Lake Huron Primary Water Supply System

Water Master Plan

60730329

December 2025

Lake Huron
Primary Water Supply System

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AECOM: 2015-04-13

Authors

Report Prepared By:

Paul Adams, CPT.
Environmental Planner

Vincent Tsang, P.Eng
Hydraulic Analysis Modeller

Dylan Devito
Process Engineer-In-Training

Report Reviewed By:

Benny Wan, P.Eng., M.Sc.
Senior Hydraulic Analysis Modeller

Karl Grueneis, B.A
Senior Environmental Planner

Prepared for:

Lake Huron Primary Water Supply System

235 North Centre Road, Suite 200

London ON, N5X 4E7

Prepared by:

Paul Adams, CPT

AECOM Canada Ltd.
410 – 250 York Street, Citi Plaza
London, ON N6A 6K2
Canada

T: 519.673.0510
F: 519.673.5975
www.aecom.com

Distribution List

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	✓	Lake Huron Primary Water Supply System
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Executive Summary

In 2024, Lake Huron Primary Water Supply System ("the Utility") initiated a Master Plan process to guide the water supply system's future water servicing strategy through a comprehensive infrastructure planning approach. The process involved extensive consultation and engagement with the public, key agencies, water system community members and Indigenous communities. The Master Plan is a detailed infrastructure planning study which provides a plan for achieving sustainable utility management for the Lake Huron Primary Water Supply System over the twenty-year planning horizon. The Master Plan process has been undertaken to determine the potential challenges in meeting the future water demands and strategy options to overcome these challenges

The geographical service area includes the City of London, Municipality of Lambton Shores, Municipality of South Huron, Municipality of Bluewater, Municipality of Middlesex Centre, Township of Lucan-Biddulph, Municipality of North Middlesex and the Municipality of Strathroy-Caradoc in addition to the soon to be added Oneida Nation of the Thames. Refer to **Figure ES.1**.

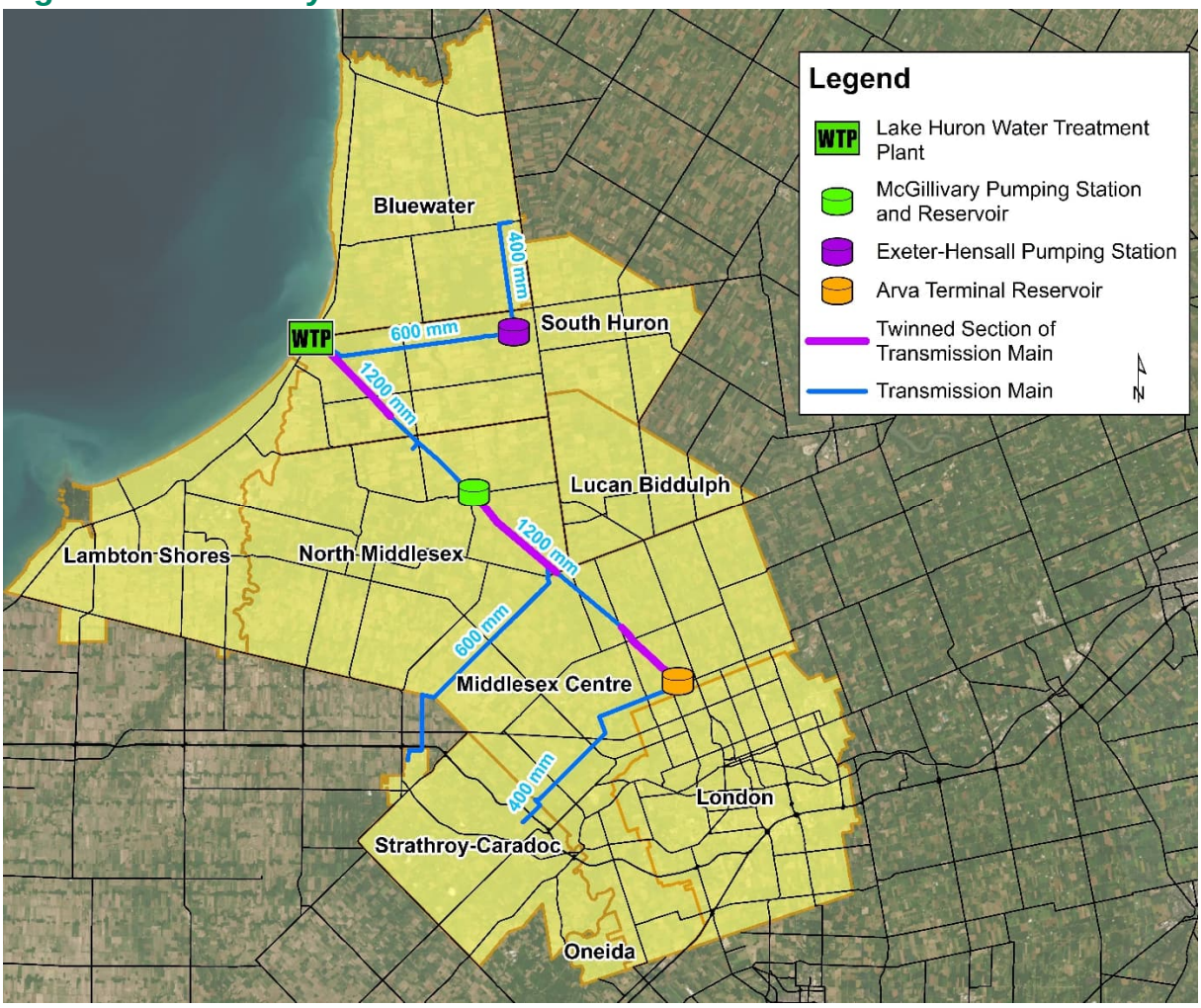
Environmental Assessment Process

The Master Plan has been completed as set out in the Municipal Engineers Association Municipal Class Environmental Assessment document (as amended in February 2024).

The Lake Huron Primary Water Supply System Master Plan followed Approach 1 under the Municipal Class Environmental Assessment and satisfies Phase 1 and Phase 2 of the Municipal Class Environmental Assessment process. This approach is particularly suited for long-term planning, where decisions impacting water supply must address a range of servicing alternatives in an organized and strategic manner. The Master Plan identifies the best overall infrastructure servicing solutions to be implemented over the 20-year planning horizon, extending to 2046.

To conclude Phase 2 of the Municipal Class Environmental Assessment process, the Master Plan report has been made available for public review on the Elgin Area Primary Water Supply System website, accompanied by the issuance of the Municipal Class Environmental Assessment Notice of Master Plan.

Figure ES.1 – Study Area



Problem and Opportunity Statement

To meet Phase 1 of the five-phase Municipal Class Environmental Assessment planning process, the following Problem and Opportunity statement was developed and utilized for guiding the development of the Master Plan:

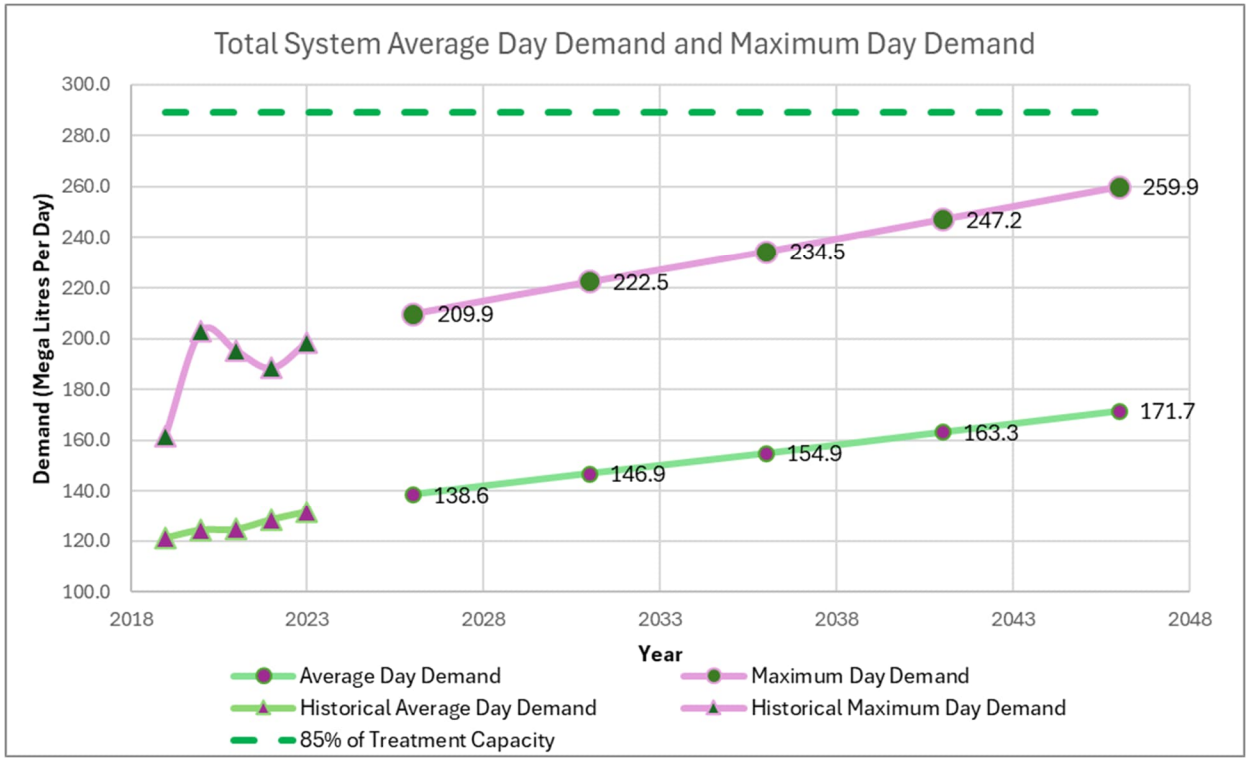
- The growth in water demands forecast for the 2046 planning horizon requires review and assessment of the system's capacity and required investment for the sustainability and reliability of the Utility's treatment, pumping, and transmission infrastructure.
- Develop and assess a range of water system strategies considered to support existing servicing and account for reasonably expected near, mid, and long-term future growth projections, including servicing to new communities.
- Develop a recommended investment strategy for the near, mid, and long-term future growth projections that will support future infrastructure planning and budgeting.

- Consult benefitting communities, the public, Indigenous communities, agencies, and other interested parties, through the development of the Plan to identify the preferred alternatives that best meet long-term needs of the Utility.
- Determine operational challenges based on the system hydraulics review related to projected future demands and growth-related requirements for treatment, pumping, transmission infrastructure.
- Review and confirm the Utility's operational storage needs.
- Assess primary transmission pipeline redundancy, including the approximate nineteen kilometres of non-twinned transmission main, and investigate alternative solutions to facilitate redundancy.
- Review and assess pressure control infrastructure to mitigate excessive and transient pressure incidents related to projected future demands and growth-related requirements.
- Review opportunities to enhance energy efficiency, conservation, and recovery across the system.
- Review the impacts of climate change on the Utility's infrastructure and assess mitigation and adaptation opportunities in alignment with the Utility's framework.
- Ensure alignment with and continuity between the Plan and the Utility's other guiding plans including the Asset Management Policy and Plan, Financial Plan, Operational Plan, and various management systems.

Water Demand Growth Forecasts

To estimate the projected water supply needs, surveys were sent to all members municipalities to understand their anticipated growth. The collected growth information was assessed/analyzed/reconciled and used to estimate the projected water demand for the Lake Huron Primary Water Supply System. Consultation with other communities not currently supplied by the Utility were also completed; their demands were excluded from the projections presented in the Master Plan. **Figure ES.2** presents the projected water demand applied in the Master Plan.

Figure ES.2 – Total System Average Day Demand and Maximum Day Demand



Based on the above forecasted demands, the Lake Huron Water Treatment Plant's current rated capacity of 290 Million Liters per day, it was determined that an expansion of the plant beyond the rated capacity is not required within the planning horizon.

Recommended Solution

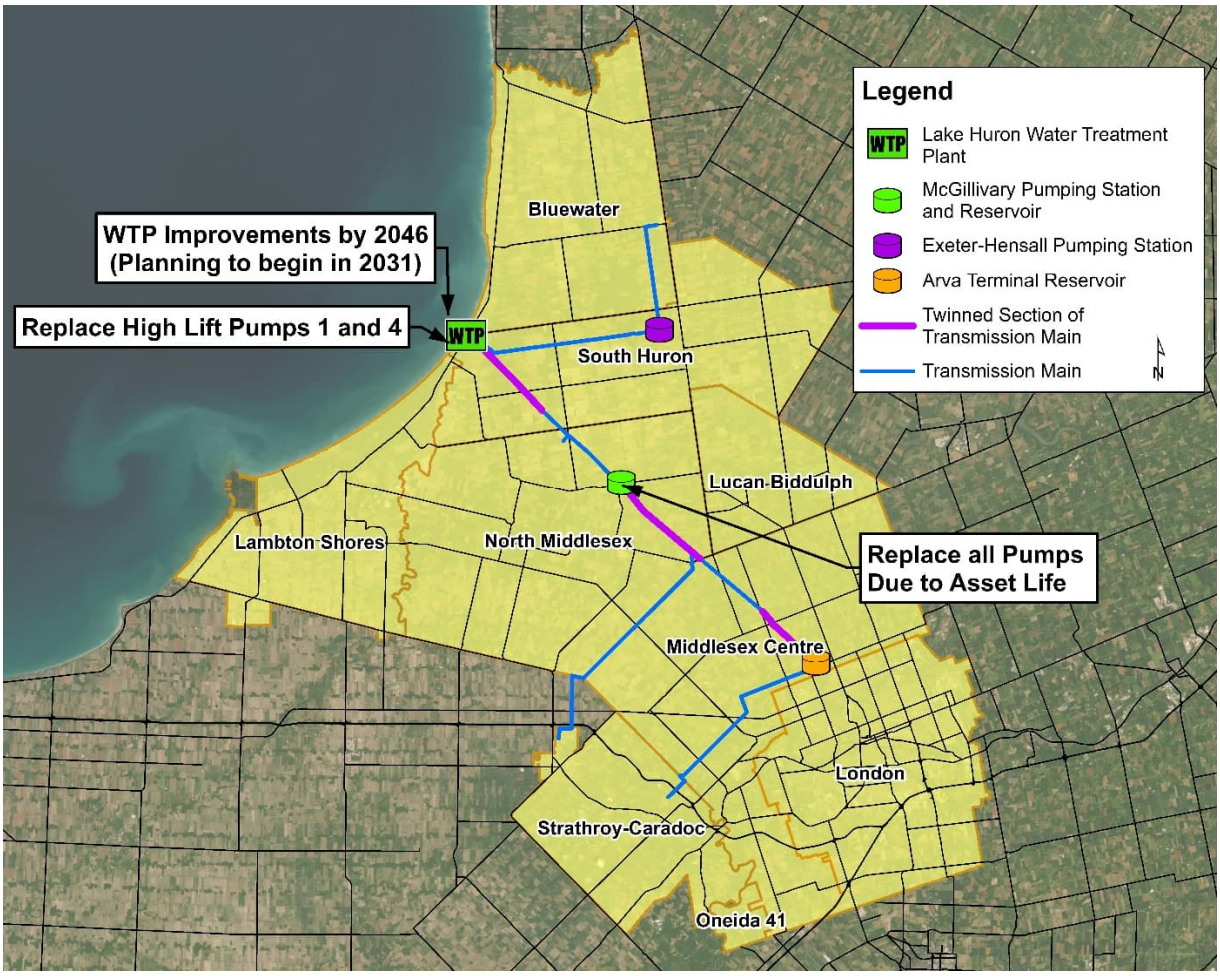
Through the environmental assessment process, it was determined that Alternative 4A – Optimizing and Upgrading the Existing System with New Infrastructure is the recommended Water Servicing Alternative. **Figure ES.3** provides an overview of the recommended system improvements which include:

- **Treatment**
  - Flocculation upgrades
  - Clarifier capacity expansion
  - Filter and backwash upgrades
  - Ultraviolet disinfection
  - Tank/channel rehabilitations
- **Pumping**
  - Pump replacement of two treatment plant high lift pumps

- Pump replacement of all McGillivray pumps
- Surge valve upgrade in McGillivray Reservoir

- **Transmission**
  - Selected transmission mains replacement through proactive program
  - Chamber flood protection and rehabilitations
  - Air release valve replacements
- **Storage**
  - Tank rehabilitations

Figure ES.3 - Recommended Water System Improvements for Lake Huron Primary Water Supply System



Tables ES.1 summarizes the Recommended Improvements and costs for implementation (Prices in 2025 Millions of Canadian Dollars).

Tables ES.2 summarizes the Recommended Studies and costs for implementation (Prices in 2025 Thousands of Canadian Dollars).

Tables ES.3 summarizes the Planned/Scheduled Studies and costs for implementation (Prices in 2025 Thousands of Canadian Dollars).

Table ES.1: Recommended Improvements

All Prices in Millions of Canadian Dollars (2025) – Class E Estimate

Project Type	Project	Class Environmental Assessment Schedule Requirement	Cost for 2026-2031	Cost for 2031-2036	Cost for 2036-2041	Costs for 2041-2046
Treatment	Clarifier Capacity Expansion and Flocculation Upgrades**	Exempt	0	0	0	70
Treatment	Filter and Backwash Upgrades **	Exempt	0.1	0	50	25
Treatment	Ultraviolet Disinfection **	Exempt	0	50	0	0
Treatment	Treatment Plant Tank and Rehabilitations	Exempt	0	0	0	4
Treatment	Lake Huron Water Treatment Plant – High Lift Pumps 1 and 4 Replacement	Exempt	0	8	0	0
Transmission	McGillivray Pumping Station- Surge Valve Upgrade	Exempt	1	0	0	0
Transmission	McGillivray Pumping Station- Booster Pumps Replacements	Exempt	0	16	0	0
Transmission	Transmission Main Replacement Program	Exempt	1.5	1.5	1.5	1.5
Transmission	Chamber Flood Protection and Rehabilitations	Exempt	2	0	0	0
Transmission	Combination Air Valve Replacements	Exempt	2	0	0	0

Project Type	Project	Class Environmental Assessment Schedule Requirement	Cost for 2026-2031	Cost for 2031-2036	Cost for 2036-2041	Costs for 2041-2046
Storage	Storage Tank Rehabilitations	Exempt	0	0	0	4

** Dependent upon feasibility study

Table ES.2 - Recommended Studies

All Prices in Thousands of Canadian Dollars (2025) – Class E Estimate.

Study Area	Study	Cost For 2026 - 2031	Cost For 2031 - 2036	Cost For 2036 - 2041	Cost For 2041 - 2046
Treatment	Optimization of Coagulant Dosing Strategy	300	0	0	0
Treatment	Polymer Upgrades	800	0	0	0
Treatment	Taste and Odour Management Strategy	250	0	0	0
Treatment	Feasibility Study for Flocculation and Clarifier Capacity Upgrades	100	0	0	0
Treatment	Feasibility Study for Filter Capacity Upgrades	100	0	0	0
Treatment	Disinfection Feasibility Study	150	0	0	0
Transmission	Transient Hydraulic Modelling Studies for Secondary Transmission Mains	150	0	0	0
Transmission	Transient Hydraulic Modelling Update for McGillivray Pumping Station	100	0	0	0

All studies are subject to business case and risk/opportunity reviews undertaken by the Lake Huron Primary Water Supply System.

Table ES.3: Other Scheduled/Planned Studies

All Prices in Thousands of Canadian Dollars (2025) – Class E Estimate

Study Area	Study	Cost For 2026 - 2031	Cost For 2031 - 2036	Cost For 2036 - 2041	Cost For 2041 - 2046
All	Master Plan Update	150	150	150	150
All	Financial Plan Update	120	120	120	120
All	Climate Change Resilience and Adaptation Plan	0	80	80	80
All	Asset Management Plan Update	250	250	250	250
All	Ongoing Condition Assessments	300	300	300	300
All	50 Year Roadmap Study and Updates	250	25	100	25
All	Energy Audit and Pumping Optimization Update	0	200	0	200
All	System Reliability and Redundancy Review	150	0	150	0
All	Water Loss Review	50	0	50	0
Treatment	Water Quality Facility Plan Update	250	250	250	250
Treatment	Stress Testing	50	50	50	50
Transmission	Lake Huron Primary Water Supply System Hydraulic Model Update and Calibration	150	150	150	150
Transmission	Transient Hydraulic Modelling Update	0	0	250	0
Transmission	Ongoing Monitoring of Primary Transmission Mains	3000	3000	3000	3000

All studies subject to business case and risk/opportunity reviews undertaken by the Lake Huron Primary Water Supply System.

Engagement

Community engagement has been undertaken, and included:

- Notices of Commencement and Public Information Centre and a Notice of Master Plan.
- A Public Information Centre was held virtually at 6:00pm on June 18, 2025.

- Indigenous communities and various organizations and agencies were notified as part of the Municipal Class Environmental Assessment consultation process that included issuance of all notifications (e.g., study commencement and Public Information Centre notices). Local Indigenous communities and organizations were also offered the opportunity to meet to confirm their interests in the Master Plan process and how they would like to be engaged.
- Adjacent communities that are not currently serviced by the Lake Huron Primary Water Supply System were provided with the Notice of Commencement and an accompanying letter (with a survey link) to understand potential future supply needs.

Conclusion

The Master Plan Report outlines the process required to ensure that the proposed recommended solutions to the problem and opportunity statement meet the requirements of the *Environmental Assessment Act*.

The proposed projects resolve the problem and opportunity statement identified in this report. A preliminary evaluation of potential impacts has been included in the evaluation, which indicates minor and predictable impacts that can be addressed.

Appropriate public notification and an opportunity for comment was provided and no comments were received that could not adequately be addressed. Subject to receiving Municipal Class Environmental Assessment finalization following the 30-day review period, the Utility can start the detailed design and permitting-approvals phase for the projects according to the timing outlined in this report.

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Appendix B. Background Information / Technical Memorandum

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B.4 Potential New Customers

Glossary of Terms

Potable Water: Water that is safe to drink and meets the health-based quality standards for human consumption.

Transmission Main: A large-diameter pipe that carries water from a water source (like a treatment plant or reservoir) to the benefitting community's distribution system.

Secondary System: Watermains that are owned by the primary water supply system that directly branch off of the primary transmission main or discharge from a secondary pumping station.

Raw Water: Untreated water sourced directly from the lake that will be transported to the treatment plant.

Low Lift Pump: A high-volume low-pressure pump that moves large volumes of water from the source such as the Raw water intake at the lake to the treatment plant.

High Lift Pump: High pressure pump that discharges water into the transmission mains.

Rated Capacity: The maximum volume of water that a treatment plant is allowed to treat per day.

Treatment Capacity: The maximum volume of water per day that a treatment plant can treat under its existing design parameters.

LHPWSS: Lake Huron Primary Water Supply System

EAPWSS: Elgin Area Primary Water Supply System

LHWTP: Lake Huron Water Treatment Plant

LHTM: Lake Huron Transmission Main

LH HLPS: Lake Huron High Lift Pumping Station

MPS: McGillivray Pumping Station

EHPS: Exeter-Hensall Pumping Station

EHTM: Exeter-Hensall Transmission Main

KMPS: Komoka-Mount Brydges Pumping Station

KMTM: Komoka-Mount Brydges Transmission Main

SCTM: Strathroy-Caradoc Transmission Main

ATR: Arva Terminal Reservoir

MR: McGillivray Reservoir

EHR: Exeter-Hensall Reservoir

MCEA: Municipal Class Environmental Assessment

MECP: Ministry of Environment, Conservation and Parks

Average Day Demand (ADD): The average daily water usage within a year.

Maximum Day Demand (MDD): The average water usage on the day that the daily water consumption is the highest.

Maximum Week Demand (MWD): The highest average daily water demand within a one-week period in a given year.

Peak Hour Demand: The highest water consumption during any single hour within a 24-hour period

Mega Liters: Equivalent to Million Liters

(ML/d): Million Liters per Day

(L/c/d): Liter per Capita per Day

(L/s): Liter per Second

(m/s): Meter per Second

(ft/s): Feet per Second

(km): Kilometer

(m): Meter

(ft): Feet

(in): Inch

(mm): Millimeter

(kg): Kilograms

(mg): Milligrams

(kg/d): Kilograms per Day

(mg/L): Milligrams per Liter

(psi): Pound per square inch

(kPa): Kilopascal

(TDH): Total dynamic head

1. Introduction

1.1 Background

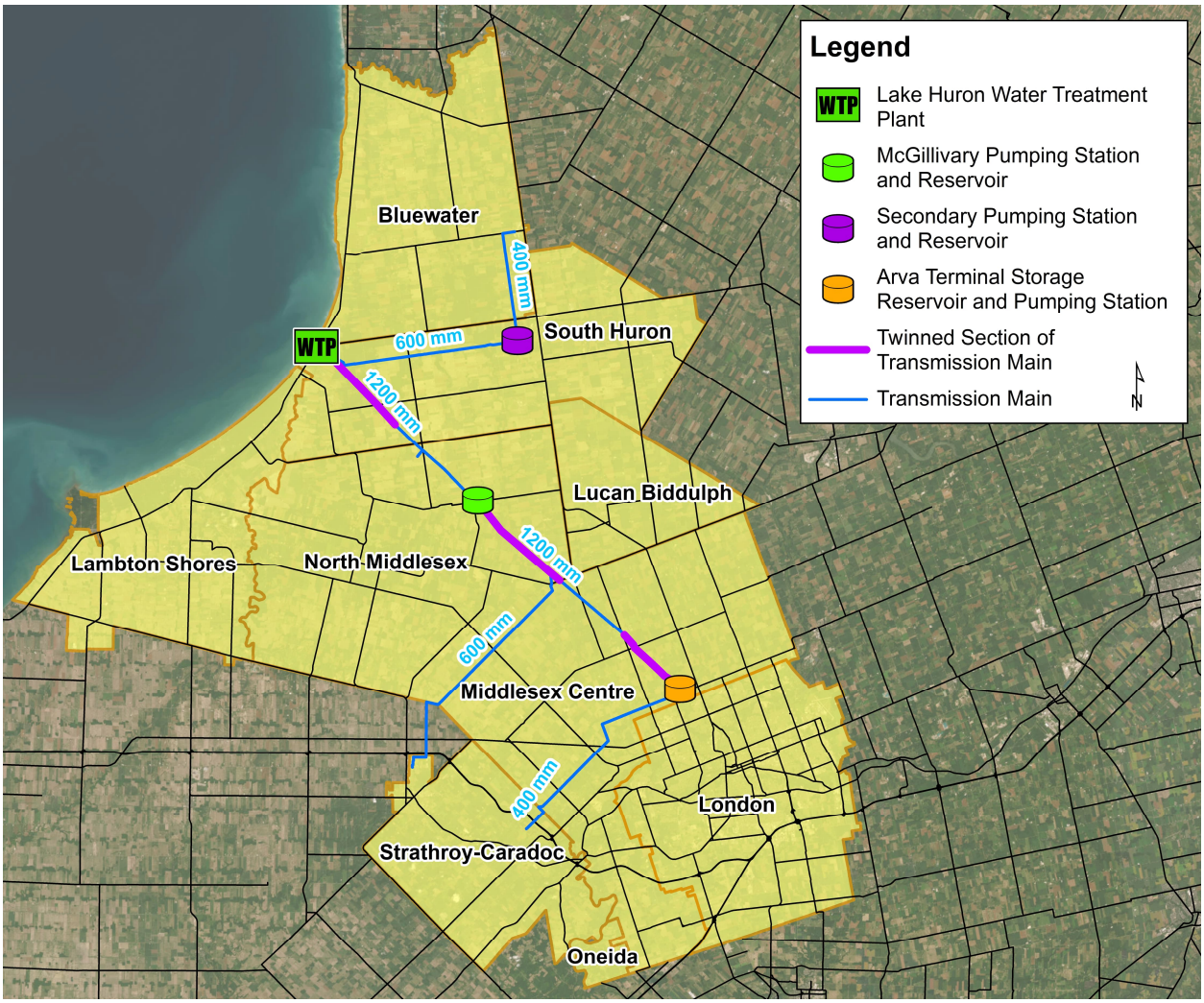
The Lake Huron Primary Water Supply System ('the Utility') is a regional water supply utility that delivers drinking water to benefitting communities within its geographical service area, including the City of London, Municipality of Lambton Shores, Municipality of South Huron, Municipality of Bluewater, Municipality of Middlesex Centre, Township of Lucan-Biddulph, Municipality of North Middlesex and the Municipality of Strathroy-Caradoc in addition to the soon to be added Oneida Nation of the Thames (Refer to **Figure 1-1**). Under the Provincial Transfer Order of 2000, the Utility is required to prepare a Master Plan (Plan) for the system, forecasting future investment and expansion requirements over a twenty-year planning period. This Plan is updated on a five-year planning cycle. The Utility's current Plan was completed in 2020 and accordingly is due to be updated to assess system growth and infrastructure needs. This ensures the Lake Huron Primary Water Supply System is a data-driven, sustainable, and future-ready utility that continues to provide safe and reliable drinking water to current and future communities.

The Utility retained AECOM Canada ULC to prepare a Master Plan to develop and assess a range of water servicing strategies to accommodate near, mid and long-term future growth, while maintaining the reliability and sustainability of the Utility.

This Master Plan has been undertaken with a broad scope and level of assessment that enables the Utility to identify needs and establish infrastructure alternatives and solutions. Specific projects identified within the Master Plan, that are required to achieve the preferred solution, may require more detailed investigations at the project specific level in order to fulfill the Municipal Class Environmental Assessment requirements (Schedule B and C projects) identified within the Master Plan.

This Master Plan addresses the requirements of the first two phases of the Municipal Class Environmental Assessment (February 2024), which is approved under the *Ontario Environmental Assessment Act*.

Figure 1-1: Study Area and Existing System



1.2 Study Purpose and Objectives

The purpose of this Master Plan study is to provide a comprehensive and environmentally sound planning process, which is open to public participation and to identify capital infrastructure projects and upgrades needed to provide sustainable water servicing to accommodate service areas and future growth to the 2046 planning horizon.

The objectives of this study include:

- Provide an opportunity to identify water supply issues within the existing Lake Huron Primary Water Supply System.
- Provide strategies to address water servicing needs of the Utility.
- Consult with interested agencies, Indigenous communities, and the public.

- Identify strategies that can address water system issues.
- Provide a 'suite' of projects that will address identified water system needs. This list will include required future studies (i.e. Schedule B or C projects), estimated costs and implementation timing and triggers.
- Prepare a Master Plan report that documents the consultation process followed and satisfies Phases 1 and 2 of the Municipal Class Environmental Assessment planning process.

1.3 Study Team Organization

To address all aspects of the environment, the full range of technical issues, and the requirements of the Master Plan process, this study was carried out by a project team consisting of staff from the Utility and AECOM. Key members of the project team included the following individuals listed in **Table 1-1**.

Table 1-1: Study Team

Lake Huron Primary Water Supply System	AECOM Canada Ltd.
Marcy McKillop – Environmental Services Engineer **Ryan Armstrong –** Asset Management Coordinator **Andrew Henry –** Director **Billy Haklander –** Senior Manager – Capital Programs **John Walker –** Operations Manger **Erin McLeod –** Quality Assurance & Compliance Manger	**Neil Awde** – Project Director **Benny Wan** – Project Manager **Karl Grueneis –** Senior Environmental Planner **Paul Adams** – Environmental Planner **Vincent Tsang** – Hydraulic Modelling Engineer **Matt Simons** – Process Engineer

2. Planning Process

2.1 Municipal Class Environmental Assessment Process

The Utility is subject to the provisions of the Environmental Assessment Act and its requirements to prepare an Environmental Assessment for applicable public works projects. The Ontario MEA "Municipal Class Environmental Assessment" document (February 2024) provides municipalities with a five-phase planning procedure, approved under the Environmental Assessment Act, to plan and undertake all municipal sewage, water, storm water management and transportation projects that occur frequently, are usually limited in scale and have a predictable range of environmental impacts and applicable mitigation measures.

In Ontario, infrastructure projects such as improvements to the Lake Huron Primary Water Supply system are subject to the Municipal Class Environmental Assessment process and must follow a series of steps as outlined in the Municipal Class Environmental Assessment guide. The Municipal Class Environmental Assessment consists of five phases as summarized below:

- ***Phase 1 – Problem or Opportunity:*** Identify the problems or opportunities to be addressed and the needs and justification.
- ***Phase 2 – Alternative Solutions:*** Identify alternative solutions to the problems or opportunities by taking into consideration the existing environment and establish the preferred solution(s) considering public and agency review and input.
- ***Phase 3 – Alternative Design Concepts for the Preferred Solution:*** Examine alternative methods of implementing the preferred solution based upon the existing environment, public and agency input, anticipated environmental effects and methods of minimizing negative effects and maximizing positive effects.
- ***Phase 4 – Environmental Study Report (ESR):*** Document in an ESR, a summary of the rationale, planning, design and consultation process for the project as established through Phases 1 to 3 above and make such documentation available for scrutiny by review agencies and the public.
- ***Phase 5 – Implementation:*** Complete contract drawings and documents, proceed to construction and operation, and monitor construction for adherence to environmental provisions and commitments. Also, where special conditions dictate, monitor the operation of the completed facilities.

The Municipal Class Environmental Assessment process ensures that all projects are carried out with effectiveness, efficiency and fairness. This process serves as a mechanism for understanding economic, social and environmental concerns while implementing improvements to municipal infrastructure.

2.1.1 Project Planning Schedules

The Municipal Class Environmental Assessment defines three types of projects and the processes required for each (referred to as Exempt (Formerly Schedule A, A+), Schedule B, or Schedule C). The selection of the appropriate schedule is dependent on the anticipated level of environmental impact, and for some projects, the anticipated construction costs. Projects are categorized according to their environmental significance and their effects on the surrounding environment. Planning methodologies are described within the Municipal Class Environmental Assessment and are different according to the class type, as described below.

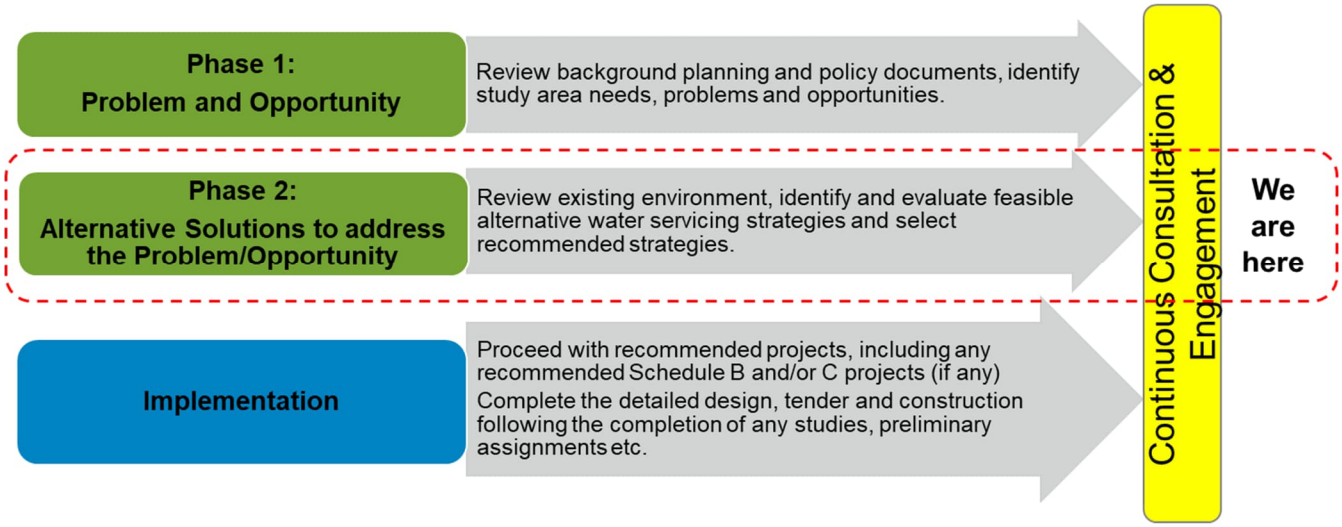
Exempt (Formerly Schedule A and A+): Projects are limited in scale, have minimal adverse environmental effects, and include a number of municipal maintenance and operational activities. These projects are exempt from the Municipal Class Environmental Assessment planning process.

Schedule B: These projects have the potential for some adverse environmental effects. The proponent is required to undertake a screening process (Phases 1 and 2), involving mandatory contact with directly affected public, Indigenous communities and with relevant review agencies to ensure they are aware of the project and that their concerns are addressed. If there are no outstanding concerns, then the proponent may proceed to implementation. At the end of Phase 2, a Project File Report documenting the planning process followed through Phases 1 and 2 shall be finalized and made available for public and agency review. Indigenous communities have the opportunity to submit a Section 16 Order request to the Minister of Environment, Conservation and Parks. Review agencies, community partners and the public may also raise concerns to the Minister (refer to Section **2.1.4** of this Report).

Schedule C: Such projects have the potential for significant adverse environmental effects and must proceed under the full planning and documentation (Phases 1 to 4) procedures specified in the Municipal Class Environmental Assessment document. Schedule C projects require that an Environmental Screening Report be prepared and filed for review by the public and review agencies.

This Master Plan Report has been prepared and will be made available for a minimum 30-day review period. **Figure 2-1** illustrates the process followed for the Lake Huron Primary Water Supply System Master Plan Municipal Class Environmental Assessment.

Figure 2-1: Municipal Class Environmental Assessment Planning Process



2.1.2 Municipal Class Environmental Assessment Master Planning Process

The Ontario Municipal Engineers Association Municipal Class Environmental Assessment Manual recognizes that, in many cases, it is beneficial to utilize the master planning process for projects which have common elements, looking at the overall infrastructure system rather than dealing exhaustively with project specific issues. The Utility has utilized this approach in preparation of this Master Plan study as the project:

- *Has a broad scope and includes an analysis of several infrastructure systems rather than a site-specific problem.*
- *Recommends a set of works which are distributed geographically throughout the study area, some of which may be implemented over a period of time.*

By planning in this way, the need and justification for individual projects and the associated broader context are better defined.

The Municipal Engineers Association Municipal Class Environmental Assessment manual outlines four (4) approaches to the master planning process. At a minimum, Master Plans address Phases 1 and 2 of the Municipal Class Environmental Assessment process. Master Plan Approach #1 (the approach used in this study) involves the preparation of a Master Plan report at the conclusion of the selection of broad preferred alternatives. To proceed with any recommended Schedule B projects identified, a Project File Report(s) must be filed for each project completing the remaining more detailed components of Phases 1 and 2. For Schedule C projects the remaining components of Phases 1,2,3 and 4 must be filed in an Environmental Study Report for public review.

Future Municipal Project Assessment Process

As part of its efforts to modernize and speed up the municipal infrastructure planning and approvals process, the Province of Ontario is planning to revoke the current 2024 Municipal Class Environmental Assessment and replace it with a streamlined Municipal Project Assessment Process where only certain municipal infrastructure planning projects (e.g. establishing a new surface water source, constructing a new water treatment plant or expanding an existing water treatment plant beyond existing rated capacity) would be subject to the Environmental Assessment Act. New pumping or storage facilities and transmission mains or watermains as currently listed in the Municipal Engineers Association Municipal Class Environmental Assessment as Schedule B would no longer be subject to the Environmental Assessment Act. The Municipal Project Assessment Process will outline the requirements for consultation, consideration of alternative designs, impact assessment studies, documentation and notification. As the new regulation is yet to be approved, the current 2024 Municipal Class Environmental Assessment planning process remains in effect.

2.1.3 Public Review of this Report and Next Steps

This Master Plan Report comprises the documentation for Phases 1 and 2 of the Municipal Class Environmental Assessment. Placement of this report for public review completes the planning stage of the project.

This Master Plan Report is available for public review and comment for a period of 30 calendar days starting on **October 28th, 2025** and ending on **November 28th, 2025**. A public notice (Notice of Master Plan) was published to announce commencement of the review period. To facilitate public review of this document, copies are available at (alternate formats available upon request):

Digital / Online: https://www.huronelginwater.ca/lake-huron-primary-water-supply-system-master-plan/

Interested persons may provide written comments to the project team by **November 28th, 2025**. All comments and concerns should be sent directly to the Project Managers:

Marcy McKillop, P.Eng.
Environmental Services Engineer
Regional Water Supply
Lake Huron and Elgin Area Primary Water Supply Systems
235 North Centre Road, Suite 200
London ON, N5X 4E7
Tel:519-930-3505 x4976
Email: mmckillop@huronelginwater.ca

Benny Wan., P.Eng
Consultant Project Manager
AECOM ULC
105 Commerce Valley Dr. W.
7th Floor
Markham, Ontario, L3T 7W3 Canada
Phone: (905) 747-7678
Email: Benny.Wan@aecom.com

2.2 Municipal and Provincial Studies and Planning Context

2.2.1 Provincial Planning Statement (2024)

The 2024 Provincial Planning Statement provides policy direction on matters of provincial interest related to land use planning and development. As a key part of Ontario's policy-led planning system, the Provincial Planning Statement sets the policy foundation for regulating the development and use of land province-wide, helping achieve the provincial goal of meeting the needs of a fast-growing province while enhancing the quality of life for all Ontarians.

Key Polices relevant to this project include the following:

2.9: Energy Conservation, Air Quality and Climate Change.

3.1: Infrastructure and Public Service Facilities.

3.6: Sewage, Water and Stormwater.

4.1: Wise Use and Management of Resources, Natural Heritage.

4.2: Wise Use and Management of Resources, Water.

4.6: Wise Use and Management of Resources, Cultural Heritage and Archaeology.

Relevance to Study: Investment in water servicing infrastructure within the Lake Huron Primary Water Supply System area, a Master Plan of this nature, will have regard for the range of planning objectives of the Provincial Planning Statement. In addition, future project specific Schedule B and Schedule C Environmental Assessments recommended by this Master Plan will consider and address impacts involving natural heritage, cultural heritage, water resources and climate change.

2.2.2 Climate Change

The Ministry of Environment, Conservation and Park's guide "Consideration of Climate Change in Environmental Assessments in Ontario" was finalized in October 2017, and therefore, requires that all Municipal Class Environmental Assessments consider this

within the scope of the project. Two approaches for consideration and addressing climate change in project planning include:

- Reducing a project's effect on climate change (climate change mitigation).
- Increasing the project's and local ecosystem's resilience to climate change (climate change adaptation).

Relevance to the Study: Climate change impacts were considered when evaluating all alternatives from a construction, energy use, and extreme weather events perspective.

2.2.3 Source Water Protection

Section A.2.10.6 of the Municipal Class Environmental Assessment document directs proponents, including the Utility to consider Source Water Protection in the context of the *Clean Water Act*. Projects proposed within a Source Water Protection vulnerable area are required to consider policies in the applicable Source Protection Plan, including their impact with respect to the project. A watershed based Source Protection Plan contains policies to reduce existing and future threats to drinking water in order to safeguard human health through addressing activities that have the potential to impact municipal drinking water systems.

The Thames - Sydenham & Region and Ausable Bayfield Maitland Valley, Drinking Water Source Protection Regions are the relevant Source Protection Plans for this study, and they contain policies that address current and potential threats to municipal drinking water supply.

There are four types of vulnerable areas covered by the Source Protection Plan:

1. Intake protection zones – An Intake Protection Zone is the area around a surface body of water where water is drawn in and conveyed for municipal drinking water.

2. Highly Vulnerable Aquifers – Aquifers are underground layers of water that supply wells. Highly vulnerable Aquifers are susceptible to contamination due to their proximity to the ground surface or where the types of materials in the ground around it are highly permeable.

3. Significant groundwater recharge areas - Significant Groundwater Recharge Areas are characterized as having porous soils (e.g. sand or gravel), which allow for water to easily seep into the ground and flow to an aquifer.

4. Wellhead Protection Areas– Wellhead Protection Areas are areas of land around a municipal well where land use activities have the greatest potential to affect the quality of water flowing into the well.

Relevance to Study: The relevance of the policies of the Source Protection Plan has been considered in this study and used in the evaluation of Alternatives for water servicing. Recommended projects from this Master Plan that require Schedule B or Schedule C Environmental Assessments will be required to address Source Water Protection on a project specific level. The water treatment plant is within an Intake Protection Zone in the Ausable Bayfield source protection region.

2.2.4 Upper Thames River Conservation Authority

A portion of the study area is located within the Upper Thames River Conservation Authority jurisdiction.

Ontario Regulation 41/24 is the regulation for all conservation authorities including the Upper Thame River Conservation Authority watershed. This regulation fulfils the general purpose of ensuring public safety and preventing property damage and social disruption, due to natural hazards such as flooding and erosion within regulated areas.

Relevance to Study: The preferred water servicing strategies and subsequent projects may require a permit from Upper Thames River Conservation Authority with respect to transmission and / or storage infrastructure.

2.2.5 Ausable Bayfield Conservation Authority

A portion of the study area is located within the Ausable Bayfield Conservation Authority jurisdiction.

Ontario Regulation 41/24 is the regulation for all conservation authorities including the Ausable Bayfield Conservation Authority watershed. This regulation fulfils the general purpose of ensuring public safety and preventing property damage and social disruption, due to natural hazards such as flooding and erosion within regulated areas.

Relevance to Study: The preferred water servicing strategies and subsequent projects may require a permit from Ausable Bayfield Conservation Authority with respect to transmission and / or storage infrastructure. The Ausable Bayfield Conservation Authority also has responsibilities as lead source protection authority for delivery of drinking water source protection planning in the Ausable Bayfield Maitland Valley Source Protection Region, through the *Ontario Clean Water Act, 2006*.

2.2.6 2020 Lake Huron Primary Water Supply System Water Master Plan

In 2020 the Utility completed a Water Master Plan Update. Master Plans are reviewed and updated every five (5) years to determine the need for updates in the servicing strategies.

Relevance to Study: The 2020 Master Plan was reviewed, and not all recommendations have not been implemented. It is noted that many of the projects identified in the previous master plan remain valid and have been considered in this Master Plan study.

3. Problem and Opportunity Statement

Phase 1 of the five-phase Municipal Class Environmental Assessment planning process requires the proponent of an undertaking (i.e., the Lake Huron Primary Water Supply System) to first document factors leading to the conclusion that an improvement is needed and develop a clear statement of the identified problems or opportunities to be investigated. As such, the Problem and Opportunity Statement is the principal starting point in the undertaking of a Municipal Class Environmental Assessment and becomes the central theme and integrating element of the project. It also assists in setting the scope of the project.

The Municipal Class Environmental Assessment Master Plan Problem and Opportunity Statement is as follows:

- The growth in water demands forecast for the 2046 planning horizon requires review and assessment of the system's capacity and required investment for the sustainability and reliability of the Utility's treatment, pumping, and transmission infrastructure.
- Develop and assess a range of water system strategies considered to support existing servicing and account for reasonably expected near, mid, and long-term future growth projections, including servicing to new communities.
- Develop a recommended investment strategy for the near, mid, and long-term future growth projections that will support future infrastructure planning and budgeting.
- Consult benefitting communities, the public, Indigenous communities, agencies, and other interested parties, through the development of the Plan to identify the preferred alternatives that best meet long-term needs of the utility.
- Determine operational challenges based on the system hydraulics review related to projected future demands and growth-related requirements for treatment, pumping, transmission infrastructure.
- Review and confirm the Utility's operational storage needs.
- Assess primary transmission pipeline redundancy, including the approximate nineteen kilometres of non-twinned transmission main, and investigate alternative solutions to facilitate redundancy.
- Review and assess pressure control infrastructure to mitigate excessive and transient pressure incidents related to projected future demands and growth-related requirements.
- Review opportunities to enhance energy efficiency, conservation, and recovery across the system.

- Review the impacts of climate change on the Utility's infrastructure and assess mitigation and adaptation opportunities in alignment with the Utility's framework.
- Ensure alignment with and continuity between the Plan and the Utility's other guiding plans including the Asset Management Policy and Plan, Financial Plan, Operational Plan, and various management systems.

4. Consultation

The involvement of the community – residents, agencies, Indigenous communities, and those who may be potentially affected by a project – is an integral part of the Municipal Class Environmental Assessment process. The purpose of the consultation process is to provide an opportunity for agencies and the public to gain an understanding of the study process; contribute to the process for the development and selection of alternatives/design concepts; and provide feedback and advice at important stages in the Municipal Class Environmental Assessment process. Specifically, the objectives of the consultation efforts are to:

- Generate awareness of the project and provide opportunities for involvement throughout the planning process.
- Facilitate constructive input from public and agency in addition to Indigenous communities at key points in the Municipal Class Environmental Assessment process, prior to decision-making.

The Municipal Class Environmental Assessment process requires two points of mandatory contact for a Master Plan Approach 1 study, which are:

- The first point of mandatory contact is made at the end of Phase 2 when the proponent has identified a problem and opportunity statement, and developed, assessed, and evaluated alternative solutions to the problem based on the social, natural, and economic environments that could be impacted by the project. This initial contact is issued to invite the public to comment on the potential impacts and local sensitivities.
- The second point of mandatory contact is when the Master Plan report is complete. The Master Plan report documents the entire planning process through Phases 1 and 2. A proponent is required to place the Master Plan report on the public record for at least 30 calendar days which provides the public the opportunity to review.

For this study three (3) points of contact were made. The first was a Notice of Study Commencement, the second was the Notice of Public Information Centre, to introduce the project and provide a background summary of the need for this study including study findings and recommendations and the third was a Notice of Master Plan.

A summary of the consultation activities undertaken for this study is provided in this section.

4.1 Public Consultation

Public notices of study commencement, Public Information Centre, and Notice of Master Plan were issued to notify agencies, local Community partners, Indigenous communities and the public of the status of the project, provide notification of the Public Information Centre and to invite feedback on the project. Refer to **Appendix A** for notices and contact list.

A list of public notices issued as part of the study are provided in **Table 4-1**.

All notices were posted on the Utility's website and emailed to existing and future customers, agencies and area Indigenous communities.

Table 4-1: Public Consultation Notices

Notice	Publication Date
Notice of Commencement **Appendix A.1**	February 14th, 2025
Notice of Public Information Centre **Appendix A.2**	June 3rd, 2025
Notice of Master Plan **Appendix A.4**	October 14th, 2025

*Publication date is excluding First Nations, this consultation occurred after receiving the Ministry of Environment Conservation and Parks acknowledgement letter.

4.1.1 Public Information Centre

A virtual Public Information Centre was held on June 18th, 2025, 6:00 pm to 8:00 pm using an online presentation format with a question-and-answer period at the end. The purpose of the Public Information Centre was to share study findings to date and gather comments on the following:

- The problem and opportunity statement.
- Existing conditions.
- The identification of water servicing strategies to address the problem and opportunity statement.
- The identification of alternative solutions to implement the servicing strategy.

- The evaluation of the alternative planning solutions and a recommended solution.
- Next steps in the process.

Representatives from the project team, including Utility staff and the AECOM Canada ULC team were available to discuss the project with participants. Four (4) community members and agency representatives attended the online presentation.

Table 4-2 summarizes and paraphrases the issues and comments raised at Public Information Centre No. 1.

Table 4-2: Comments from the Public Information Centre

Comment / Issue	Response
Project mentions upgrades to Transmission Chamber Flood Protection. Are they existing problems with flooding and what would flood protection of transmission chambers generally entail?	Typically, chambers are meant to be waterproof, so they aren't any leaking right now. With aging infrastructure leaks can occur so rehabilitation is required when leaks occur. It needs to be monitored periodically as a preventative measure.
Would there be a separate Environmental Assessment for adding the other municipalities and First Nation communities that are interested in joining.	This would all depend on the nature of the work to supply the community. If it is an extension of the secondary system within a municipal right of way, the projects are generally exempt from the Environmental Assessment process. The Utility is currently extending its water supply system to service Oneida Nation of the Thames.

4.1.2 Notice of Master Plan

The Notice of Master Plan was sent out to review agencies, community partners, Indigenous Communities and posted on the Lake Huron Primary Water Supply System web page. During the 30-day review period, anyone with interest could provide comments or ask questions. The notice briefly outlined the recommended projects and provided a link to the location where the report could be viewed or downloaded. **Table 4-3** summarizes the comments received and detailed email and letter responses can be found in **Appendix A.6.**

4.2 Member Communities

Existing member communities were sent the Notice of Commencement along with a survey requesting information on future water demands to the year 2046. The surveys and responses can be found in **Appendix A**. The following existing member communities were contacted:

- City of London.
- Municipality of Bluewater.
- Municipality of Lambton Shores.
- Township of Lucan-Biddulph.
- Municipality of Middlesex Centre.
- Municipality of North Middlesex.
- Municipality of South Huron.
- Municipality of Strathroy-Caradoc.
- Onieda Nation of the Thames is currently in the process of connecting to the system with a tender date of Fall 2025.

4.3 Potential New Customers

Communities adjacent to the existing water system were sent the Notice of Commencement and were asked if they would be interested in receiving water from the Lake Huron Water Supply System. The following communities responded with an interest in potentially receiving water from the Utility:

- Oxford County
- Munsee-Delaware First Nation
- Municipality of Thames Centre (Dorchester and Thorndale)

4.4 Public and Agency Consultation

All relevant community partners regulatory agencies and authorities were contacted at the project initiation stage through correspondence notifying them of the study commencement and requesting their comments. All of these agencies were included in the project mailing list, which was updated regularly to ensure accuracy. They were also notified of the Public Information Centre and the Notice of Master Plan. The following section provides a summary of correspondence received from external agencies. Agency correspondence can be found in **Appendix A.**

Table 4-3: Public and Agency Comments

Agency	Comment	Response
Ministry of Environment Conservation and Parks	Ministry of Environment, Conservation and Parks provided information on the following: Requirements for Duty to Consult with Indigenous communities. MECP reviewed the Master Plan and provided an email with only a minor text revision request.	This study has undertaken the necessary requirements to fulfil the Duty to Consult. See **Section 4.5** for details of Indigenous community consultation. Text was revised as requested. See **Appendix A.6** for the MECP email.
Ministry of Citizenship and Multiculturalism	Comments on Archaeological Resources and Potential Built Heritage Resources. Letter with comments on the Master Plan Report was provided in response the Notice of Master Plan.	This study has been completed at a high/broad level and further study will be required. Any projects requiring a Schedule B or Schedule C Municipal Class Environmental Assessment will undergo further Culture Heritage Resources Studies such as a Stage 1 Archaeological Assessment or Cultural Heritage Evaluation Report. See Appendix A for detailed comments and response. The Master Plan was updated to address some of the MCM comments and a letter was provided outlining the changes made and the rationale for not making other changes. See **Appendix A.6** for both letters.

Agency	Comment	Response
Municipality of South Huron	• Exeter-Hensall Booster Pumping Station & Reservoir does not appear to have been reviewed to address operational issues. • Frequent LHPWSS shutdowns and impact on municipal systems, including pressure surges, was not reviewed. Please confirm if there are plans to extend any twinned section of the 1200mm transmission main for improved security.	• The LHPWSS Master Plan includes all LHPWSS infrastructure, including the Exeter-Hensall Pumping Station and Reservoir. Hydraulic modelling of the overall system was undertaken to assess existing and future conditions, including an evaluation of available pressure at member community connection points. Operational issues and concerns should continue to be brought forward to the LHPWSS and our contracted Operator. • The LHPWSS acknowledges the impact of system shutdowns on member communities and their systems. Shutdowns are scheduled and coordinated to accommodate key infrastructure renewal and/or maintenance activities to maintain levels of service. Hydraulic modelling was undertaken as part of the Master

Agency	Comment	Response
		Plan. Various hydraulic modelling studies were identified in the Master Plan, including transient hydraulic modelling studies for secondary transmission mains as a short-term recommendation (2026-2031). • Twinning of the 19 km of the non-twinned section of the 1200 mm diameter transmission main was not identified as a recommended improvement over the planning horizon of this Master Plan (up to 2046), based on the modelling and assessment completed. The need for twinning will be reassessed as part of any future studies, including but not limited to the next LHPWSS Master Plan. Emailed response can be found in **Appendix A.6.**
Lambton Public Health	No comments on the Master Plan were made only a request to update the contact list with new Lambton Public Health staff.	Contact list was updated as requested.

4.5 Indigenous Community Engagement

All Indigenous communities outlined in the Ministry of Environment, Conservation and Parks Notice of Commencement correspondence have been contacted via a Notice of Commencement/Project Introduction/Invitation to consult. These Indigenous communities received each notice with an accompanying cover letter. The following communities were contacted throughout the course of this study:

- Oneida Nation of the Thames
- Chippewas of the Thames First Nation
- Munsee-Delaware Nation
- Chippewas of Kettle and Stoney Point
- Aamjiwnaang First Nation
- Bkejwanong (Walpole Island)
- Caldwell First Nation
- Delaware Nation
- Six Nations of the Grand River

None of the communities contacted provided any comments or concerns. However, the Munsee-Delaware Nation expressed interest in potentially receiving water from the Utility. The Utility will continue to consult with Munsee-Delaware Nation to explore their interest in becoming a new customer, acknowledging that Munsee-Delaware Nation is currently supplied with water by the Chippewas of the Thames First Nation.

Onieda Nation of the Thames requested a presentation to Chief and Council outlining the Master Plan. The Lake Huron Primary Water Supply System presented the Master Plan on Wednesday November 26th 2025. The presentation can be found in **Appendix A.5.**

5. Current and Projected Flow Demands and Design Criteria

5.1 Water Demand Forecast

5.1.1 Water Demand Forecast of Existing Member Communities

To support the flow projection analysis, surveys were distributed to the member communities that currently take their water supply from Lake Huron Primary Water Supply System. The surveys were sent to the following municipalities: Municipality of North Middlesex, Township of Lucan Biddulph, Municipality of Middlesex Centre, Municipality of Bluewater, Municipality of Lambton Shores, Municipality of South Huron, Municipality of Strathroy-Caradoc and City of London for obtaining their projected water demands. Survey responses were received from the following communities:

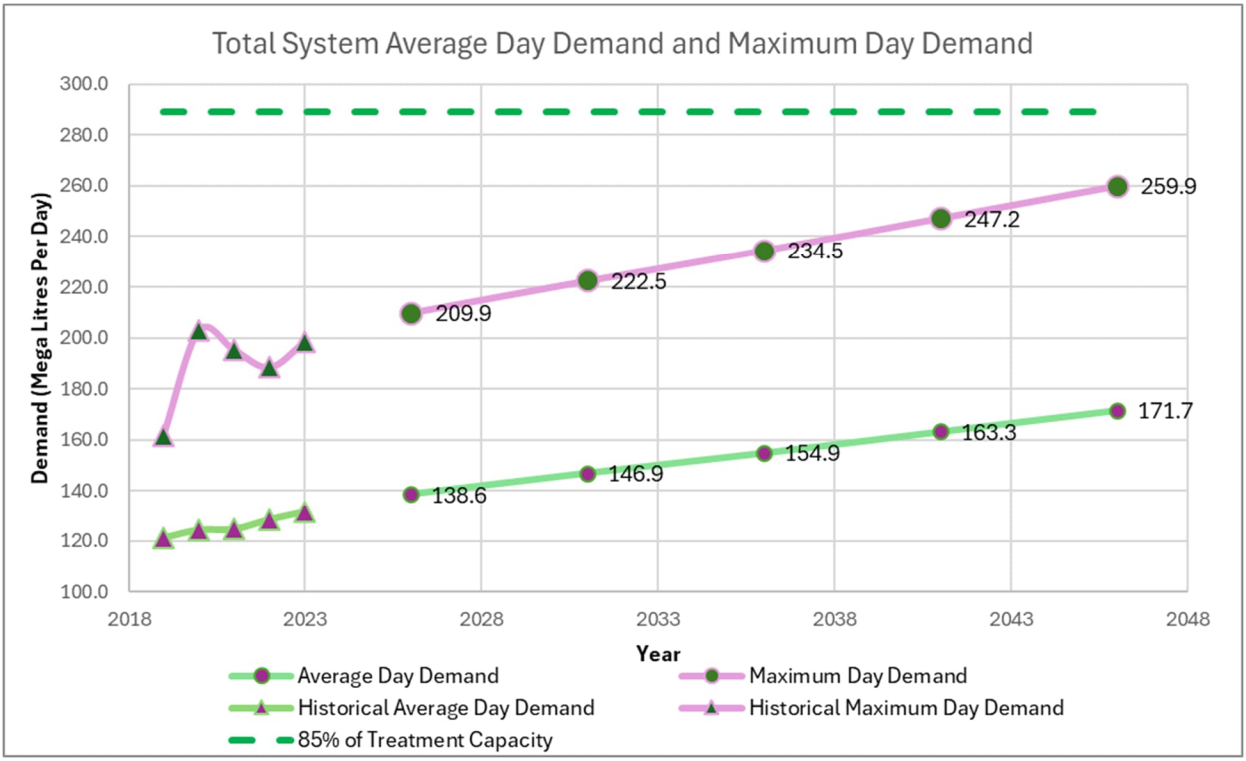
- Municipality of North Middlesex
- Township of Lucan Biddulph
- Municipality of Middlesex Centre
- Municipality of Lambton Shores
- City of London

For the Municipality of Bluewater, Municipality of South Huron, and Municipality of Strathroy-Caradoc, their water demands were evaluated based on the available historical trend projection. As part of the water demand projection exercise, a consideration of recent municipal Master Plan or Class Environmental Assessment for the municipal water system was considered, as well as County Official Plan growth projections.

Based on the received information, the projected water demand for the Lake Huron Primary Water Supply System is summarized in **Figure 5-1**.

Note, throughout the report “Mega Liters per Day” and “Million Liters per Day” are commonly used to quantify water flow and it should be noted that 1 Mega Liter per Day is equal to 1 Million Liters per Day.

Figure 5-1: Total Average Day Demand and Maximum Day Demand of Lake Huron Primary Water Supply System Existing Member Communities



Further details of the Technical Memorandum – Flow Projections Analysis for Lake Huron Primary Water Supply System are provided in **Appendix B.1**.

5.2 Water Design Criteria

According to the Ministry of the Environment, Conservation and Parks Design Guidelines for Drinking Water Systems, Section 3.4.1, the drinking water system including the water treatment plant and treated water storage should be designed to satisfy the greater of the following demands:

- Maximum Day Demand plus fire flow (where fire protection is to be provided).
- Peak Hour Demand.

The above guidelines are intended for water supply in local distribution systems. The Lake Huron Primary Water Supply System is responsible for providing water treatment and transmission only. Providing distribution-related storage (fire, equalization and emergency) and meeting peak demands are the responsibility of the member municipality.

The Lake Huron Primary Water Supply System only provides water supply in accordance with water supply agreements and may meet some limited fluctuations in

member community water needs above average day flow. Member communities are required to meet their water needs above average day within their distribution system - maximum day, peak hour, fire and emergency etc.

The treatment and pumping components were assessed under the Maximum Day Demand condition and if deficiencies were identified, the storage component was evaluated against the Maximum Week Demand to confirm the serviceability. For the hydraulic modelling, the extended Seven (7)-day Maximum Week Demand simulation, which also captured the Maximum Day Demand, was adopted to ensure serviceability.

6. Existing Water System

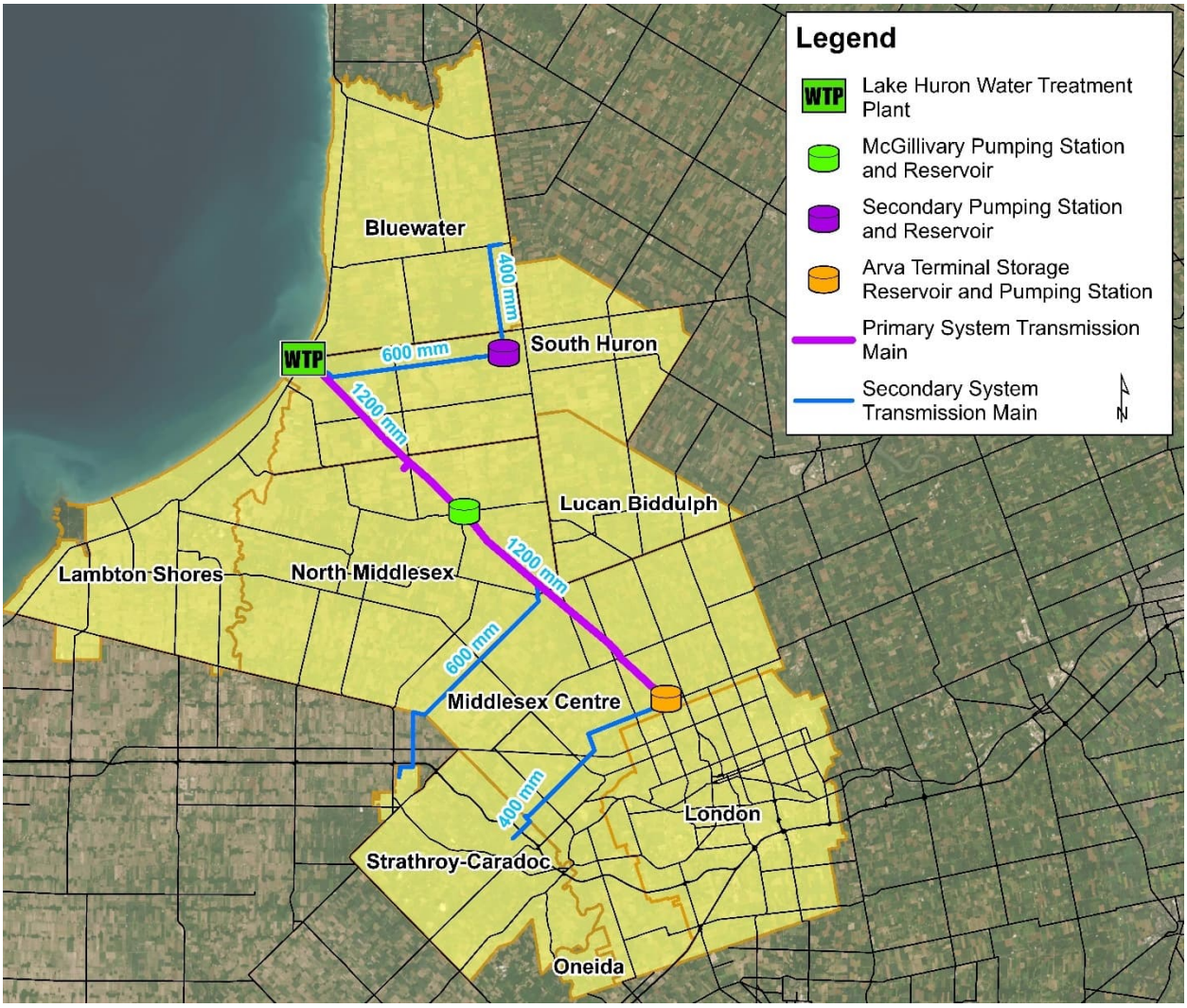
6.1 Existing Water System Description

The Lake Huron Primary Water Supply System) provides potable water to eight benefiting municipalities: Municipality of Bluewater, Municipality of South Huron, Municipality of Lambton Shores, Municipality of North Middlesex, Township of Lucan-Biddulph, Municipality of Middlesex Centre, Municipality of Strathroy-Caradoc and the City of London. Work is ongoing to provide service and supply the Oneida Nation of the Thames with drinking water which is estimated to be complete in 2026. **Figure 1-1** provides an overview of the area serviced by the Lake Huron Primary Water Supply System.

6.1.1 Water Conveyance Infrastructure

Approximately 85% of the supplied water is conveyed to the Arva Terminal Reservoir with the remainder going to customers in between the Lake Huron Water Treatment Plant and Arva Terminal Reservoir. Water is pumped through the primary transmission pipeline and can either go directly to the Arva Terminal Reservoir or supply McGillivray Reservoir and Pumping Station. There are approximately 144 kilometers of primary and secondary pipelines within the Lake Huron Primary Water Supply System, which includes the 47.0 km, 1200mm diameter primary pipeline, of which 29 kilometers are twinned. Refer to **Figure 6.1**. The most recent twining of primary pipeline was completed in 2014.

Figure 6-1: Primary and Secondary Pipelines



Storage for the Lake Huron Primary Water Supply System is provided in four (4) in-ground reservoirs:

- Lake Huron Water Treatment Plant Treated Water Clear Well – 10 Million Liters (2 cells: North and South).
- McGillivray Reservoir – 18.2 Millon Liters (1 cell).
- Arva Terminal Reservoir – 109 Millon Liters (total for 4 cells).
- Exeter-Hensall Reservoir – 8.0 Millon Liters (total for 2 cells).

. The following pumping stations convey flows further down through the system:

- Lake Huron Water Treatment Plant High Lift Pumping Station complete with six (6) fixed speed horizontal split case water pumps for pumping of drinking

water and two (2), 290 cubic meter capacity, hydropneumatic air chambers for surge and transient control:

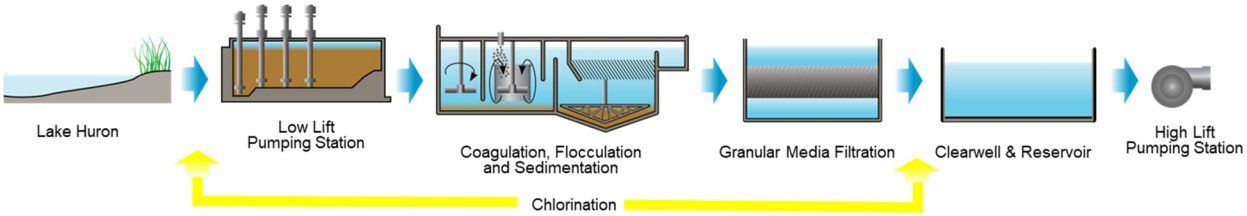
- Two (2) pumps rated for 1,160 Liters per Second at 152 Metres of Total Dynamic Head.
- Two (2) pumps rated for 900 Liters per Second at 125 Metres of Total Dynamic Head.
- Two (2) pumps rated for 1,300 Liters per Second at 150 Metres of Total Dynamic Head.

- McGillivray Pumping Station complete with four (4) fixed speed horizontal split case water pumps rated for 1,160 Liters per Second at 78 Metres of Total Dynamic Head for pumping of drinking water and two (2) 425 cubic meter capacity, hydro-pneumatic air chambers for surge and transient control.
- Komoka-Mount Brydges Booster Pumping Station complete with four (4) inline booster water pumps:
  - Two (2) pumps rated for 181 Liters per Second at 55 Metres of Total Dynamic Head.
  - One (1) pump rated for 100 Liters per Second at 37.4 Metres of Total Dynamic Head.
  - One (1) pump rated for 51 Liters per Second at 24 Metres of Total Dynamic Head.
- Exeter-Hensall Pumping Station complete with three (3) variable speed horizontal split case water pumps rated for 92 Liters per Second at 78 Metres of Total Dynamic Head.

6.1.2 Lake Huron Water Treatment Plant

The Lake Huron Water Treatment Plant is a conventional water treatment plant with a 340 Million Liters per Day capacity located north of Grand Bend, in the Municipality of South Huron. The treatment plant produces drinking water which is pumped to supply all the benefiting municipalities of the Lake Huron Primary Water Supply System. The water treatment process consists of taking lake water, commonly referred to as raw water, from Lake Huron and putting it through treatment processes including, pre-chlorination, screening, seasonal taste and odour control, coagulation, flocculation, sedimentation, filtration, post-chlorination, and pH adjustment. An overview of the treatment schematic is provided in **Figure 6-1** below: uses a conventional treatment process.

Figure 6-2: Conventional Treatment Process Overview



6.1.2.1 Raw Water Intake

An 1800-millimetre diameter reinforced concrete intake pipe extends approximately 2,530 metres into Lake Huron at a depth of 8.8 meters. The intake pipe has a bell end for the raw water to enter the pipe as well chlorination injectors in which chlorinated water is dosed to prevent mussels from accumulating and possibly blocking the intake structure. The raw water intake pipe is sized to convey a flow of 454 Million Liters per Day.

6.1.2.2 Low Lift Pumping Station

The Low Lift Pumping Station, also commonly referred to as the Raw Water Pumping Station, receives raw water from the intake pipe, where it enters a surge well, followed by three (3) mechanical screens to prevent large debris from entering the pumps between the surge well and the two (2) low lift pump wells. The Low Lift Pumping Station is equipped with six (6) vertical turbine pumps:

- Two (2) pumps rated for 1,330 Liters per Second at 18 Metres of Total Dynamic Head with a common variable speed drive.
- Three (3) fixed speed pumps rated for 1,330 Liters per Second at 18 Metres of Total Dynamic Head.
- One (1) fixed speed pump rated for 830 Liters per Second at 18 Metres of Total Dynamic Head.

The Low Lift Pump configuration offers a firm capacity of 454 Million Liters per Day and conveys water to the treatment processes. Prior to the coagulation process, the flow is split into a north and south treatment train for redundancy. Both of these pipes are equipped with flow meters.

6.1.2.3 Coagulation

The coagulation process at the Lake Huron Water Treatment was recently upgraded to include jet mixing on both the north and south raw water pipes. Liquid Aluminum Sulphate (Alum) is dosed with jet mixing from (2) 66 cubic meter in-ground concrete storage tanks.

6.1.2.4 Seasonal Taste and Odour Control

The Lake Huron Water Treatment plant has a seasonal taste and odour control system that seasonally doses powdered activated carbon, to achieve the removal of taste and odour compounds including but not limited to 2-methylisoborneol and geosmin. The powdered activated carbon is dosed upstream of coagulation, in the raw water pipe.

6.1.2.5 Flocculation

Flocculation is provided by two (2) serpentine tanks, one for the north treatment train and one for the south treatment train. Each tank is separated into two mixing zones for different mixing intensities. Mixing is performed with walking beam type mixers.

6.1.2.6 Sedimentation

Four (4) parallel inclined plate clarifiers are used for the sedimentation process at the facility; two (2) for each treatment train. Flocculated water flows through the bottom of the tank and upwards through the plates to remove solids. The settled solids are then separated from the effluent water and transferred to a central hopper. Each clarifier has the following zones:

- 440 cubic meter settling zone
- 390 cubic meter sludge storage zone
- 790 cubic meter sludge thickening zone

Clarifier effluent water, also known as settled water, is then conveyed downstream by gravity for filtration.

6.1.2.7 Filtration

Twelve (12) high-rate dual media filters, consisting of a top layer of anthracite and a bottom layer of filter sand, are used to filter the settled water. Each of the filters has an effective filtration area of 102 square meters and an associated underdrain. Filters are equipped with effluent control valves to adjust the flow rate through each of the filters. Four (4) backwash pumps each rated at 530 Liters per Second, are used to backwash the filters and remove trapped particles from the void spaced within the media.

6.1.2.8 Clear Wells / Reservoirs

Filtered effluent water is conveyed into two (2) clear wells / reservoirs with a total volume of approximately 10.1 million liters of storage. Chlorine is added to provide primary disinfection and sustain a chlorine residual throughout the transmission system. From the each clear well / reservoir water is conveyed to the suction conduit where the high lift, backwash and service water pumps draw from

6.1.2.9 High Lift Pumping Station

The High Lift Pumping Station draws treated water from the reservoir and supplies the transmission system. The High Lift Pump Station at the Lake Huron Water Treatment plant is equipped with six (6) pumps and two (2) surge tanks:

- Two (2) pumps with a capacity 100 Million Liters per Day
- Two (2) pumps with a capacity of 112 Million Liters per Day
- Two (2) pumps with a capacity of 78 Million Liters per Day
- Two (2) hydro pneumatic tanks with a combined capacity of 580 cubic meters, provider surge and transient control.

Immediately upstream of the surge tanks, sodium hydroxide (caustic soda) is dosed to increase the pH of the drinking water providing corrosion control.

6.1.2.10 Residual Management Facility

The Lake Huron Water Treatment Plant Residual Management Facility thickens and dewaters waste from the sedimentation tanks as well as backwash water from the filters.

6.2 Water System Needs Assessment

The hydraulic capacity of the following infrastructure was assessed for the Lake Huron Primary Water Supply System:

- Water Treatment
- Pumping Stations
- Transmission Mains
- Storage

A value of 85% of the available capacity was used as a trigger point to initiate planning and coordination of the plant expansion to meet future demands.

6.2.1 Treatment

The total rated capacity of 340 Million Liters per Day for the Lake Huron Water Treatment Plant was determined to be sufficient for the planning horizon, with the medium projected Maximum Day Demand being 260 Million Liters per Day in 2046.

Notwithstanding this, recent operations and commentary from the 2024 Lake Huron Water Treatment Plant - Water Quality Facility Plan Update completed by Stantec, indicates the treatment plant can currently adequately operate at a capacity of 240 Million Liters per Day and it is recommended that further stress testing be completed to

verify sustainable operation at higher flows. For the purposes of this master plan, 240 Million Liters per Day has been used as the maximum sustainable operational capacity of the Lake Huron Water Treatment, however it is acknowledged that this capacity is most likely higher for typical raw water quality experienced at the plant. It is also acknowledged that the water quality of the raw water being treated will have a significant impact on operational treatment capacity.

The Water Quality Facility Plan (Stantec, 2024) also reviewed individual treatment processes in comparison to industry guidelines, primarily the Ministry of Environment, Climate Change and Parks' Water Design Guidelines, to determine a theoretical capacity. The following paragraphs provide a commentary on the water treatment processes based on Water Quality Facility Plan (Stantec, 2024) as well as other AECOM on-site experience.

6.2.1.1 Pre-Disinfection

The capacity of the pre-disinfection process at the Lake Huron Water Treatment Plant was evaluated to be 303 Million Liters per Day in the Water Quality Facility Plan (Stantec, 2024). This is one of the highest rated unit process capacities evaluated and it was noted that disinfection capacity was a highly conservative desktop approach.

6.2.1.2 Coagulation

The Water Quality Facility Plan (Stantec, 2024) did not provide a unit process capacity for coagulation. It is also noted that the coagulation process was in the midst of an upgrade at the plant during the time of this study. It is understood that the upgrade was set to provide a capacity of 340 Million Liters per Day.

Notwithstanding this, there were various recommendations such as using monitoring tools like ultraviolet transmittance and zeta potential to give operation staff more data in determining an optimum coagulant dosage. Further study is recommended to review ways to optimize the operation of the coagulation system.

6.2.1.3 Seasonal Taste and Odour Control

The Water Quality Facility Plan (Stantec, 2024) did not provide a unit process capacity for the seasonal taste and odour control system. It is noted that powder activated carbon is only dosed seasonally and as-needed to address taste and odour compounds. Further study is recommended to review taste and odour management including evaluating other methods, not just powder activated carbon, to ensure taste and odour compounds are adequately managed.

6.2.1.4 Flocculation

The capacity of the flocculation process at the Lake Huron Water Treatment Plant was evaluated to be 191 Million Liters per Day in the Water Quality Facility Plan (Stantec, 2024). The report also noted that the Ministry of Environment, Climate Change and Parks' Water Design Guidelines range for retention time ranges from 25-30 minutes in warm weather and 30-40 minutes in cold weather, though other sources suggest less time.

The 191 Million Liters per Day aligns with a hydraulic retention time of 40 minutes which is at the conservative end of the hydraulic retention time range. Reducing the hydraulic retention time criterion to 30 minutes, which has been commonly used in Ontario, yields a capacity of 255 Million Liters per Day which is significantly more however is still below the rated capacity of the plant.

Flocculation performance is dependent upon a number of factors including water chemistry, polymer used, mixing energies, etc. so jar testing and stress testing are more appropriate to evaluate flocculation process improvements. Performing these studies is recommended for a variety of raw water conditions.

The flocculation process is equipped with a walking beam mixing mechanism, which is an older technology. A risk of pinch points exists for operation staff passing by the oscillating arms of the flocculators within the facility. Although the walking beams are currently functional, as the system ages and risk of failure increases, the plant is subject to vulnerabilities. Servicing parts from manufacturers for repair in the event of a failure could lead to longer delays and increased prices due to the age of the equipment. An immediate upgrade project is not required as the plant has serviced the flocculators successfully prior and they are in good working order. A feasibility study for potential upgrades can help to better inform the level of risk for the current system and the increased efficiency that would be provided in the event of an upgrade. This study would also help to inform capital planning for potential upgrades within the planning horizon.

6.2.1.5 Sedimentation

The capacity of the sedimentation process at the Lake Huron Water Treatment Plant was evaluated to be 201 Million Liters per Day in the Water Quality Facility Plan (Stantec, 2024). The report used a maximum surface overflow rate criterion of less than 10 meters per hour which is appropriate for solids contact clarifiers with lamella plates.

In the Water Quality Facility Plan (Stantec, 2024), clarification capacity was a risk identified for the Lake Huron Water Treatment Plant in relation to growing demands. It was determined that if demands were to increase, the current clarifiers could become a bottleneck. Under high projected plant flows, elevated settled water turbidity from clarification would become challenging for the filters ability to efficiently operate.

Increasing the turbidity loading would cause high head loss and result in more frequent filter backwashing. Operationally, this would result in filters being out of service more often and an increased consumption of water and energy. A feasibility study for clarifier capacity upgrades is needed to identify if major capacity or more moderate upgrades such as a sedimentation polymer aid, are required to meet hydraulic demands. Options in the feasibility such as converting to a ballasted clarification process could also be reviewed.

6.2.1.6 Filtration

The capacity of the filtration process at the Lake Huron Water Treatment Plant was evaluated to be 241 Million Liters per Day in the Water Quality Facility Plan (Stantec, 2024). The report used a maximum filter loading criterion of less than 9.8 meters per hour with only 10 of the 12 filters in service which is conservative, but also appropriate to evaluate a sustainable filter operation. The Ministry of Environment, Climate Change and Parks' Water Design Guidelines states that for "traditional dual media filter designs, a maximum filtration rate of 11.7 meters per hour is recommended, although filter rates of up to 20 meters per hour have successfully been achieved." At a filter loading rate of 11.7 meters per hour, with two filters out of service, the theoretical capacity would increase to 287 Million Liters per Day. Like other unit processes, stress testing is recommended to further evaluate the filter performance.

Notwithstanding the above and as indicated in the Water Quality Facility Plan (Stantec, 2024), the filter operation could be further improved. Currently the filters do not have a "filter-to-waste" nor air scouring capabilities which most new filter systems are equipped with. The underdrain and surface wash systems are older technologies. Moreover, according to operational staff, the plant experiences lower filter run times during parts of the spring and fall where turbidity could be high after storm events and when there are changing lake conditions. The incorporation of these capabilities and varying water quality should be considered within a future feasibility study to review the filtration process.

6.2.1.7 Disinfection

The capacity of the filtration process at the Lake Huron Water Treatment Plant was evaluated to be 303 Million Liters per Day in the Water Quality Facility Plan (Stantec, 2024). While this possible to achieve, AECOM has worked on the Contact Time calculations for the Lake Huron Water Treatment Plant and have previously provided a "Worst Scenario Contact Time Calculation" with a flow of only 200 Million Liters per Day. It is acknowledged however, that the operator has many tools to decrease the Contact Time requirement (i.e. dose chlorine, reduce caustic soda dosing, etc.).

As the plant uses chlorination for primary disinfection, the Lake Huron Water Treatment Plant is not equipped with other processes, such as ultraviolet disinfection, membrane

filtration or ozonation, as a back up and to create a more redundant multi-barrier approach to disinfection. This is also the case for handling cryptosporidium removals as filtration is the only process at the plant to achieve these disinfection credits.

To enhance the robustness of the disinfection process, it is recommendation to further review other disinfection technologies including but not limited to, ultraviolent disinfection. These technologies can be included in a study to that evaluates the feasibility of implementing these into the plant. It is acknowledged that the future feasibility study can build on the previously completed Lake Huron Water Treatment Plant Ultraviolet Facility and Reservoir Preliminary Design Report (Jacobs, 2023).

6.2.2 Pumping

6.2.2.1 Lake Huron Water Treatment Plant

Based on hydraulic capacity, the Lake Huron Water Treatment Plant high lift pumps are sufficient to meet the projected flows within the 2046 design horizon based on medium demands. However, two (2) of the pumps are original to the facility and are expected to require replacement within the planning period. Both pumps are likely beyond their useful lifespan and planning for replacement should be initiated based on the age of the asset.

6.2.2.2 McGillivray Pumping Station

The capacity for the McGillivray Pumping Station is sufficient to meet the projected flows for the 2046 design horizon. Based on the age of the assets, replacement for all of the pumps is expected to be required in the planning period. The transient analysis should be updated for this station with the proposed pumps.

6.2.2.3 Exeter-Hensall Pumping Station

The Exeter-Hensall Pumping Station has sufficient capacity to meet the expected flows within the design horizon. A transient analysis should be completed for this system.

6.2.2.4 Komoka-Mount Brydges Pumping Station

The Komoka-Mount Brydges Pumping Station has sufficient capacity to meet the expected flows within the design horizon. A transient analysis should be completed for this system.

6.2.3 Transmission

6.2.3.1 Lake Huron Primary Transmission Main

The velocity within the un-twinned sections of the Lake Huron Transmission Main exceeded maximum values when the McGillivray Pumping Station was in operation with

2 pumps. However, this occurred in the projected year of 2046, and it is expected that the system is well protected for transients for existing conditions. Overall, the Lake Huron Transmission Main was found to have sufficient capacity to meet demand with the design horizon. From a hydraulic standpoint, transmission upgrades are not expected to be required; however, the age and condition of the transmission main will likely require proactive replacement. The Lake Huron Primary Water Supply System continuously monitors the condition of transmission mains which provides insight into a pipe replacement program. A primary transmission main strategy can be developed that enhances the reliability of the current pipe replacement program and minimizes risks associated with future aging infrastructure. This planning would help inform asset replacements such as air release valves and chamber flood protection rehabilitation. In addition, it is recommended to complete a reliability and redundancy study which includes the primary transmission mains.

6.2.3.2 Komoka-Mount Brydges Transmission Main

The Komoka-Mount Brydges transmission main was determined to have sufficient capacity to supply demands within the planning horizon. It is recommended that a reliability and redundancy study be completed that includes the Komoka-Mount Brydges transmission Main.

6.2.3.3 Exeter-Hensall Transmission Main

The Exeter-Hensall transmission main was determined to have sufficient capacity to supply demands within the planning horizon. It is recommended that a reliability and redundancy study be completed that includes the Exeter-Hensall transmission main.

6.2.3.4 Strathroy-Caradoc Transmission Main

The Strathroy-Caradoc transmission main was determined to have sufficient capacity to supply demands within the planning horizon. It is recommended that a reliability and redundancy study be completed that includes the Strathroy Caradoc transmission main.

6.2.4 Storage

6.2.4.1 Arva Terminal Reservoir

Based on the hydraulic capacity assessment, the Arva Reservoir has sufficient capacity within the planning horizon.

6.2.4.2 Exeter-Hensall Reservoir

Based on the hydraulic capacity assessment, the Exeter-Hensall Reservoir has sufficient capacity within the planning horizon.

6.2.4.3 McGillivray and Lake Huron Water Treatment Plant Reservoirs

Storage at both the Lake Huron Water Treatment Plant and McGillivray Reservoir were found to have marginal deficits for pump synchronization. The existing pumping facilities are currently sequenced to minimize storage needs at the treatment facility and the McGillivray Reservoir. If operation was not synchronized, more storage would be required at both facilities. With the current sequencing, existing storage capacity in both facilities is sufficient to accommodate their pumping capacities. Further details of the storage capacity assessment can be found in Technical Memorandum 2, included in **Appendix B.2**. Within the planning horizon, tank rehabilitation is likely required due to the age of some of reservoir facilities.

7. Identification and Screening of Alternative Water Servicing Strategies

Having identified hydraulic capacity deficiencies in the existing system to service existing and future populations, there are six (6) alternative servicing strategies moving forward. These strategies have been screened based on the water modelling and the technical ability to provide water in the most efficient manner to existing and future customers to the 2046 planning horizon.

7.1 Strategy 1: Do Nothing – Maintain the Status Quo

Assumes no improvements will be made to the systems beyond those already planned or approved. Regular maintenance activities will continue. This alternative does not address the problem and opportunity statement, and therefore this alternative was not carried forward to evaluation. **Not carried forward for additional study.**

7.2 Strategy 2: Limit Growth / Soley Optimize the Existing System with no new infrastructure

Assumes no improvements will be made beyond those already planned or approved and includes measures to limit future growth in the service areas. While limiting growth would reduce the need for upgrades and improvements to the water service system, it does not address the problem and opportunity statement or recognize the Regional Water Supply does not have the jurisdiction to implement such measures on member municipalities. This also contradicts Provincial Policy Statement on municipal growth and the official plan for the member municipalities. Therefore, this alternative was not carried forward to evaluation. **Not carried forward for additional study.**

7.3 Strategy 3: Water Conservation / Reduction in Use

This alternative only partially addresses the problem and opportunity statement. Water conservation and reduction in use can provide some treatment and transmission relief but does not address future growth and would not be an adequate solution on its own. This alternative also does not recognize that the Utility has limited jurisdictional control to implement conservation measures on member communities. This strategy is encouraged as a best practice measure for community water systems.

7.4 Strategy 4: Water System Improvements to Rated Capacity

This alternative addresses the problem and opportunity statement by providing the ability to accommodate future growth through upgrades (including system optimization) to the current system up to the rated capacity. The rated capacity for the system is sufficient to provide water to customers to the 2046 planning horizon. **Carried forward to be studied further and develop alternative servicing solutions.**

7.5 Strategy 5: Water System Improvements Beyond Rated Capacity

This alternative addresses the problem and opportunity statement by providing the ability to accommodate future growth through an expansion of the system beyond the current rated capacity. The existing system rated capacity is sufficient to provide water to customers to the 2046 planning horizon, so this alternative is not necessary at this time. **Not Carried forward for additional study.**

7.6 Alternative 6: Alternative Source for Selected Customers/Communities

This alternative would consider finding an alternative source of water for selected customers to supplement the current supply to accommodate future growth. This would require new water supply agreements and would be difficult to implement due to jurisdictional and intra-basin complexities. **Not carried forward for additional study.**

8. Identification and Evaluation of Alternatives for Water Servicing Strategy 4

After screening the water servicing strategies identified in Section 7 of this report, it was determined, based on the water modelling and the technical ability to provide water in the most efficient manner, that **Strategy 4 - Water System Improvements up to the Rated Capacity** was to be studied further to develop alternative servicing solutions. This section identifies the Alternatives Solutions evaluated to implement Strategy 4.

8.1 Alternative 4A – Optimizing and Upgrading the Existing System with New Infrastructure

This alternative would optimize and upgrade the existing system to the current rated capacity through various system improvements and new infrastructure.

8.2 Alternative 4B – New Water Treatment Plant

This alternative would replace the existing Water Treatment Plant with a new plant with a rated capacity that matches the existing plant.

8.3 Evaluation Criteria

A detailed qualitative assessment of each alternative for **Water Servicing Strategy Number 4: Water System Improvement to the System Rated Capacity** was completed based on evaluation components and criteria. In this evaluation approach, trade-offs consider the advantages and disadvantages of each alternative to address the problem and opportunity statement with the least environmental effects and the most technical benefits which forms the rationale for the identification of the preferred alternative.

Each evaluation category was evaluated based on the following scoring system. Low impact is considered a preferred solution compared to moderate or high impact.

In order to evaluate the alternatives for **Strategy Concept 4**, a set of criteria were chosen which are categorized as follows in **Table 8-1.**

Table 8-1: Evaluation Criteria

Category	Criteria	Indicators
Socio-Economic: (Considerations to potential long and short term impacts	**Long Term Impacts to the Community in relation to the**	Potential effects (Noise, Dust, Vibration, property access) related to disruptions to residences, agricultural, business, and

Category	Criteria	Indicators
to the communities the Utility services)	**services provided by the Utility**	travelling public during construction and operation. Potential effects on existing and approved / planned land uses. Degree of Property Acquisition / Easement requirements
	Supports growth and development	Conformance with approved local (communities the Utility services) , and provincial plans and policies. Ability to meet utility needs and strategic plan.
Cultural Environment (How the alternatives may impact existing Heritage Buildings or lands including potential archaeological sites.)	**Archaeology**	Potential effects to cultural heritage resources.
	Built Heritage	Potential effects to built heritage resources.
	Cultural Heritage Landscapes	Potential effects to Cultural Heritage Landscapes.
	Indigenous Communities	Potential Impacts to Treaty Lands.
Natural Environment (Potential Impacts to the Natural Environment due to the construction, operation of new or updated infrastructure)	**Impacts to the Aquatic Environment**	Potential for impacts to Aquatic habitat and Species at Risk
	Impacts to the Terrestrial Environment	Potential for impacts to Terrestrial habitat and Species at Risk
	Source water Protection	Potential impacts to Groundwater Recharge Areas, Intake Protection Zones and Highly Vulnerable Aquifers in relation to current Source Water Protection Plans.
	Climate Change	Potential for impacts to climate change (greenhouse gas emissions) Potential for climate change to impact the projects and the ongoing operation (climate change resiliency)
Technical (The ability of the alternatives to	**Meets Future Needs**	Addresses the existing system capacity constraints.

Category	Criteria	Indicators
meet the current and future needs of the utility and how it can be integrated with the existing system.)		Improvements to level of service utilization of the existing and future infrastructure. Meets the long-term capacity (treatment, transmission, storage and pumping) requirements to service the projected population growth to 2046.
	Drinking Water Quality	Alignment with Regional Water Supplies current Asset Management Policy
	Maintenance of Service	Reliability of the water system (treatment, and transmission) Ability to maintain or improve water quality. Operation redundancy to improve services security and allow for safe and efficient maintenance activities. Potential to minimize increases to operational and/or maintenance complexity of the system.
	Constructability	Construction complexity including potential for utility conflicts. Security of Utility Infrastructure
	Legal Jurisdictional	Future regulatory requirements. Complexity of Approvals. Land Requirements.
Economic (Costs to construct, maintain and operate the new infrastructure for the utility)	**Project and Operations Changes Costs**	Capital Costs. Property Acquisition/Easement Costs (no costs / order of magnitude). Operation and Maintenance Costs (Day to Day costs and Contracted Operations Services costs). Life Cycle Costs

8.4 Evaluation of Strategy 4 Water Servicing Alternatives

A full evaluation matrix for the Strategy 4 alternative is provided in **Table 8-1**. Based on the criteria and methodology applied as part of the evaluation process, the recommended alternative is **Alternative 4A – Optimizing and Upgrading the Existing System**.

A summary for the rationale for this recommendation includes:

- Moderate impacts to Natural Heritage.
- Moderate Impacts to/from Climate Change.
- Meets the need of current and potential new customers.
- Moderate construction complexity.
- Straight forward permitting and approvals.
- Moderate capital cost.

8.4.1 Recommended Water Servicing Alternative

After evaluating against the criteria discussed in **Section 8.3**, it was determined that **Alternative 4A – Optimizing and Upgrading the Existing System with New Infrastructure** is the recommended Water Servicing Alternative.

This alternative optimizes and upgrades the existing system up to the current rated capacity through various system improvements and new infrastructure. Detailed descriptions of the recommend projects to achieve this are discussed in **Section 9** of this report. **Figure 8-1** provides an overview of the recommended Water System Improvements which include:

Treatment Processes:

- Flocculation Upgrades
- Clarifier Capacity Expansion
- Filter and Backwash Upgrades
- Ultraviolet Disinfection
- Tank/channel rehabilitations

Pumping:

- Pump Replacement of Lake Huron treatment plant high lift pumps (2)
- Pump Replacement of all McGillivray Pumping Station pumps (4)

- Installation of a new Surge Valve in McGillivray Reservoir (upstream of reservoir fill valve)
- Surge tank inspection and maintenance

Transmission:

- Selected transmission mains replacement through proactive program
- Chamber Flood Protection and Rehabilitations
- Combination Air Valve Replacements

Storage:

- Tank Rehabilitations

Table 8-2 – Lake Huron Primary Water Supply System - Evaluation of Water Servicing Strategy 4 Alternatives

Category	Criteria	Alternative 4A Optimize and Upgrade the Existing System (Treatment, Pumping, Storage, Transmission) *Utilize existing infrastructure with potential operational changes and new infrastructure upgrades.*	Alternative 4B New Water Treatment Plant *Replace existing water treatment plant with new plant constructed adjacent to the existing plant within Port Blake Park*
Socio Economic (Considerations to potential long and short term impacts the communities the Utility Services)	**Long Term Impacts to the Community in relation to the utility.**	Low Impacts to the community in relation to operations.	Moderate to high impacts to the community in relation to operations and construction.
		Moderate Impacts, no property acquisition is anticipated however potential impacts to recreation as new infrastructure has the potential to be constructed in Port Blake Park.	High Impact, no property acquisition is anticipated however there would be impacts to recreation as the new plant would be constructed in Port Blake Park.
	Supports growth and development	Low Impact, supports growth and future development within the existing customer service area and potential new customers based on average day demand conditions.	Low to Moderate Impact, supports growth and future development within the existing customer service area and potential new customers.
Cultural Environment (How the alternatives may impact existing Heritage Buildings or lands including potential archaeological sites.)	**Archaeology**	Potential Impacts to Archaeology. Stage 1 Archaeological Assessment May be Required if upgrades are constructed in Port Blake Park outside of the fence line of the existing plant.	Potential Impacts to Archaeology. Stage 1 Archaeological Assessment required.
	Built Heritage	No Impacts to Built Heritage.	Potential Impacts to Built Heritage. Cultural Heritage Evaluation Report will be required.
	Cultural Heritage Landscapes	No Impacts to Cultural Heritage Landscapes.	Potential Impacts to Cultural Heritage Landscapes. Cultural Heritage Evaluation Report will be required.
	Indigenous Communities	No or minimal Impacts to Indigenous Communities. Continued consultation required.	No or minimal Impacts to Indigenous Communities. Continued consultation required.
Natural Heritage (Potential Impacts to the Natural Environment due to the construction, operation of new or updated infrastructure)	**Impacts to the Aquatic Environment**	Low to moderate Impacts to the aquatic environment	Moderate to High impacts to the aquatic environment. New Greenfield sites may have Species at Risk and other aquatic habitats.
	Impacts to the Terrestrial Environment	Low to Moderate Impacts to the terrestrial environment.	Moderate to High impacts to the terrestrial environment. Greenfield site may have Species at Risk and other terrestrial habitats
	Source water Protection	Potential to be in Groundwater Recharge areas.	Potential to be in Groundwater Recharge areas.
		All alternatives have to potential to be within Low Threat designated vulnerable areas.	All alternatives have to potential to be within Low Threat designated vulnerable areas. The new plant would be partially within an intake protection zone.

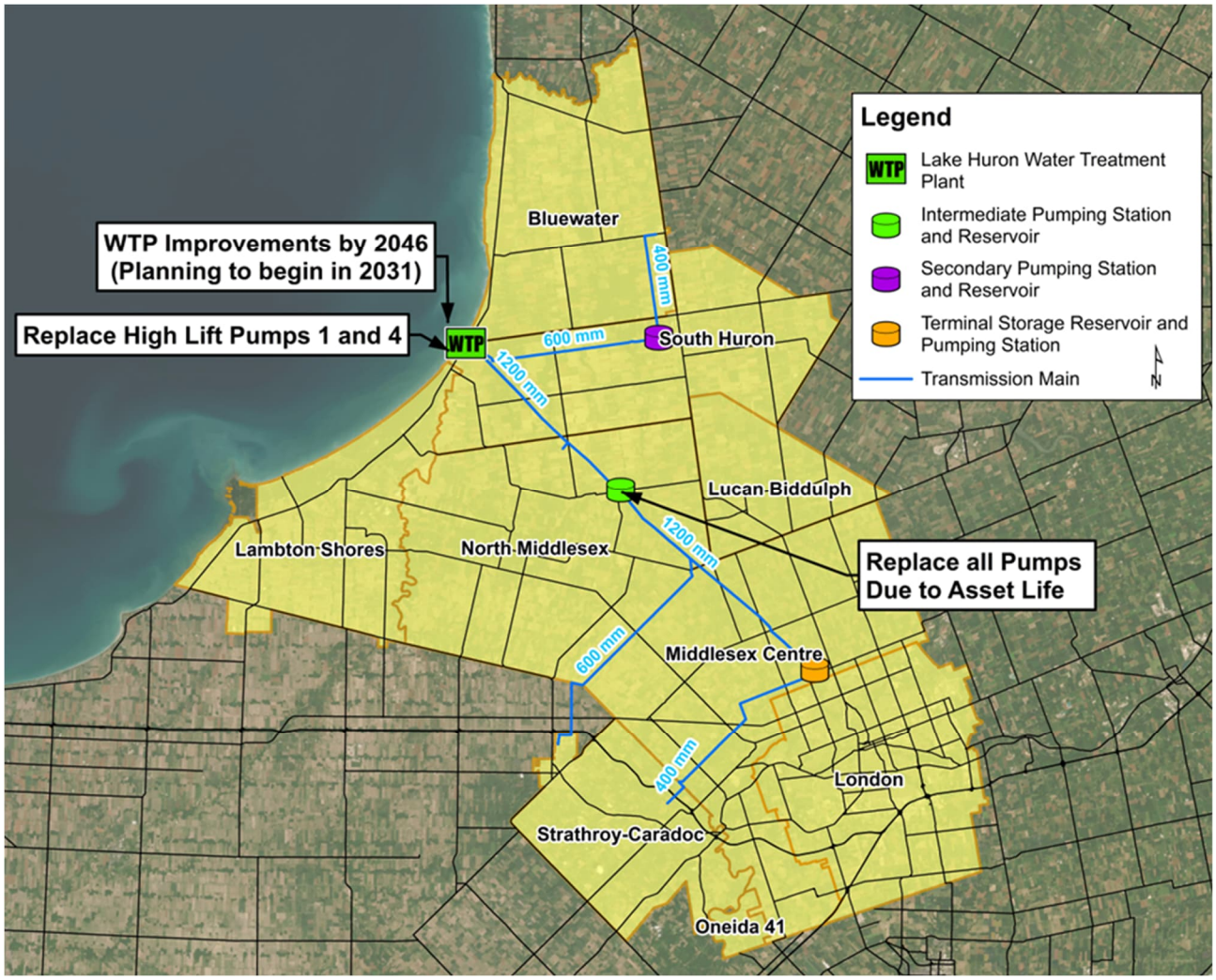
* Any recommended projects will require a more detailed assessment of Natural Heritage and Cultural Heritage Resource impacts at a project specific level (i.e. Schedule B or C projects)

Table 8-2 – Lake Huron Primary Water Supply System - Evaluation of Water Servicing Strategy 4 Alternatives

Category	Criteria	Alternative 4A Optimize and Upgrade the Existing System (Treatment, Pumping, Storage, Transmission) *Utilize existing infrastructure with potential operational changes and new infrastructure upgrades.*	Alternative 4B New Water Treatment Plant *Replace existing water treatment plant with new plant constructed adjacent to the existing plant within Port Blake Park*
	Climate Change	The existing plant is partially within an intake protection zone. Lowest impact to Climate change due to limited construction activities. Less equipment required for optimization.	High Climate change impacts due to construction activities.
Technical (The ability of the alternatives to meet the current and future needs of the utility and how it can be integrated with the existing system.)	**Meets Future Needs**	Low Impact, meets current and future needs of the existing and future customers for average day demand conditions.	Low Impact, Meets the current and future needs of the existing and future customers.
	Drinking Water Quality	No change to potable water quality.	No change to potable water quality.
	Maintenance of Service	Low Impact, No change to the maintenance of the system.	Moderate to High Impact. More complex system maintenance incorporating a new Water treatment plant.
	Constructability	Low to moderate Impacts to construct new infrastructure.	Moderate to High Impact, The new plant would be more complex to design and construct than the optimizing and upgrading.
	Legal Jurisdictional	Low Impact. Fewer and more straightforward permitting and approvals.	Moderate Impact. The new treatment plant may require more stringent permitting and approvals.
Economic and Financial (Costs to construct, maintain and operate the new infrastructure for the utility)	**Project and Operations Changes Costs**	Moderate impact to Capital Costs. Low Operation and Maintenance Costs. No Land Acquisition Costs.	Moderate to High Impacts to Capital Costs. Low to Moderate Operation and maintenance costs. No Land acquisition costs.
		RECOMMENDED	**NOT RECOMMENDED**

* Any recommended projects will require a more detailed assessment of Natural Heritage and Cultural Heritage Resource impacts at a project specific level (i.e. Schedule B or C projects)

Figure 8-1: Recommended Water System Improvements



9. Recommended Improvements

9.1 Recommended Improvement Projects

The recommended projects for the water system have been categorized by differentiating between treatment, transmission, and storage projects. The estimated capital cost and preferred timing/schedule for each project is displayed in **Section 9.4.**

Moving forward in the planning horizon, it is recommended that continuous treatment plant improvements be implemented after the associated feasibility study has been conducted. An overview of the recommended projects is provided below:

9.1.1 Treatment

9.1.1.1 Clarifier Capacity Expansion and Flocculation Upgrades

Depending on the outcome of the related feasibility study, an upgrade project can be carried forward to reduce safety risks associated with the flocculation technology and enhance the capacity of the system. This upgrade could potentially retrofit the existing basins using a new technology such as a vertical impeller style flocculators. In addition, this project could be extended to include the construction of additional hydraulic capacity if identified in the feasibility study. It is acknowledged that the clarifiers and flocculation can likely be upgraded together to find existing synergies within the plant. Similarly to flocculation, the feasibility study will dictate the required clarifier capacity expansion project. This task would include the design and construction of additional clarifier capacity in response to increasing projected demands. The expanded clarifiers would mitigate risks of elevated settled water turbidity causing reduced filtration capacity. A high-rate sedimentation alternative should be considered for this project due to the existing site space. The associated process, mechanical, and electrical work would have to be incorporated to service the new clarification process.

9.1.1.2 Filter and Backwash Upgrades

The filter and backwash upgrade project would improve the filtration capacity and provide enhanced backwashing capabilities leading to operational benefits at the facility. Improvement works are suggested to be completed on the aging filter underdrains which would allow for deeper media beds. This potential modification could allow for the filters to be re-rated to an increased loading rate, pending consultation with the Ministry of Environment, Climate Change and Parks. Adding air scour to the filters can extend filter runtimes and provide a more optimized backwash sequence leading to reduce energy and water consumption. Ultimately, the exact work to be carried out would be better informed after the completion of the feasibility study, however, this would likely require the design and construction of additional filters.

9.1.1.3 Ultraviolet Disinfection

After completing a feasibility study to determine the recommended disinfection technology, it is envisioned that an ultraviolet disinfection upgrade project be implemented. Installing ultraviolet treatment would improve potential disinfection shortfalls with the chlorination system and contribute to a multiple barrier approach that increases the plant's resiliency. This project would include both the design and construction of an additional disinfection treatment barrier.

9.1.1.4 Treatment Plant Tank Rehabilitations

Previous studies and condition assessments have indicated that several concrete tanks are approaching the end of their expected service life within the planning horizon. This project intends to carry out concrete patch repairs and rehabilitation work based on the prioritization identified in condition assessments. The rehabilitation work should take a proactive approach that prevents unforeseen maintenance shutdowns and potential water quality issues arising from deteriorating infrastructure.

9.1.1.5 Lake Huron Water Treatment Plant – High Lift Pumps 1 and 4 Replacement

Both High Lift Pumps 1 and 4 are recommended to be replaced as they are beyond their useful lifespan. This project will entail the design, selection, and installation of new pumps including the required instrumentation programming to tie into the existing Supervisory Control and Data Acquisition system. This upgrade should also include the pump control valve replacement. The installation of new pumps would support the water system's long-term operational reliability and redundancy moving forward in the planning horizon.

9.1.2 Transmission

9.1.2.1 McGillivray Surge Valve Upgrade

It is noted that at the time of this Master Plan, work is underway to replace the surge valve at the McGillivray Pumping Station. This project helps ensure the transmission system is well protected from potential damaging transient pressures.

9.1.2.2 McGillivray Pumping Station Booster Pump Replacements

All four (4) pumps at the McGillivray Station are recommended to be replaced as part of this project to ensure the transmission system can continue meeting projected demands and minimize risks of sudden equipment failure. The project will encompass the design, selection, and installation of new pumps including the instrumentation programming to tie into the existing Supervisory Control and Data Acquisition system.

This upgrade should also include the pump control valve replacement. The transient analysis for this station should be updated as part of the pump replacement project

9.1.2.3 Proactive Transmission Main Replacement Program

It is recommended to continue the proactive replacement of transmission main pipe sections and the associated appurtenances within the planning period. Pipe monitoring, a water loss review, and a risk and redundancy review are all suggested studies that build on one another to inform the planning of what sections need to be replaced. In addition, air valve replacements and chamber flood protection and rehabilitation will be informed from these studies.

9.1.2.4 Chamber Flood Protection and Rehabilitations

The water system's flood protection components and associated chambers will be addressed in this project to ensure the protection of the transmission system. Structural repairs and additional rehabilitation work should be completed to protect equipment from water damage.

9.1.2.5 Combination Air Valve Replacements

Given the age of the pipeline, a systematic replacement of combination air release/vacuum valves is recommended to maintain system reliability. Many of the existing valves are likely to have decreased functionality from wear and corrosion which could pose increased risks of pipe stresses. Surge critical air valves should include the non-slam feature to minimize transient pressure spikes. To complete this project, it is also recommended to carry out the pipe monitoring studies and condition assessments, which will identify the highest priority locations requiring replacements. This project will improve the efficiency of the transmission system and reduce potential pipe failures.

9.1.3 Storage

9.1.3.1 Storage Tank Rehabilitations

Due to the age of the storage tanks and the anticipated deterioration, a rehabilitation project should be carried forward to ensure the continued reliability of the water system. This project will consist of structural rehabilitation and concrete patch repairs to upkeep the system integrity, as it is expected that the concrete of the storage tanks will be approaching their expected end of service lives toward the end of the planning horizon. Continued condition assessments are recommended to help prioritize which tanks require rehabilitations and to determine the extent of necessary repairs.

9.2 Recommended Studies

The following recommended studies are suggested to inform capital project planning following the water treatment process needs assessment in **Section 6.2**:

9.2.1 Treatment

9.2.1.1 Optimization of Coagulant Dosing Strategy

To enhance the capacity of pre-treatment, it is recommended to carry forward the development of an optimization strategy for coagulant dosing from the Water Quality Facility Plan (Stantec, 2024). The strategy would seek to improve the basis for dosing beyond raw water turbidity and can incorporate suggested tools such as particle charge instruments and/or online ultraviolet transmittance analyzers. Developing a jar-testing procedure can be used in conjunction with the recommended tools to contribute to a standard operation procedure to be used by plant operators.

9.2.1.2 Polymer Upgrades

It is suggested to conduct a polymer upgrade study to evaluate the effectiveness of dosing polymer as a sedimentation/flocculation aid. Currently, the plant doses polymer primarily as a filter aid, however the polymer could be added in upstream processes to increase the hydraulic capacity at high loading rates. This study should investigate alternative polymers and trial them on a bench scale to quantify the increased capacity of flocculation and sedimentation. It is expected that with an effective polymer, the plant gains an additional tool to manage settled water turbidity.

9.2.1.3 Taste and Odour Management Strategy

With worsening effects of climate change and varying water quality, a taste and odour management strategy is suggested to be developed. This strategy would aim to increase the plants' ability in managing taste and odour events through identifying treatment alternatives. Various treatment options can be evaluated such as optimizing the current powdered activated carbon dosing using jar testing, or other means such as granulated activated carbon.

9.2.1.4 Feasibility Study for Flocculation & Clarifier Capacity Upgrades

Feasibility studies for both flocculation and clarification capacity upgrades are recommended to be completed within the planning horizon. An evaluation of various technology alternatives that are capable of meeting increasing capacity demands should be reviewed. It is expected that future stress testing will help guide both studies in determining the scale of the required capacity upgrade. Depending on the level of hydraulic improvement necessary, the studies can focus on larger capacity upgrades or smaller optimization efforts.

9.2.1.5 Feasibility Study for Filter Capacity Upgrades

Following the recommended stress testing, it is recommended to complete an additional feasibility study for filter capacity upgrades. This study would evaluate the possibility of constructing new filters or retrofitting the current system to extend the hydraulic capacity. As recommended by the Water Quality Facility Plan (Stantec, 2024), filter-to-waste and extended terminal sub-fluidization wash should be included in this study These changes help ensure future Ministry compliance in addition to providing benefits in the operation of the filters.

9.2.1.6 Disinfection Feasibility Study

A disinfection feasibility study is recommended to be complete in response to future projected demands and Ministry compliance. There is a potential for an increase up to a 3-log removal requirement for Cryptosporidium, in which the current disinfection process would not be able to achieve as found in the Water Quality Facility Plan (Stantec, 2024). It is suggested to evaluate the feasibility of incorporating additional technologies, including but not limited to ultraviolet disinfection, as part of a multi-barrier disinfection approach which could mitigate potential shortfalls in the existing chlorination system.

9.2.2 Transmission

9.2.2.1 Transient Hydraulic Modelling Studies for Secondary Transmission Systems

To maintain reliability in the secondary transmission systems, it is recommended to conduct transient hydraulic modelling studies. These studies should review head loss and velocity values within the transmission mains under a variety of different conditions. Since transient pressures can vary significantly depending on factors such as pump operation setpoints and valve closures, it is important to model a range of scenarios. The modeling of the secondary system will support long-term decisions making and enhance maintenance planning efforts for the water system.

9.2.2.2 Transient Hydraulic Modelling Update Study for McGillivray Pumping Station

Similar to the secondary transmission system, transient hydraulic modelling is suggested to be conducted at the McGillivray Pumping Station. As the water system continues to grow, the reliability and continued operation of the McGillivray Station will increase in importance. This study will aim to ensure the station is protected from potential damage arising from transient pressure conditions.

9.3 Other Planned/Scheduled Studies

The follow studies have been previously scheduled/planned to occur within the planning horizon or are recommended to be completed routinely by the Lake Huron Primary Water Supply System.

9.3.1 Master Plan Update

The next Master Plan Update is scheduled in 2029 for the Lake Huron Primary Water Supply System. This plan should provide a strategic planning process and comprehensive evaluation of the water system to meet the current and future water system demands effectively. The update will help to further contribute to capital planning and treatment facility improvements.

9.3.2 Financial Plan Update

It is recommended that the Lake Huron Primary Water Supply System continues to update their financial plan to support the capital budgeting process for necessary water system improvements and maintenance. This plan typically should include the analysis of capital, operating, asset management, and lifecycle costs.

9.3.3 Climate Change Resilience and Adaptation Plan

It is recommended to complete a climate change resilience and adaptation plan to further evaluate any potential vulnerabilities and ensure the water system's reliable operation in worsening environmental conditions. The study should involve conducting risk assessments to determine the resiliency of the current infrastructure in response to extreme weather events and changing water quality. Adaptation plans can also be developed to provide mitigation strategies against environmental factors, including but not limited to, enhanced storage capacities and protection against flooding. It is expected that once the initial plan is created, updates can be made routinely or if the environmental conditions change significantly.

9.3.4 Asset Management Plan Update

The asset management plan is aimed at evaluating the condition, performance, and remaining useful life for assets in the water system. Assets are also typically assessed in terms of their risk and level of service to facilitate optimized repairs/maintenance. Lifecycle and financial planning should continue to be included within the asset management plan keeping in mind long-term budgeting to ensure sustainable funding for asset renewal and maintenance. In addition to many of the recommended studies, updating the asset management plan will help provide direction in which treatment plant improvements should be prioritized.

9.3.5 Ongoing Condition Assessments

Ongoing condition assessments are a critical component of the Lake Huron Primary Water Supply System's effective asset management strategy, which provides the necessary insights to inform the maintenance, rehabilitation, and replacement of assets. It is recommended to continue undertaking assessments inclusive of both desktop reviews and detailed field investigations, to carry out recommendations from the asset management plan. This information can be analyzed to prioritize water system improvements and prevent any critical failure of assets from deterioration.

9.3.6 50 Year Roadmap Study

It is recommended to complete a 50 Year Roadmap Study to evaluate the projected effect on the water system from population growth, urbanization, and industrial development, while accounting for climate variability and evolving regulatory standards. This study should also include how the Lake Huron Primary Water Supply System would respond to various long-term growth scenarios and initiate a high-level planning process to guide future infrastructure investments. In general, the long-term planning and vision for the water system should be investigated to inform short-term decision-making, ensuring infrastructure resilience, operational efficiency, and effective future planning. Once the initial roadmap study is completed, updates can be carried out to reflect the dynamic changes based on the growth of the Lake Huron Primary Water Supply System.

9.3.7 Energy Audit and Pump Optimization Study Update

To enhance the sustainability of the water system and improve operational efficiency, it is recommended to complete an energy optimization update. This study should review opportunities to optimize pump operations and reservoir filling to reduce overall energy consumption. Incorporating demand patterns and analyzing system inefficiencies can help the Lake Huron Primary Water Supply System to offset the rising cost of electricity. Additionally, the previously mentioned hydraulic modelling studies can provide insight into pressure management within the transmission system which is linked to energy usage.

9.3.8 System Reliability and Redundancy Review

It is recommended to complete an evaluation of the water system's reliability and redundancy. Primarily, areas of that lack redundancy should be identified and reviewed to consider the long-term reliability of the associated infrastructure. Areas such as untwined sections of the transmission main and pumping stations can be investigated the to determine the level of risk that is posed in lacking redundancy. This study should also be extended to review other asset areas such as treatment processes and digital technology infrastructure.

9.3.9 Water Loss Review

To continue maintaining levels of service, a water loss review should be conducted as part of the lifecycle strategy mentioned in the Asset Management Plan Report 2022 by the Lake Huron Primary Water Supply System. This study would help quantify the volume of water loss occurring between the treatment facilities and benefiting municipalities. Identifying areas prone to water loss can also highlight potential points of failure to inform future condition assessment in addition to estimating amounts of non-revenue water produced. The study can also include any opportunities to review water loss occurring within the treatment plant and prior to entering the transmission system, to quantify the potential for non-revenue water savings and reduced water usage.

9.3.10 Treatment

9.3.10.1 Water Quality Facility Plan Update

To better inform the next Master Plan Update and further understand the facilities treatment capabilities, a water quality facility plan update is recommended. This involves a detailed and strategic process that evaluates the treatment capabilities of the existing system and ensures regulatory compliance. With the increasing effects of climate change and population growth, the update should incorporate future water quality challenges and emerging contaminant considerations. Similar to previous iterations of the water quality facility plan, a phased implementation roadmap should be developed to prioritize improvements and provide recommendations.

9.3.10.2 Stress Testing

To gain further refined information on limiting treatment process capacities, it is recommended to undertake additional cold water stress testing. Running the test in different water quality conditions would help build certainty as to the true operable capacity of the facility. This would provide insight into operating plant processes in a low efficiency scenario and help further prioritize where potential bottlenecks exist within the treatment facility. Carrying out additional stress testing throughout the planning horizon would provide a proactive assessment to ensure the treatment process are functioning efficiently and complying with regulatory requirements.

9.3.11 Transmission

9.3.11.1 Lake Huron Primary Water Supply System Hydraulic Model Update and Calibration

The Utility should consider a comprehensive update and calibration for the Lake Huron Primary Water Supply System hydraulic model. It is recommended that the network

update should be conducted for every 2 years and model calibration to be completed for every 5 years.

9.3.11.2 Transient Hydraulic Modelling Update

To maintain reliability in the transmission system, it is recommended to conduct transient hydraulic modelling study updates for the Lake Huron Primary Water Supply System. Since transient pressures can vary significantly depending on factors such as pump operation setpoints and valve closures, it is important to model a range of scenarios. The modelling of the system will support long-term decision making and enhance maintenance planning efforts for the water system.

9.3.11.3 Ongoing Monitoring of Primary Transmission Mains

In accordance with the Prestressed Concrete Cylinder Pipe Degradation Modeling Report completed in 2023 by Pure Technologies, it is recommended to continuously monitor the transmission mains to complete proactive pipeline replacements.

9.4 Recommended Capital Program

Based on the recommended infrastructures for the preferred servicing strategy, the capital cost and preferred timing/schedule was identified. The cost estimation was based on the size/capacity and constructability. The costs included the following key considerations and excludes planning (Class Environmental Assessments, studies etc.):

- Design and contract administration
- Permits and Approvals
- Contingency
- Equipment acquisition and installation

The following tables below display the recommended capital program projects and studies:

Table 9-1 summarizes the Recommended Improvements and costs for implementation (Prices in 2025 Millions of Canadian Dollars).

Table 9-2 summarizes the Recommended Studies and costs for implementation (Prices in 2025 Thousands of Canadian Dollars).

provides the estimated costs for the future studies to be considered to support the potential improvement works.

Table 9-3 summarizes the Planned/Scheduled Studies and costs for implementation (Prices in 2025 Thousands of Canadian Dollars).

Table 9-1: Recommended Improvements

All Prices in Millions of Canadian Dollars (2025) – Class E Estimate.

Project Type	Project	Class Environmental Assessment Schedule Requirement	Cost for 2026-2031	Cost for 2031-2036	Cost for 2036-2041	Costs for 2041-2046
Treatment	Clarifier Capacity Expansion and Flocculation Upgrades**	Exempt	0	0	0	70
Treatment	Filter and Backwash Upgrades **	Exempt	0.1	0	50	25
Treatment	Ultraviolet Disinfection **	Exempt	0	50	0	0
Treatment	Treatment Plant Tank Rehabilitations	Exempt	0	0	0	4
Treatment	Lake Huron Water Treatment Plant – High Lift Pumps 1 and 4 Replacement	Exempt	0	8	0	0
Transmission	McGillivray Pumping Station- Surge Valve Upgrade	Exempt	1	0	0	0
Transmission	McGillivray Pumping Station- Booster Pumps Replacements	Exempt	0	16	0	0
Transmission	Transmission Main Replacement Program	Exempt	1.5	1.5	1.5	1.5
Transmission	Chamber Flood Protection and Rehabilitations	Exempt	2	0	0	0
Transmission	Combination Air Valve Replacements	Exempt	2	0	0	0
Storage	Storage Tank Rehabilitations	Exempt	0	0	0	4

All Capital Works' Prices in 2025 Millions of Canadian Dollars. All projects are subject to business case and risk/opportunity reviews undertaken by the Lake Huron Primary Water Supply System.

** Dependent upon feasibility study

Table 9-2: Recommended Future Studies

All Prices in 2025 Thousands of Canadian Dollars (2025) – Class E Estimate.

Study Area	Study	Cost For 2026 - 2031	Cost For 2031 - 2036	Cost For 2036 - 2041	Cost For 2041 - 2046
Treatment	Optimization of Coagulant Dosing Strategy	300	0	0	0
Treatment	Polymer Upgrades	800	0	0	0
Treatment	Taste and Odour Management Strategy	250	0	0	0
Treatment	Feasibility Study for Flocculation and Clarifier Capacity Upgrades	100	0	0	0
Treatment	Feasibility Study for Filter Capacity Upgrades	100	0	0	0
Treatment	Disinfection Feasibility Study	150	0	0	0
Transmission	Transient Hydraulic Modelling Studies for Secondary Transmission Mains	150	0	0	0
Transmission	Transient Hydraulic Modelling Update for McGillivray Pumping Station	100	0	0	0

All studies are subject to business case and risk/opportunity reviews undertaken by the Lake Huron Primary Water Supply System.

Table 9-3 Scheduled/Planned Studies

All Prices in Thousands of Canadian Dollars (2025) – Class E Estimate.

Study Area	Study	Cost For 2026 - 2031	Cost For 2031 - 2036	Cost For 2036 - 2041	Cost For 2041 - 2046
All	Master Plan Update	150	150	150	150

Study Area	Study	Cost For 2026 - 2031	Cost For 2031 - 2036	Cost For 2036 - 2041	Cost For 2041 - 2046
All	Financial Plan Update	120	120	120	120
All	Climate Change Resilience and Adaptation Plan	0	80	80	80
All	Asset Management Plan Update	250	250	250	250
All	Ongoing Condition Assessments	300	300	300	300
All	50 Year Roadmap Study and Updates	250	25	100	25
All	Energy Audit and Pumping Optimization Update	0	200	0	200
All	System Reliability and Redundancy Review	150	0	150	0
All	Water Loss Review	50	0	50	0
Treatment	Water Quality Facility Plan Update	250	250	250	250
Treatment	Stress Testing	50	50	50	50
Transmission	Lake Huron Primary Water Supply System Hydraulic Model Update and Calibration	150	150	150	150
Transmission	Transient Hydraulic Modelling Update	0	0	250	0
Transmission	Ongoing Monitoring of Primary Transmission Mains	3000	3000	3000	3000

All studies are

subject to business case and risk/opportunity reviews undertaken by the Lake Huron Primary Water Supply System.

10. Conclusions and Next Steps

The Master Plan Report outlines the process required to ensure that the proposed recommended solutions to the problem and opportunity statement meet the requirements of the *Environmental Assessment Act*.

The proposed projects resolve the problem and opportunity statement identified in this report. A preliminary evaluation of potential impacts has been included in the evaluation, which indicates minor and predictable impacts that can be addressed.

Appropriate public notification and an opportunity for comment was provided and no comments were received that could not adequately be addressed. Subject to receiving Municipal Class Environmental Assessment finalization following the 30-day review period, the Utility can start the detailed design and permitting-approvals phase for the projects according to the timing outlined in this report.

10.1 Approvals

The recommended projects in this report, will be exempt from the Municipal Class Environmental Assessment processes. When these projects get implemented, depending on the complexity, approvals will be required from various regulatory authorities including but not limited to Ministry of Environment Conservation and Parks (Drinking Water Works Permit), previously identified Conservation Authorities where work is within their regulated areas, Electrical Safety Authority, and potentially Ministry of Natural Resources and Forestry.

Any future project recommended in this report should still consider for any potential impacts to cultural heritage resources and be screened for archaeological potential prior to construction. Any required future Cultural Heritage studies (e.g., Stage 1 archaeological assessment and Cultural Heritage Evaluation Reports) as a result of the recommended projects will be undertaken as early as possible by an archaeologist licensed under the Ontario Heritage Act during planning and design phase. All archaeological assessment reports will be submitted for Ministry of Citizenship and Multiculturalism’s review prior to the completion an environmental assessment process and prior to any ground disturbance.