributary area with minor challenges (MECP, 2008). A design storm of 1:10-year was used.

The recommended sanitary pump station level of service is outlined in Table 3-10 and Table 3-11.

Table 3-10: Sanitary Pump Station Hydraulic Condition

Weather Scenario	Hydraulic Condition of Pump Station		
	Fair	Moderate	Severe
Dry Weather and Wet Weather (up to and including 10yr return event)	Measured flow < 85% of firm capacity	Measured flow > 85% of firm capacity and < 100% of firm capacity	Measured flow > 100% of firm capacity
Wet Weather (above 10yr up to 100yr return event)	Measured flow < peak capacity and no bypass at the station	Measured flow > peak capacity and bypass at the station	Measured flow > peak capacity and local flooding

Table 3-11: Sanitary Pump Station Recommended Level of Service

Parameter	Pump Station Level of Service		
	Good	Review	Gap
Facility Level of Service	Dry weather flows and 10yr storm flows are less than the pumping stations firm capacity	10yr storm flows are greater than the firm but less than the peak capacity	10yr storm flows are greater than the pumping station peak capacity

In addition to the pumping requirements, the MECP also provides design standards for forcemains. At design pumping rates, a cleansing velocity of at least 0.6 m/s should be maintained. At peak flow, the maximum velocity should be limited to 3 m/s. Consideration also needs to be made for air/vacuum relief valves as well as the operating pressure in the forcemain.

3.3.3 Wastewater Treatment

The MECP requires that treatment process units at wastewater treatment plants be sized based on various design parameters. Table 3-12 details the design basis for the process required by the MECP.

Table 3-12: WWTP Design Basis Requirements (MECP Design Guidelines for Sewage Works, 2008)

Treatment Unit	Design Basis
Sewage Pumping Stations	Design Peak Instantaneous Flow
Screening	Design Peak Instantaneous Flow
Grit Removal	Design Peak Hourly Flow, Peak Hourly Grit Loading
Primary Sedimentation	Design Peak Daily Flow
Aeration (without nitrification)	Average Daily BOD_5 Loading (based on Design Average Daily Flow)
Aeration (with nitrification)	Average Daily BOD_5 loading (based on Design Average Daily Flow), Peak Daily TKN Loading (based on Design Peak Daily Flow)
Secondary Sedimentation	Design Peak Hourly Flow, Peak Daily Solids Loading
Sludge Return for Activated Sludge	50% to 200 % of Design Average Daily Flow
Disinfection	Design Peak Hourly Flow
Effluent Filtration	Design Peak Hourly Flow
Outfall Sewer	Design Peak Instantaneous Flow
Sludge Treatment (digestion and dewatering)	Maximum Monthly Mass Loading and Flow Rates

The MECP indicates a wastewater treatment plant should be able to treat the flows of sewage generated within buildings serviced by the sewer system exclusive of any extraneous flows (i.e., the average daily flow). The MECP Design Guidelines (MECP, 2008) also indicates that “during wet weather, the minimum level of treatment required for flows above the dry weather flows from combined sewer system is primary treatment.” Therefore, based on the above MECP criteria, the recommended level of service for wastewater treatment plants is to provide full treatment to all average daily flow.

4 GAP ANALYSIS

4.1 Gap Analysis

For the assessment of the existing and proposed water and wastewater system the evaluation of infrastructure servicing gaps is based on the LOS review of systems using hydraulic models for the distribution networks and potential wastewater collection systems. Treatment facility capacity assessments are based on the MECP design guidelines set out in the Design Criteria.

4.2 Modelling Methodology

Figure 4-1 provides a summary of the modelling methodology applied to assess potential future Lion's Head distribution and collection systems. The approach has been tailored in the review for each system to identify gaps in servicing using a combination of traditional spreadsheet hydraulic models and established steady-state hydraulic water models.

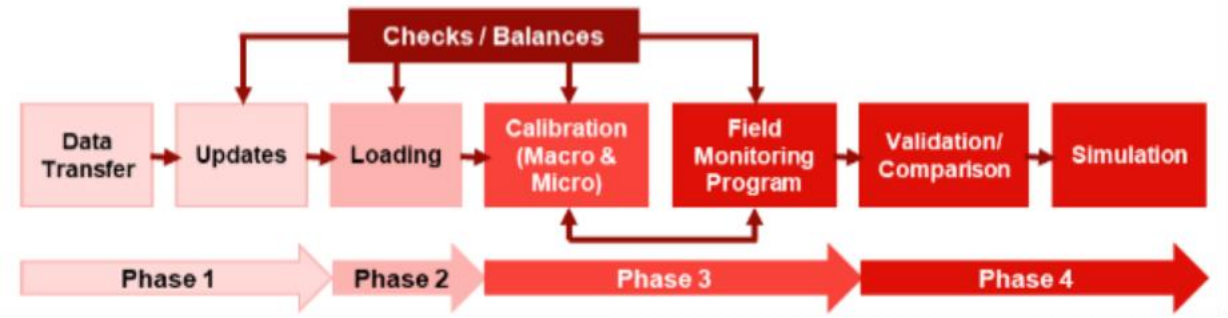

Figure 4-1: Combined Modelling Approach

- Phase 1: Review data sources such as GIS and field data and the specific processes used to transfer information into the models. Using maps and tables, identify new information and update/re-build the model to represent actual infrastructure in the ground (i.e. pipe sizes and materials, elevations, geocoded locations, pump curves and boundary conditions
- Phase 2: Load models with water demand and/or converted water demand for wastewater generation consisting of residential and non-residential loads.
- Phase 3: Existing field monitoring data and/or SCADA records is compared to initial model simulation and key model parameters are adjusted until simulated values match the records. The model is fine tuned and micro calibrated from any further

field monitoring program data collected and the model is adjusted until it reaches the desired calibration targets. WSP tailored the degree and effort of calibration based on available data provided for the study.

— Phase 4: Without changing any parameters, the calibrated models are used to predict conditions at specific locations the validation data set. If these predictions are within acceptable range, the models are deemed “validated” and ready for use as a decision-support tool of the Master Plan. The alternatives and future conditions are simulated using the calibrated parameters and growth projection scenarios.

This methodology has been tailored to ensure accuracy of the model development to current industry standards and master plan deliverable objectives as follows:

— Development of the water model includes importing in-service components of the distribution system for existing conditions. This included a review of basic data for pumps, valves, and pipes with a view to improving the 24/7 simulation of the water system.

— Review of existing operation controls (in discussion with operators) and key SCADA histories going back at least one year to develop statistics and check true average / maximum / peak times.

— Translation / conversion of all existing water data to develop a tailored calibration program with suitable calibration targets around the use of available flow monitoring and water meter consumption data. An all-pipe model loaded at every node is the basis for a sound hydraulic calibration, without which it is not meaningful to perform pump optimisation and water quality and transient analyses.

— Gaps in data were be identified as part of the calibration program.

— Analysis shall include steady-state and fire flow. Proposed scenarios included Average Day, Maximum Day, Peak Hour, and Maximum Day + Fire Flow.

— Develop results from modeling that include guidelines for each system including zone servicing elevations, reaffirming land usage demands for residential, commercial, industrial, and institutional classification

— Develop a list of all short and long-range construction projects and improvements for the existing and proposed systems required in the future.

— Document and report all assumptions, methodologies, and quality assurance and control tools used.

— Recommend locations for the future installation of permanent flow monitoring facilities at pumping stations and/or in key collection / distribution system locations for the following master plan update.

Water System

Based on the identified water system design criteria, the following critical gaps in level of service are noted and were used to review alternative solutions:

- Residents located outside of the Lion's Head service area are on private wells and there is no centralized treatment of potable water.
- The existing Lion's Head water treatment plant has insufficient maximum daily demand (MDD) + fire flow capacity to accommodate existing conditions and consequently the growth scenarios given that the system has only been designed to service the domestic water needs.

Wastewater System

Under existing conditions sanitary collection is based on private sceptic systems. Based on capacity, it is able to maintain service of the same area. However, the population is on private septic tanks, and the current system does not allow for growth. The lack of an existing wastewater municipal collection system is not considered a gap in the level of service but will limit future growth in the area.

5 ALTERNATIVE SOLUTIONS

5.1 Proposed Water Servicing Alternatives

Four water servicing alternatives have been considered for the servicing of Lion's Head and surrounding areas per consultations with OCWA and the Municipality of Northern Bruce Peninsula.

1. Maintain existing level of service
2. Expand water to service new growth in Lion's Head and provide sufficient volume for fire flow
3. Expand water to send to Ferndale (Including expanding water to service new growth in Lion's Head and provide sufficient volume for fire flow)
4. Expand water to send to Isthmus Bay and Barrow Bay (Including expanding water to service new growth in Lion's Head and provide sufficient volume for fire flow)

The following sections describe the considered alternatives are evaluated to address problem/opportunity statement. Calculations completed to determine the average day and max day demand including the incremental increases in population is included in **Appendix B**.

5.1.1 Alternative DWS1 – Maintain Existing Level of Service

The Maintain Existing Level of Service alternative serves as a baseline for the other alternatives. In this alternative, the water distribution system would remain unchanged. The existing system services 378 connections, totalling approximately 624 people (Census Profile, 2021 Census of Population, Lion's Head, Ontario, 2021). The existing flows are summarized in Table 3-7. The existing system does not provide fire flow. Lands with existing private well system will continue to be supplied by these systems, as will any new developments.

5.1.2 Alternative DWS2 – Expand Water to Service New Growth in Lion's Head and Provide Sufficient Volume for Fire Flow

This alternative includes servicing existing residents and new growth in Lion's Head that is expected to occur at the outskirts of the community, to the northeast and west and the southeast and west, as shown in Figure 3-1. Based on the initial population estimate of 624 people and the growth projections provided by the By-Law Growth Management Amendment to the County of Bruce Official Plan, the population in Lion's Head over the near-term, mid-term, long-term, and future long-term is expected in increase by 112,

196, 364, and 420 people, respectively. This additional population would increase the MDD by 131 m3/day, 229 m3/day, 425 m3/day, and 446 m3/day, respectively. This was calculated using a flow of 425 L/cap/day. The Existing, Near-Term, Mid-Term, and Long-Term growth scenarios were calculated using a maximum day factor of 2.75 and a peak rate factor of 4.13. The Future Long-Term growth scenario was calculated using a maximum day factor of 2.50 and a peak rate factor of 3.75. Peaking factors are based on the total population serviced and are summarized in Table 3-5.

Required fire flow for the existing population is 233 L/s for 3 hours, calculated using FUS, equating to a required fire storage of 2,520 m3. The fire flow requirements are not anticipated to change unless a new building is to be developed which requires more fire flow than the Bruce Peninsula District School.

Population and flow data can be found summarized in Table 5-1.

Table 5-1: Alternative DWS2 Water Servicing and Growth

SCENARIO	Equivalent POPULATION	ADD (M^3/Day)	MDD (M^3/DAY)	Peak Hour Demand (M^3/DAY)	MDD + FIRE FLOW (M^3/DAY)	STORAGE (M^3)
Existing	624	505	1,387	2,084	3,907	3,583
Near-Term (5-Years)	736	552	1,518	2,280	4,038	3,624
Mid-Term (10-Years)	820	588	1,616	2,428	4,136	3,655
Long-Term (20-Years)	988	659	1,813	2,722	4,332	3,716
Future Long-Term (25-Years)	1,044	683	1,708	2,561	4,227	3,683

5.1.3 Alternative DWS3 – Expand Water to Send to Ferndale (Including Expanding Water to Service New Growth in Lion's Head and Provide Sufficient Volume for Fire Flow)

This alternative includes expanding water to existing residents and new growth in Lion's Head as well as expanding water to supply Ferndale. This would involve installing a watermain west along Ferndale Road until its intersection with Highway 6, where the community of Ferndale is located, as seen in Figure 5-1. This would not include providing service to any residents along the way, due to restrictions in separating local mains from trunk mains. This can be taken under review in the future. An additional 68 individual service connections would allow for this alternative, as shown in Figure 5-1,

totalling to 506, and resulting in a MDD + Fire Flow of 4,082 m³/day. Population and flow data can be found summarized in Table 5-2. Based on contour data from Ontario Base Mapping, shown in Figure 5-2, Ferndale is located down grade of the watermain dead end on Ferndale Road.

Based on the initial population estimate of 624 people and the growth projections provided by the By-Law Growth Management Amendment to the County of Bruce Official Plan, the population in Lion's Head over the near-term, mid-term, long-term, and future long-term is expected in increase by 112, 196, 364, and 420 people, respectively. This additional population would increase the MDD by 131 m³/day, 229 m³/day, 425 m³/day, and 446 m³/day, respectively. This was calculated using a flow of 425 L/cap/day. The DWS3, and Near-Term growth scenarios were calculated using a maximum day factor of 2.75 and a peak rate factor of 4.13. The Mid-Term, Long-Term, and Future Long-Term growth scenario were calculated using a maximum day factor of 2.50 and a peak rate factor of 3.75. Peaking factors are based on the total population serviced and are summarized in Table 3-5.

Table 5-2: Alternative DWS3 Water Servicing and Growth

SCENARIO	Equivalent POPULATION	ADD (M^3/DAY)	MDD (M^3/DAY)	Peak Hour Demand (M^3/DAY)	MDD + FIRE FLOW (M^3/DAY)	STORAGE (M^3)
DWS3	774	568	1,562	2,346	4,082	3,638
Near-Term (5-Years)	970	616	1,693	2,543	4,213	3,679
Mid-Term (10-Years)	1,138	716	1,791	2,690	4,311	3,709
Long-Term (20-Years)	1,194	723	1,807	2,710	4,327	3,714
Future Long-Term (25 Years)	1,306	746	1,866	2,800	4,386	3,733

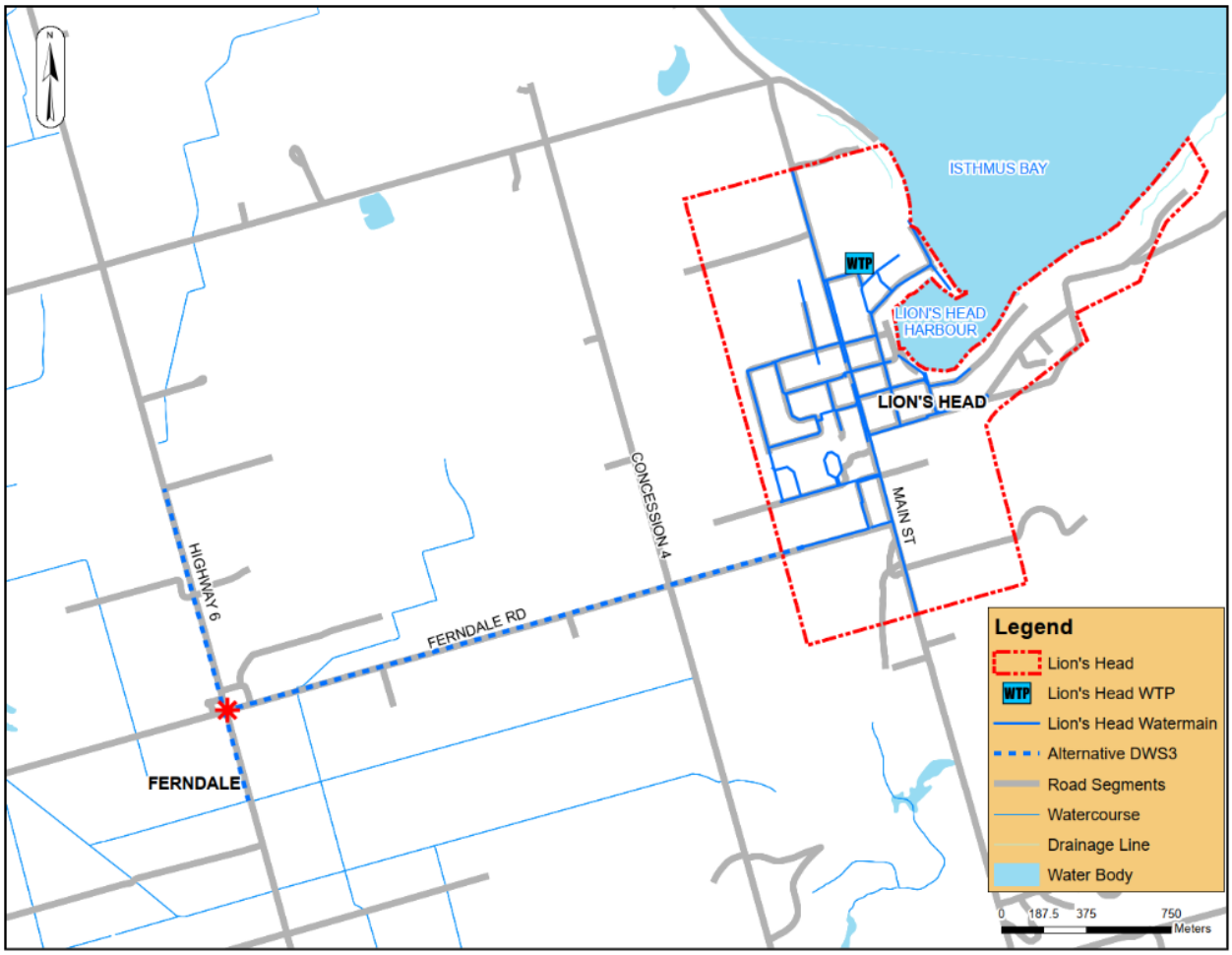

Figure 5-1: Alternative DWS3 – Extend Water Service to Ferndale

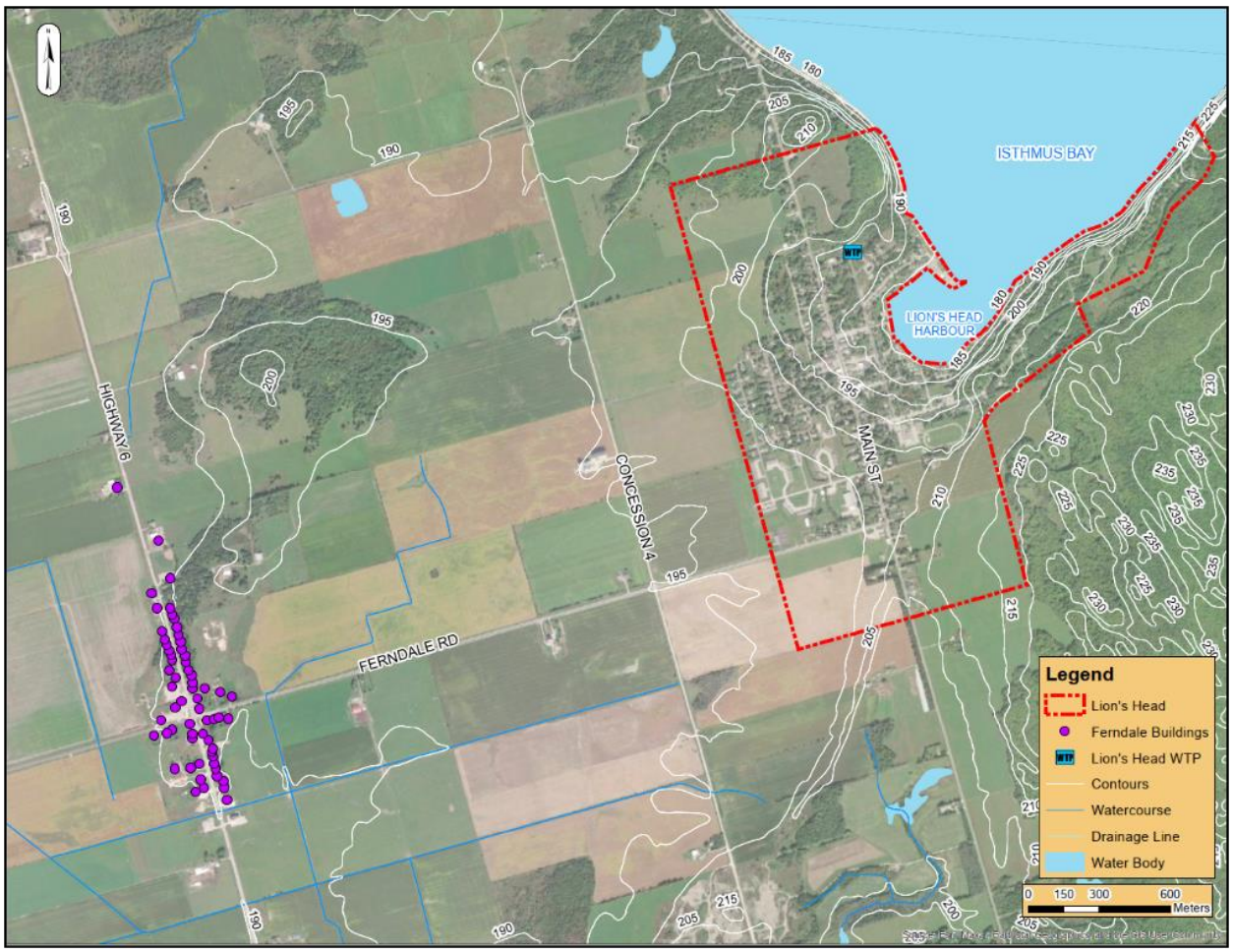

Figure 5-2: Alternative DWS3 - Ferndale Building and Contour Data

5.1.4 Alternative DWS4 – Expand Water to Send to Isthmus Bay and Barrow Bay (Including Expanding Water to Service New Growth in Lion's Head and Provide Sufficient Volume for Fire Flow)

This alternative includes expanding water to existing residents and new growth in Lion's Head as well as expanding water to supply Isthmus Bay and Barrow Bay. Expanding to Isthmus Bay would involve installing a watermain north along Main Street, which transitions into Isthmus Bay Road, as shown in Figure 5-3. The inclusion of this community would require an additional 124 connections, as shown in Figure 5-4. Expanding water to supply Barrow Bay would involve installing a watermain south along Main Street until it reaches the community of Barrow Bay, at Little Lake, as shown in Figure 5-5. The inclusion of this community would allow for an additional 135 connections, as shown in Figure 5-6. This would not include providing service to any residents along the way, due to restrictions in separating local mains from trunk mains.

This can be taken under review in the future. An additional 259 connections would be required for this alternative, totalling 697 connections. The resulting MDD + Fire Flow would be 4,386 m3/day. Population and flow data can be found summarized in Table 5-3.

Based on the initial population estimate of 624 people and the growth projections provided by the By-Law Growth Management Amendment to the County of Bruce Official Plan, the population in Lion's Head over the near-term, mid-term, long-term, and future long-term is expected in increase by 112, 196, 364, and 420 people, respectively. This additional population would increase the MDD by 131 m3/day, 229 m3/day, 425 m3/day, and 446 m3/day, respectively. This was calculated using a flow of 425 L/cap/day. All growth scenarios were calculated using a maximum day factor of 2.50 and a peak rate factor of 3.75. Peaking factors are based on the total population serviced and are summarized in Table 3-5.

Table 5-3: Alternative DWS4 Water Servicing and Growth

SCENARIO	Equivalent POPULATION	ADD (M3/DAY)	MDD (M^3/DAY)	Peak Hour Demand (M^3/DAY)	MDD + FIRE FLOW (M^3/DAY)	STORAGE (M^3)
DWS4	1,194	747	1,867	2,800	4,386	3,733
Near-Term (5-Years)	1,306	794	1,986	2,978	4,505	3,770
Mid-Term (10-Years)	1,390	830	2,075	3,112	4,595	3,798
Long-Term (20-Years)	1,558	901	2,253	3,380	4,773	3,854
Future Long-Term (25 Years)	1,614	925	2,313	3,469	4,883	3,872

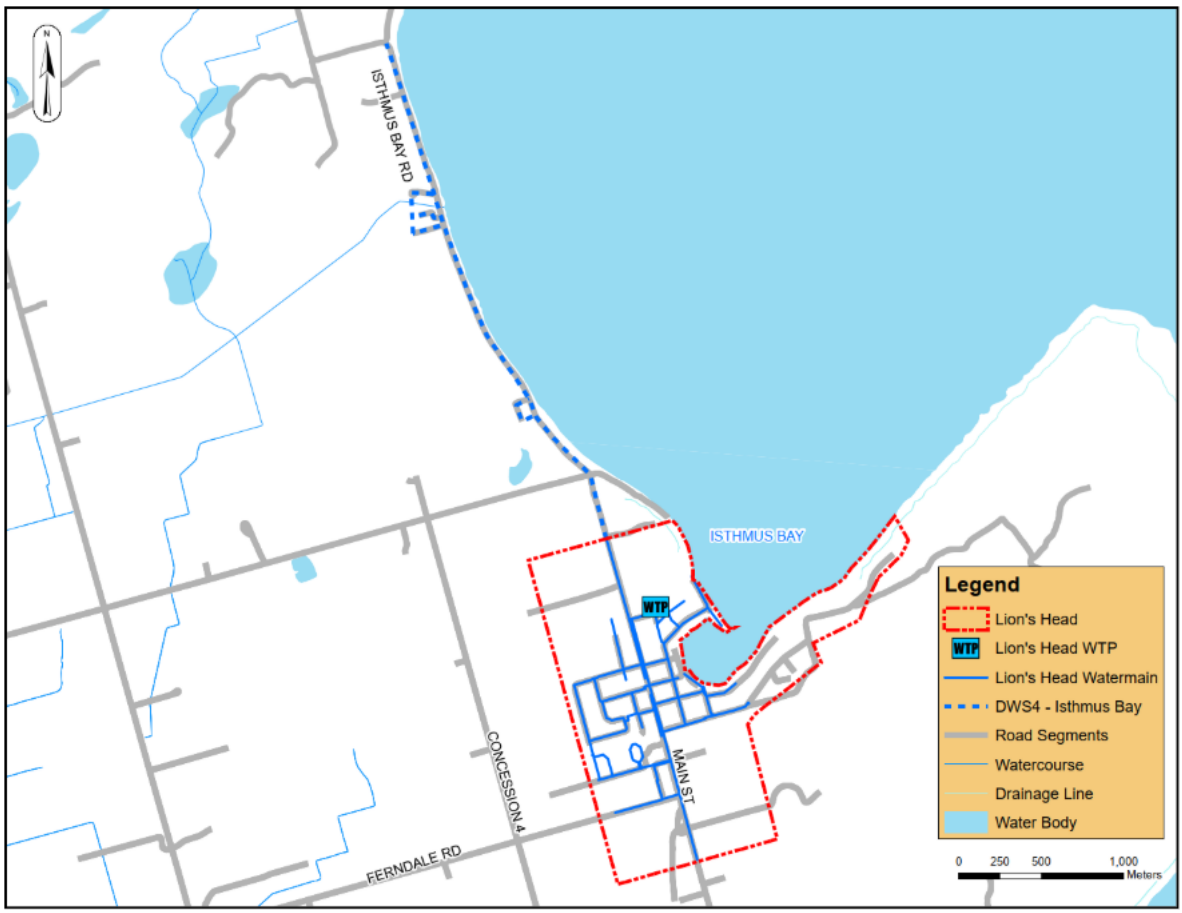

Figure 5-3: Alternative DWS4 - Extend Water to Isthmus Bay

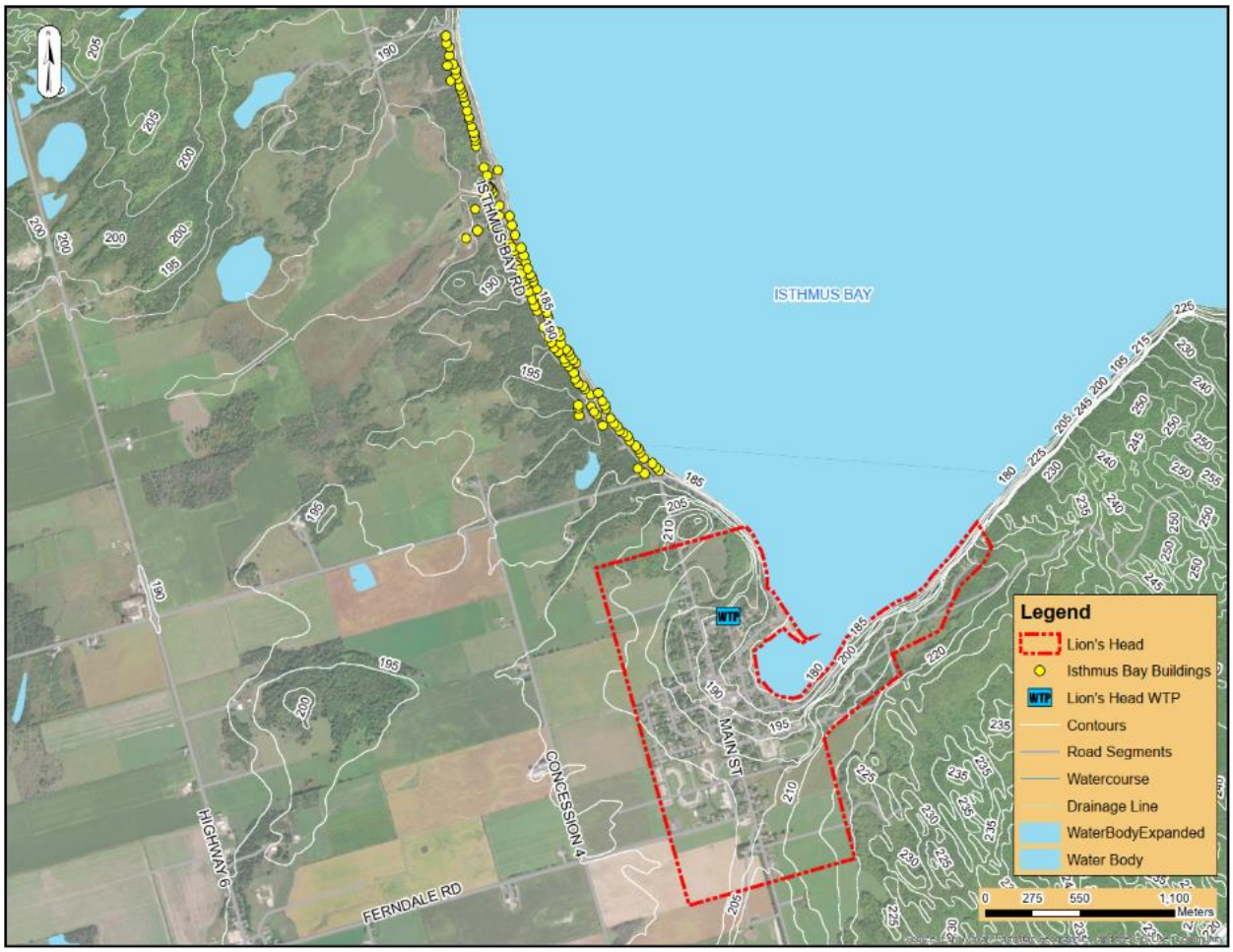

Figure 5-4: Alternative DWS4 - Isthmus Bay Building and Contour Data

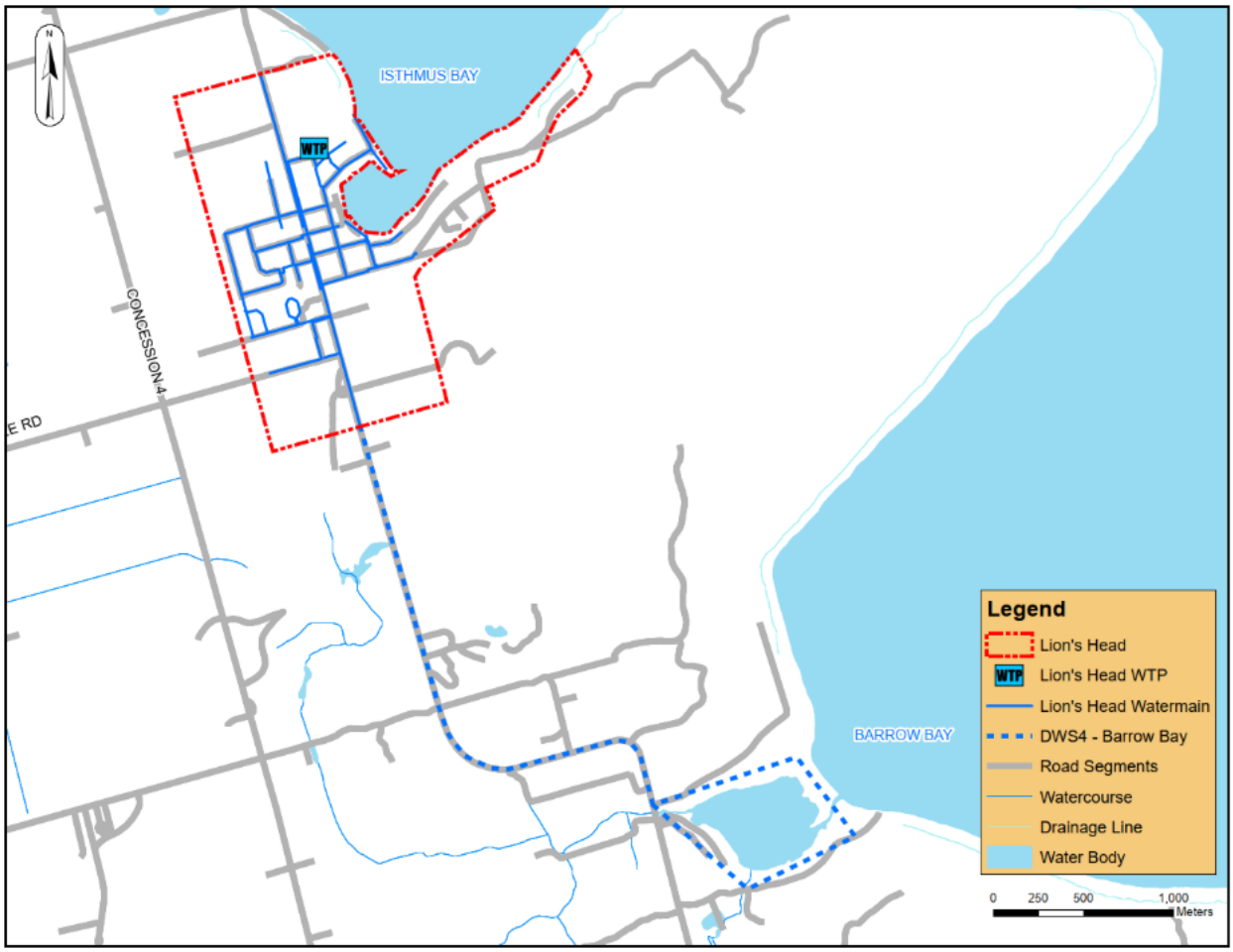

Figure 5-5: Alternative DWS4 - Extend Water to Barrow Bay

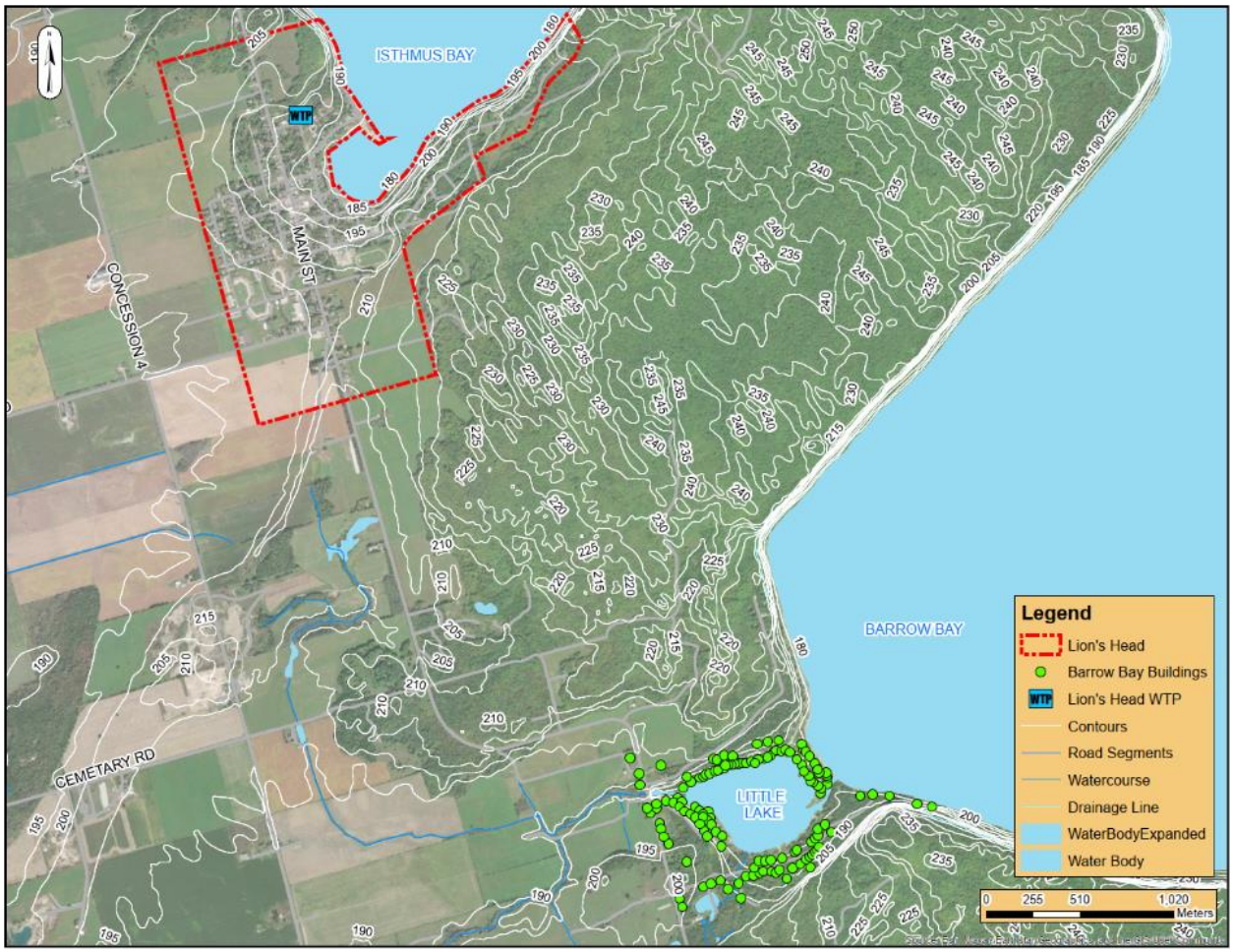

Figure 5-6: Alternative DWS4 - Barrow Bay Building and Contour Data

5.2 Proposed Wastewater Servicing Alternatives

Two wastewater servicing alternatives have been considered for the servicing of Lion's Head per consultations with OCWA and the Northern Bruce Peninsula.

1 Maintain existing level of service
2 Construct new wastewater treatment facility and provide wastewater servicing to downtown Lion's Head

The following sections describe the considered alternatives. Calculations can be found in **Appendix B.**

5.2.1 Alternative WWS1 – Maintain Existing Level of Service

The Maintain Existing Level of Service alternative serves as a baseline for the other alternatives. In this alternative, the existing private septic systems, either communal or

individual, will continue to service existing lots and future growth within the community of Lion's Head.

5.2.2 Alternative WWS2 – Construct New Wastewater Treatment Facility and Provide Wastewater Servicing to Downtown Lion's Head

This alternative includes constructing a new wastewater treatment facility to service existing residents and new growth in Lion's head that is expected to occur at the outskirts of the community, to the northeast and west and the southeast and west, as shown in Figure 3-1. Assuming downtown Lion's Head is considered the current population serviced by, the average day flow (ADF) of water in downtown Lion's Head was 504.5 m3/day for 2022, as recorded in the WISKI data from OCWA. The maximum daily flow (MDF) for water was calculated to be 1,387 m3/day. Assuming a wastewater production of 85% of the daily water consumption rate, the ADF for wastewater is 429 m3/day and the MDF is 1,179 m3/day.

Equivalent population and maximum day flow has been calculated and is summarized in Table 5-4. A Harmon Peaking factor of 2.75 was used, as per the design criteria.

Table 5-4: Alternative WWS2 Wastewater Servicing Growth

SCENARIO	EQUIVALENT POPULATION[1]	ADF (M3/DAY)	MDF (M^3/DAY)
WWS2	624	429	1,179
Near-Term (5-Years)	736	469	1,290
Mid-Term (10-Years)	820	500	1,374
Long-Term (20-Years)	988	560	1,541
Future Long-Term (25 Years)	1,044	580	1,596

It's to be noted that a typical wastewater treatment plant complete with lagoon(s) may require approximately 16 ha – 20 ha to treat the expected flows.

6 EVALUATION OF ALTERNATIVE SOLUTIONS

6.1 Evaluation Approach and Criteria

6.1.1 Infrastructure Evaluation Approach

The approach used to determine the preferred alternatives for water and wastewater servicing in the Lion's Head area is explained in this section. An evaluation matrix was created to document the advantages and disadvantages of each alternative, and to ultimately identify the preferred solutions.

- **Define Evaluation Criteria**– Criteria were defined for the evaluation of the alternatives. The evaluation criteria for this project included (1) natural environment, (2) social and economic environment, (3) technical suitability, (4) constructability, and (5) cost. The five (5) evaluation criteria were considered to have separate weighting of importance in this evaluation and subdivided into key indicators.
- **Document Advantages, Disadvantages and Potential Impacts** – The impacts associated with each alternative were determined and documented. These impacts were categorized under one (1) of the five (5) evaluation criteria and further subdivided under key indicators.
- **Compare Alternatives** – Each servicing alternative's performance with respect to the evaluation criteria was compared to that of the other alternatives. Scores were assigned to describe an alternative's relative performance on a specific criterion and then weighted to get the overall score.
- **Determine the Preferred Alternative** – The servicing alternative with the least overall impact is preferred and recommended for implementation.

6.1.2 Infrastructure Evaluation Criteria

As noted, prior, the evaluation methodology involves the assessment of the impacts associated with the water and wastewater servicing alternatives under five (5) evaluation criteria. A detailed breakdown of the impacts within the respective criteria, is provided in Table 6-1.

Table 6-1: Evaluation Criteria Description

Criteria	Indicator	Description
Natural Environment (20% Criteria Weighting)	Surface and groundwater (30% Of Criteria)	Impacts to the environment from infrastructure development
	Natural heritage features/vegetation (30% Of Criteria)	Potential impacts due to construction on natural habitat and species at risk
	Climate change (40% Of Criteria)	Potential impacts to surrounding natural environment from climate change events
Social and Economic Environment (20% Criteria Weighting)	Existing infrastructure (private and municipal) (25% Of Criteria)	Potential impacts to private or municipal systems, such as roadways, buildings, watermains, wells, sewers, septic tanks, etc.
	Aesthetics (20% Of Criteria)	Potential impacts on the community from the presence of new infrastructure/open space usage
	Redundancy and security of supply (25% Of Criteria)	Ability of system to provide a consistent Level of Service
	Climate change (30% Of Criteria)	Impacts to public during climate change events to provide Level of Service
Technical Suitability (20% Criteria Weighting)	Existing capacity (25% Of Criteria)	Current/proposed infrastructure to service existing demand capacity
	Impacts on further expansion (25% Of Criteria)	Opportunity to service the greater community and ability to connect future areas under expansion
	Full build out (20% Of Criteria)	Opportunity to service full-build out of the community
	Climate Change (30% Of Criteria)	Impacts from climate change events which impact maintaining Level of Service

Table 6 1: Evaluation Criteria Description - Continued

Criteria	Indicator	Description
Constructability (20% Criteria Weighting)	Ease of construction and site access (20% Of Criteria)	When traditional construction approaches are applied, the impacts associated with installation
	Impact on operations during construction (25% Of Criteria)	Impacts associated with maintaining the current Level of Service
	Ease of integration with existing infrastructure (25% Of Criteria)	Impacts associated with tie-in to existing infrastructure or disconnection of old infrastructure
	Climate Change (30% Of Criteria)	Impacts from climate change events on the installation and timing of projects
Cost (20% Criteria Weighting)	Capital Costs (50% Of Criteria)	Cost to construct new infrastructure to establish the system
	Relative operation and maintenance costs (50% Of Criteria)	Cost to maintain yearly operations, including eq replacement

6.1.3 Evaluation Matrix

As per the evaluation matrix used to compare each alternative for water and wastewater, the indicators under each criterion, were given a number score from 1-5, depending on the alternatives overall impact. A zero (0) was given for no impact, a 1-2 for a minor impact, a 3-4 for a moderate impact and a 5 for a significant impact. The final score was then multiplied by the criteria weighting as summarized in Table 6-1. The evaluation matrix is provided in **Appendix C**. A summarized evaluation of water is provided in Table 6-2, and Table 6-3 for wastewater.

6.1.4 Water System Alternative Solutions Evaluation

Table 6-2: Comparative Evaluation of Water Servicing Alternatives

1.MAINTAIN EXISTING LEVEL OF SERVICE	2.EXPAND DRINKING WATER SYSTEM TO SERVICE NEW GROWTH IN LION'S HEAD AND PROVIDE SUFFICIENT VOLUME FOR FIRE FLOW	3.EXPAND DRINKING WATER TO SERVICE NEW GROWTH IN LION'S HEAD AND SEND TO FERNDALE	4.EXPAND DRINKING WATER TO SERVICE NEW GROWTH IN LION'S HEAD AND SEND TO ISTHMUS BAY AND BARROW BAY
Natural Environment			
Surface and Groundwater			
– No construction involved, therefore no impacts. – **Score: 0**	– Establishment of new surface water source/new wellheads and/or expansion of existing surface water source and treatment for servicing fire flow volume. – **Score: 2**	– Establishment of new surface water source /new wellheads and/or expansion of surface water source and treatment with higher capacity – **Score: 3**	– Establishment of new surface water source /new wellheads and/or expansion of surface water source and treatment with higher capacity. – **Score: 3**
Natural Heritage Features/Vegetation			
– No construction involved, therefore no impacts. – **Score: 0**	– Impacts are limited to previously impacted lands; however, some impacts due to new construction. – **Score: 1**	– Greater impacts to natural environment as new watermain construction increases, potential along more sensitive habitats to service new development. – **Score: 3**	– Even greater impacts to natural environment as new watermain construction increases, potential along more sensitive habitats to service new development. – **Score: 4**

Table 6 2: Comparative Evaluation of Water Servicing Alternatives - Continued

1.MAINTAIN EXISTING LEVEL OF SERVICE	2.EXPAND DRINKING WATER SYSTEM TO SERVICE NEW GROWTH IN LION'S HEAD AND PROVIDE SUFFICIENT VOLUME FOR FIRE FLOW	3.EXPAND DRINKING WATER TO SERVICE NEW GROWTH IN LION'S HEAD AND SEND TO FERNDALE	4.EXPAND DRINKING WATER TO SERVICE NEW GROWTH IN LION'S HEAD AND SEND TO ISTHMUS BAY AND BARROW BAY
Climate Change			
– Does not mitigate climate change or provide resilient infrastructure. Service disruption may occur. – **Score: 3**	– New infrastructure designed with climate change resiliency to provide the required Level of Service during severe weather and power outages. – **Score: 1**	– New infrastructure designed with climate change resiliency to provide the required Level of Service during severe weather and power outages. – **Score: 1**	– New infrastructure designed with climate change resiliency to provide the required Level of Service during severe weather and power outages. – **Score: 1**
Social and Economic Environment			
Existing Infrastructure (Private and Municipal)			
– No construction involved, therefore no impacts. – **Score: 0**	– Minor impacts; existing residents are already serviced by water. – **Score: 1**	– Conversion from private wells to public system and installation of new watermain in right-of-way over a large area. – **Score: 3**	– Conversion from private wells to public system and installation of new watermain in right-of-way over a large area. – **Score: 3**
Aesthetics			
– No construction involved, therefore no impact to the visual appearance of the community. – **Score: 0**	– Establishment of additional water treatment, pumping and storage infrastructure within the community – **Score: 2**	– Establishment of additional water treatment, pumping and storage infrastructure within the community. – **Score: 2**	– Establishment of additional water treatment, pumping and storage infrastructure within the community. – **Score: 2**

Table 6 2: Comparative Evaluation of Water Servicing Alternatives - Continued

1.MAINTAIN EXISTING LEVEL OF SERVICE	2.EXPAND DRINKING WATER SYSTEM TO SERVICE NEW GROWTH IN LION'S HEAD AND PROVIDE SUFFICIENT VOLUME FOR FIRE FLOW	3.EXPAND DRINKING WATER TO SERVICE NEW GROWTH IN LION'S HEAD AND SEND TO FERNDALE	4.EXPAND DRINKING WATER TO SERVICE NEW GROWTH IN LION'S HEAD AND SEND TO ISTHMUS BAY AND BARROW BAY
Redundancy and Security of Supply			
– Development would be limited by ability to establish new wells. – **Score: 5**	– Increased security of water supply from a maintained and regulated system. – **Score: 2**	– Increased security of water supply from maintained and regulated system. More opportunities to provide redundancy in a looped network. – **Score: 1**	– Increased security of water supply from maintained and regulated system. More opportunities to provide redundancy in a looped network. – **Score: 1**
Climate Change			
– Does not mitigate climate change or provide resilient infrastructure. Service disruption may occur. – **Score: 3**	– New infrastructure designed with climate change resiliency to provide the required Level of Service during severe weather and power outages. – **Score: 1**	– New infrastructure designed with climate change resiliency to provide the required Level of Service during severe weather and power outages. – **Score: 1**	– New infrastructure designed with climate change resiliency to provide the required Level of Service during severe weather and power outages. – **Score: 1**
Technical Suitability			
Existing Capacity			
– Existing capacity is currently being met, however fire flow service is not provided. – **Score: 3**	– New systems are designed to service existing and future capacity requirements, however limited to current service area. – **Score: 0**	– New systems are designed to service existing and future capacity requirements including phased development for connecting the greater community. – **Score: 0**	– New systems are designed to service existing and future capacity requirements including phased development for connecting the greater community. – **Score: 0**

Table 6 2: Comparative Evaluation of Water Servicing Alternatives - Continued

1.MAINTAIN EXISTING LEVEL OF SERVICE	2.EXPAND DRINKING WATER SYSTEM TO SERVICE NEW GROWTH IN LION'S HEAD AND PROVIDE SUFFICIENT VOLUME FOR FIRE FLOW	3.EXPAND DRINKING WATER TO SERVICE NEW GROWTH IN LION'S HEAD AND SEND TO FERNDALE	4.EXPAND DRINKING WATER TO SERVICE NEW GROWTH IN LION'S HEAD AND SEND TO ISTHMUS BAY AND BARROW BAY
Further Expansion			
– Development would be limited due to lack of fire flow municipal water servicing based on current capacity. Does not address Class EA Problem Statement. – **Score: 5**	– New systems are designed to service existing and future capacity requirements, however limited to current service area. – **Score: 3**	– New systems are designed to service existing and future capacity requirements including phased development for connecting the greater community. – **Score: 2**	– New systems are designed to service existing and future capacity requirements including phased development for connecting the greater community. – **Score: 2**
Full Build Out			
– Without fire flow municipal water service there will be trouble with implementing a full build out for growth and land uses (e.g. Commercial). – **Score: 5**	– Meets the requirements to establish full-build out of Lion's Head; however, limited to expanding out to the surrounding community. – **Score: 3**	– Provides infrastructure to the largest service area; however, the rate of full expansion is limited by phased development of a larger distribution system. – **Score: 2**	– Provides infrastructure to the largest service area; however, the rate of full expansion is limited by phased development of a larger distribution system. – **Score: 1**

Table 6 2: Comparative Evaluation of Water Servicing Alternatives - Continued

1.MAINTAIN EXISTING LEVEL OF SERVICE	2.EXPAND DRINKING WATER SYSTEM TO SERVICE NEW GROWTH IN LION'S HEAD AND PROVIDE SUFFICIENT VOLUME FOR FIRE FLOW	3.EXPAND DRINKING WATER TO SERVICE NEW GROWTH IN LION'S HEAD AND SEND TO FERNDALE	4.EXPAND DRINKING WATER TO SERVICE NEW GROWTH IN LION'S HEAD AND SEND TO ISTHMUS BAY AND BARROW BAY
Climate Change			
— Does not provide opportunity to mitigate climate change or provide resilient infrastructure for fire flow servicing. Service disruption may occur. — **Score: 5**	— New infrastructure designed with climate change resiliency to provide the required Level of Service during severe weather and power outages. The smaller network of infrastructure is easier to maintain. — **Score: 1**	— New infrastructure designed with climate change resiliency to provide the required Level of Service during severe weather and power outages. The larger network of infrastructure requires more watermain to maintain. — **Score: 2**	— New infrastructure designed with climate change resiliency to provide the required Level of Service during severe weather and power outages. The larger network of infrastructure requires more watermain to maintain. — **Score: 2**
Constructability			
Ease of Construction and Site Access			
— N/A — **Score: 0**	— Minor impacts for construction access within pre-established watermain network where only upsizing is required. Existing network of roads provide good access. — **Score: 1**	— Installation of new watermain over a larger area along defined roadways or newly established easements will result in longer phased construction. — **Score: 4**	— Installation of new watermain over a larger area along defined roadways or newly established easements will result in longer phased construction. — **Score: 5**

Table 6 2: Comparative Evaluation of Water Servicing Alternatives - Continued

1.MAINTAIN EXISTING LEVEL OF SERVICE	2.EXPAND DRINKING WATER SYSTEM TO SERVICE NEW GROWTH IN LION'S HEAD AND PROVIDE SUFFICIENT VOLUME FOR FIRE FLOW	3.EXPAND DRINKING WATER TO SERVICE NEW GROWTH IN LION'S HEAD AND SEND TO FERNDALE	4.EXPAND DRINKING WATER TO SERVICE NEW GROWTH IN LION'S HEAD AND SEND TO ISTHMUS BAY AND BARROW BAY
Operations during construction			
– N/A – **Score: 0**	– Minor impacts anticipated as private and public systems may be maintained during construction with current established existing system. – **Score: 1**	– Minor impacts anticipated as private and public systems may be maintained during construction. – **Score: 2**	– Minor impacts anticipated as private and public systems may be maintained during construction. – **Score: 2**
Ease of Integration with Existing Infrastructure			
– N/A – **Score: 0**	– Minor impacts in the Lion's head community since there is existing infrastructure within the ground. Minor impacts anticipated for establishment of new infrastructure. – **Score: 2**	– More moderate impacts anticipated for establishment of new infrastructure due to phasing of work and longer construction to connect services to properties located in the adjacent communities. – **Score: 3**	– More moderate impacts anticipated for establishment of new infrastructure due to phasing of work and longer construction to connect services to properties located in the adjacent communities. – **Score: 3**
Climate Change			
– N/A – **Score: 0**	– Minor impacts due to climate change events when construction is carried out during warm-weather months. – **Score: 1**	– Minor impacts due to climate change events when construction is carried out during warm-weather months for a longer duration due to size of distribution network. – **Score: 2**	– Minor impacts due to climate change events when construction is carried out during warm-weather months for a longer duration due to size of distribution network. – **Score: 2**

Table 6 2: Comparative Evaluation of Water Servicing Alternatives - Continued

1.MAINTAIN EXISTING LEVEL OF SERVICE	2.EXPAND DRINKING WATER SYSTEM TO SERVICE NEW GROWTH IN LION'S HEAD AND PROVIDE SUFFICIENT VOLUME FOR FIRE FLOW	3.EXPAND DRINKING WATER TO SERVICE NEW GROWTH IN LION'S HEAD AND SEND TO FERNDALE	4.EXPAND DRINKING WATER TO SERVICE NEW GROWTH IN LION'S HEAD AND SEND TO ISTHMUS BAY AND BARROW BAY
Cost			
Capital Costs			
– System is currently established. No construction involved; therefore, no impacts and no capital costs are anticipated. – **Score: 0**	– Moderate capital costs to install new water treatment, pumping and storage facilities, and distribution network. – **Score: 2**	– More significant capital costs to install new larger water treatment, pumping and storage facilities, and distribution network. – **Score: 4**	– Most significant capital costs to install new larger water treatment, pumping and storage facilities, and distribution network. – **Score: 5**
Relative Operation and Maintenance Costs			
– No additional operation and maintenance costs; however, current facilities are aging and not localized. Existing infrastructure will need replacement over time. – **Score: 2**	– Moderate costs for yearly operations of facilities and upkeep of distribution network. – **Score: 3**	– Greater costs for yearly operations of larger facilities and upkeep of distribution network. – **Score: 4**	– Greatest costs for yearly operations of larger facilities and upkeep of distribution network. – **Score: 5**
Overall Rank			
2	**1**	**3**	**4**

6.1.5 Wastewater system Alternative Solutions Evaluation

Table 6-3: Comparative Evaluation of Wastewater Servicing Alternatives

1. MAINTAIN EXISTING LEVEL OF SERVICE	2. CONSTRUCT NEW WASTEWATER TREATMENT FACILITY AND PROVIDE WASTEWATER SERVICING TO DOWNTOWN LION'S HEAD
Natural Environment	
Surface and Groundwater	
– No construction involved, therefore no impacts; however, degree of private septic bed impacts is unknown. – **Score: 2**	– Installation of new pumping and pipe infrastructure anticipated to reduce impacts by directing wastewater to municipal treatment. – **Score: 1**
Natural Heritage Features/Vegetation	
– No construction involved, therefore no impacts. – **Score: 0**	– Greater impacts to natural environment as new sanitary construction increases, potential along more sensitive habitats to service new development. – **Score: 3**
Climate Change	
– Does not mitigate climate change or provide resilient infrastructure. Service disruption may occur. – **Score: 4**	– New infrastructure designed with climate change resiliency to provide the required Level of Service during severe weather and power outages. – **Score: 1**
Social and Economic Environment	
Existing Infrastructure (Private and Municipal)	
– No construction involved, therefore no impacts. – **Score: 0**	– Conversion from private septic to public system and installation of new sanitary main and forcemain in right-of-way. – **Score: 2**
Aesthetics	
– No construction involved, therefore no impact to the visual appearance of the community. – **Score: 0**	– Establishment of new wastewater treatment and pumping infrastructure within the community - including odour control. – **Score: 2**
Redundancy and Security of Supply	
– Development would be limited by ability to install new septic systems in proximity to existing surface water source and wells. – **Score: 5**	– Increased security to wastewater collection from a maintained and regulated system. – **Score: 1**

Table 6 3: Comparative Evaluation of Wastewater Servicing Alternatives - Continued

1. MAINTAIN EXISTING LEVEL OF SERVICE	2. CONSTRUCT NEW WASTEWATER TREATMENT FACILITY AND PROVIDE WASTEWATER SERVICING TO DOWNTOWN LION'S HEAD
Climate Change	
— Does not mitigate climate change or provide resilient infrastructure. Service disruption may occur. — **Score: 3**	— New infrastructure designed with climate change resiliency to provide the required Level of Service during severe weather and power outages. — **Score: 1**
Technical Suitability	
Existing Capacity	
— Currently existing capacity is at its limits with privately operated septic bed systems which impacts land availability. — **Score: 5**	— New systems are designed to service existing and future capacity requirements. — **Score: 0**
Further Expansion	
— Development would be limited due to lack of municipal wastewater service. Does not address Class EA Problem Statement. — **Score: 5**	— New systems are designed to service the existing and future capacity requirements, however limited to downtown Lion's Head — **Score: 2**
Full Build Out	
— Without municipal wastewater service there will be difficulty with implementing a full build out due to limitations and land availability for privately operated septic bed systems. Does not address the Class EA Problem Statement — **Score: 5**	— Meets the requirements to establish full-build out of the community of Lion's Head, however limited to full-build out only within community boundary. — **Score: 2**
Climate Change	
— Does not provide opportunity to mitigate climate change or provide resilient infrastructure. Service disruption may occur to private systems. — **Score: 5**	— New infrastructure designed with climate change resiliency to provide the required Level of Service during severe weather and power outages. — **Score: 1**

Table 6 3: Comparative Evaluation of Wastewater Servicing Alternatives - Continued

1. MAINTAIN EXISTING LEVEL OF SERVICE	2. CONSTRUCT NEW WASTEWATER TREATMENT FACILITY AND PROVIDE WASTEWATER SERVICING TO DOWNTOWN LION'S HEAD
Constructability	
Ease of Construction and Site Access	
– N/A – **Score: 0**	– Significant impact for construction access within Lion's Head; however, network of roads provide good access to install new sanitary main and forcemain. – **Score: 3**
Operations during Construction	
– N/A – **Score: 0**	– Minor impacts anticipated as private septic systems may be maintained during construction. – **Score: 1**
Ease of Integration with Existing Infrastructure	
– N/A – **Score: 0**	– Minor impacts in Lion's Head since there is limited existing infrastructure within the ground. – **Score: 1**
Climate Change	
– N/A – **Score: 0**	– Minor impacts due to climate change events when construction is carried out during warm-weather months. – **Score: 2**
Cost	
Capital Costs	
– System is currently not established. No construction involved; therefore, no impacts and no capital costs are anticipated. – **Score: 0**	– More significant capital costs to install new wastewater treatment, pumping facilities and forcemain, and collection network. – **Score: 4**
Relative Operation and Maintenance Costs	
– No additional operation and maintenance costs; however, current private systems are aging and municipally owned system will require maintenance. – **Score: 2**	– Moderate costs for yearly operations of facilities and upkeep of collection network. – **Score: 3**
Overall Rank	
2	**1**

7 RECOMMENDED SOLUTIONS

7.1 Water Infrastructure Servicing Options

The preferred alternative is DWS2 - Expand Water to Service New Growth in Lion's Head and Provide Sufficient Volume for Fire Flow. Under this alternative, municipal water servicing is required that meets current and future growth within the considered service area to the year 2051. New infrastructure should be developed in a phased approach to reduce impacts to current water services, and the overall community in general. The recommended infrastructure solutions for municipal water servicing include upgrades to the existing water treatment plant, with adequate water storage to provide for fire flow capacity. The main new infrastructure requirements for municipal water servicing for DWS2 include the following:

- Upgraded existing water treatment plant with 683 m^3/day of Average Day Demand (ADD), 1,708 m^3/day Maximum Day Demand (MDD) and 4,227 m^3/day of MDD + Fire Flow (FF) capacity
- Approximately 2 km of new distribution watermain
- Approximately 20 new fire hydrants
- New water service connections
- New water storage for MDD+FF of approximately 3,683 m^3

7.1.1 Water option 1: Expanded Water Distribution System and Upgraded Existing Water Treatment Plant with New Water Storage On-Site

This option involves upgrading the existing water treatment plant, including increased low lift and high lift pumping. Implementation of water storage (in-ground or elevated) on the existing property to meet MDD+FF storage requirements, and for future expansion as required. The construction of new distribution watermain would be required to service the new properties within the considered service area. High lift pumping at the upgraded water treatment plant will pressurize the water system to meet service requirements for ADD, MDD, PHD and MDD + FF. Existing wells currently utilized within the considered service area, would be decommissioned after new service connections are connected to the operational water system. The upgraded water treatment plant would be optimized for the desired level of treatment for improved operational efficiency.

Refer to Figure 7-1 for general layout of the water system under this option. Final options for review and selection to proceed to design and construction would be subject to the completion of required Municipal Class Environmental Assessments. Preliminary estimated construction costs for this option and phasing is summarized in Section 8.

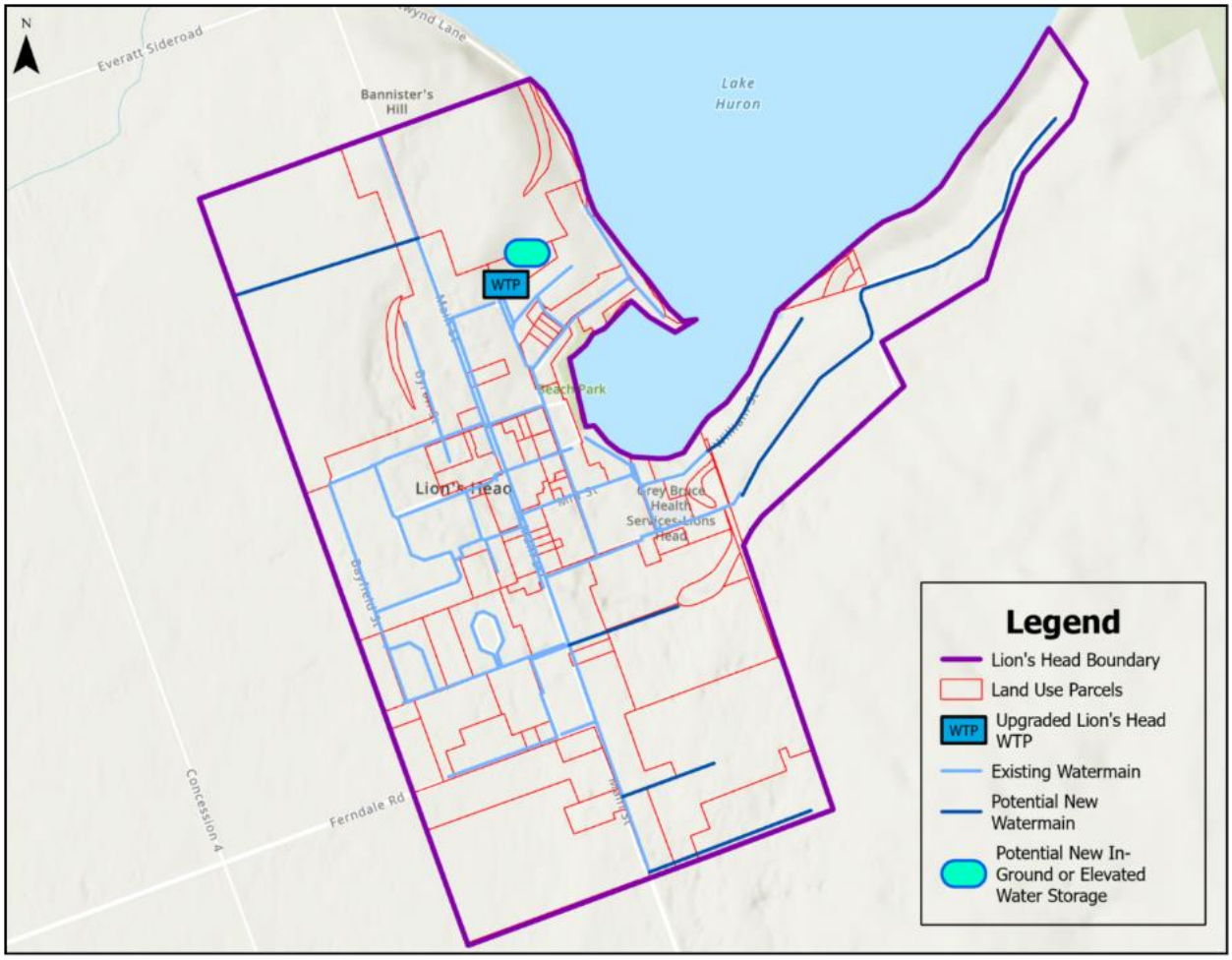

Figure 7-1: Upgraded Existing WTP with On-Site Water Storage

7.1.2 Water Option 2: Expanded Water Distribution System, Upgraded Existing Water Treatment Plant, and New Water Storage on Separate Property

This option involves upgrading the existing water treatment plant, including increased low lift and high lift pumping. Implementation of water storage (in-ground or elevated) would be on a separate property to meet MDD+FF storage requirements, and for future expansion as required. Separate water storage on another property may increase hydraulic performance of the system reducing pumping requirements and providing pressure stabilization. It can also serve as an operational redundancy if there is an

issue with the water treatment plant. However, a separate water storage facility is more difficult to construct due to higher capital costs and land availability (potential purchase of land).

The construction of new distribution watermain would be required to service the properties within the considered service area. High lift pumping at the upgraded water treatment plant will pressurize the water system to meet service requirements for ADD, MDD, PHD and MDD + FF. Existing wells currently utilized within the considered service area, would be decommissioned after new service connections are connected to the operational water system. The upgraded water treatment plant would be optimized for the desired level of treatment for improved operational efficiency.

Refer to Figure 7-2 for general layout of the water system under this option. The location of the water storage shown provided in the figure is an example within the considered service area, that is at a greater elevation compared to the existing water treatment plant location. Final options for review and selection to proceed to design and construction would be subject to the completion of required Municipal Class Environmental Assessments. Preliminary estimated construction costs for this option and phasing is summarized in Section 8.

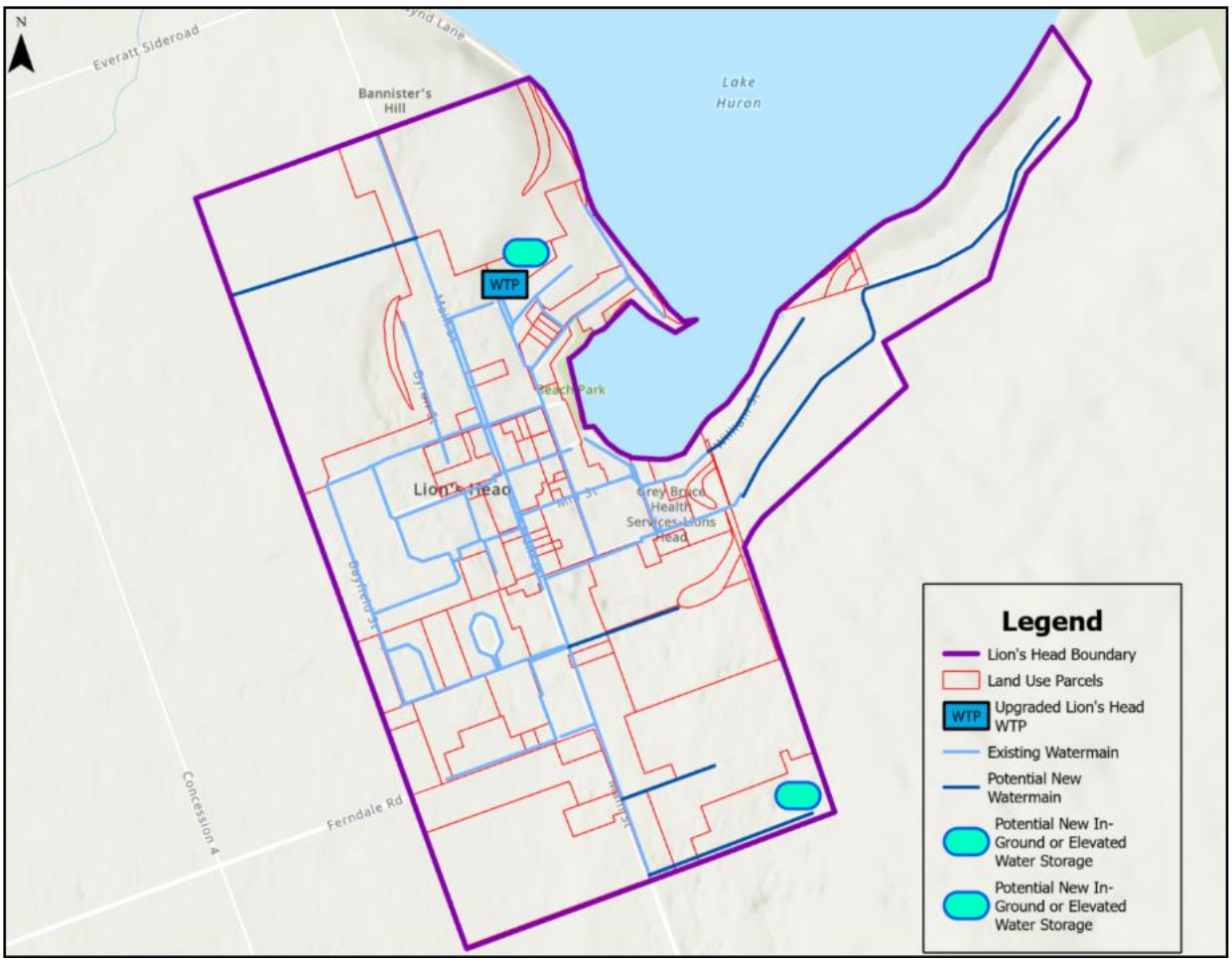

Figure 7-2: Upgraded Existing WTP with Off-Site Water Storage

7.2 Wastewater Infrastructure Options

The preferred is WWS2 – Construct New Wastewater Treatment Facility and Provide Wastewater Servicing to Lion's Head. Under this alternative, a new municipal sanitary collection, pumping and treatment plant would be required that meets current and future growth within the considered service area to the year 2051. New infrastructure should be constructed in a phased approach to reduce impacts to the properties with existing septic systems, and the overall community in general. The recommended infrastructure solutions for municipal wastewater servicing include development of a new wastewater treatment plant and new sanitary pumping station(s). The main new infrastructure requirements for municipal wastewater servicing for WWS2 include the following:

- New wastewater treatment plant with 580 m^3/day Average Day Flow (ADF and Maximum Day Flow (MDF) of 1,596 m^3/day capacity
- New sewage pumping station(s)

— Approximately 8 km of new gravity sewers
— Approximately 80 new manholes
— New sanitary service connections

7.2.1 Wastewater option 1: New Wastewater Collection System and Wastewater Treatment Plant New Lion's Head

This option involves the construction of a new wastewater collection, pumping systems and wastewater treatment plant, to replace existing septic systems at properties within the considered service area.

The ideal location for the new wastewater treatment plant and pumping systems would be centralized within the community, with considerations for land availability to implement this new infrastructure (potential purchase of land) and outfall location and capacity. A primary lagoon treatment facility would be suitable for the quantity of sanitary flow to meet the servicing requirements while the final treatment process would be further reviewed under a future Municipal Class Environmental Assessment.

Refer to Figure 7-3 for general layout of the wastewater system under this option. The location of the wastewater treatment plant, pumping station, and forcemain provided in the figure is an example for reference. Final options for review and selection to proceed to design and construction would be subject to the completion of required Municipal Class Environmental Assessments. Preliminary estimated construction costs for this option and phasing is summarized in Section 8.



Figure 7-3: New Centralized WWTP and New SPS

7.2.2 Wastewater Option 2: Phased Wastewater Treatment Plant Aligned with Demand Growth Outside of Lion's Head

This option involves the construction of a new wastewater collection, pumping systems and wastewater treatment plant, to replace existing septic systems at properties within the considered service area. Option 2 differs from Option 1 in that this option considers pumping sanitary to a wastewater treatment plant located outside of the Lions Head community boundary to a larger property that may permit future expansion. As well, wastewater Option 2 involves construction of a wastewater treatment plant in a phased approach that aligns with demand growth. The initial phase would involve constructing a plant to service the expected Near-Term (5-year) demand. From there, additional phased upgrades would be developed to meet expected demand by 2051. A primary lagoon treatment facility would be suitable for the quantity of sanitary flow to meet the servicing requirements while the final treatment process would be further reviewed under a future Municipal Class Environmental Assessment.

This option offers a lower upfront capital cost, as the ultimate buildout condition won't be met until closer to the required time. The risk of overbuilding the systems would also be reduced. However, a phased expansion approach would require careful planning to meet demands over interim conditions and has a higher risk of being delayed with multiple construction points.

Refer to Figure 7-4 for general layout of the wastewater system under this option. The location of the wastewater treatment plant, pumping station, and forcemain provided in the figure is an example for reference. Final options for review and selection to proceed to design and construction would be subject to the completion of required Municipal Class Environmental Assessments. Preliminary estimated construction costs for this option and phasing is summarized in Section 8.

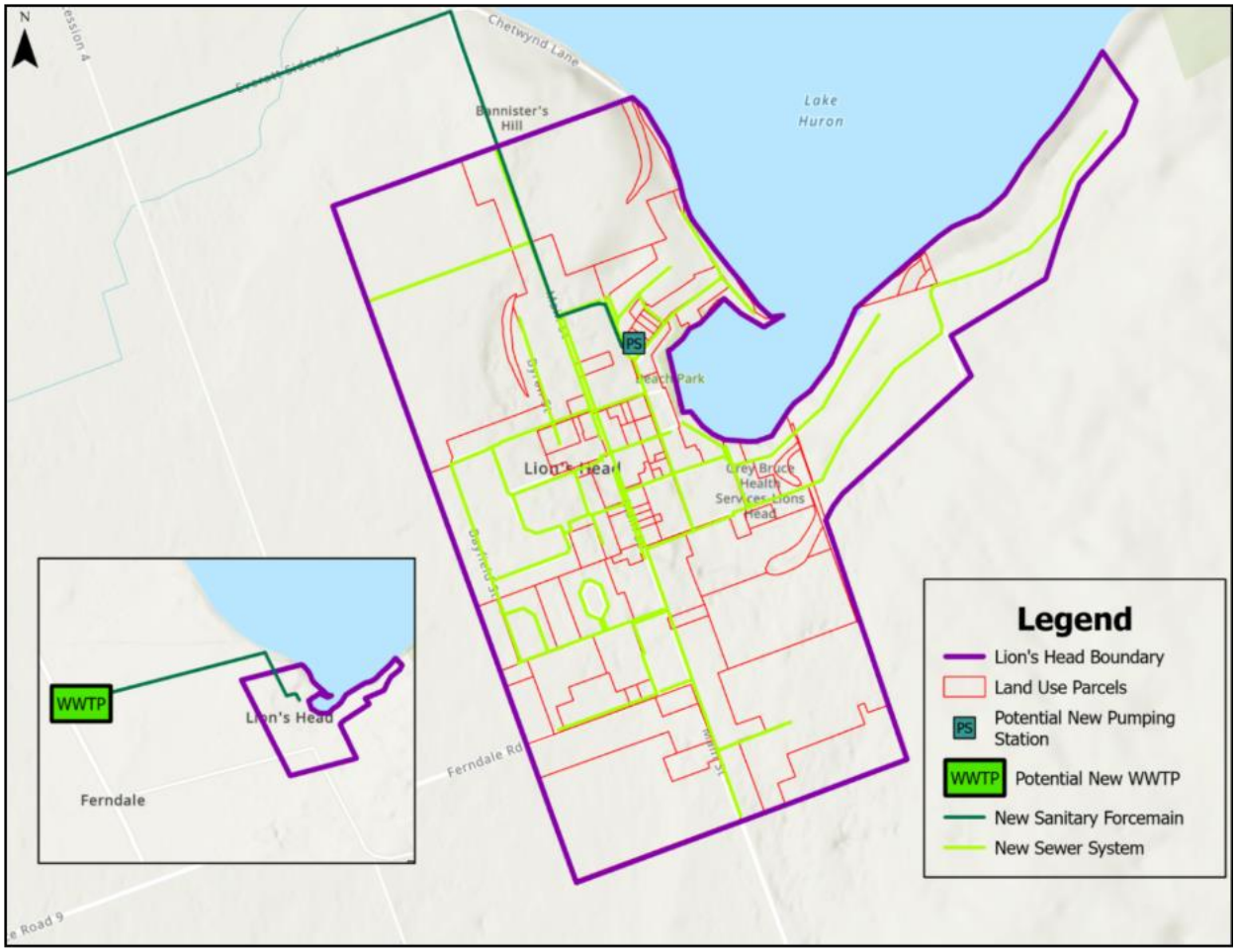

Figure 7-4: New WWTP Located Outside of Community Boundary and New SPS

8 MASTER PLAN IMPLEMENTATION AND PHASING

8.1 Implementation: Projects and Phasing

To implement the preferred servicing alternatives for both water and wastewater servicing, a phased approach to implementation is recommended within the growth horizon, given that further studies and construction would need to be completed concurrently while the system is established. A summary of the high-level project phasing is detailed in Table 8-1.

Table 8-1: Water and Wastewater Phasing Projects

GROWTH YEAR	PROJECTS/STUDIES AND PHASING
Near-Term (5-Years) 2026-2031	Complete Environmental Schedule C Studies for Treatment Facilities Identify Preferred Infrastructure Servicing Options Property Acquisition (as required) Start to Facility Construction. (water and wastewater) Initial Build-out of watermains and sewers to existing residents and businesses. (500m – 1km of piping) New SPS Forcemain (1.5km of piping)
Mid-Term (10-Years) 2031-2036	Construction/Expansion of New Facilities Completion Phased Build-out of watermains and sewers prioritizing short-term growth and connection to existing residents and businesses. (2 additional linear kilometers of piping) Update to Master Servicing Plan (Update to growth projections and refined service area.)
Long-Term (20-Years) 2036-2046	Continue Construction Phased Build-Out of Water Distribution Network and Wastewater Collection System. (2 additional linear kilometers of piping) Phased planned expansion of facilities (as applicable)
Future Long-Term (25-Years) 2046-2051	Construction and phased build-out of remaining water distribution network and wastewater collection system. (2 additional linear kilometers of piping) Update to Master Servicing Plan (Update to growth projections and refined service area.)

8.1.1 Water Projects

The water treatment plant would need to be upgraded based on the selection of water storage requirements prior to distribution system being expanded for fire flow servicing within 10 years. Additionally, there will be approximately 2 km of new watermain pipe to be installed to service a fully established water distribution network with installation of approximately 20 new fire hydrants and new water service connections. It's anticipated that construction of watermain would be phased over the full growth horizon of 25 years in order to service the projected population.

8.1.2 Wastewater Projects

Wastewater infrastructure servicing options includes development of a new dedicated Wastewater Treatment Plant either within the community or at a new location outside, which will receive flow from Lion's Head via a new centralized pumping station sized to convey average day and peak flow. The treatment plant would need to be phased in development to receive existing sanitary within the next 10 years. The treatment type and location would need to be reviewed and selected through a dedicated Municipal Class Environmental Assessment.

Additionally, there will be build-out of a new sewer collection network of approximately 8 km of new sanitary gravity sewer to be installed to service the town with approximately 80 maintenance holes. It's anticipated that construction of sanitary sewer would be phased over the full growth horizon of 25 years in order to service the projected population.

8.2 Cost Estimation Summary

The following Table 8-2 and Table 8-3 summarize the projected capital project opinion of probable costs in current 2026 dollars which provide insights on the order-of-magnitude costs for comparison purposes only. Refer to **Appendix E** for a detailed breakdown of costs and a summary of assumed project elements. Its to be noted that other cost considerations for operations and engineering studies are not included in the summary.

Table 8-2: Water System Projects Capital Costs

	Project	Year Required	Opinion of Probable Cost (2026$)	Class EA Schedule
Option 1- Expanded Water Distribution System and Upgraded Existing Water Treatment Plant with New Water Storage On-Site	Part A – Facilities	2031	$22.5 million	Schedule C
	Part B – Watermain	2031-2046	$9 million	Exempt
	Part C - Intakes	2031	$0.6 million	Schedule C
Option 2 – Expanded Water Distribution System, Upgraded Existing Water Treatment Plant, and New Water Storage on Separate Property	Part A – Facilities	2031	$24.75 million	Schedule C
	Part B – Watermain	2031-2046	$11 million	Exempt
	Part C – Intakes	2031	$0.6 million	Schedule C

Table 8-3: Wastewater System Projects Capital Costs

	Project	Year Required	Opinion of Probable Cost (2026$)	Class EA Schedule
Option 1- New Centralized WWTP within Lions Head	Part A – Facilities	2031	$45 Million	Schedule C - WWTP Schedule B – Pumping Station
	Part B – Gravity Sewer	2031-2046	$20.25 million	Exempt
	Part C - Forcemain	2031	$0.9 million	Schedule B – Pumping Sation
Option 2 – New Phased WWTP Outside of Lions Head	Part A – Facilities	2031	$34.75 million	Schedule C - WWTP Schedule B – Pumping Station
	Part B – Gravity Sewer	2031-2046	$20.25 million	Schedule B
	Part C - Forcemain	2031	$5.75 million	Schedule B

9 CLOSURE

The Master Plan was developed to identify a preferred strategy to provide accessible and reliable drinking water and wastewater services in Lion's Head, meeting current and future needs to 2046 and beyond. The Master Plan serves as the basis for, and support of, future infrastructure projects as identified through the study. The Master Plan takes into consideration climate change and social and economic impacts, as well as current limitations to growth in Lion's Head, given the existing infrastructure. Background reports and relevant legislation/regulations were reviewed as part of the Master Plan process.

To assess water infrastructure needs, the Master Plan included an examination of existing water demands, potential future water demands, and treatment and storage capacity. To assess wastewater infrastructure needs, the Master Plan an examination of existing sewage flows, potential flows, and pumping and treatment capacity. An analysis of existing population and projected future growth was undertaken for both water and wastewater to understand future infrastructure requirements.

An 'Evaluation Matrix' was completed to evaluate alternative solutions for resolving identified gaps in existing water and wastewater infrastructure in Lion's Head. The evaluation matrix was applied to objectively assess the impacts and identify the preferred solutions.

9.1 Additional Studies

Approach No.1 of the MCEA process for Master Plans recognizes that it does not fulfill the necessary requirements for Schedule B and C projects identified. Future environmental assessments and associated technical investigations through separate studies will be required to be completed to meet the applicable MCEA requirements prior to detailed design and construction. Schedule B projects would require the filing of the Project file for public review while Schedule C projects would have to fulfil Phases 3 and 4 prior to filing an Environmental Study Report (ESR) for public review.

9.2 Master Plan Approval and Completion

The Master Plan will be approved for implementation subject to adoption by the Council of the Municipality.

The following are required to be completed to finalize the Municipal Class Environmental Assessment process:

- Address remaining comments from Municipal staff, Council and OCWA.
- Final Public Notice (Notice of Master Plan) for Master Plan completion would be circulated to local Indigenous communities, stakeholders, and agencies via email, and posted in local newspapers and on the Municipal project website.
- Master Plan posted for public comment on the municipal project website.
- Finalize the Master Plan.
- Final Council approval of the Master Plan.

9.3 Recommendations

Section 7.0 of the Master Plan provides documentation on the recommended solutions and potential options identified for water and wastewater projects. High level project phasing and projected capital probable costs are discussed in Sections 8.0 and 9.0.

It is recommended that the Master Plan be reviewed on a regular basis to evaluate the accuracy of key assumptions (e.g. the rate of growth), confirm the continued suitability of the preferred solutions, and ensure investing aligns with actual growth in coordination with Municipal and Regional Official Plans. The Master Plan should also be updated as required to address any significant changes in the environmental setting and/or local conditions, taking into account the views of residents, Indigenous communities, municipal council and staff, agencies and others to assist in informing its direction.

In parallel, a growth monitoring process, implemented by the Municipality, could provide a reliable method to track development activity, reassess servicing capacity, and to ensure continued alignment with Municipal and Regional infrastructure planning with local growth strategies.