City of Barrie

Water Supply Master Plan Update

Final Report

July 2019

Water Supply Master Plan Update

Final Report

City of Barrie

FINAL

PROJECT NO.: 171-07636-00
DATE: JULY 2019

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July 05, 2019

City of Barrie
City Hall, 70 Collier Street
P.O. Box 400
Barrie, Ontario
L4M 4T5

Attention: Mr. Tom Reeve, Senior Infrastructure Planning Program Coordinator

Dear Mr. Reeve:

We are pleased to provide our final Master Plan Report for the City of Barrie - Water Supply Master Plan Update. The purpose of this report is to present a review of the existing water infrastructure within the City through a summary of background documentation and available data. The study includes details on the growth and level of service assumptions used for the gap analysis and review of alternative solutions to meet the servicing objectives for the City.

We would be happy to discuss this report with you at your convenience.

Yours sincerely,

Michelle Albert, P. Eng

Project Manager

MP/mp

WSP ref.:171-07636-00

Quality Management

ISSUE/REVISION	FIRST ISSUE	REVISION 1	REVISION 2	REVISION 3
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Prepared by	Maika Pellegrino	Maika Pellegrino	Maika Pellegrino	Maika Pellegrino
Signature				
Checked by	Michael Flowers	Sinclair Garner	Sinclair Garner	Sinclair Garner
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Authorised by	Michelle Albert	Michelle Albert	Michelle Albert	Michael Albert
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Signatures

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PROJECT MANAGER

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1 Introduction

1.1 Study Purpose

The City of Barrie (The City) has completed updates to four Master Plans: Water Supply, Water Distribution and Storage, Wastewater Collection, and Wastewater Treatment. Each Master Plan Update identifies the water or wastewater servicing projects that will be required to accommodate and facilitate growth and intensification over the planning horizon, including:

- Residential and employment growth;
- Intensification of the City as required by Provincial policy; and
- Optimal design and delivery of water and wastewater servicing City-wide.

Alternative water and wastewater servicing solutions have been developed based on a high-level review of their natural, physical, social/cultural and financial impacts. In accordance with Approach #2 under the Municipal Class Environmental Assessment document (MCEA, October 2000, as amended in 2007, 2011, and 2015) Appendix 4, this Master Plan Report documents the completion of Phase 1 and completion of Phase 2 at a high-level to satisfy the requirements of an MCEA Master Plan. Most importantly, this report identifies the necessary projects that should be completed to achieve the objectives of the Master Plan over the planning horizon. For Schedule 'B' Class EA projects identified in this report to be constructed within the next 10 years, the related public consultation, technical studies and detailed assessment of alternative solutions relating to these projects are contemplated under this assignment. If Schedule "C" Class EA projects are identified and prioritized within the next 10 years, then the City will complete a detailed evaluation of alternatives to satisfy Phase 2 as well as the completion of Phases 3 and 4 of the MCEA prior to the public review of an Environmental Study Report.

This report documents the MCEA Master Plan study for the Water Supply Master Plan. This report is an update to the Master Plan completed in 2013 in support of the City's Official Plan Amendment and Secondary Plan to account for lands annexed from the Town of Innisfil, as per the *Barrie-Innisfil Boundary Adjustment Act, 2009*.

1.2 Municipal Class EA Process

As required under the Ontario *Environmental Assessment Act (EAA)*, this study followed the MCEA (October 2000, as amended in 2007, 2011, and 2015) planning process. The MCEA establishes a framework by which broad environmental outcomes of public sector infrastructure projects are reviewed and evaluated. The stated purpose of the EAA is to provide *the betterment of the people of the whole or any part of Ontario by providing for the protection, conservation and wise management in Ontario of the environment*. The EAA interprets environmental outcomes to be those associated with the natural, social, cultural, built, and economic environments.

The EAA requires that municipalities complete a MCEA for public works and infrastructure projects, including those for roads, transit ventures, and water and wastewater projects. Key principles of the MCEA process include:

- Consultation with stakeholders and affected parties upon study commencement, and throughout the process of the project;
- Consideration of all reasonable alternatives, including “alternatives to” and “alternative methods” of implementing a preferred solution;
- Identification and consideration of broad environmental affects, as identified previously, for each alternative under evaluation;
- The systematic evaluation of all alternative solutions and/or methods to determine the net environmental effects, based on available information; and
- The provision of clear and comprehensive documentation that demonstrates how the MCEA planning process was followed, and to ensure transparency and traceability of the decision-making process for the project.

Under the MCEA, the Master Plan process allows a proponent, such as the City of Barrie, to prepare the planning, design, and construction of a group of related municipal works, rather than individually on a project-by-project basis. The benefits of the Master Plan approach include:

- The rationale for each individual project is more clearly articulated;
- The range of alternatives are more broadly addressed;
- The extent of potential environmental outcomes is better understood;
- There is an enhanced ability to assess cumulative outcomes; and
- The process allows for the integration of land use planning.

The Master Planning process differs from project specific undertakings in several aspects, and facilitates long range planning that enables the municipality to identify opportunities and proactively develop strategies for addressing any associated issues. This approach generally yields a series of individual activities, projects, and programs, together with a phased implementation plan that covers over an extended time period. Accordingly, the works may be implemented separately as individual projects but, collectively, they form part of the overall management system embodied in the Master Plan.

The Study is being undertaken in accordance with Approach #2, as described in Appendix 4 of the MCEA document. An overview of the Municipal Class Environmental Assessment process is provided in Figure 1-1. This approach involves the preparation of a Master Plan document upon the completion of Phase 1 and high-level analysis and public consultation completed as part of Phase 2 of the process. The Master Plan document is then made available for public comment prior to being approved by the municipality. Under Approach #2, the Master Plan is done at a high level of assessment. The objective of the Master Plan is to identify required projects and their MCEA schedule. After the completion of the Master Plan, additional public consultation, technical studies and detailed evaluation of alternative solutions are needed at the project-specific level in order to fulfill the requirements for any specific Schedule "B" projects. Further study and the completion of Phases 3 and 4 are also required to fulfill the requirements for any specific "C" projects identified within the Master Plan itself.

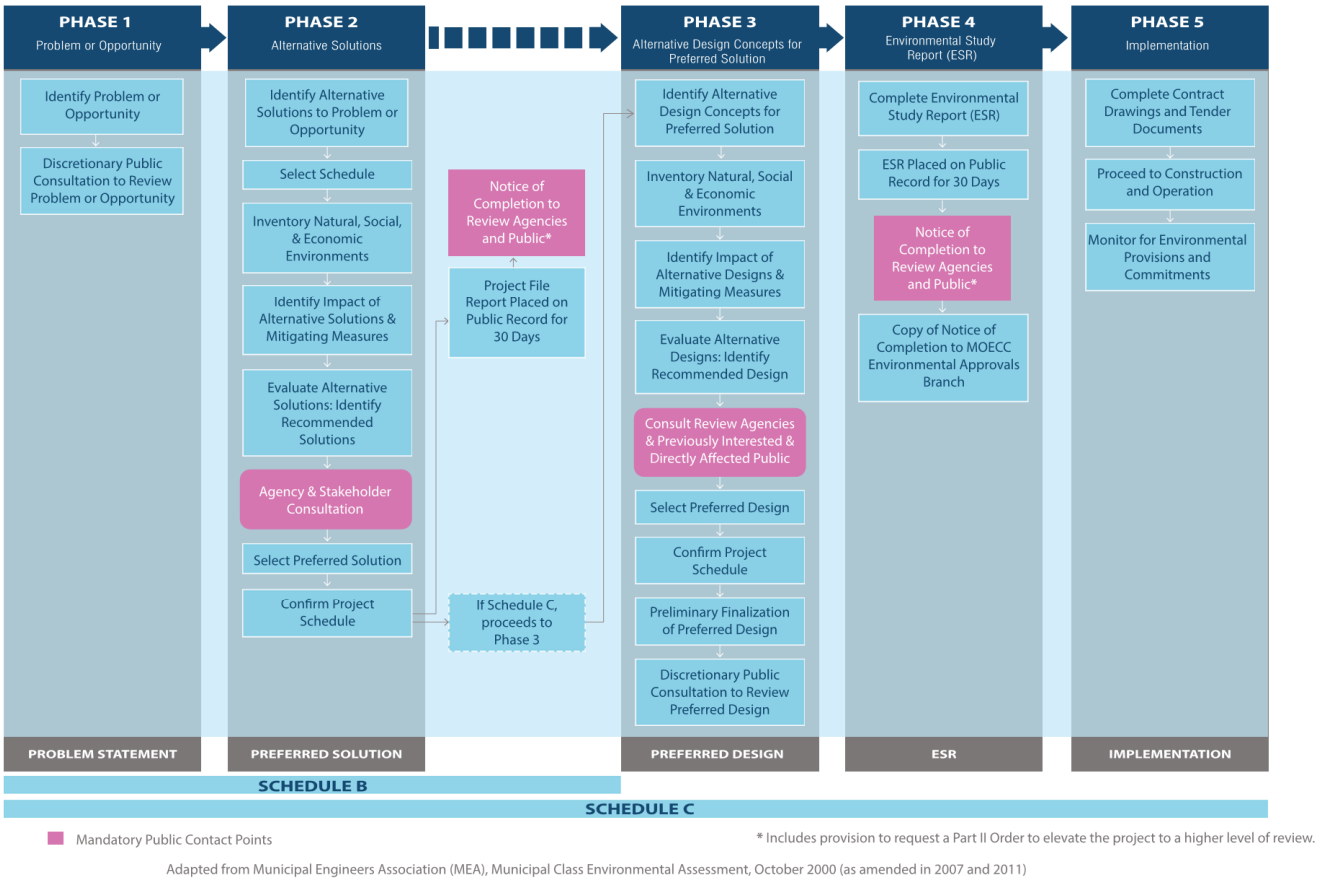


Figure 1-1 Municipal Class Environmental Assessment Process

The Master Plan would therefore become the basis for, and be used in support of, any future Schedule "B" and Schedule "C" projects identified within it. Schedule B projects require project-specific investigations and analyses and the filing of the Project File for public review, while Schedule "C" projects would have to fulfill Phases 3 and 4 of the MCEA process prior to filing an Environmental Study Report (ESR) for public review.

The City of Barrie Water Supply Master Plan demonstrates the methodology and rationale for identifying the required Schedule “A”, “A+”, “B” and “C” projects to accommodate and facilitate growth within the City of Barrie to the year 2041.

1.3 Public and Stakeholder Consultation

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

Consultation early and throughout the process is a key feature of environmental assessment planning. The purpose of the consultation process is to notify stakeholders of the project details and provide an opportunity for interested parties to review and submit comments related to the study. The following public and stakeholder consultation activities were completed throughout the Master Planning process. Refer to **Appendix A** for copies of all Notices, stakeholder contact lists and Public Information Centre material. This information is provided in accordance with the standards prescribed by the Class EA document, which outlines the guidelines for establishing contact with appropriate review agencies in relation to the nature of the project.

1.3.1 Notice of Study Commencement

A Notice of Study Commencement was issued to both the City of Barrie website, as well as in the newspaper. Notification was provided through the following means:

- By advertisement in the Barrie Examiner on August 10th and 12th, 2017;
- By posting to the City’s website on August 10th and August 12th, 2017;
- Via e-mail to all agency contacts provided in the project contact list (**Appendix A**).

As a result, all relevant review agencies and the public were notified of the project being initiated, the problem and opportunity being addressed, and given the opportunity to provide comments. A record of the Notice of Study Commencement is located in **Appendix A**.

1.3.2 Notice of Public Information Centre (PIC)

A Notice of Public Information Centre (PIC) was issued through both the City of Barrie website, as well as in the newspaper. Notification was provided through the following mediums:

- By advertisement in the Barrie Advance on October 18th and 25th, 2018;
- By posting to the City’s website on October 18th and 25th, 2018; and,
- Via e-mail to all agency contacts provided in the project contact list (**Appendix A**).

As a result, all relevant review agencies and the public were notified of the Public Information Centre being held, the problem and opportunity being addressed, and given the opportunity to provide attend and provide comments and feedback. A record of the Notice of Public Information Centre is located in **Appendix A**.

1.3.3Public Information Centre (PIC)

A Public Information Centre was held on November 1st, 2018, at the Southshore Community Centre in the City of Barrie. A notice of the meeting was issued on October 18th and 25th on the City's website as well as in the Barrie Advance. The Notice was also circulated to review agencies, as well as Indigenous communities.

The Public Information Centre was a drop-in, open house format, beginning at 4:00PM and lasting three hours. It included a series of display boards describing each of the Master Plan processes. During this time, City staff, as well as members of the consultant team, were in attendance to discuss the Master Plan updates and address any questions from community residents.

The general purpose of the Public Information Centre was to present the findings of the Master Plan updates by providing the following information:

- Scope of the Master Plan process;
- Class EA Master Plan process;
- Growth projections;
- Review of the Water Supply System;
- Review of Water Distribution and Storage;
- Review of Wastewater Collection;
- Review of Wastewater Treatment;
- Recommendations from the Master Plans;
- An overview us Master Plan process time line and next steps; and,
- An opportunity for residents to provide comments and feedback on the Master Plan updates.

A total of 26 community members attended the Public Information Centre, and five comment sheets were submitted. A record of these documents is provided in **Appendix A**.

1.3.4Agency and Public Comments and Responses

Table 1-1 is a summary of comments received through consultation with regulatory agencies and members of the public during the Master Plan process. A copy of all notices and comments received during the study are provided in **Appendix A**.

Table 1-1 Summary of Comments received on the City of Barrie Master Plans

Review Agency	Comment	Response
Agencies		
Ministry of Tourism, Sport and Culture	All technical heritage studies and their recommendations are to be addressed and incorporated into the EA. Please advise MTCS whether any technical heritage studies will be completed for your EA project, and provide them to MTCS before using a Notice of Completion. If your screening has identified no known or potential cultural heritage resources, or no impacts to these resources, please include the completed checklists and supporting documentation in the EA report or file.	The Ministry of Tourism, Sport and Culture will be circulated on the Notice of Study Completion and kept informed of any technical heritage studies in support of the Master Plan updates. MTCS will be circulated of any studies prior to the Notice of Study Completion.

1.3.5Notice of Study Completion

Section to be completed once Master Plan has been reviewed and approved by City Council a Notice of Study Completion will be issued.

1.4 Master Plan Study Timeline

Table 1-2 provides a review of key milestones to the Water Supply Master Plan Study Process:

Table 1-2 Master Plan Study Timeline

Milestone	Timeline	Description
Notice of Study Commencement	August 2017	A Notice of Study Commencement was issued on August 10th and 12th, 2017. The Notice reviewed the purpose of the study and the study process. Contact information for the City of Barrie Project Manager was provided.
Notice of PIC	October 2018	A Notice of Public Information Centre was issued on October 18th and 25th, 2018. The Notice identified the location, time, and purpose of the PIC. Contact information for the City of Barrie Project Manager was provided.
PIC	November 2018	A Public Information Centre was held on November 1st, 2018 at the Southshore Community Centre. The PIC was 3 hours in length, from 4:00PM to 7:00PM.
Master Plan Report	April 2019	Final Draft Master Plans submitted to the City for Final Review and Approval
Master Plan Approval	May 2019	Endorsement from Barrie City Council
Notice of Study Completion	June 2019	Issuance of Notice of Study Completion

2 Background and Context

2.1 City of Barrie Profile

2.1.1 City of Barrie

The City of Barrie is one of Ontario's fastest growing municipalities, and is the largest urban centre within the Simcoe County area. It is a single-tier municipality located north of the City of Toronto, traversed by Highway 400 and is located on the shores of Lake Simcoe, specifically Kempenfelt Bay. Lake Simcoe has been identified as a highly sensitive body of water due to the cold-water aquatic ecosystem that it supports. Accordingly, it is closely monitored with respect to phosphorous and nutrient loading.

This Master Plan has been developed to facilitate Barrie's current and projected growth to ensure that sufficient servicing can be provided to facilitate this growth to 2041. It is also important that the Lake Simcoe watershed be protected, as required under Provincial legislation.

2.1.2 City of Barrie Demographic Statistics

According the 2016 Census Profile (Statistics Canada, 2017), the City boundary encompasses nearly 99 square kilometers and as of the 2016 census, has a population of 141,434 excluding undercount. This represents a growth rate of 3.9% from the 2011 census. The median age of residents in 2016 was 38.5 years, with those aged 15 to 64 years representing approximately 68% of the total population. The median total income of households in 2015 was $78,000, with a total labour force aged 15 years and older of 78,945 employments, representing an potential employment rate of 64.3%. English is the predominant mother tongue, spoken by 85% of the population.

2.1.3 Study Area

The Study Area for this Master Plan includes the entire municipal jurisdiction as shown in Figure 2-1. This includes the "Salem and Hewitts Secondary Plan Areas" located within the southern portion of the City's municipal boundary.

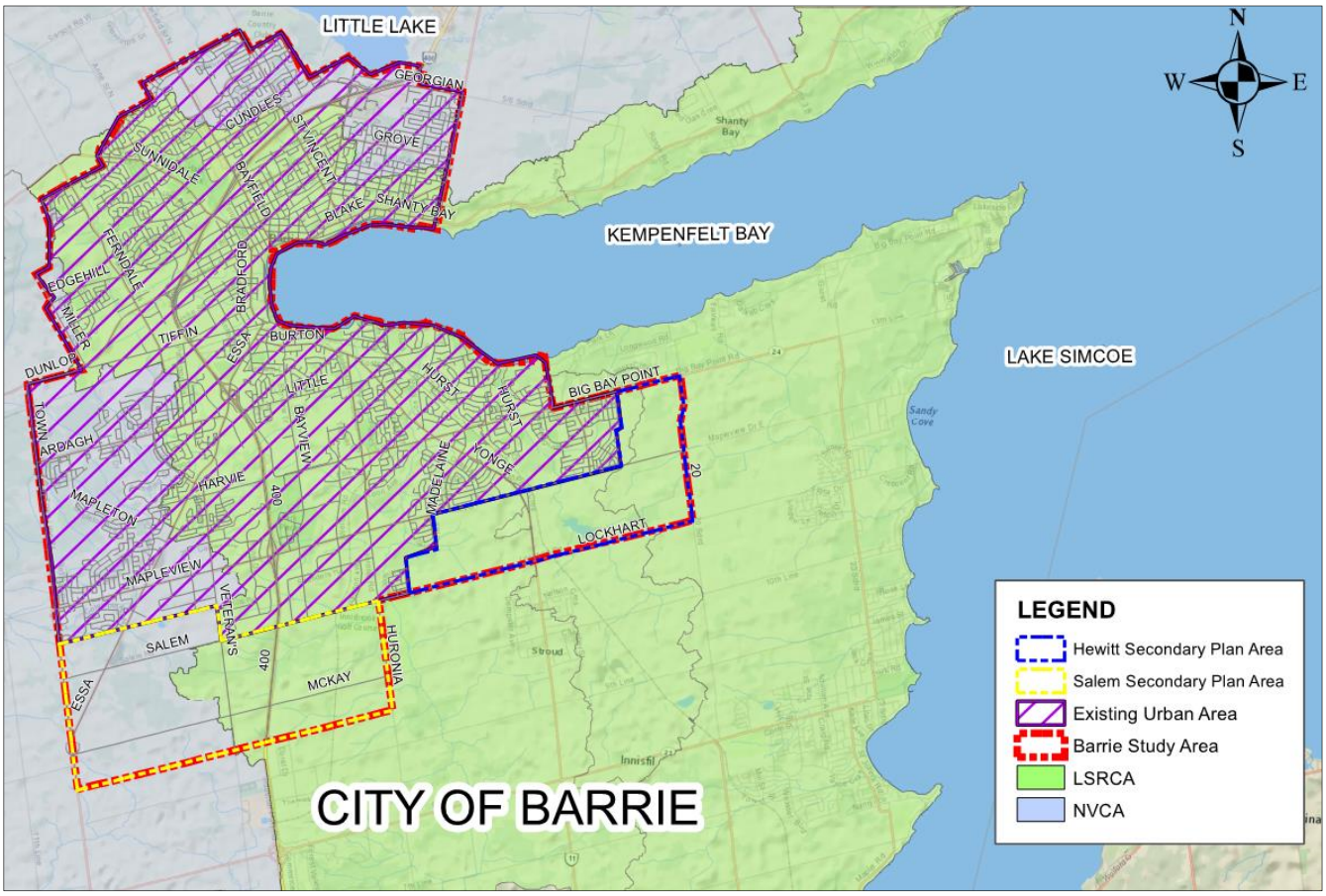


Figure 2-1 Master Plan Study Area

2.1.4History of Salem and Hewitts Secondary Plan

In 2010, the *Barrie-Innisfill Boundary Adjustment Act* came into effect, extending the southern boundary of the City to include 2,293 hectares of land (the "Salem and Hewitts Secondary Plan Areas") previously located within the Town of Innisfill. The Salem and Hewitts Secondary Plan Areas are an important component to implementing the City of Barrie Growth Management Plan, and meeting Provincial population and employment targets as identified in the Growth Plan for the Greater Golden Horseshoe, 2017. Accordingly, the Salem and Hewitts Secondary Plan Areas provide an opportunity for the City to accommodate and support this anticipated growth and change over the planning horizon.

2.1.5Lake Simcoe Watershed

The Lake Simcoe watershed includes 3,400 square kilometres and crosses 20 municipal boundaries, including York and Durham Regions, Simcoe County, and the Cities of Kawartha Lakes, Barrie and Orillia. It is the largest body of water in Southern Ontario, other than the Great Lakes and has an important natural and cultural heritage role within the Province. Natural features within the Lake Simcoe Watershed include 18 major river systems, 4,225 kilometres of creek, stream and tributary channels and over 75 species of fish.

Collectively, the watershed provides water resources to over 450,000 residents (Lake Simcoe Region Conservation Authority, 2016). Land use within the watershed is classified as 8% urban, and 36% agriculture. The lake itself is economically important, generating over $200- million of tourism revenue per annum. The watershed is managed by the Lake Simcoe Region Conservation Authority (LRSCA), an organization incorporated under the *Conservation Authorities Act* (1946, as amended).

2.1.6 Nottawasaga Valley Watershed

The Nottawasaga Valley watershed includes an area of approximately 3,700 square kilometers, and includes lands within 18 municipalities located in the upper-tier municipalities of Simcoe, Dufferin and Grey County. It is generally located in an area bound by the Oak Ridges Moraine to the south, Niagara Escarpment to the west, Oro Moraine to the east, and Georgian Bay on Lake Huron to the north. The watershed encompasses all the water that drains along the Nottawasaga River, which receives water from many smaller tributaries including the Boyne River, Innisfill Creek, Mad River, Pine River and Willow Creek, among several others. The watershed is managed by the Nottawasaga Valley Conservation Authority (NVCA), and organization incorporated under the *Conservation Authorities Act* (1946, as amended).

2.2 Regulatory Framework

A fundamental purpose of updating the Master Plan is to comply with and meet regulatory requirements. These include various acts, regulations, guidelines and policies that govern water and wastewater supply, collection and treatment, as well as the pattern of development for which these systems will be expanded to service. This regulatory framework is overseen by three main bodies: the Ontario Ministry of the Environment, the Ontario Ministry of Natural Resources, and the federal government. Several of the key regulatory requirements impacting the Master Plan update are reviewed in the following sections.

2.2.1 Safe Drinking Water Act, 2002

The *Safe Drinking Water Act, 2002* provides the legislative framework for municipal drinking water systems. It establishes a set of province-wide standards, rules and regulations to ensure the population has access to safe and reliable drinking water. The Act specifies requirements for drinking water systems, testing services and the certification of system operators and water quality analysts including regulatory water quality standards and mechanisms for compliance.

2.2.2Clean Water Act, 2006

The *Clean Water Act, 2006* aims to ensure that Ontarians get access to safe drinking water through the protection of existing and future sources of drinking water. In the multi-barrier approach, protecting water at its source by preventing its contamination is the first step. The Act requires communities to assess the existing and potential threats to their water sources, and take the corresponding actions to reduce or eliminate the threats. In addition, it empowers communities to take action by requiring public participation in local source protection planning, and by requiring that all plans and actions be based on sound science.

2.2.3Water Opportunities Act, 2010

The *Water Opportunities Act, 2010* provides a framework for the economic development of water resources while conserving and sustaining them long-term. The Act seeks to foster innovative technologies, services and practices in the private and public sectors for water, wastewater, and stormwater. Another key objective is the creation of opportunities for economic development and clean-technology jobs.

2.2.4Growth Plan for the Greater Golden Horseshoe, 2017

The Growth Plan for the Greater Golden Horseshoe (the “Growth Plan”) 2017, developed pursuant to the *Places to Grow Act, 2005*, and as an update to the Growth Plan for the Greater Golden Horseshoe, 2006, is a framework for implementing the Province’s vision for building stronger, prosperous communities by better managing growth and includes policies for the provision of well-planned infrastructure and strategic investment decisions to support forecasted population and economic growth.

The Growth Plan (GP) establishes that municipal water and wastewater systems will be planned, designed, constructed or expanded through a comprehensive water or wastewater master plan, informed by watershed planning that takes into consideration the following:

- That effluent discharge will not negatively impact the quality and quantity of water (GP-Section 3.2.6.3.c.i);
- That the preferred option for servicing growth and development will not exceed the assimilative capacity of the effluent receivers and sustainable water supply for servicing, ecological, and other needs (GP-Section 3.2.6.3.c.ii); and
- That the full life cycle costs of the system can be sustained over the long-term (GP-Section 3.2.6.3.c.ii).

The Growth Plan further requires that municipalities that share an inland water source or receiving water body will co-ordinate their planning for potable water, stormwater, and wastewater systems based on watershed planning to ensure the quality and quantity of water is protected, improved, or restored (GP-Section 3.2.4.6).

2.2.5City of Barrie Official Plan

The City of Barrie Official Plan (the "Official Plan"), version from January 2018 Office Consolidation, provides direction for managing growth and change within the City. This includes the consideration of land use change, the provision of public works, and the responsibilities of local boards, the municipality, and the actions of private enterprises. Guiding principles of the Official Plan (OP) include:

- To guide, direct, and monitor the rate of growth to match the supply of land, municipal services and facilities with the needs of residents and employers, in accordance with the City's population, employment, intensification and density targets (OP-Section 3.1.1.d).
- To direct growth to take advantage of existing services and infrastructure where possible, and to minimize the cost of infrastructure extension (OP-Section 3.1.1.e).
- To protect, improve or restore the elements that contribute to the ecological health of the Lake Simcoe watershed, including, water quality, hydrology, key natural heritage features and their functions, and key hydrologic features and their functions.
- To ensure that adequate water supply, sewage collection, sewage treatment, electrical supply and stormwater management systems are provided to the residents of the City (OP-Section 5.1.1.a).
- To ensure that servicing of development shall employ best management practices to ensure sensitivity to the natural environment and efficiency of City services and operations (OP-5.1.1.e).

The City of Barrie Official Plan also states that infrastructure is to be provided in a coordinated, efficient and cost-effective manner to accommodate projected needs, and that it is integrated with planning for growth (OP-Sections 5.1.1.g, 5.1.1.h).

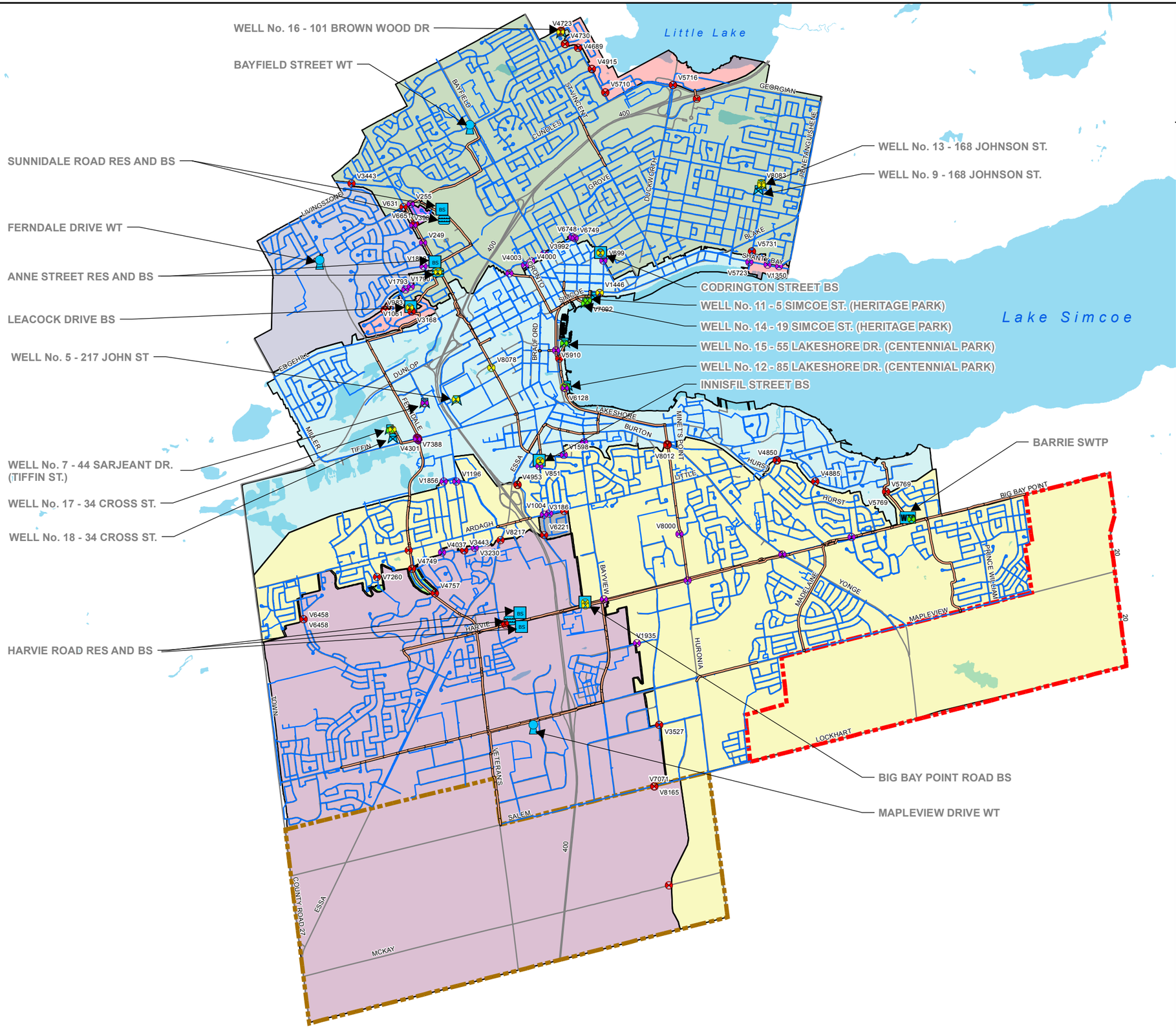
2.3 System Overview

The City of Barrie water supply system is currently serviced by twelve (12) groundwater wells and one surface water treatment plant (SWTP). Two additional wells (Well 4A and 19) are currently not equipped and connected to the distribution system. The distribution system consists of approximately 600 km of mains ranging in diameter from 32 mm to 1200 mm and is comprised of 5 major pressure zones - Zones 1, 2 North (2N), 3 North (3N), 2 South (2S) and 3 South (3S), and 4 zones with reduced pressure – 2N reduced, 3N reduced, 3S reduced and Chieftain Decreased, as presented in Figure 3-2. The elevation of the service area ranges from 218 to 316 masl. Seven (7) major Booster Pumping Stations (BPS) transfer supply to higher zones, with the Innisfil BPS reserved for emergency backup of Zone 2S supply from the SWTP. Floating storage is provided by three (3) reservoirs and three (3) elevated tanks, with at least one storage facility per pressure zone. There are several isolated closed pressure zone areas supplied by pressure regulating valves (PRV). A process schematic is included in **Appendix B**. Refer to Water Storage and Distribution Master Plan (WS&D MP) for additional information, regarding the pressure zones, storage facilities, BPS and pressure reducing/sustaining valves.

As can be seen in Figure 2-2, Zone 1 is serviced by Wells 3A, 5, 7, 11, 12, 14, 15, 17 and 18. Zone 2N is serviced by Wells 9, 13, and 16. Surplus water from Zone 1 is pumped out to Zones 2N and 3N, boosting the pressure to meet the water demands and required pressure in those areas. Similarly, a portion of water pumped into Zone 2S is boosted to Zone 3S to meet the demands and pressure requirements in this Zone. The 2N/3N/1 zone boundaries also have the ability to convey flow between zones during periods when the lower tier zones undergo pressure drops during higher demand situations. These transferences do not occur often but allow for sustained servicing. In addition to primary zones both 3N and 2N pressures zones have subzone for reduced pressure servicing for localized conditions. These subzones receive flow from the adjacent zone based on the pressure settings of PRVs and Pressure sustaining valves (PSV).

Zone 2S is serviced by the SWTP. Prior to 2011, the City was serviced entirely by groundwater. The Barrie SWTP was commissioned in September 2011. The 2S/3S zone boundaries also have the ability to convey flow between zones during periods when the lower tier zones undergo pressure drops during higher demand situations. These transferences do not occur often, but allow for sustained servicing. In addition to primary zones both 3N and 2N pressures zones have subzones for reduced pressure servicing for localized conditions. One of these subzones includes the Chieftain Decreased Pressure zones. These subzones receive flow from the adjacent zone based on the pressure settings of PRV/PSV's.

The City's Drinking Water Works Permit (DWWP), Municipal Drinking Water License (MDWL) and Permit to Take Water (PTTW) have been included in **Appendix C**. The maximum quantity of water is regulated by the PTTW No.5183-8EZKMA issued by the Ministry of Environment in correspondence dated May 18, 2011. The permit expires on April 30, 2021. The stated total combined water taking limit for the City of Barrie is 148,264 m^3/d, this includes Wells 4A and 19 and the SWTP.



1224 GARDINERS RD, SUITE 201
KINGSTON, ONTARIO,
CANADA, K7P 0G2
WWW.WSP.COM

CITY OF BARRIE
P.O. BOX 400
BARRIE, ONTARIO

Legend

- BOOSTER STATION
- WATER RESERVOIR
- ELEVATED STORAGE TANK
- WELL PUMP HOUSE
- WATER TREATMENT PLANT
- Hewitt Secondary Plan Area
- Salem Secondary Plan Area
- WATER MAIN > 350
- WATER MAIN
- ROADS
- WATERBODY

WATER PRESSURE ZONE

- 1
- 2N
- 2N REDUCED
- 2S
- 3N
- 3N REDUCED
- 3S
- 3S REDUCED
- CHIEFTAIN DECREASED PRESSURE

VALVE

- PRESSURE REDUCING VALVE
  PRESSURE SUSTAINING VALVE
- FLOW CONTROL VALVE
- THROTTLE CONTROL VALVE
- OTHER

Data Source: Ontario Base Mapping, Ministry of Natural Resources, August 2013. Engineering Department, City of Barrie 2017.

Scale:
0 320640 1,280 Meters
1:55,000

N W E S

Project:

Water and Wastewater Master Plan Updates

City of Barrie, Ontario

Title:

WATER DISTRIBUTION OVERVIEW MAP

Project No.:	Date:		
171-07636-03	SEPTEMBER 2018		
Drawn By:	Checked By:	Code:	Figure No.:
RJ	MF	MP	2 -2

File Location:M:\2017\171-07636-03 Barrie W&WW Master Plans Update\3.0 Technical\3.7 Reports\3.7.8 Master Plan Report\Maps\City of Barrie Maps\171-07636-03_Fig3-2_WaterDistributionOverview_r1.mxd

2.3.1 Provincial Policy Statement, 2014

The Provincial Policy Statement (PPS), 2014, is issued by the Province from time to time under the authority of Section 3 of the *Planning Act*. The PPS contains provides policy direction on matters relating to land use planning and development and applies to any land use planning decisions made under the *Planning Act* by municipal councils, local boards, planning boards, provincial ministers, provincial government and agency officials, including the Ontario Municipal Board. Municipal planning decisions are to be consistent with the policies of the PPS.

The PPS includes policies relevant to water and wastewater infrastructure planning including the requirement that infrastructure be provided in a coordinated, efficient and cost-effective manner. Additional requirements under the 2014 PPS include:

- These systems are to be sustainable, feasible, financially viable and comply with all regulatory requirements, as well as protect human health and the natural environment (PPS-Section 1.6.6.1.b)
- That water and wastewater infrastructure will be integrated at all stages of land use planning and implementing processes (PPS-Section 1.6.6.1.d)

The 2014 PPS also states that settlement areas will be serviced by municipal water and wastewater systems, with intensification and redevelopment within these areas provided by municipal water services wherever feasible (PPS-Section 1.6.6.2).

2.3.2 Groundwater Supply

The total water taking limit for the City's 14 existing wells is 113,900 m^3/d, or 99,486 m^3/d when excluding Wells 4A and 19 not current equipped and connected to the distribution network. Table 2-1 summarizes the maximum allowable water taking for each well, as well as the current firm operating capacity, which is 78,146 m^3/d.

Table 2-1 Maximum Allowable Water Taking from Barrie Wells and Operating Capacity

WELL NO.	PTTW CAPACITY (m^3/d)	CURRENT OPERATING CAPACITY (m^3/d)
Well No. 3A - 54 Anne [1]	6,552	0
Well No. 4A – 99 Perry St. [2]	6,552	0
Well No. 5 – 217 John St.[3]	6,552	5,184
Well No. 7 – 44 Sarjeant (Tiffin St.)	6,552	6,552
Well No. 9 – 168 Johnson	6,552	6,552

WELL NO.	PTTW CAPACITY (m^3/d)	CURRENT OPERATING CAPACITY (m^3/d)
Well No. 11 – 5 Simcoe St. (Heritage Park) [4]	9,100	6,912
Well No. 12 – 85 Lakeshore (Centennial Park)	9,100	9,100
Well No. 13 – 168 Johnson	6,552	6,552
Well No. 14 – 19 Simcoe St. (Heritage Park)	9,100	9,100
Well No. 15 – 55 Lakeshore (Centennial Park)	9,100	9,100
Well No. 16 – 101 Brown Wood	7,862	7,862
Well No. 17 – 34 Cross	11,232	11,232
Well No. 18 – 34 Cross	11,232	11,232
Well No. 19 – Boulton Court[2]	7,862	0
Total Water Taking Limit	**113,900**	
Total Operating Capacity	**89,378**	
In Zone 1	68,412	
In Zone 2N	20,966	
Total Firm Operating Capacity[5]	**78,146**	

[1] The Well No. 3A is partially plugged, has not been used since 2011, and the well pumps have been removed. Therefore, the current operating capacity is null.

[2] Since Wells 4A and 19 are not currently equipped with well pumps nor connected to the distribution network, it is assumed the future rated capacity of these pumps is equal to the PTTW allowance. Pump house and watermains still need to be constructed.

[3] The casing of Well No. 5 does not allow the installation of a well pump up to its PTTW allowance and required pressure. The current operating capacity is limited at 5,184 m^3/d (60 L/s).

[4] The output of Well No. 11 is limited at 6,912 m^3/d (80 L/s), since this well presents trace contamination with chlorinated solvent.

[5] Equal to the total operating capacity in Zones 1 and 2N less that of the largest available unit.

All the wells utilize chlorine gas for disinfection, except Well 5 which also utilizes UV as pre-disinfection. Each well has iron and manganese sequestering systems using sodium silicate. All wells include on-site emergency power generators, except Well 3A which is not in operation since 2011. A summary of the equipment at each well is presented in Table 2-2.

Table 2-2 Summary of Groundwater Well Process Equipment

WELL NO.	PUMPING EQUIPMENT	DISINFECTION EQUIPMENT	IRON & MANGANESE SEQUESTERING	STANDBY POWER EQUIPMENT
Well No. 3A - 54 Anne St. South	N/A	Chlorine gas feed system with 182 m^3 chlorine contact chamber	Sodium silicate injection system with 2,788 L storage tank	None
Well No. 4A – 99 Perry St.	N/A	N/A	N/A	N/A
Well No. 5 – 217 John St.	Vertical turbine pump rated at 75.7 L/s @ 76.8 m TDH	UV pre-disinfection system with 4 medium-pressure, high-intensity lamps. Chlorine gas feed system	Sodium silicate injection system with 4,540 L storage tank	130 kW standby diesel generator with 1,135 L fuel tank
Well No. 7 – 44 Sarjeant Dr. (Tiffin St.)	Vertical turbine pump rated at 75.7 L/s @ 82.3 m TDH	Chlorine gas feed system with 2.1 m dia. chlorine contact pipe 30.5 m long	Sodium silicate injection system with 4,540 L storage tank	130 kW standby diesel generator with 1,135 L fuel tank
Well No. 9 – 168 Johnson St.	Vertical turbine well pump rated at 75.7 L/s @ 48.8 m TDH Vertical turbine high lift pump rated at 75.7 L/s @ 85 m TDH	Chlorine gas feed system with 182 m^3 chlorine contact chamber	Sodium silicate injection system with 8,000 L storage tank (shared with Well 13)	300 kW standby diesel generator with 900 L fuel tank (shared for either Well 9 or Well 13)

WELL NO.	PUMPING EQUIPMENT	DISINFECTION EQUIPMENT	IRON & MANGANESE SEQUESTERING	STANDBY POWER EQUIPMENT
Well No. 11 – 5 Simcoe St. (Heritage Park)	Vertical turbine pump rated at 105.3 L/s @ 114.9 m TDH	Chlorine gas feed system with 2.1 m dia. chlorine contact pipe 18.3 m long	Sodium silicate injection system with 2,788 L storage tank	350 kW standby diesel generator with 1,135 L fuel tank (shared for either Well 11 or Well 14)
Well No. 12 – 85 Lakeshore Dr. (Centennial Park)	Vertical turbine pump rated at 105.3 L/s @ 127.1 m TDH	Chlorine gas feed system with 600 mm dia. chlorine contact pipe 750 m long	Sodium silicate injection system with 4,200 L storage tank	210 kW standby diesel generator with 900 L fuel tank
Well No. 13 – 168 Johnson St.	Vertical turbine well pump rated at 75.7 L/s @ 54.9 m TDH Vertical turbine high lift pump rated at 75.7 L/s @ 85 m TDH (shared for either Well 9 or Well 13)	Chlorine gas feed system with 182 m^3 chlorine contact chamber	Sodium silicate injection system with 8,000 L storage tank (shared with Well 9)	300 kW standby diesel generator with 900 L fuel tank (shared for either Well 9 or Well 13)
Well No. 14 – 19 Simcoe St. (Heritage Park)	Vertical turbine pump rated at 105.3 L/s @ 114.3 m TDH	Chlorine gas feed system with 900 m of 450 mm dia. pipe and 150 m of 400 mm dia. pipe as chlorine contact pipe	Sodium silicate injection system with 2,788 L storage tank	350 kW standby diesel generator with 1,135 L fuel tank (shared for either Well 11 or Well 14)
Well No. 15 – 55 Lakeshore Dr. (Centennial Park)	Vertical turbine pump rated at 105.3 L/s @ 127.1 m TDH	Chlorine gas feed system with 500 and 600 mm dia. chlorine contact pipe 715 m long	Sodium silicate injection system with 2,788 L storage tank	230 kW standby diesel generator with 900 L fuel tank

WELL NO.	PUMPING EQUIPMENT	DISINFECTION EQUIPMENT	IRON & MANGANESE SEQUESTERING	STANDBY POWER EQUIPMENT
Well No. 16 – 101 Brown Wood Dr.	Vertical turbine well pump rated at 90.8 L/s @ 42.67 m TDH Vertical turbine high lift pump rated at 90.8 L/s @ 82.55 m TDH	Chlorine gas feed system with 141 m^3 chlorine contact chamber	Sodium silicate injection system with 3,300 L storage tank	275 kW standby diesel generator with 948 L fuel tank
Well No. 17 – 34 Cross St.	Vertical turbine pump rated at 130 L/s @ 121 m TDH	Chlorine gas feed system with 600 and 900 mm dia. chlorine contact pipe 432 m long	Sodium silicate injection system with 10,500 L storage tank (shared with Well 18)	400 kW standby diesel generator with 3,100 L fuel tank (shared for Well 17 or 18)
Well No. 18 – 34 Cross St.	Vertical turbine pump rated at 130 L/s @ 121 m TDH	Chlorine gas feed system with 600 and 900 mm dia. chlorine contact pipe 432 m long	Sodium silicate injection system with 10,500 L storage tank (shared with Well 17)	400 kW standby diesel generator with 3,100 L fuel tank (shared for Well 17 or 18)
Well No. 19 – Boulton Court	N/A	N/A	N/A	N/A

Historically, the groundwater system was considered to be under significant stress mainly due to the significant groundwater use (AquaResource Inc. and Golder Associates Ltd., 2010). However, since the start-up of a surface water supply in 2011, the risk of low water quantity is now considered little (AquaResource Inc., Golder Associates Ltd. & International Water Consultants Ltd., 2013).

Discussions with the City's Water Operations Department have indicated the wells are in good condition. No issues with well casings have been identified and the well maintenance contracts do not suggest any issues outside the standard practices, although some wells have presented lower output along the years and constant maintenance is required. In general, the wells present hard water and discoloured water was observed during flushing in Zone 2N. Refer to WS&D MP for additional information regarding discoloured water in Zone 2S.

The City has also performed exploratory investigation for identification of new well site locations. Well 20 and Well 21 were identified to increase the groundwater supply system capacity, but their pumping capacity has not yet been defined.

2.3.3 Surface Water Supply

The SWTP is located on the southern shore of Kempenfelt Bay at 20 Royal Parkside Drive. The treatment plant incorporates a low lift pump station, coagulation/flocculation, membrane filtration, chlorine disinfection, and high lift pumping station. The current operation is limited to a firm capacity of 60 MLD (restricted by the number of filtration trains online). The PTTW currently limits the water taking from Lake Simcoe to 65.2 MLD. A process schematic of the plant is presented in Figure 2-3.

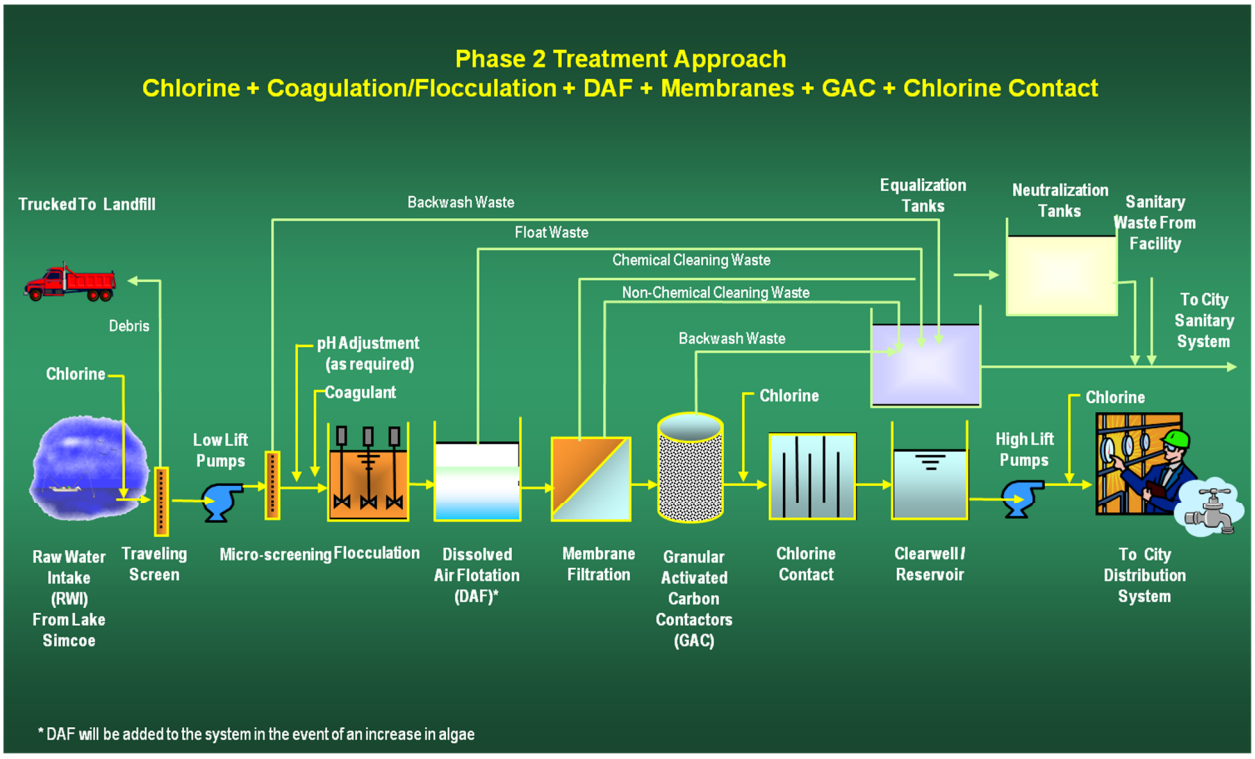


Figure 2-3 Process Schematic of Surface Water Treatment Plant

A summary of the SWTP treatment train is presented in Table 2-3.

Table 2-3 Summary of Surface Water Treatment Plant

PROCESS	SUMMARY
Raw water intake	1.525 m dia. pipe extending 750 m into Kempenfelt Bay at a depth of 26 m. Includes a zebra mussel control system using chlorine gas injection along the length of the intake. Secondary 1.525 m dia. secondary intake pipe extending 150 m into the bay for future use.
Low lift pumping station	Two-cell wet well with 9.5 mm mesh screens Two vertical turbine pumps with VFD control each rated at 31.5 MLD @ 55 m TDH Two vertical turbine pumps (one with VFD control) each rated at 15.75 MLD @ 49 m TDH 0.5 mm mesh strainers after low lift pumps
Coagulation/Flocculation	Two flocculation tanks 670 m^3 each with 15-minute detention time for totalizing 63 MLD.
Primary membrane filtration	5 trains, each rated for 20 MLD for a firm capacity of 60 MLD (with one tank as standby and one tank in cleaning) at a design temperature of 8°C, for a firm capacity of 60 MLD Each train equipped with a centrifugal pump with VFD control rated at 24.3 MLD @ 15.8 m TDH Two backpulse pumps, each rated at 24.3 MLD @ 16.1 m TDH, for membrane backwashing Heated recirculation pumps, membrane cleaning solution dosage pumps, and air blowers for use during backwash and chemical cleaning Two equalization tanks (685 and 875 m^3) for primary membrane and GAC filter backwash Two neutralization tanks (each 35 m^3) for neutralization of membrane cleaning solution after use

PROCESS	SUMMARY
Secondary membrane filtration	Two trains each rated at 3.2 MLD with no standby for filtration of the backwash waste from the low lift pump station strainers, primary membrane filters, and GAC filters to facilitate a 99.5% water recovery of the plant. This was based on the primary membrane design capacity of 60 MLD at 8°C with a minimum recovery set point of 94.2%.
Granular Activated Carbon (GAC) filtration	Three GAC contactors with a total volume of 120 m^3, for an initial capacity of 60 MLD, based on 20 MLD per train and 8 minutes Empty Bed Contact Time (EBCT). Two backwash pumps rated at 44 MLD @ 12 m TDH
Chlorination	Chemical gas feed system with two 5 ML chlorine contact tanks (one used as a reservoir by the high lift pump station)
Reservoir and Chlorine Contact	The current reservoir has a 10 ML capacity and a 10 ML chlorine contact tank.
High lift pumping station	Two vertical turbine pumps each rated at 29 MLD @ 65.5 m TDH Three vertical turbine pumps each rated at 14.5 MLD @ 65.5 m TDH One vertical turbine pump rated at 7 MLD @ 65.5 m TDH (for low flow demand)
Standby power	2,000 kW diesel generator with a 25,000 L fuel tank for the entire Phase 1 (current build out) of the plant

2.3.4Water Quality

Data reported in the *Annual Reports* for the City of Barrie Drinking Water System includes results from microbiological testing, and inorganic and organic chemical testing for raw and treated water sources within the City. Data from 2011 to 2015 reports was reviewed to identify trends or issues in terms of water quality. Few significant exceedances were observed; however, the data show elevated sodium levels and chlorinated solvents at certain sources. A more detailed analysis of the data was then performed on the actual analysis data from 2015 to 2018 in order to identify the trends.

Sodium

As presented in Table 2-4, the sodium concentrations at Wells 3A, 9, 11, 12, 14 and at the SWTP exceed 20 mg/L in the drinking water, a level which is reportable to the local Medical Officer(s) of Health under the Ontario Regulation 170/03: Drinking Water Systems.

The sodium levels are however lower than the aesthetic objective (non-health related) of 200 mg/L set by the Guidelines for Canadian Drinking Water Quality (GCDWQ) and Ontario Drinking Water Quality Standards (ODWS).

Table 2-4 Historical Sodium Concentrations (in mg/L): Treated Water[1]

YEAR	WELL 3A	WELL 5	WELL 7	WELL 9	WELL 11	WELL 12	WELL 13	WELL 14	WELL 15	WELL 16	WELL 17	WELL 18	SWTP
2011	23.5	18.0	7.11	29.8	59.0	76.9	34.2	49.7	16.9	8.50	6.92	7.76	28.3
2012	23.5	18.0	7.11	29.8	59.0	76.0	34.2	49.7	16.9	8.50	6.92	7.76	25.9
2013	23.5	18.0	7.11	29.8	59.0	76.9	34.2	49.7	16.9	8.50	6.92	7.76	28.3
2014	23.5	10.8	7.70	31.5	67.0	106	40.0	52.2	18.9	8.81	7.44	6.95	25.9
2015[2]	-	-	-	-	-	-	-	-	-	-	7.44	6.95	-

[1] Data retrieved from City of Barrie Drinking Water System Annual Reports (City of Barrie Water Operations, 2011, 2012, 2013, 2014 & 2015)

[2] Sodium samples were not required to be collected during this reporting period, however, were included in a general chemistry sample collected from Wells 17 and 18.

Sodium concentrations in raw water from 2015 to 2018 for each well are presented in Figure 2-4 and Table 2-5. It must be noted that when not enough data was available, data was tabulated instead of graphed. From Figure 2-4, no observable trends can be observed in the sodium concentrations for any of the wells represented. While the sodium concentrations in all the wells are below the drinking water aesthetic objective of 200 mg/L, they all exceed the drinking water 20 mg/L threshold of reportability to the local Medical Officer of Health as well. In Table 2-5, it can be observed that the sodium concentrations in all the wells are considerably below 200 mg/L, but they are slightly above 20 mg/L for Well 5 (2016), Well 15 (2016-2018), and the SWTP (2015). It is assumed that the sodium concentrations will be similar in the treated water.

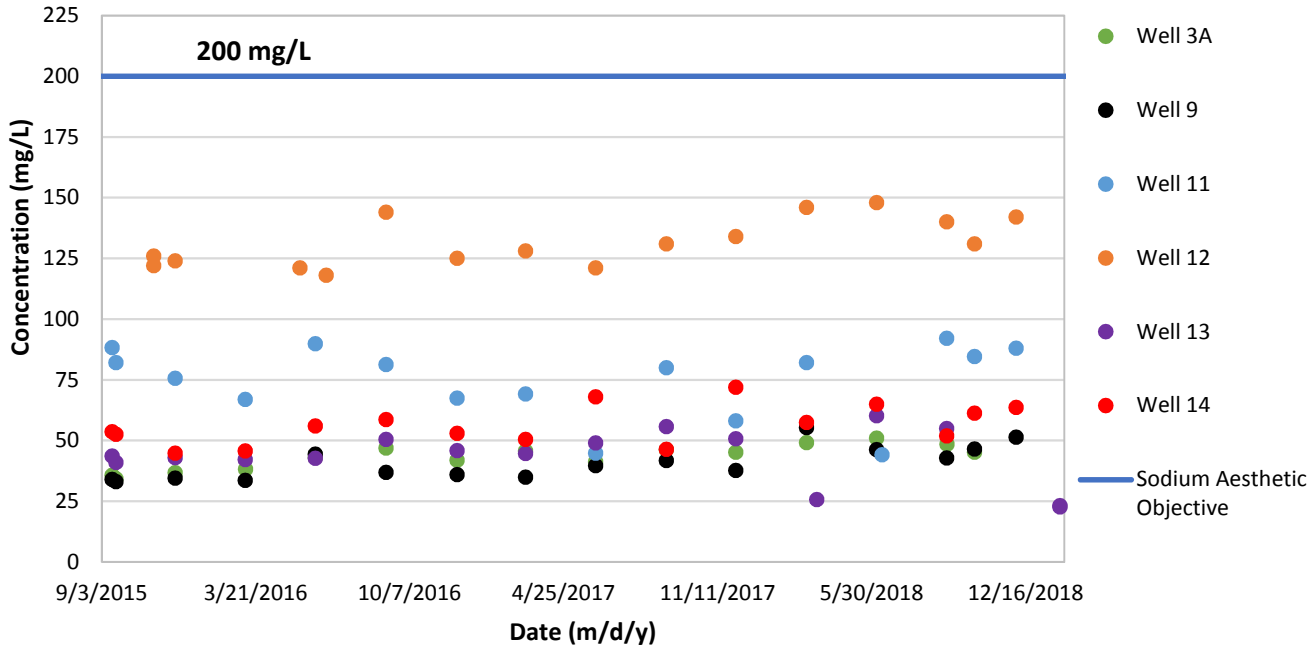


Figure 2-4 Sodium Concentrations in Raw Water from 2015 to 2018 for Wells 3A, 9, 11, 12, 13, and 14

Table 2-5 Historical Sodium Concentrations (in mg/L): Raw Water

YEAR	WELL 5	WELL 7	WELL 15	WELL 16	WELL 17	WELL 18	SWTP
2015	16	7.04	19.2	8.68	8.34	7.2	30.9
2016	20.6	9.06	23.6	11.3	9.8	9.28	N/A
2017	15.4	N/A	22.5	N/A	N/A	N/A	N/A
2018	17.7	9	20.8	10	9	9	N/A

In accordance with MDWL No. 014-101, additional testing for sodium in the raw water is required for Wells 3A, 9, 11, 12, 13, 14. From the observations above, it is recommended to keep frequently monitoring the sodium levels in the raw water for these Wells on a quarterly basis and extended it for the SWTP. This is to allow for the early identification of any increasing trend in the sodium levels.

Chlorinated Solvents

Chlorinated solvents are a family of chemical compounds that contain chlorine. These compounds include, for example, trichloroethylene (TCE), and perchloroethylene (PCE), also known as tetrachloroethylene. Chlorinated solvents are a health risk due to their toxicity at low levels, and their high environmental persistence. According to the Annual Reports studied, Well 11 presented traces of chlorinated solvent contamination from 2011 to 2015, while Well 14 presented traces of the same contamination in 2015 only, as presented in Table 2-6 and Table 2-7.

Figures 2-5, 2-6, 2-7, and 2-8 show the TCE and PCE concentrations when above the Maximum Detection Limit (MDL), and MDLs when the concentrations are below the MDL, from January 2015 to January 2019 in raw water in Wells 11, 12, 14, and 15, respectively. It can be observed that all recorded concentrations for both TCE and PCE are either below the MDL (0.44 µg/L at its highest, 0.10 µg/L at its lowest), or less than 0.8 µg/L for Wells 11, 12, and 15, and less than 1.8 µg/l for Well 14. Well 11 presents a downward trend for PCE and TCE concentrations, and Well 14 for TCE concentration. No value has been recorded above the MDL for PCE or TCE in Well 12 (except for one TCE spike to 0.7 µg/L in August 2017), PCE in Well 14, and PCE or TCE in Well 15 (except for one TCE spike to 0.1 µg/L in August 2017): this means no conclusions can be drawn on the PCE/TCE concentrations trends in those wells over the years. The single spike in TCE concentrations in Wells 12 and 15 in August 2017 is most likely due to a singular event in that month. The previously presented trends in raw water are assumed to be maintained in treated water, which means that it is expected that drinking water TCE and PCE concentrations will remain well below the MACs of 10 µg/L (PCE) and 5 µg/L (TCE).

The most significant concerns are with Well 11 as it represents 9% of the current firm operating capacity of the groundwater supply. The abandoning of Well 11 would reduce the current the firm operating capacity to 71,234 m^3/d. Based on a review of the data, the contamination with chlorinated solvents in Well 11 is decreasing. Therefore, based on the data available, the risk of having to abandon this well due to contamination is low. If Well 11 has to be decommissioned, Wells 4A, 19, 20 or 21 could be activated to increase the groundwater supply system capacity.

Table 2-6 Historical Chlorinated Solvent Concentrations (in µg/L): Raw Water[1,2]

YEAR	VOC		WELL 11	WELL 12	WELL 14	WELL 15
2011	PCE	Minimum	3.1	<0.35	<0.35	<0.35
		Maximum	4.3	<0.35	<0.35	<0.35
	TCE	Minimum	0.77	<0.43	0.50	<0.43
		Maximum	1.1	<0.44	0.63	<0.43
2012	PCE	Minimum	<0.35	<0.35	<0.35	<0.35
		Maximum	3.4	<0.35	2.7	<0.35
	TCE	Minimum	<0.43	<0.43	0.47	<0.43
		Maximum	0.87	<0.43	0.95	<0.43
2013	PCE	Minimum	1.0	<0.35	<0.35	<0.35
		Maximum	1.3	<0.35	<0.35	<0.35
	TCE	Minimum	<0.44	<0.44	0.74	<0.44
		Maximum	<0.44	<0.43	1.0	<0.43
2014	PCE	Minimum	0.57	<0.35	<0.35	<0.35
		Maximum	0.90	<0.35	<0.35	<0.35
	TCE	Minimum	<0.44	<0.44	0.59	<0.44
		Maximum	<0.44	<0.44	1.10	<0.44
2015	PCE	Minimum	0.46	<0.35	<0.35	<0.35
		Maximum	0.69	<0.35	<0.35	<0.35
	TCE	Minimum	<0.44	<0.44	0.61	<0.44
		Maximum	0.47	<0.44	1.3	<0.44

[1] Data retrieved from City of Barrie Drinking Water System Annual Reports (City of Barrie Water Operations, 2011, 2012, 2013, 2014 & 2015).
[2] All numbers indicated as an upper limit represent the MDL.

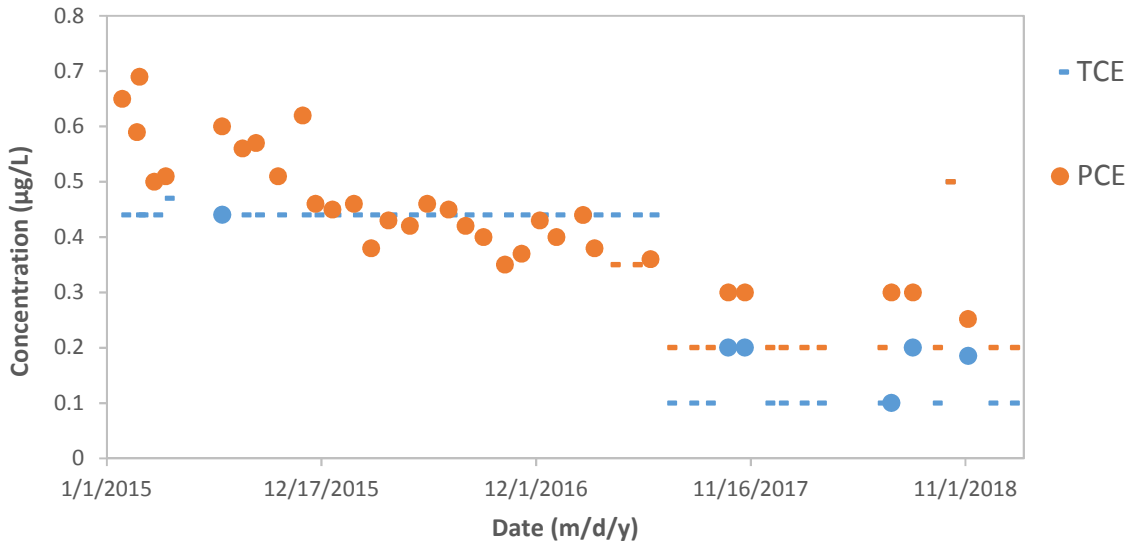


Figure 2-5 TCE and PCE Concentrations in Well 11 Raw Water from January 2015 to January 2018 (dashed lines represent MDLs; dots represent reported concentrations)

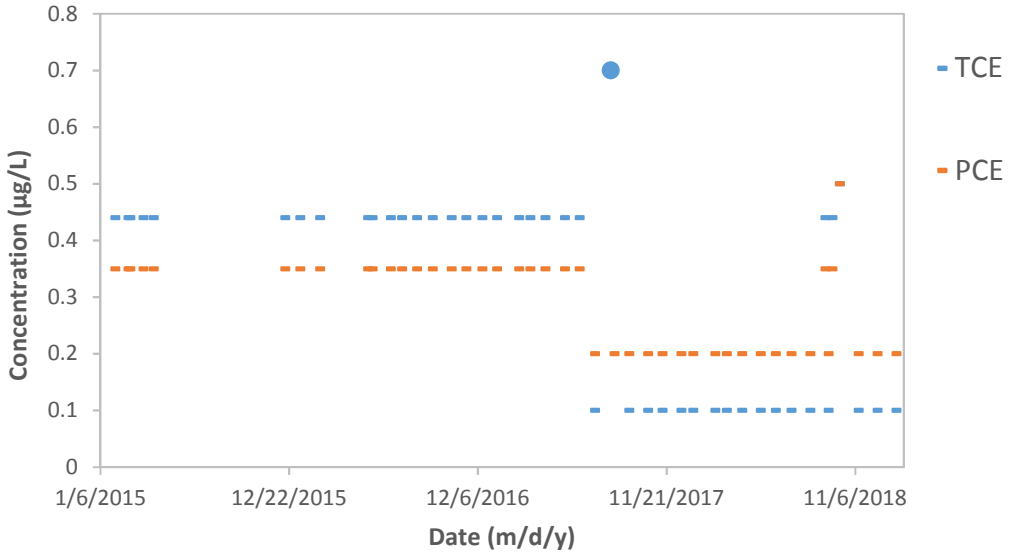


Figure 2-6 TCE and PCE Concentrations in Well 12 Raw Water from January 2015 to January 2018 (dashed lines represent MDLs; dots represent reported concentrations)

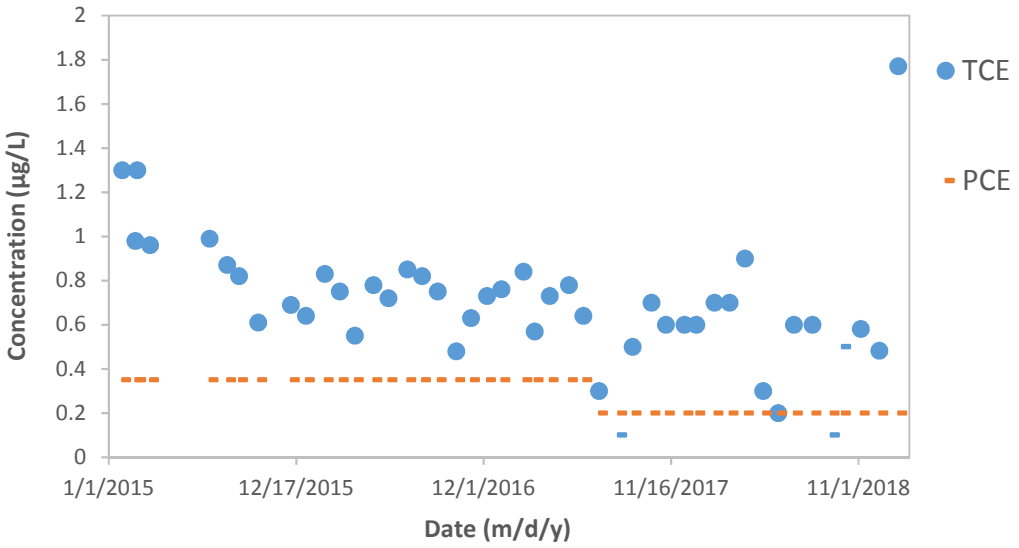


Figure 2-7 TCE and PCE Concentrations in Well 14 Raw Water from January 2015 to January 2018 (dashed lines represent MDLs; dots represent reported concentrations)

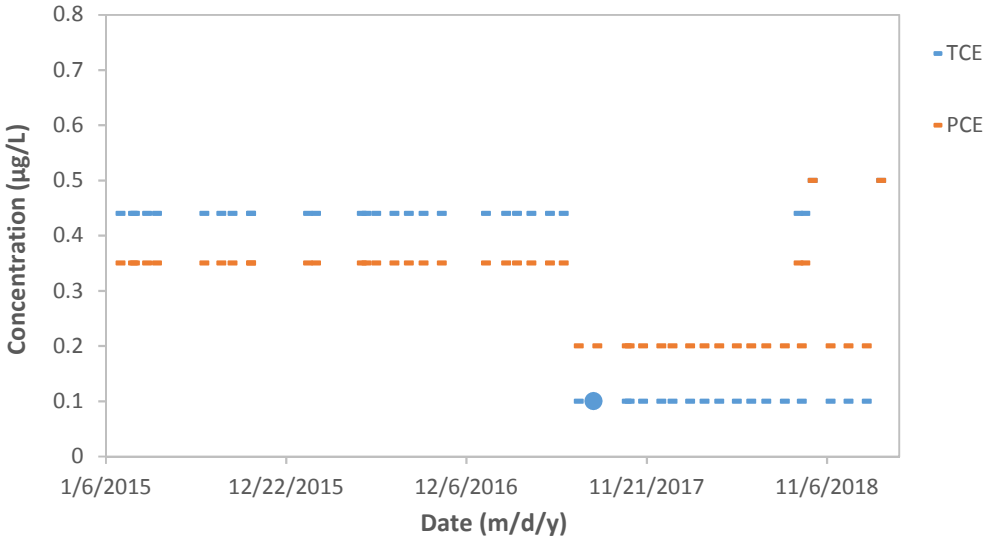


Figure 2-8 TCE and PCE Concentrations in Well 15 Raw Water from January 2015 to January 2018 (dashed lines represent MDLs; dots represent reported concentrations)

Table 2-7 Historical Chlorinated Solvent Concentrations (in µg/L): Treated Water[1,2]

YEAR	VOC	WELL 3A	WELL 5	WELL 7	WELL 9	WELL 11	WELL 12	WELL 13	WELL 14	WELL 15	WELL 16	WELL 17	WELL 18	SWTP
2011	PCE	<0.2	0.45	0.45	0.45	1.2	0.45	0.45	1.2	0.45	0.45	0.45	0.45	<0.35
	TCE	<0.2	<0.38	<0.38	<0.38	0.52	<0.38	<0.38	0.52	<0.38	<0.38	<0.38	<0.38	<0.44
2012	PCE	<0.35	<0.35	<0.35	<0.35	3.3	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35
	TCE	<0.44	<0.44	<0.44	<0.44	0.67	<0.44	<0.44	0.88	<0.44	<0.44	<0.44	<0.44	<0.44
2013	PCE	<0.35	<0.35	<0.35	<0.35	3.3	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35
	TCE	<0.44	<0.44	<0.44	<0.44	0.67	<0.44	<0.44	0.88	<0.44	<0.44	<0.44	<0.44	<0.44
2014	PCE	<0.35	<0.35	<0.35	<0.35	3.3	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35
	TCE	<0.44	<0.44	<0.44	<0.44	0.67	<0.44	<0.44	0.88	<0.44	<0.44	<0.44	<0.44	<0.44
2015	PCE	<0.35	<0.35	<0.35	<0.35	0.5	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35
	TCE	<0.44	<0.44	<0.44	0.49	<0.44	<0.44	<0.44	<0.44	<0.44	<0.44	<0.44	<0.44	<0.44

[1] Data retrieved from City of Barrie Drinking Water System Annual Reports (City of Barrie Water Operations, 2011, 2012, 2013, 2014 & 2015)

[2] All numbers indicated as an upper limit represent the MDL.

The levels of PCE and TCE are below the Maximum Acceptable Concentration (MAC) values set by ODWS of 10 µg/L for PCE and 5 µg/L for TCE. However, the MAC for PCE is set at 5 µg/L by US EPA and there is a strong tendency the same limit will be adopted in Canada or by the Ministry of the Environment, Conservation and Parks (MECP), which would mean a reduction of the PCE limit from 10 to 5 µg/L. The current PCE concentrations of Well 11 are close to the future limit. In accordance with the MDWL No. 014-101, additional testing (monthly) of chlorinated solvents in the raw water is required for Wells 11, 12, 14 and 15. Therefore, it is recommended to keep the monthly frequent monitoring for these wells, in order to identify the potential need of treatment at an early stage.

Manganese

Recently Health Canada (and the Federal-Provincial-Territorial Committee on Drinking Water, referred to as CDW) established a public consultation on lowering the aesthetic objective (AO) of total manganese from 50 µg/L to 20 µg/L and adding a MAC of 100 µg/L of total manganese in drinking water to the existing drinking water guidelines (Health Canada, 2016).

In Table 2-8, it can be observed that typically, the reported manganese concentrations in raw water are below the future drinking water MAC in all wells, with a few exceptions: 596 µg/L in Well 11 in 2018, 403 µg/l in Well 12 in 2016, and 189 µg/l in Well 16 in 2017. To explain these high concentration anomalies, further insights into singular events that may have been the source, or additional data recorded at more frequent intervals (quarterly instead of annually) would be needed. The manganese concentration in Wells 11, 12 and 14 were above the current aesthetic objective of 50 µg/L. The manganese concentrations in all wells tend to be above the future aesthetic objective of 20 µg/l, with the exception of Well 5 where they are slightly lower than the objective.

Sequestration is the current control measure used by the City of Barrie to limit the aesthetic problems (discoloured water) associated with manganese within the distribution system. Since sequestration does not remove manganese from the water, this method should only be considered for water supplies with manganese levels below the MAC in the source or treated water. This indicates the need to pursue treatment of water for manganese removal once the new objectives are in place, at a minimum additional treatment will be required at Wells 11, 12 and 16, in light of the manganese concentration presented in Table 2-8.

In addition, careful consideration needs to be given due to the potential accumulation and subsequent release of manganese in the distribution system. Therefore, manganese removal may be required at other wells in order to limit the accumulation of manganese in the distribution system and to maintain concentrations well below the MAC and AO at the tap.

It is recommended to increase the frequency of monitoring of dissolved and particulate manganese at the raw water and treated water for all wells and SWTP, and along the distribution system, as well as other pertinent parameters that could affect the design of manganese removal technologies, such as pH and Redox potential. This will allow the identification of the systems that would require manganese removal and collect data for design purposes.

Table 2-8 Historical Manganese Concentrations (in µg/L): Raw Water

YEAR	WELL 3A	WELL 5	WELL 7	WELL 9	WELL 11	WELL 12	WELL 13	WELL 14	WELL 15	WELL 16	WELL 17	WELL 18	SWTP
2015	31.6	15.1	19.3	N/A	69.5	51.4	26.3	89.2	23.6	22.7	22.9	17.6	0.1<MDL
2016	34.7	17.7	20.7	0.26	60	403	27.8	86.6	27.2	25.1	23.9	20.2	N/A
2017	N/A	19	N/A	N/A	N/A	N/A	N/A	N/A	34	189	N/A	N/A	N/A
2018	34	17	21	2	596	39	24	90	26	24	24	21	N/A

2.3.5Existing Flows

Water supply and consumption data from 2015 to 2017 was reviewed to determine historical water supply requirements for the Barrie Water System. The City of Barrie is divided into 5 major pressure districts: Zones 1, 2 North (2N), 3 North (3N), 2 South (2S) and 3 South (3S). Water from Zone 1 is pumped to Zones 2N, 2S and 3N to meet water demands in those areas. Similarly, a portion of the water pumped into Zone 2S is conveyed to Zone 3S to meet the demands.

The historical demands in each individual zone have been determined by analyzing the water production and pumping rates at the SWTP, well stations and BPS obtained from SCADA. It should be noted that these numbers do not include water supplied by the reservoirs to the distribution system during peak demand times. Average day demand (ADD) and maximum day demand (MDD) data is included in Table 2-9.

Table 2-9 Barrie Water System Supply by Zone

YEAR	ZONE 1		ZONE 2N		ZONE 2S		ZONE 3N		ZONE 3S		SYSTEM WIDE	
	ADD (m^3/d)	MDD (m^3/d)	ADD (m^3/d)	MDD (m^3/d)	ADD (m^3/d)	MDD (m^3/d)	ADD (m^3/d)	MDD (m^3/d)	ADD (m^3/d)	MDD (m^3/d)	ADD (m^3/d)	MDD (m^3/d)
2011	7,741	10,268	13,849	19,587	9,358	21,366	2,640	1,840	9,397	11,996	42,985	65,057
2015	7,052	16,000	11,929	17,771	6,730	15,500	1,981	4,766	9,468	14,612	37,160	68,649
2016	7,694	16,687	11,515	17,664	8,547	17,604	2,294	5,440	8,060	13,117	38,110	70,512
2017	6,532	15,023	11,249	18,715	7,291	16,918	2,349	5,485	8,578	12,549	35,999	68,690

[1] The 2011 data was taken from the City of Barrie Secondary Plan, Background Studies & Infrastructure Master Plans Intensification & Annexed Lands.
[2] The ADD values were calculated from SCADA data, while the MDD values were obtained from SCADA data for each zone and chosen to represent the system-wide MDD.

The historical average day and maximum day flow requirements from Table 2-9 are plotted on Figure 2-9. In 2016, a reduction by 15% of the average water consumption since 2011 was observed, which represents a substantial decrease of the Per Capita Average Day Demand since the population increased 3.8% from 2011 to 2016.

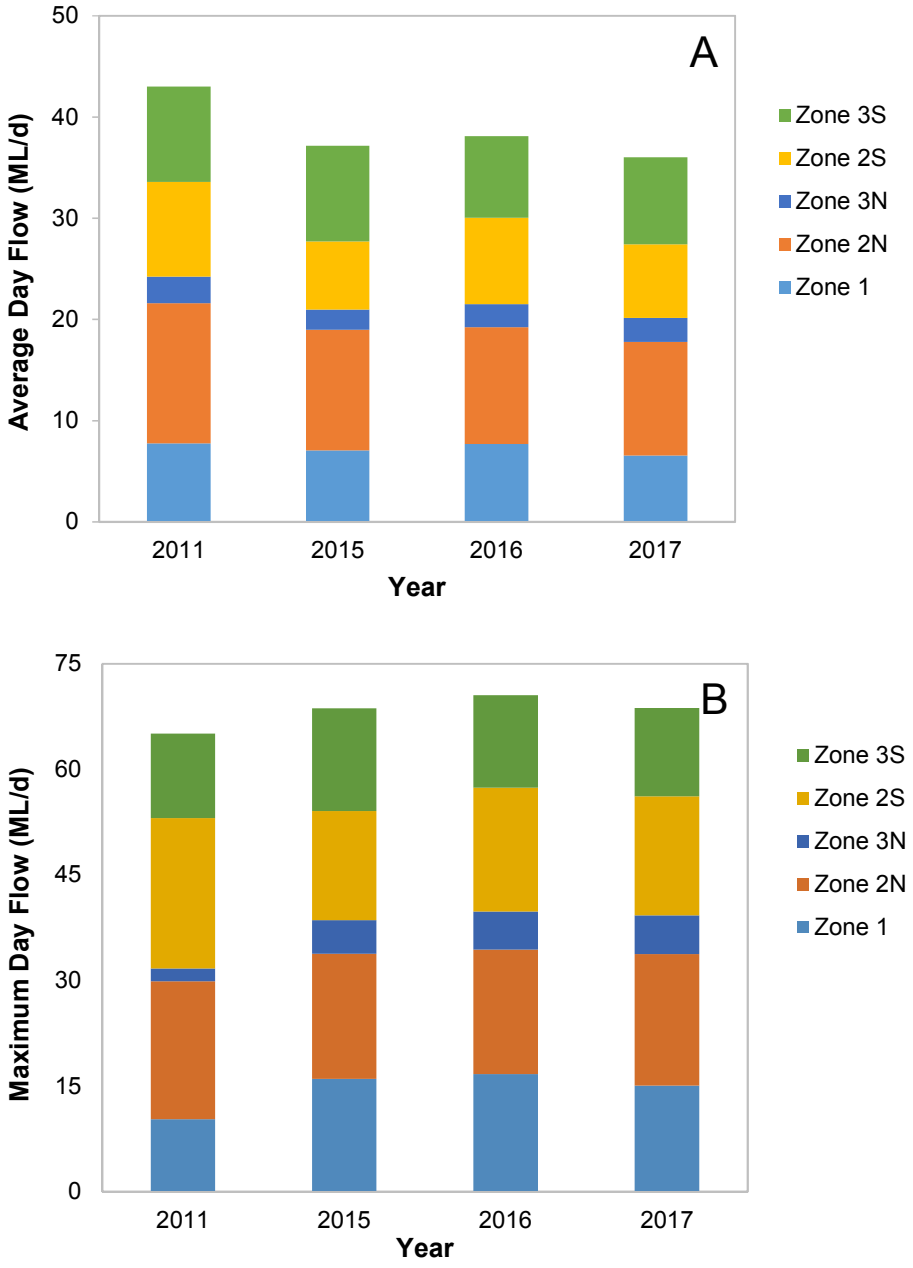


Figure 2-9 Historical Average Day (A) and Maximum Day (B) Flows by Zone in 2011, 2015, 2016, and 2017

Table 2-10 compares the average day production flow and the average day metered flow. It was observed that in average 11.6% of the produced water is non-revenue water due to lack of meters (85 locations), leaks and other uses. Also, approximately 64 % of demand was residential, while the remaining 36 % of the demand was due to Institutional, Commercial and Industrial (ICI) establishments, based on analysis of billing data.

Table 2-10 Comparison of Average Daily Production and Metering Data From 2015 to 2017

YEAR	PRODUCTION ADD (m^3/d)	RESIDENTIAL METERED ADD (m^3/d)	NON-RESIDENTIAL METERED ADD (m^3/d)	TOTAL METERED ADD (m^3/d)	%NON-REVENUE WATER
2015	37,160	20,389	11,712	32,102	13.6%
2016	38,110	22,040	12,277	34,316	10.0%
2017	35,999	20,341	11,410	31,980	11.2%

[1] The production ADD values were calculated from SCADA data, while the metered ADD values were calculated from the billing data.

[2] The non-revenue water percentage were calculated by comparing the production date and the billing data.

3 Growth and Servicing Projections

3.1 Population and Employment Projections

As part of the City's Official Plan update and this Master Plan process, Watson & Associates Economists, Ltd. have prepared detailed growth forecasts for the City of Barrie, based in the census data. The forecasts, developed for the 2021, 2026, 2031, 2036, 2041 and 2071 time horizons, accommodate for both residential and employment growth. The current population and these projections are summarized in Table 3-1.

The residential population is expected to increase from 145,844 to 252,964 by 2041. Per Table 3-1, the City of Barrie's equivalent population (both residential and employment) will have doubled the 2016 population by 2071.

The largest residential increase will occur in Zones 1 and 2S with approximately 2.5 times their respective 2016 population, followed closely by Zone 3S with an increase of approximately 2.4 times. The largest employment growth will occur in Zone 3S with 2.6 times its 2016 population. By sheer numbers, the Zone 2S will have the largest residential increase of nearly 69,000 people, and the Zone 3S will have the largest employment increase of nearly 21,000 people. The Zone 3N will have the smallest anticipated growth in both residential and employment populations, in the range of 1.2-1.5 times, when compared their respective 2016 population.

Table 3-1 Residential and Employment Population Projections

		2016	2021	2026	2031	2036	2041	2071
ZONE 1	Residential	20,705	22,604	25,448	30,817	35,450	39,818	52,927
	Employment	19,988	21,437	23,083	25,016	28,051	31,858	41,639
	Equivalent Population	**40,693**	**44,041**	**48,531**	**55,833**	**63,501**	**71,676**	**94,566**
ZONE 2N	Residential	47,524	47,488	48,407	51,188	53,063	55,540	66,497
	Employment	23,877	24,572	25,467	25,709	27,371	30,288	36,343
	Equivalent Population	**71,401**	**72,060**	**73,874**	**76,897**	**80,434**	**85,828**	**102,840**
ZONE 3N	Residential	9,580	9,503	9,489	9,556	9,757	9,857	11,084
	Employment	938	931	931	926	953	1,004	1,121
	Equivalent Population	**10,518**	**10,434**	**10,420**	**10,482**	**10,710**	**10,861**	**12,205**
ZONE 2S	Residential	44,566	57,578	70,578	77,810	88,475	98,412	113,463
	Employment	13,527	16,408	19,211	20,935	23,899	27,246	30,764
	Equivalent Population	**58,093**	**73,986**	**89,789**	**98,745**	**112,374**	**125,658**	**144,227**
ZONE 3S	Residential	23,469	30,398	35,306	40,584	44,248	49,337	56,041
	Employment	15,444	20,086	24,629	28,412	33,053	38,602	43,090
	Equivalent Population	**38,913**	**50,484**	**59,935**	**68,996**	**77,301**	**87,939**	**99,131**
SYSTEM-WIDE	Residential	145,844	167,571	189,228	209,955	230,993	252,964	300,012
	Employment	73,774	83,434	93,321	100,998	113,327	128,998	152,957
	Equivalent Population	**219,618**	**251,005**	**282,549**	**310,953**	**344,320**	**381,962**	**452,969**

3.2 Future Water Demand Requirements

The City of Barrie has two raw water supplies, surface water (Kempenfelt Bay) and groundwater, while the conveyance between the zones are guaranteed by the BPSs. Water is then transferred to the higher zones through BPSs. The groundwater and surface water supplies must be able to supply the maximum day demand plus fire flow or peak hour demand, whichever is higher. However, for the purpose of this study, it is assumed the water supplies are only required to supply the maximum day demands of each pressure zone, since the peak hourly and fire flow demands are supplied by the various reservoirs and BSPs in the system. Refer to WS&D MP for additional information regarding this subject.

Separate maximum day flows have been provided based on the historic maximum day for surface water zones (2S and 3S) and groundwater zones (1, 2N, 3N). Based on the anticipated population growth, projections for water demand for each zone were calculated. Table 3-2, Table 3-3, and Table 3-4 summarize the average day and maximum day water production flows, as well as residential and employment population, for 2015 ,2016, and 2017, respectively. The production flows were calculated based on 2015-2017 SCADA data, which was validated and confirmed that the data accurately reflected the actual state of the operations. Based on these values, the average per capita demand and maximum day factor were developed. The same residential and employment population was used for comparison purposes between 2015-2017. It should be noted the water transferences through the PRVs, which occurs only during emergency situations to keep the system pressure, are considered minimal and were not accounted for the calculation of the future water demands. Refer to WS&D MP for additional information regarding this subject. The results are presented below.

Table 3-2 Barrie 2015 Water Production

PARAMETER	ZONE 1	ZONE 2N	ZONE 3N	ZONE 2S	ZONE 3S	SYSTEM WIDE
Residential Population	20,705	47,524	9,580	44,566	23,469	145,844
Employment Population	19,988	23,877	938	13,257	15,444	71,033
ADD (m^3/d)	7,052	11,929	1,981	6,730	9,468	37,160
Per Capita ADD (Lpcd)	173	167	188	116	243	171
MDD (m^3/d)	16,000	17,771	4,766	15,500	14,612	68,649
Maximum Day Factor	2.27	1.49	2.41	2.30	1.54	1.85

[1] The ADD values were calculated from SCADA data considering 365-day for 2015.
[2] The MDD values were obtained from SCADA data for each zone (Zone 1 on 08/20/15, Zone 2N on 07/28/15, Zone 3N on 07/29/15, Zone 2S on 07/25/15, and Zone 3S on 05/26/15 and chosen to represent the system-wide MDD.
[3] The per capita average demand per day was determined by dividing the ADD over the residential and employment population for each zone (with unit conversions).
[4] The maximum day factor was determined by dividing the MDD over the ADD for each zone.

Table 3-3 Barrie 2016 Water Production

PARAMETER	ZONE 1	ZONE 2N	ZONE 3N	ZONE 2S	ZONE 3S	SYSTEM WIDE
Residential Population	20,705	47,524	9,580	44,566	23,469	145,844
Employment Population	19,988	23,877	938	13,257	15,444	71,033
ADD (m^3/d)	7,694	11,515	2,294	8,547	8,060	38,110
Per Capita ADD (Lpcd)	189	161	218	147	207	176
MDD (m^3/d)	16,687	17,664	5,440	17,604	13,117	70,512
Maximum Day Factor	2.17	1.53	2.37	2.06	1.63	1.85

[1] The ADD values were calculated from SCADA data considering 366-day for 2016.
[2] The MDD values were obtained from SCADA data for each zone (Zone 1 on 09/25/16, Zone 2N on 06/19/16, Zone 3N on 10/03/16, Zone 2S on 11/21/2016, and Zone 3S on 08/10/16) and chosen to represent the system-wide MDD.
[3] The per capita average demand per day was determined by dividing the ADD over the residential and employment population for each zone (with unit conversions).
[4] The maximum day factor was determined by dividing the MDD over the ADD for each zone.

Table 3-4 Barrie 2017 Water Production

PARAMETER	ZONE 1	ZONE 2N	ZONE 3N	ZONE 2S	ZONE 3S	SYSTEM WIDE
Residential Population	20,705	47,524	9,580	44,566	23,469	145,844
Employment Population	19,988	23,877	938	13,257	15,444	71,033
ADD (m^3/d)	6,532	11,249	2,349	7,291	8,578	35,999
Per Capita ADD (Lpcd)	161	158	223	126	220	166
MDD (m^3/d)	15,023	18,715	5,485	16,918	12,549	68,690
Maximum Day Factor	2.30	1.66	2.34	2.32	1.46	1.91

[1] The ADD values were calculated from SCADA data considering 365-day for 2017.

[2] The MDD values were obtained from SCADA data for each zone (Zone 1 on 09/13/15, Zone 2N on 06/16/17, Zone 3N on 07/12/17, Zone 2S on 06/21/17, and Zone 3S on 09/24/17) and chosen to represent the system-wide MDD.

[3] The per capita average demand per day was determined by dividing the ADD over the residential and employment population for each zone (with unit conversions).

[4] The maximum day factor was determined by dividing the MDD over the ADD for each zone.

Based on the anticipated population growth, projections for water demand for each zone were calculated. The groundwater and surface water supplies are assumed to only be required to supply the maximum day demands, with the peak hourly and fire flow demands supplied by the various reservoirs in the system. Future water demand projections were developed using the following criteria obtained from Table 3-2 and Table 3-3:

— Average per capita demand and Average Day Demand:

The average daily demand per capita of each zone was calculated through dividing the water production rates, including both residential and ICI demands, by the total equivalent population from 2015 to 2017. The average of the values obtained, as shown in Table 3-5, were selected to calculate the average day demands projections using the unit flow rate multiplied by the residential and non-residential population growth.

— Maximum Day Demand and Maximum Day Factor:

The maximum value from the 2015 to 2017 maximum day factors was selected, with a lower bound of 1.8 for the current established population, creating a baseline for 2016. For the projected future population, the maximum day factor proposed in the *Design Guidelines For-Drinking Water Systems, 2008* from MECP were used. This methodology was used to provide more conservative maximum demand projections, as shown in Table 3-5. The maximum day demands were calculated by applying the maximum day factor to the average day demand.

Table 3-5 Maximum Day Factor and Average Daily Demand Per Capita Per Zone

	ZONE 1	ZONE 2N	ZONE 3N	ZONE 2S	ZONE 3S
Maximum Day Factor from 2015 to 2017 [1]	2.30	1.66	2.41	2.32	1.63
Maximum Day Factor for Established Population	2.30	1.80	2.41	2.32	1.80
Maximum Day Factor for Future Population [2]					
2021	1.90	1.80	2.00	1.75	1.80
2026	1.80	1.80	2.00	1.75	1.80
2031	1.80	1.75	2.00	1.75	1.80
2036	1.80	1.75	2.00	1.65	1.80
2041	1.80	1.75	2.00	1.65	1.80
2071	1.75	1.75	1.90	1.65	1.75
Average Daily Demand Per Capita (Lpcd) for Established and Future Population [3]	174	162	210	129	224

[1] Based on the maximum day factor of each zone found in Table 3-2, Table 3-3 and Table 3-4.

[2] The maximum day factors for the future population were based on Table 3-1: Peaking factors of *Design Guidelines For-Drinking Water Systems, 2008* from MECP, according to the total equivalent population of each projected year.

[3] The average daily demand each zone was calculated based on the average daily demand per capita found in Table 3-2, Table 3-3 and Table 3-4.

The combined population projections, average day demand and maximum day demand projections to ultimate buildout are summarized in Table 3-6. The demands associated with growth in the Salem and Hewitts Secondary Plan Areas have been included in Zones 2S and 3S.

Table 3-6 Barrie Projected Future Water Demands

YEAR	PARAMETER	ZONE 1	ZONE 2N	ZONE 3N	ZONE 2S	ZONE 3S	SYSTEM WIDE
2021	Equivalent Population	44,041	72,060	10,434	73,986	50,484	251,005
	ADD (m^3/d)	7,676	11,671	2,190	9,581	11,289	42,408
	MDD (m^3/d)	17,422	21,008	5,277	21,057	20,321	85,085
2026	Equivalent Population	48,531	73,874	10,420	89,789	59,935	282,549
	ADD (m^3/d)	8,459	11,965	2,187	11,627	13,403	47,641
	MDD (m^3/d)	18,772	21,537	5,271	24,638	24,125	94,343
2031	Equivalent Population	55,833	76,897	10,482	98,745	68,996	310,953
	ADD (m^3/d)	9,731	12,454	2,200	12,787	15,429	52,603
	MDD (m^3/d)	21,063	22,374	5,297	26,668	27,772	103,174
2036	Equivalent Population	63,501	80,434	10,710	112,374	77,301	344,320
	ADD (m^3/d)	11,068	13,027	2,248	14,552	17,286	58,182
	MDD (m^3/d)	23,469	23,376	5,393	29,053	31,115	112,406
2041	Equivalent Population	71,676	85,828	10,861	125,658	87,939	381,962
	ADD (m^3/d)	12,493	13,901	2,280	16,272	19,665	64,611
	MDD (m^3/d)	26,034	24,905	5,456	31,892	35,397	123,684
2071	Equivalent Population	94,566	102,840	12,205	144,227	99,131	452,969
	ADD (m^3/d)	16,482	16,656	2,562	18,677	22,168	76,546
	MDD (m^3/d)	32,745	29,727	5,985	35,859	39,229	143,546

[1] The ADD was calculated by multiplying the total equivalent population (Residential and Employment) found in Table 3-1 by the average daily demand per capita found in Table 3-5 (with unit conversions).

[2] The MDD was calculated by the addition of two components for each pressure zone:
(1) 2016 maximum day demand as baseline, calculated by applying the selected maximum day factor for the established population found in Table 3-5 to the average day demand in 2016; and
(2) the maximum day demand for the future population, calculated by applying the selected maximum day factor for the future population found in Table 3-5 to the average day demand for each projected year.

3.2.1 Comparison with Previous Master Plan

Figure 3-1 to Figure 3-3 illustrate the comparison between the 2013 Master Plan projections and this Master Plan update. The overall projected water demand has decreased, which aligns with the reduction of average water demand that has been observed since 2011, as shown in Figure 2-9. This implies that, compared to the previous Master Plan, the needs for capital upgrades to increase water supply to the City of Barrie within the build-out timeframe will be reduced, and these upgrades will be needed later than anticipated.

The current master plan update has a more conservative approach, where the future water demand is calculated based on the maximum day demand per pressure zone, while the 2013 Master Plan used the maximum day demand occurred in the whole system for the calculation of the projections.

The 2013 Water Supply Master Plan included recommendations to implement further water efficiency strategies and to optimize the SWTP to reach 62 MLD by 2031. However, the projects list recommended in the 2013 Master Plan did not included projects related to water supply.

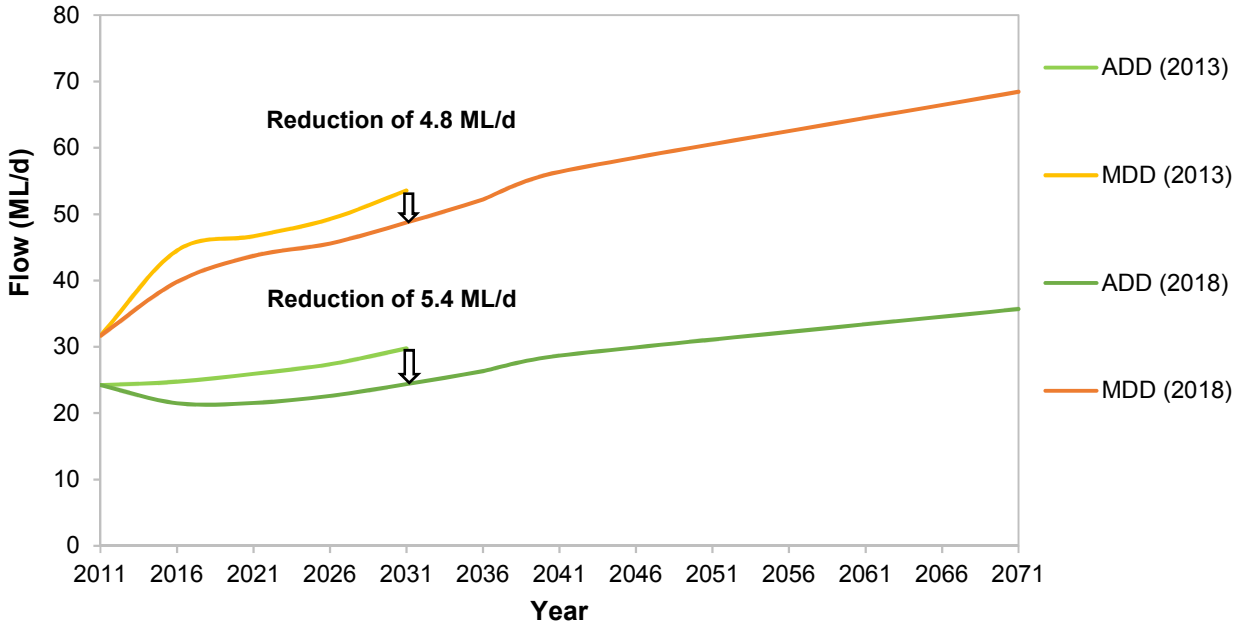


Figure 3-1 Comparison of 2013 and 2018 Master Plan Groundwater Demand Projections (Northern Zones: 1, 2N, and 3N)

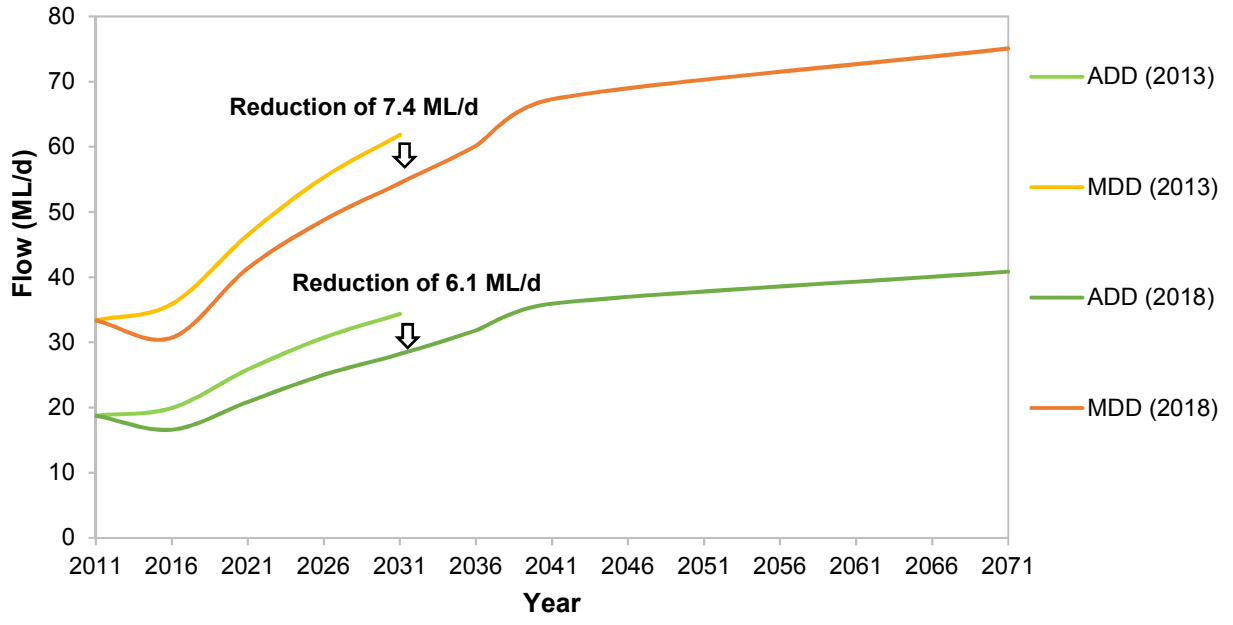


Figure 3-2 Comparison of 2013 and 2018 Master Plan Surface Water Projections (Southern Zones: 2S and 3S)

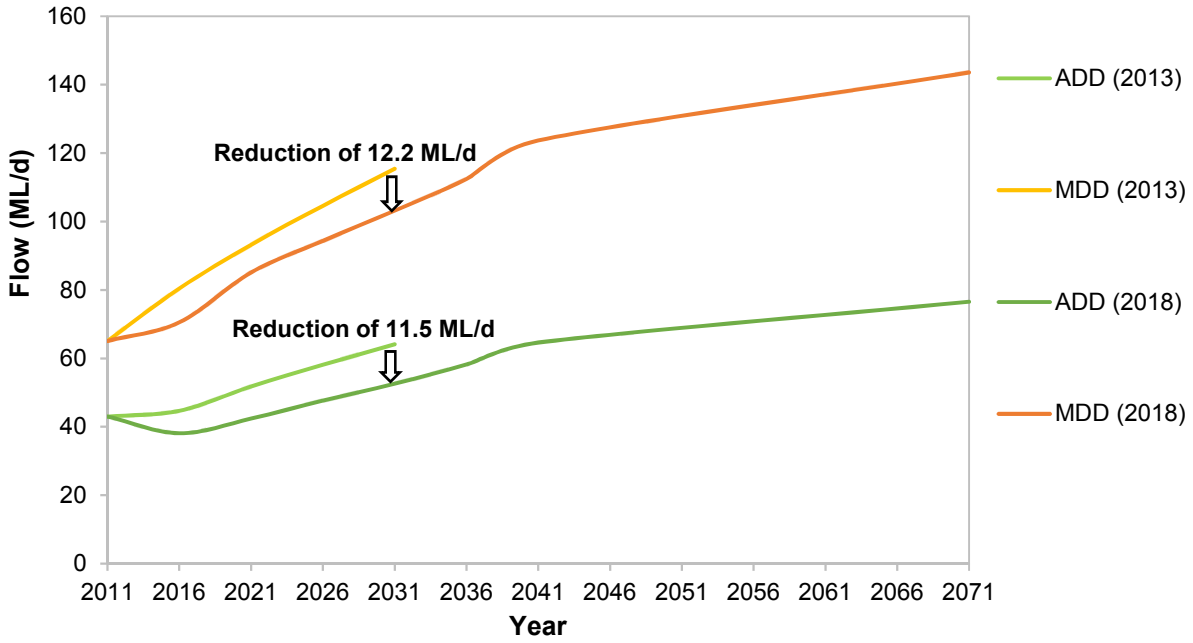


Figure 3-3 Comparison of 2013 and 2018 Master Plan System-Wide Projections

4 Problem Statement

4.1 Approach to Problem

To provide a plan for the drinking water supply system, the system must be evaluated for its ability to meet the water demands as well as the security (redundancy) in the system. To evaluate the system, the future demands will be compared to the existing supply capacities. The groundwater wells and the surface water supply drinking water system are currently operating independently and therefore, they will be analyzed separately. Redundancy in the system will also be reviewed to determine if there are excessive risks.

Once the future demand and supply capacities are compared, it will be determined if the supply is sufficient or if other actions are required. Following which alternatives will be presented, evaluated, and recommended. Recommendations will also be presented for any works to increase redundancy in the system.

4.2 Capacity Constraints

A capacity review of the City of Barrie water system firm capacity and water demand projections was conducted to identify the future servicing gaps for each system. Figure 4-1 to Figure 4-3 illustrate the water supply capacity plotted against the water demand projections, for each water source and for the entire system. Refer to WS&D MP for additional information regarding the capacity constraints of storage and BPS.

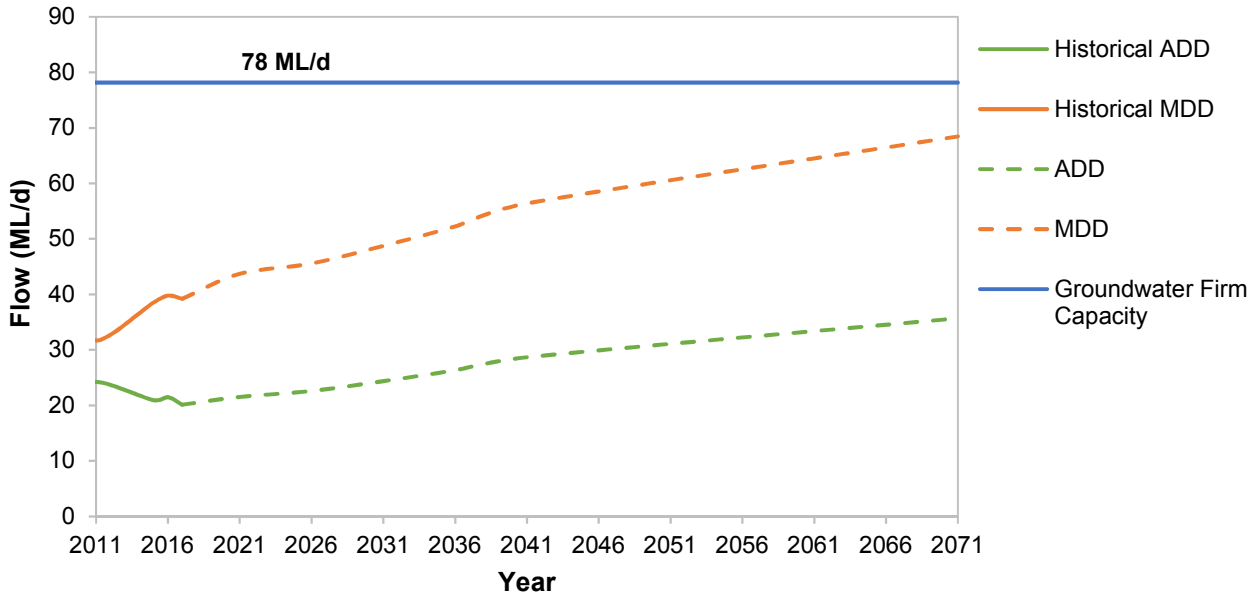


Figure 4-1 City of Barrie 2018 Groundwater Demand Projections (Northern Zones: 1, 2N, and 3N) compared to Groundwater Firm Production Capacity

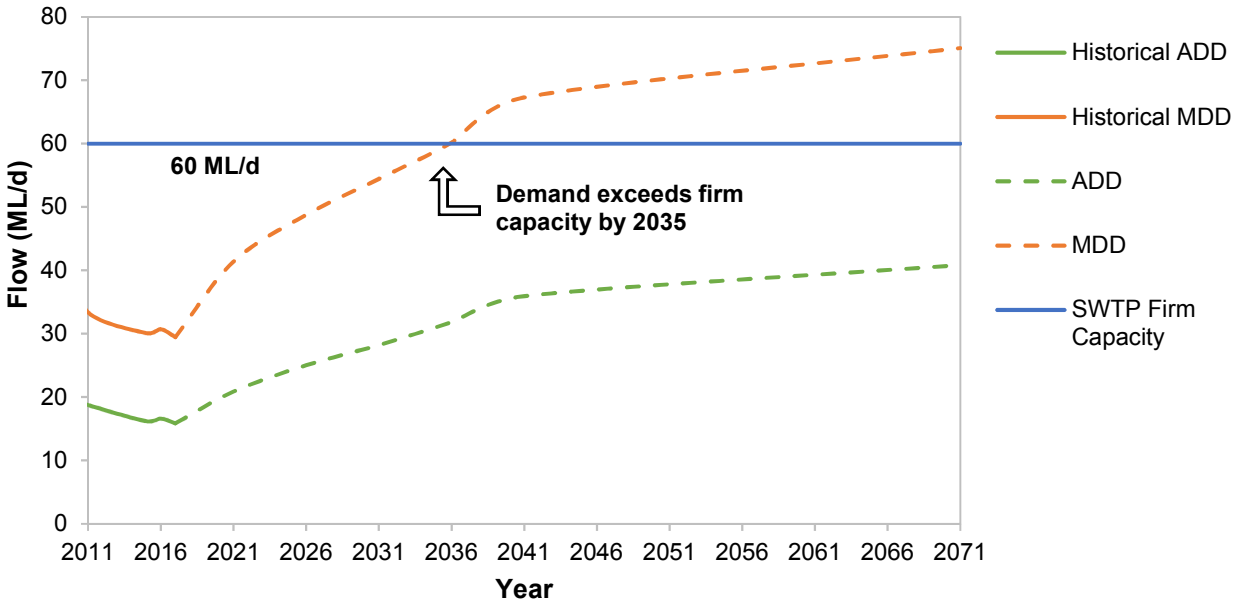


Figure 4-2 City of Barrie 2018 Surface Water Demand Projections (Southern Zones: 2S, and 3S) compared to SWTP Firm Production Capacity

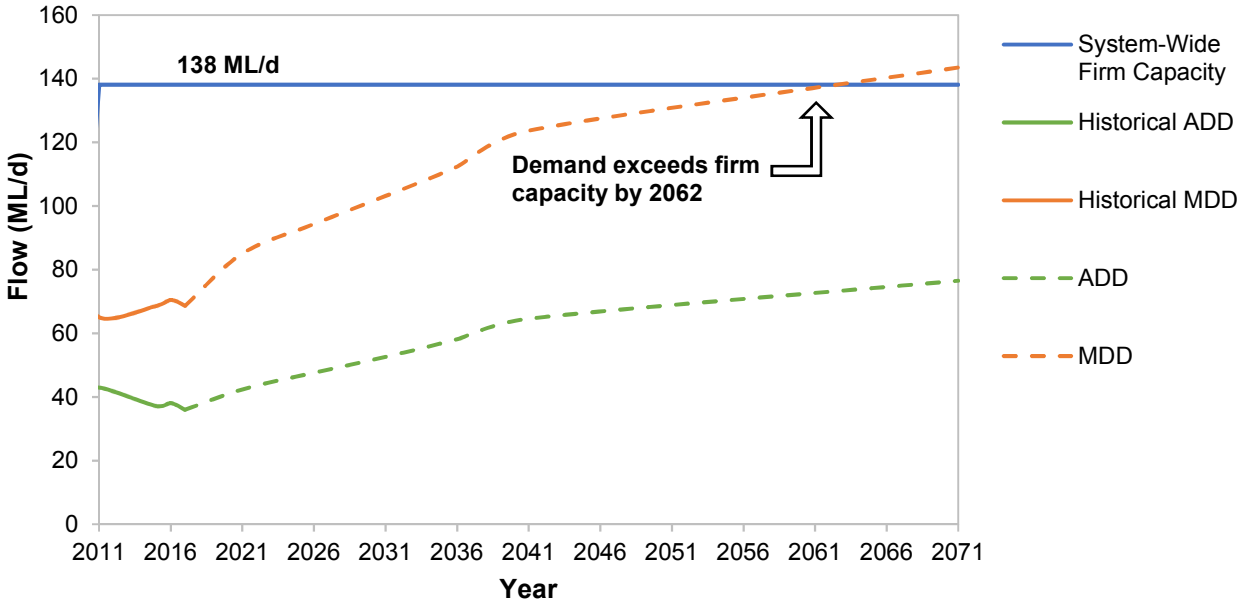


Figure 4-3 City of Barrie 2018 System-Wide Water Demand Projections compared to System-Wide Firm Production Capacity

4.2.1 Problem Statement

Under the City's current supply strategy, the southern zones (2S and 3S) are serviced by surface water and the northern zones (1, 2N and 3N) are serviced by groundwater. Based on the current servicing strategy, the following conclusions can be taken from Figure 4-1 to Figure 4-3:

- Based on the current SWTP operating capacity of 60 ML/d, the water demand of Zones 2S and 3S, including the Salem and Hewitts Secondary Plan Areas, will exceed the firm capacity of the SWTP by 2035. The maximum day demand projections for Zones 2S and 3S exceed the SWTP capacity by approximately 7.3 ML/d in 2041 and by approximately 15.1 ML/d in 2071. Additional water supply is required by 2041 (7.3 ML/d).
- Based on the groundwater firm production of 78 ML/d, the current production will be sufficient to service the growth projections of Zones 1, 2N and 3N until 2071. This estimate of available water supply is conservative since Wells 4A and 19 are currently not in operation.

4.2.2 Sensitivity Analysis

A sensitivity analysis was performed on 2041 projections for the two following scenarios, to better gauge the effects on the water supply system in case the water usage changes.

- High ICI demand scenario: For this scenario, it was considered the ICI properties were developed using MECP design rates (28 m^3/ha.d for institutional and commercial, 35 m^3/ha.d for industrial), with 60% density factor, in addition to the employment demand. This water demand is 38% higher than the expected scenario.
- High average daily per capita scenario: For this scenario, it was considered the average daily per capita for future equivalent population is 225 Lpcd, instead the current average daily per capita. This water demand is 11% higher than the expected scenario.

From Table 4-1, in Barrie the ADD has a potential range from 64,611 to 107,874 m^3/d for a 2041 projection, while the MDD has a potential range from 123,684 m^3 to 199,838 m^3/d for a 2041 projection.

Table 4-1 Sensitivity Analysis On 2041 Water Demand Projections

		NORTHERN ZONES	SOUTHERN ZONES	SYSTEM-WIDE
2041	ADD (m^3/d)	28,674	35,938	64,611
	MDD (m^3/d)	56,395	67,289	123,684
2041 High Average Daily Per Capita	ADD (m^3/d)	31,159	42,458	73,617
	MDD (m^3/d)	60,824	78,057	138,882
2041 High ICI demand	ADD (m^3/d)	51,227	56,647	107,874
	MDD (m^3/d)	96,072	103,766	199,838

The sensitivity analysis scenarios for the southern zones, northern zones, and system-wide 2041 MDD projections are displayed below in Figure 4-4, Figure 4-5, and Figure 4-6. The high average daily per capita projections indicate that the respective firm capacity could be reached by 2062 for the northern zones, 2031 for the southern zones, and 2040 system-wide. The high ICI demand projections indicate that the respective firm capacity could be reached by 2033 for the northern zones, 2026 for the southern zones, and 2029 system-wide.

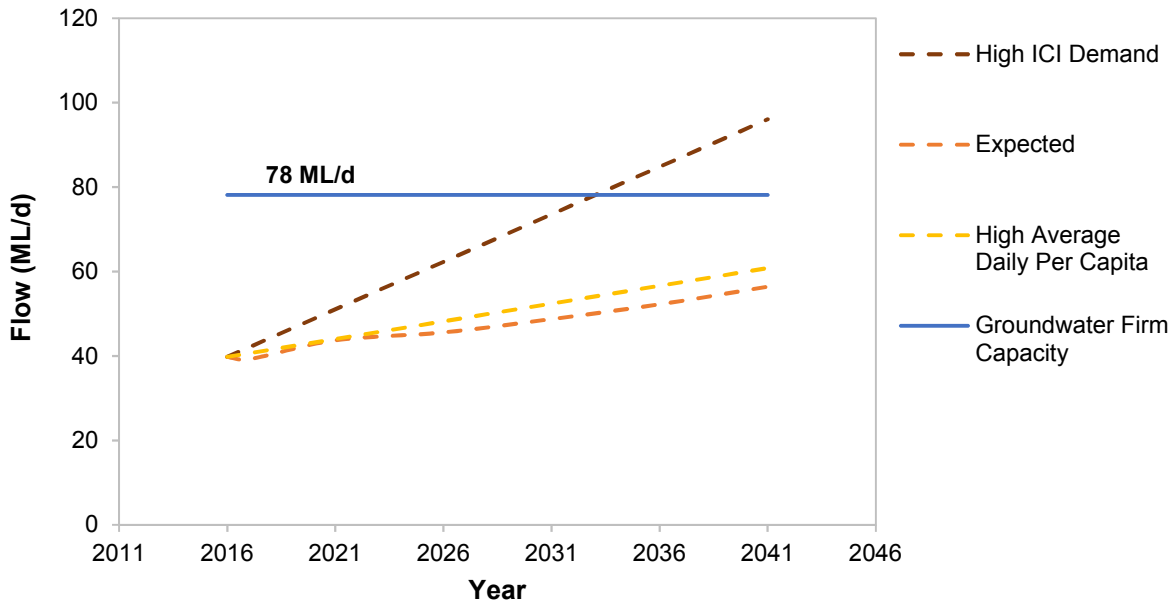


Figure 4-4 Sensitivity Analysis Displaying Scenarios for the 2041 Northern Zones MDD Flow Projection

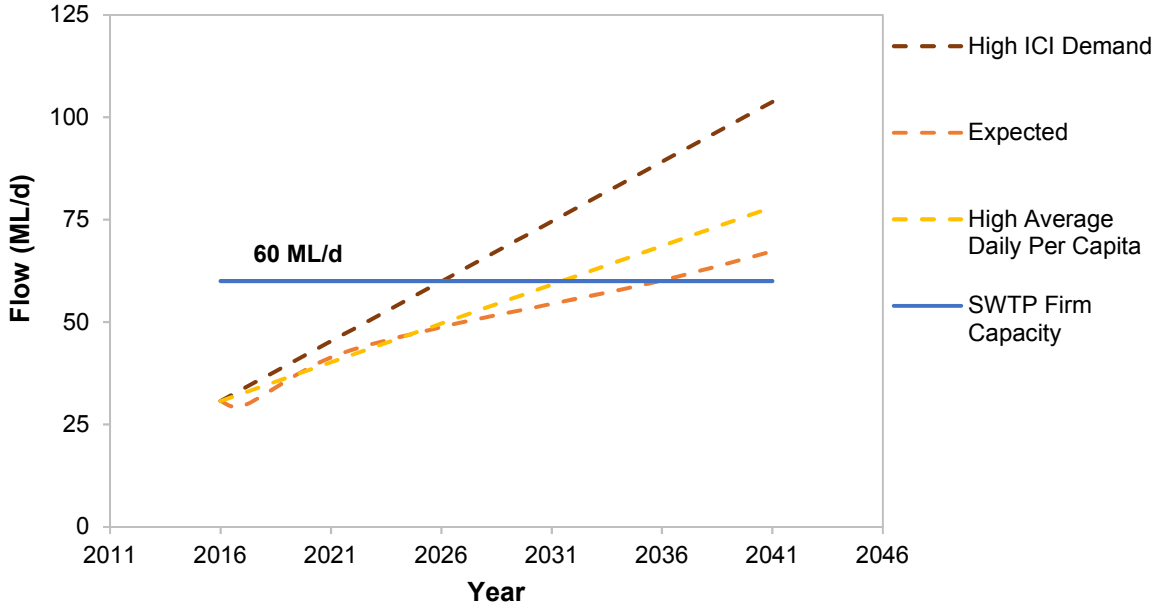


Figure 4-5 Sensitivity Analysis Displaying Scenarios for the 2041 Southern Zones MDD Flow Projection

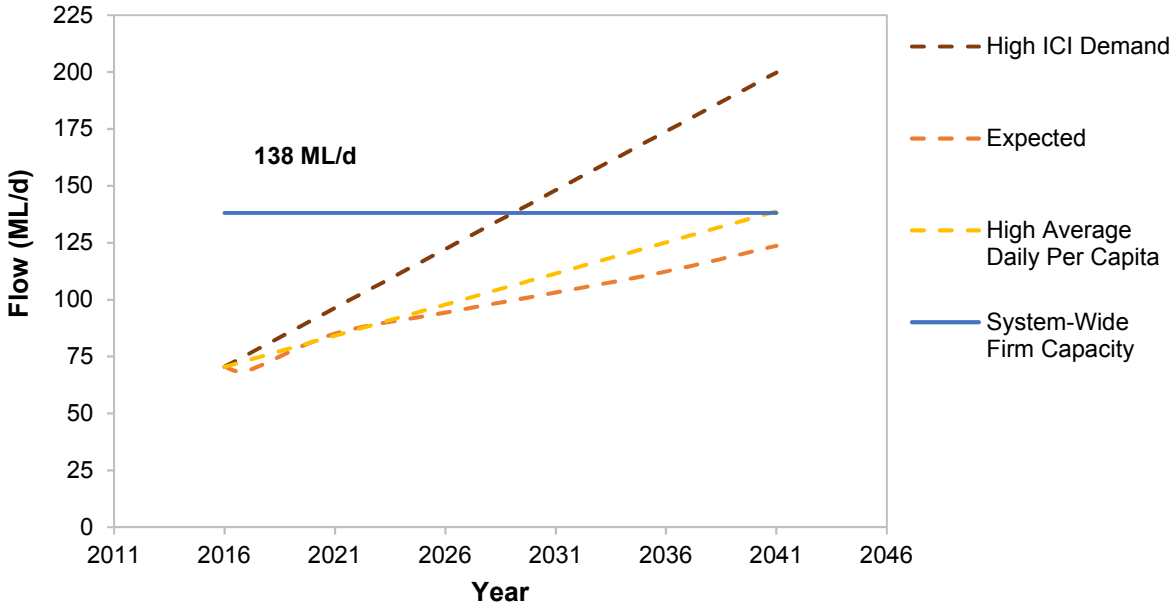


Figure 4-6 Sensitivity Analysis Displaying Scenarios for the 2041 System-Wide MDD Flow Projection

5 Alternative Solutions

5.1 Identification of Alternatives

The long-list of alternatives were identified in consultation with the City of Barrie and are outlined below:

Alternative 1. Do Nothing
Alternative 2. Limit Growth
Alternative 3. Improve Water Efficiency/Water Conservation
Alternative 4. Surface Water Treatment Plant Expansion
Alternative 5. New Zone 2S reduced supplied by Groundwater system
Alternative 6. Divert Wells to Southern Zones
A. Divert Wells 17/18
B. Divert Wells 12/14/15
Alternative 7. Mix Surface Water Supply and Groundwater Supply

5.1.1 Alternative 1 – Do Nothing

Do Nothing is an alternative required as part of the Class EA and the water system will continue to operate as it currently does in this scenario. The groundwater supply system will be sufficient to service growth projections to the year 2071 for Zones 1, 2N, and 3N. However, this does not provide a solution to the capacity constraints that Zones 2S and 3S would experience by 2035, when the SWTP reaches its maximum capacity. As such, the current firm capacity of the SWTP of 60 ML/d would not be adequate to meet the projected water demands in 2041 and 2071. This alternative will not solve the problem, and it was not considered further.

5.1.2 Alternative 2 – Limit Growth

The Limit Growth alternative involves restricting population growth within the City to minimise the impacts on existing infrastructure and resources. Lower growth rates would ensure the sufficiency of the existing infrastructure for a longer period of time and would delay any need for expansion. Specifically, the need to expand the firm capacity of the SWTP would be delayed. However, the Province has directed the City to grow and accommodate additional population and employment to 2041 through the Growth Plan. Therefore, this alternative is not technically feasible and it was not considered further.

5.1.3 Alternative 3 – Improve Water Efficiency/Water Conservation

The Water Efficiency/Water Conservation alternative involves implementing further water conservation strategies and reducing water leakage in the system, in order to decrease water demand. An effective water efficiency program could defer infrastructure expansions of the water supply system required to accommodate future growth.

The City of Barrie has proactively implemented water conservation programs to reduce water consumption and sewage treatment costs. Since 1999, the City has been working with residents to install low flow toilets and showerheads as part of a water conservation program in partnership with the Ontario Clean Water Agency and the Ministry of the Environment.

The City has the following strategies currently in place to promote water conservation:

- **Lawn & Garden Maintenance**

  In the summer, the water use in Barrie increases by as much as 40%, mostly due to outdoor water uses like lawn watering. Besides the lawn and garden maintenance practices suggested by the City, outdoor water use restrictions are set out in the By-Law 2010-036. The by-law establishes water conservation measures covering the temporary outdoor water use and lawn watering limitations. These measures assist with ensuring sufficient water system reserve availability during peak use periods, but may not have an impact on the maximum day demand.

- **Water Efficiency in your Home**

  The City encourages the water consumers to complete a water audit to track water usage and identify leaks, as well as share tips for improving household water-efficiency.

- **Toilet Rebate Program**

  The City offers a $50 rebate to residents who replace high-flow fixtures (greater than 6 litres per flush) with low flow fixtures (6 litres or less), and has been doing so since 2005.

Additional information regarding the current outdoor water use restrictions program can be found on the City's webpage.

Advanced Metering Infrastructure

In 2011, the City of Barrie implemented a new Advanced Metering Infrastructure (AMI) system; a fully automated metering system which provides readings every 15 minutes and transmits the data every 6 hours. The AMI system is a valuable tool which allows the City and individual consumers to track their water consumption and conservation efforts daily or weekly online. Water and wastewater bills also include a graphical illustration of consumption history over 12 months and a calculation of the average daily cost for the billing period. This leading-edge technology is the City's latest tool to track and promote water conservation.

The water efficiency and water conservation measures implemented by the City have already yielded results. It is possible to observe the average water demand has dropped 15% since 2011, as shown in Figure 2-9.

The combined residential/non-residential average consumption per capita in the City of Barrie was 169 Lpcd in average from 2015 to 2017. By calculating the outdoor usage according to AWWA M52 manual, the maximum outdoor water use was 10 Lpcd between 2025 and 2017.

The City has seen significant success with the indoor water efficiency measures and programs that have been put in place. In fact, the City's current water use consumption of 169 Lpcd is already lower than the generally accepted achievable water use consumption rate between 190 and 265 Lpcd in North America (AWWA M52). The City's outdoor water usage is also below the minimal acceptable value of 19 Lpcd (AWWA M52). For this reason, additional reduction of the indoor or outdoor water consumption is not considered for planning purposes.

Although this alternative will not be carried forward for further evaluation, Water Efficiency/ Water Conservation measures add efficiency and resiliency to the system and these programs should continue on the basis of sustainability.

5.1.4 Alternative 4 – Surface Water Treatment Plant Expansion

The Surface Water Treatment Plant Expansion involves the expansion of the SWTP to supply the water demand of Zones 2S and 3S and maintain the water supply of Zones 1, 2N and 3N with the groundwater system.

The Barrie SWTP was originally designed to undergo a phased expansion in four 60 MLD increments to an ultimate rated capacity of 240 MLD. Based on the MDD projections provided in Section 3.2, an additional 7.3 ML/d and 15.1 ML/d firm capacity is required prior 2041 and 2071, respectively, in order to feed Zones 2S and 3S. It was determined that the SWTP can be expanded from 60 ML/d to 90 ML/d in two phases in order to meet future demand projections. This would more closely service demand projections within the study planning horizon rather than accelerating the next 60 ML/d expansion of the plant.

Figure 5-1 shows the impact of the timing of the SWTP expansions on the water supply compared to the water demand projections.

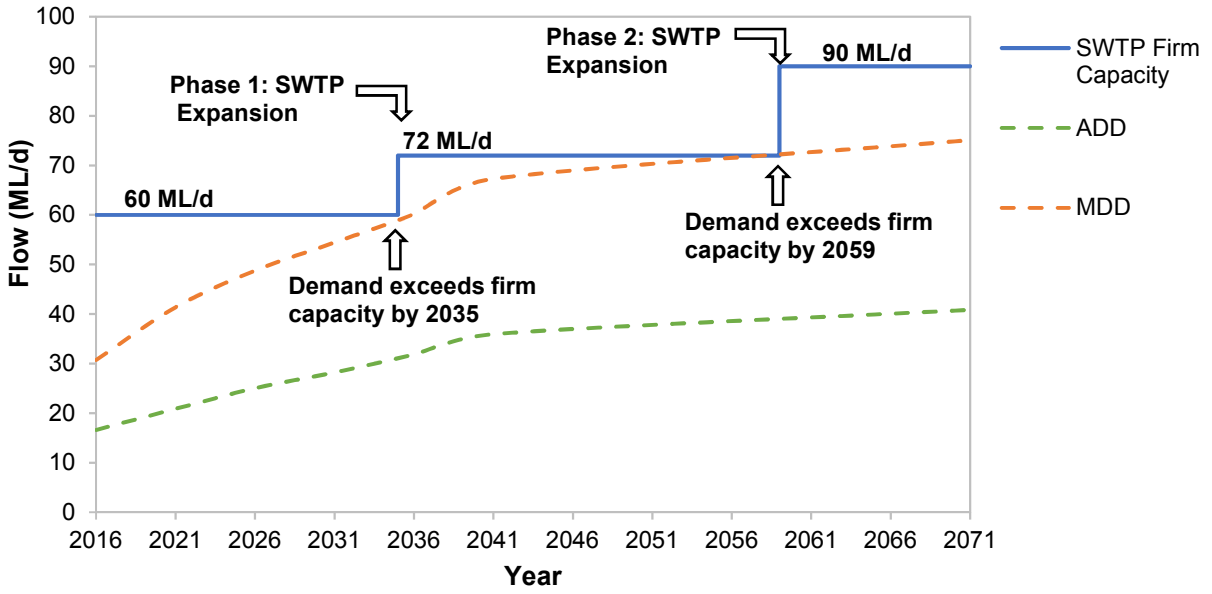


Figure 5-1 City of Barrie 2018 Surface Water Demand Projections compared to SWTP Firm Production Capacity (Southern Zones: 2S, and 3S) with the implementation of Alternative 4

With Alternative 4, Zones 2S and 3S would have sufficient water supply capacity at 60 ML/d to service water demand until 2035, when the supply would be increased to 72 ML/d (Phase 1 SWTP expansion). Phase 2 of the SWTP expansion would be required by 2059 to maintain service, increasing the supply to 90 ML/d beyond the 2071 horizon projections.

5.1.5 Alternative 5 – New Zone 2S Reduced Supplied by Groundwater System

Alternative 5 considers the development of a new independent zone called Zone 2S Reduced. The new Zone 2S Reduced would be fed by the groundwater system through Zone 1, in order to reduce the overall demand on the SWTP, while keeping with the City's existing servicing strategy of distinct zones supplied by surface water and groundwater intact. This alternative was also considered in the previous Master Plan (Genivar, 2013).

The eastern boundary of the new 2S Reduced Zone would be the Innisfil BPS as illustrated in Figure 5-2 below. The area west of the Innisfil BPS would be serviced by groundwater and the area east of the Innisfil BPS would be serviced by the surface water system. The groundwater supply to the 2S reduced zone would be provided from the Innisfil BPS with direct feed or Wells 17/18 via the Ferndale Drive transmission main. The independent Zone 2S reduced will be isolated from the rest of Zone 2S to prevent mixing of surface water and groundwater, with the addition of PRVs.

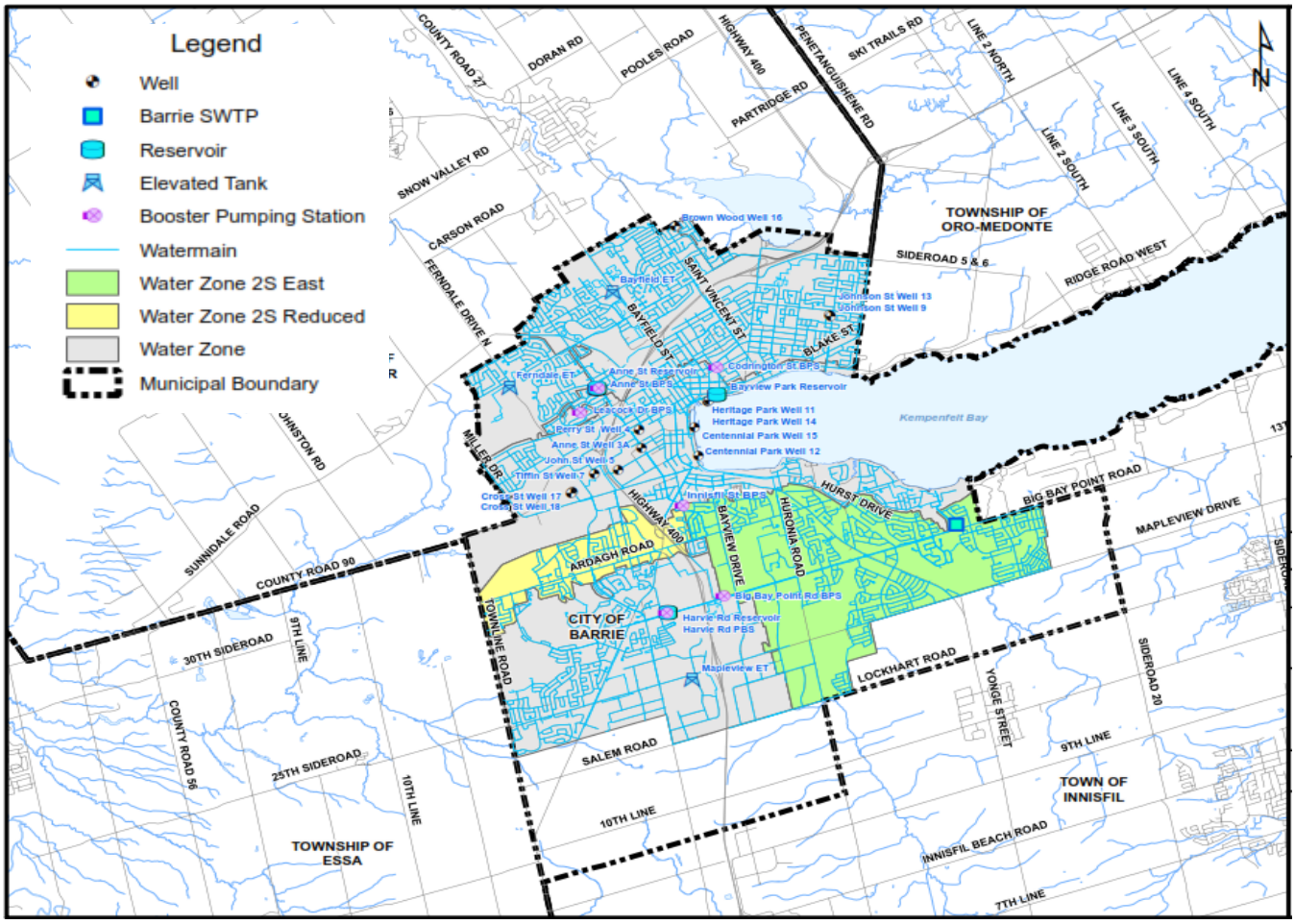


Figure 5-2 New 2S Reduced Zone Boundaries

Zone 2S Reduced would service approximately 20% of Zone 2S population. The ADD and MDD projections for the 2S Reduced Zone are illustrated in Table 5-1.

Table 5-1 Barrie Projected Future Water Demands with Alternative 5

YEAR	PARAMETER	ZONE 1	ZONE 2N	ZONE 3N	ZONE 2S (REDUCED)	ZONE 2S	ZONE 3S	SYSTEM WIDE
2021	Equivalent Population	44,041	72,060	10,434	0	73,986	50,484	251,005
	ADD (m^3/d)	7,676	11,671	2,190	0	9,581	11,289	42,408
	MDD (m^3/d)	17,422	21,008	5,277	0	21,057	20,321	85,085
2026	Equivalent Population	48,531	73,874	10,420	0	89,789	59,935	282,549
	ADD (m^3/d)	8,459	11,965	2,187	0	11,627	13,403	47,641
	MDD (m^3/d)	18,772	21,537	5,271	0	24,638	24,125	94,343
2031	Equivalent Population	55,833	76,897	10,482	0	98,745	68,996	310,953
	ADD (m^3/d)	9,731	12,454	2,200	0	12,787	15,429	52,603
	MDD (m^3/d)	21,063	22,374	5,297	0	26,668	27,772	103,174
2036	Equivalent Population	63,501	80,434	10,710	22,475	89,899	77,301	344,320
	ADD (m^3/d)	11,068	13,027	2,248	2,910	11,642	17,286	58,182
	MDD (m^3/d)	23,469	23,376	5,393	5,811	23,243	31,115	112,406
2041	Equivalent Population	71,676	85,828	10,861	25,132	100,526	87,939	381,962
	ADD (m^3/d)	12,493	13,901	2,280	3,254	13,018	19,665	64,611
	MDD (m^3/d)	26,034	24,905	5,456	6,378	25,513	35,397	123,684
2071	Equivalent Population	94,566	102,840	12,205	28,845	115,382	99,131	452,969
	ADD (m^3/d)	16,482	16,656	2,562	3,735	14,942	22,168	76,546
	MDD (m^3/d)	32,745	29,727	5,985	7,172	28,687	39,229	143,546

The Innisfil BPS is located on Innisfil Street on the boundary of Pressure District 1 and 2S. The pumping station includes three (3) vertical turbine pumps rated at 70 L/s and 73.5 m TDH, with a firm capacity of 140 L/s (12,096 m^3/d). The pumping station was historically used to provide groundwater to Zone 2S prior to commissioning the Barrie SWTP.

The 2041 MDD projections for Zone 2S reduced are 6,378 m^3/d (74 L/s) and ultimate buildout water demand of 7,172 m^3/d (83 L/s). Therefore, the pumping station has more than sufficient capacity and head to meet the projected requirements.

Since Zone 2S has been serviced by surface water, the Innisfil BPS has been operated in pressure mode for fire protection and the pumps are exercised daily for maintenance purposes. Therefore, no upgrades of the Innisfil BPS would be required.

Wells 4A and 19 are not required before 2071, in order to provide sufficient groundwater supply to meet the ultimate buildout projected demand requirements.

Figures 5-3 and 5-4 illustrate the water supply capacity plotted against the water demand projections with new Zone 2S Reduced.

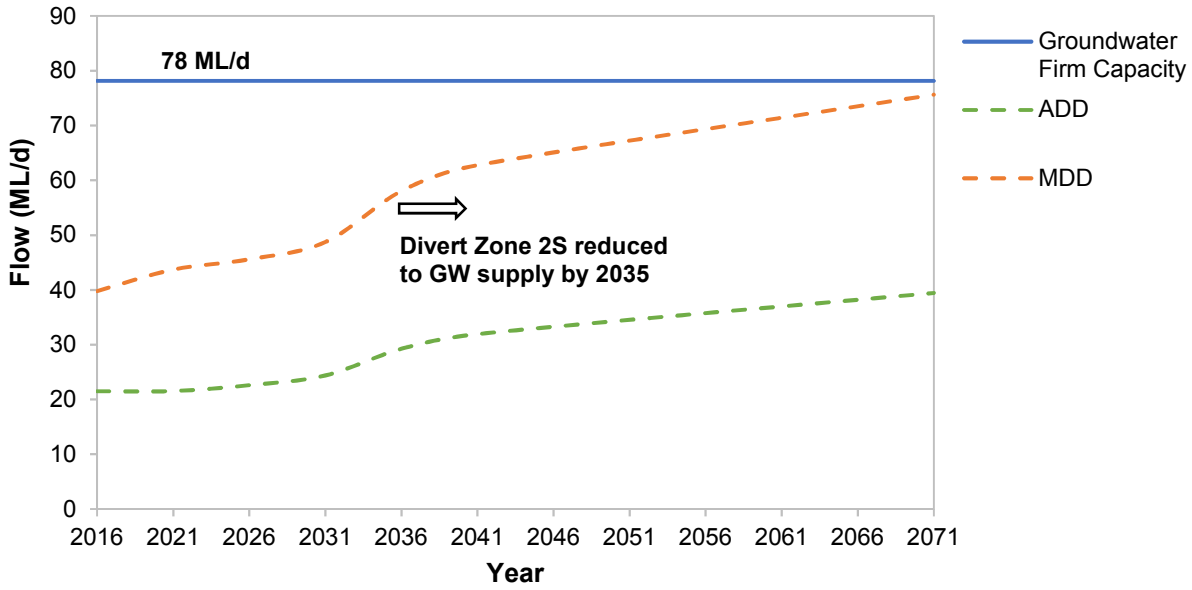


Figure 5-3 City of Barrie 2018 Groundwater Demand Projections compared to Groundwater Firm Production Capacity (Northern Zones: 1, 2N, and 3N) with the implementation of Alternative 5

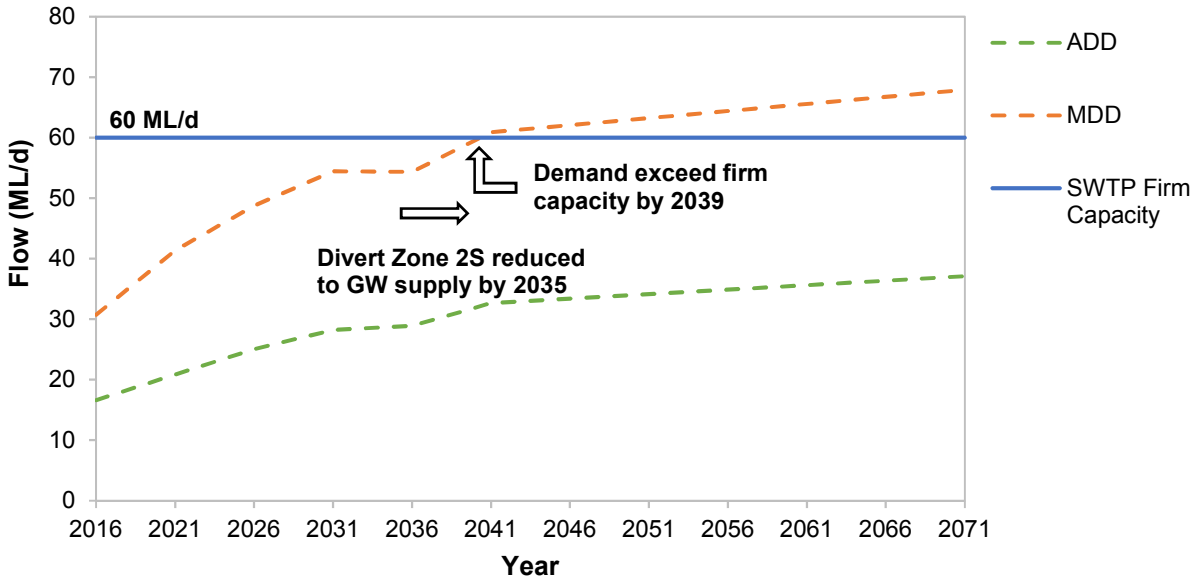


Figure 5-4 City of Barrie 2018 Surface Water Demand Projections compared to SWTP Firm Production Capacity (Southern Zones: 2S, and 3S) with the implementation of Alternative 5

With Alternative 5 implemented, the servicing of max day demands from Zones 2S and 3S, including the Salem and Hewitts Secondary Plan Areas, can be deferred to the year 2039. Groundwater supply is sufficient to service demands from Zones 1, 2N, 3N and 2S reduced prior to 2071.

A larger subzone of Zone 2S reaching 30% of its population would be required to alleviate further the surface water system. The infrastructure upgrades required to create such large subzone would impact the entire distribution network of Zones 2S and 3S. The difficulty to further isolate the distribution network comes from the fact the Zone 2S network overlaps with the servicing watermains currently feeding Zone 3S. New dedicated transmission mains, several PRV's and boosting facilities would be required.

The New Zone 2S reduced alternative will not solve the problem, and it was not carried forward.

5.1.6 Alternative 6 - Divert Wells to the Southern Zones

Alternative 6 involves the diversion of the Wells 17/18 to Zones 2S and 3S. Alternative 6B involves the diversion of Wells 12, 14, and 15 to Zones 2S and 3S. The diversions in both alternatives are only when required to meet MDD. Most of the time, these zones in their entirety will be serviced using surface water in accordance with the current water supply strategy.

These alternatives consider mixing surface water and groundwater supplies in Zones 2S and 3S. The infrastructure upgrades required to create a subzone of Zone 2S or to isolate the entire Zone 2S from the Zone 3S, in order to prevent mixing of surface water and groundwater in more than one zone, would impact the entire distribution system of these zones. The difficulty to further isolate the distribution network comes from the fact the Zone 2S network overlaps with the servicing mains currently feeding Zone 3S. Therefore, this alternative considers mixing surface water and groundwater supplies in Zone 2S and 3S. For additional implications of the mixing water supplies, refer to Section 5.1.7.

A. Divert Wells 17/18 to Zones 2S and 3S

The Ferndale Drive transmission main would be used to supplement water supply in Zone 3S, by diverting Wells 17 and 18 directly to Harvie Reservoir with 28 ML capacity, if the MDD exceeds available surface water supply. A portion of the Ferndale Dr. watermain from Tiffin St. to Ardagh Rd. (1.6km long, 600mm diameter. HDPE) is offline and will need to be rehabilitated or reconstructed by 2035.

Wells 17 and 18 each have an operating capacity of 11,232 m^3/d, with a combined capacity of 22,464 m^3/d (260 L/s). These wells provide more than sufficient groundwater supply to complement the projected maximum day demand of Zones 2S and 3S by 2071.

To compensate for the supply loss from Wells 17 and 18 in the northern zones, Wells 4A and 19 will be connected to the groundwater system by 2044. This will provide sufficient groundwater supply to meet the ultimate buildout projected demand requirements of Zones 1, 2N and 3N. Wells 20 and 21 are not required before 2071 to ensure water supply.

Figures 5-5 and 5-6 illustrate the water supply capacity plotted against the water demand projections with the diversion of the wells.

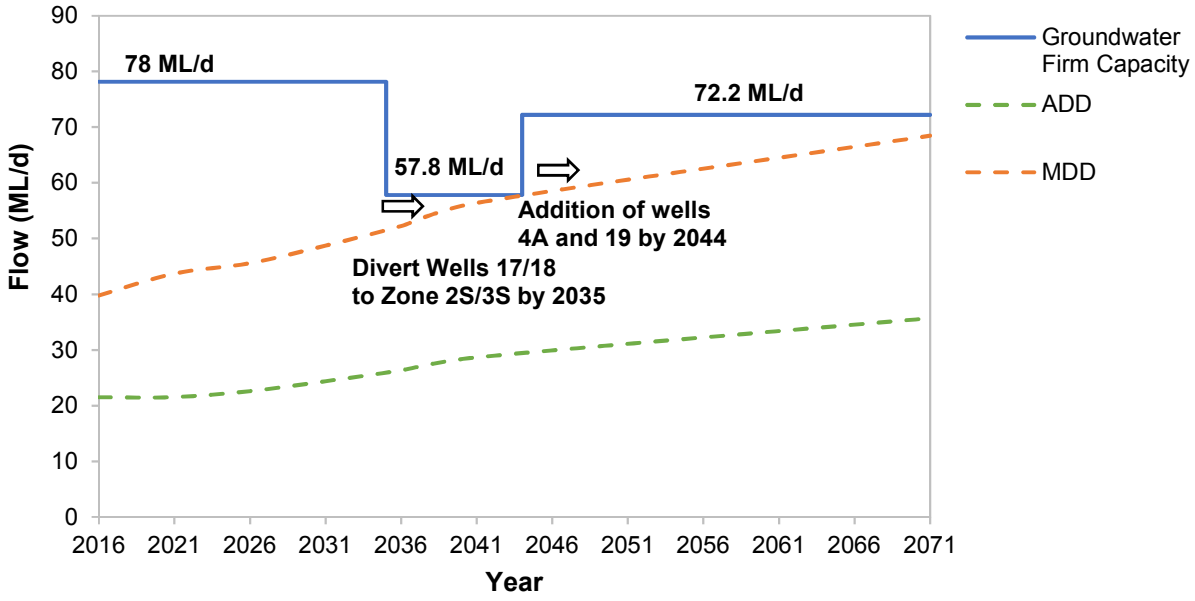


Figure 5-5 City of Barrie 2018 Groundwater Demand Projections compared to Groundwater Firm Production Capacity (Northern Zones: 1, 2N, and 3N) with the implementation of Alternative 6A

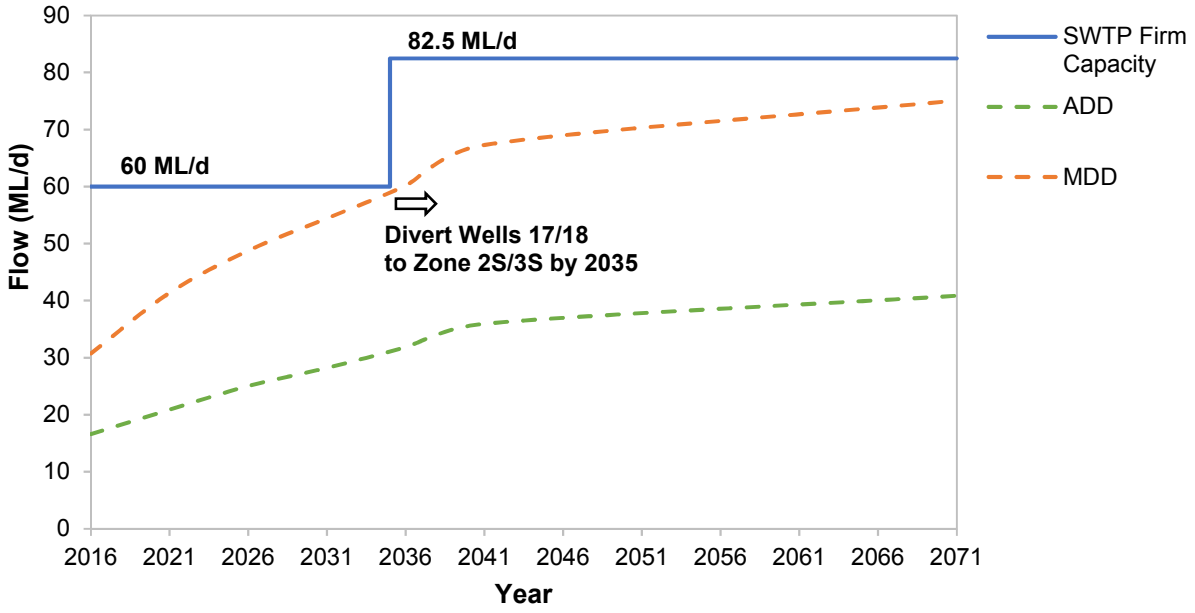


Figure 5-6 City of Barrie 2018 Surface Water Demand Projections compared to SWTP Firm Production Capacity (Southern Zones: 2S, and 3S) with the implementation of Alternative 6A

B. Divert Wells 12/14/15 back to Zone 2S and 3S

Under this alternative, the Innisfil BPS via Innisfil St. watermain to Little Ave transmission main and Wells 12, 14 and 15 will be used to supplement water supply in Zone 2S and Zone 3S if maximum day demands exceed available surface water supply. A new dedicated transmission main crossing the downtown area is needed between Wells 12, 14 and 15 to along Lakeshore Dr. and Essa Rd by 2035.

Additional pumping capacity would be required to ensure the Innisfil BPS has sufficient capacity and head to meet the projected requirements, especially as Salem and Hewitts Secondary Plan Areas are added. However, a building extension to accommodate an additional pump would be very limited since it is shared building with Hydro and the yard piping configuration limits the expansion. At preliminary evaluation, the pumps would have to be replaced for bigger pumps in order to increase the capacity of this BPS.

Wells 12, 14 and 15 each have an operating capacity of 9,100 m^3/d, with a combined capacity of 27,300 m^3/d (316 L/s). These wells provide more than sufficient groundwater supply to complement the projected maximum day demand of Zones 2S and 3S.

As with Alternative 6A, to compensate for the supply loss from these Wells in the northern zones, Wells 4A and 19 will be connected to the groundwater system by 2035. This will provide sufficient groundwater supply to meet the 2041 projected demand requirements of Zones 1, 2N and 3N. Wells 20 and 21 may be required before 2071 to ensure water supply in the northern zones.

Figures 5-7 and 5-8 illustrate the water supply capacity plotted against the water demand projections with the diversion of the wells.

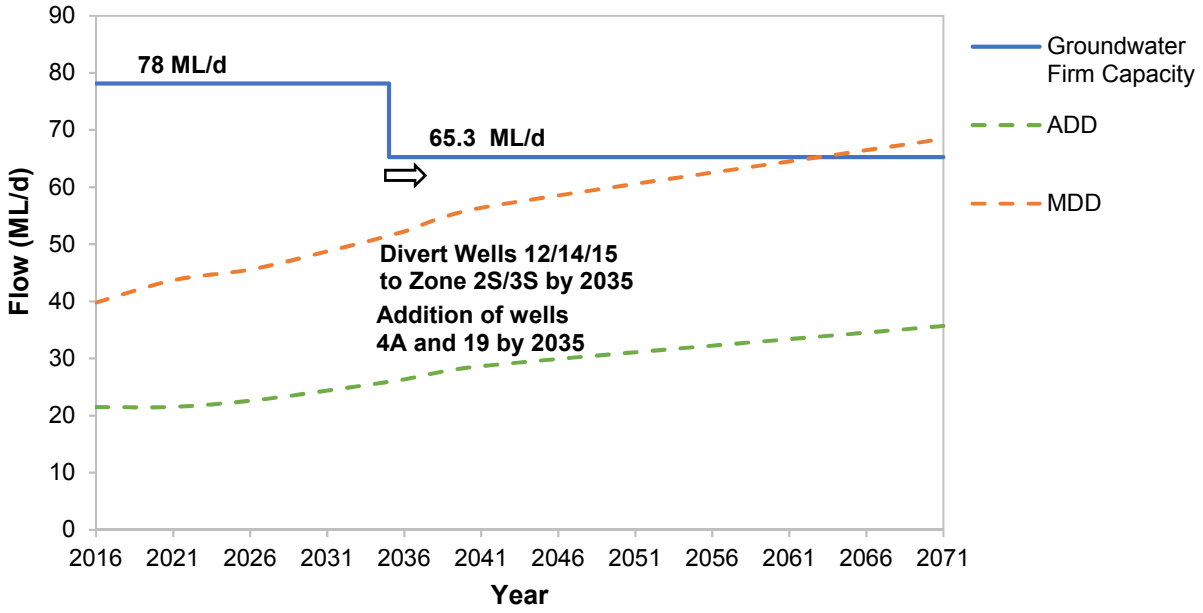


Figure 5-7 City of Barrie 2018 Groundwater Demand Projections Compared to Groundwater Firm Production Capacity (Northern Zones: 1, 2N, and 3N) with the implementation of Alternative 6B

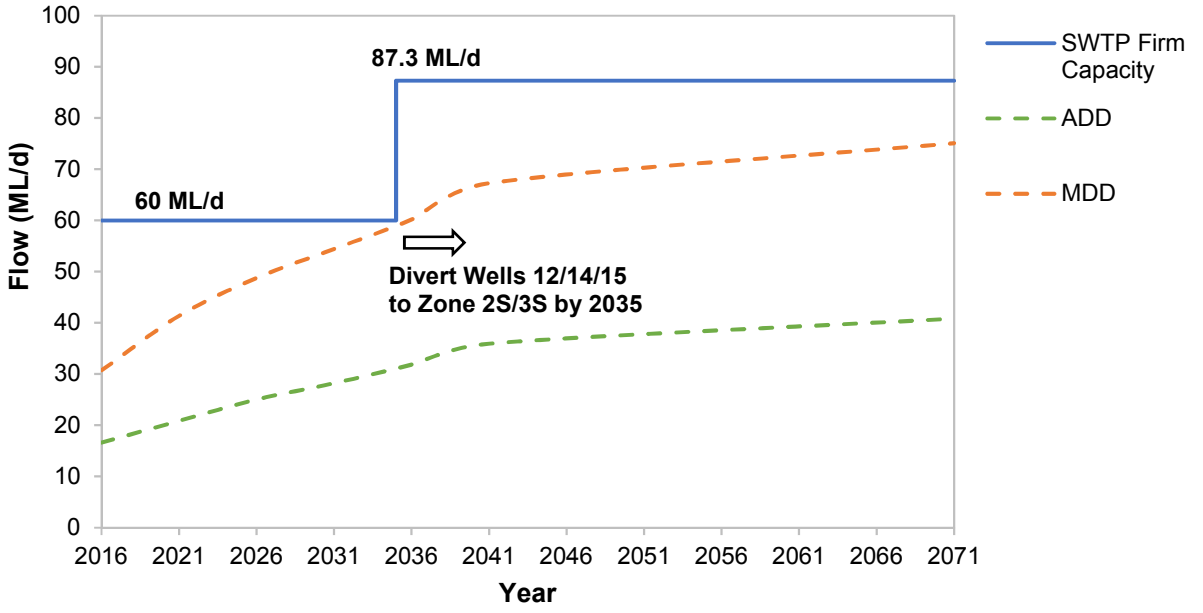


Figure 5-8 City of Barrie 2018 Surface Water Demand Projections Compared to SWTP Firm Production Capacity (Southern Zones: 2s, and 3S) with the implementation of Alternative 6B

Both alternatives can meet the southern zones 2071 build-out MDD, but only Alternative 6A provides enough supply to meet the one for the northern zones 2071. With Alternative 6B, the demand exceeds the groundwater supply by 2063 in the northern zones. Alternative 6B also requires additional works at an earlier stage than Alternative 6A. Well 14 also presents some contamination with chlorinated solvents and may be taken off line in the future. In conclusion, Alternative 6A is considered to be more favourable than Alternative 6B, and it is the only alternative to be carried forward.

5.1.7 Alternative 7 – Mix Surface Water Supply and Groundwater Supply

Under the City's current water supply strategy and with the incorporation of the Salem and Hewitts Secondary Plan Areas, the Zones 2S and 3S water demand will exceed the SWTP capacity by 2035. However, there is 21.8 MLD excess groundwater capacity available in 2041 based on demand projections for northern zones serviced by groundwater. This alternative involves mixing the surface and groundwater systems over the course of two phases.

Since the groundwater production capacity is significantly higher than water demand projections, mixing groundwater and surface water supplies could be an option to meet maximum day requirements. Implementation of a mixing strategy to meet maximum day demands could defer expansion of the SWTP required to accommodate future growth. This alternative assumes distinct surface water and groundwater zones the majority of the time. Mixing will only be used when the demands in Zone 2S and 3S exceed the current rated capacity of the SWTP. This is expected to occur later in the planning horizon and only for a few days per year in the summer months.

As stated above, the infrastructure upgrades required to create a subzone of Zone 2S or to isolate the entire Zone 2S from the Zone 3S, in order to prevent mixing of surface water and groundwater in more than one zone, would impact the entire distribution system of these zones. Therefore, this alternative considers mixing surface water and groundwater supplies in Zone 2S and 3S. Most of the time, these zones, in their entirety, will be serviced using surface water in accordance with the current water supply strategy. It is estimated that less than 0.5% of the total annual consumption of Zones 2S and 3S will be from groundwater supply by 2041.

In Phase 1, upgrades to the Innisfil BPS will be used to supplement water supply in Zone 2S and 3S, if maximum day demands exceed available surface water supply. Boosting southward was a previous condition of the Innisfil BPS and should supply these zones without further upgrades until 2059. No additional transmission mains are required.

There are several PSVs and PRVs needed between Zones 2S and 3S in order to maintain constant upstream system pressure in Zone 2S while ensuring demands in Zone 3S are met. These will need to be adjusted/replaced to allow for the existing station to boost to the southern zones.

In Phase 2, there are two options to increase the southern zone water supply by 15.1 ML/d to meet the ultimate build-out demand. The first option includes expanding the capacity of the Innisfil BPS by 2059, and the construction of Wells 4A and 19 pump houses and their connections to the distribution system will be required to provide sufficient groundwater supply to the system by 2062. This option is feasible with adjustments to the PSV and PRV during Phase 1, as pressure reduction needs to be removed. This option is also contingent on the use of existing transmission mains (400mm size) from Zone 1 to Innisfil BPS. The 300mm transmission main to Big Bay BPS (2.8km long in total) should be upsized to 400mm to provide redundancy.

The second option includes diverting Wells 17/18, the rehabilitation of a portion of the dedicated Ferndale Drive transmission main (1.6km of 600mm diameter) from these wells to Harvie Reservoir, and the construction of Wells 4A and 19 pump houses and their connection to the distribution system as well by 2059.

The first option would require the least amount of capital investment (unless additional dedicated transmission mains from Zone 1 Wells are to be considered), but it would promote the highest amount of mixing. On the other hand, the second option would provide the most redundancy and operational flexibility, while controlling most of the groundwater mixing to Zone 3S. Considering the Phase 2 should occur beyond 2041, it is recommended to re-assess the water needs and evaluate the best option in the future.

Figure 5-9 illustrates the water supply capacity plotted against the water demand projections with the integration of both systems.

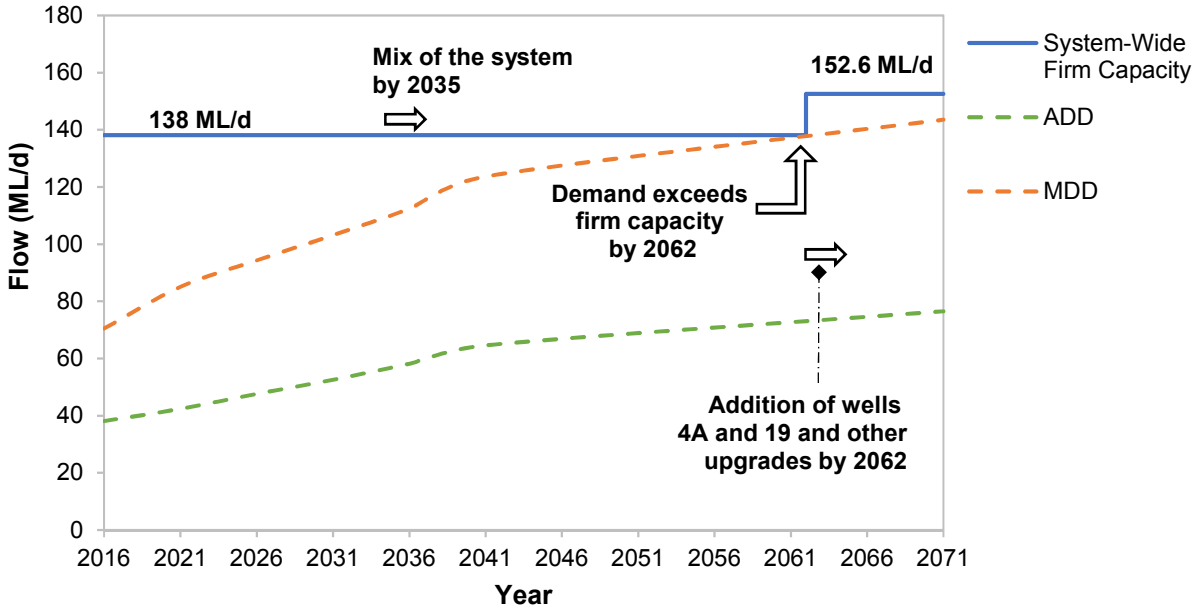


Figure 5-9 City of Barrie 2018 System-Wide Water Demand Projections compared to System-Wide Firm Production Capacity with the implementation of Alternative 7

The groundwater and surface water supplies are sufficient to service maximum day demands to the year 2058 if this strategy is implemented.

When considering mixing surface water and groundwater supplies, it is important to consider the following:

- Ensure compatibility of disinfection methods. It is not anticipated that this will be an issue since all the groundwater wells and the Barrie SWTP utilize chlorine gas for disinfection.
- With the expansion of the distribution network and the increase of the water age, the chlorine decay in the distribution network may also be a concern.
- Using groundwater to supplement surface water supplies may therefore result in temporary discolouration in the surface water zones. However, aesthetics may not be a primary concern since blending will only occur in short duration to meet maximum day demands.
- There may be concerns from ICI customers that could be negatively affected to changes in water quality in their process. This would have to be reviewed in more detail and potentially those ICI customers contacted in advance of these changes taking place.
- Jar testing is highly recommended to ensure the compatibility of the two water sources based on parameters such as turbidity, temperature, alkalinity, hardness and pH.

Other municipalities have effectively implemented surface water and groundwater mixing, including York Region and the Region of Waterloo. The water supply of Town of Aurora in York Region is composed of approximately 75% of surface water and 25% groundwater. In the Town of Aurora, the surface water and groundwater supplies are currently mixed at a water storage tank from which point blended water is supplied in the distribution system and the percentage of mixing can be controlled, smoothing the water quality variation. However, this is not a possible solution for the City, since the contribution of groundwater supply for Zones 2S and 3S would be minimal.

From a technical perspective, there are few obvious drawbacks to this alternative and it has potential to solve the problem. Therefore, it was carried forward for further evaluation.

5.2 Short-Listed Alternatives

Based on an initial assessment of whether each alternative could adequately address/solve the problem, three alternatives were short-listed for further evaluation:

- **Alternative 4.** Surface Water Treatment Plant Expansion
- **Alternative 6A.** Divert Wells 17/18 to Zones 2S and 3S
- **Alternative 7.** Mix Surface Water Supply and Groundwater Supply

It is important to note that in the life cycle costs analysis, the common works between the alternatives are not included in this analysis, including the works related to water storage, BPS, and water distribution.

A 20-year planning period from 2021 to 2041 was used and the following assumptions were applied to calculate the life cycle costs:

- On capital projects, an allowance of 15% for design/engineering, 10% for contract administration and site inspection, and a 30% construction contingency based on the construction costs were included in calculating the total capital costs;
- An allowance of 5% of capital projects or studies were used for the City's Project Management;
- A HST rate of 1.76% were used;
- An interest rate of 5% and an inflation rate of 2% were used;
- The capital costs were distributed along the 20 years, according to the planning horizon for the required infrastructure investments.

5.2.1 Alternative 4 – Surface Water Treatment Plant Expansion

DESCRIPTION OF INFRASTRUCTURE UPGRADES

Alternative 4 proposes a two-phase expansion of the SWTP first from 60 to 72 MLD by 2035, and then from 72 to 90 MLD by 2049 to supply Zones 2S and 3S before 2028. Zones 1, 2N and 3N would remain independently supplied by the groundwater system. No other infrastructure upgrade or modification is required specifically for this alternative.

At first, an optimization study for the SWTP to identify opportunities to increase capacity within the current equipment is recommended.

To expand the SWTP from 60 to 72 MLD, the required upgrades are:

- **Raw Water Intake** – None
- **Low Lift Pumping Station** – Upgrade of one 15.75 MLD pump to 31.5 MLD. This results in a 78.76 MLD firm capacity with one 31.5 MLD pump out of service.
- **Flocculation** – One additional train is required for a total of 4 trains with a 10 minutes retention time.
- **Primary Membranes** – The 5 trains are to be fully populated at 24 MLD per train which is the hydraulic capacity of the system
- **Secondary Membranes** – One additional train will be required.
- **GAC Contactors** – One additional train is recommended (for a total of 4) with a capacity of 15 MLD per train and 8.9 minutes EBCT.
- **Reservoir and Chlorine Contact Tank** – The weir has to be raised to provide a volume of 14 ML for the reservoir and 6 ML for the chlorine contact tank.
- **High Lift Pumping Station –**. The high lift pumping station has a capacity of 72 MLD to provide fire flows. No upgrades required if sufficient storage is provided in the distribution system to meet fire flow demands.
- **Chemical Systems** – No upgrades required to provide a capacity upgrade to 72 MLD

To expand the SWTP from 72 to 90 MLD, the required upgrades are:

- **Raw Water Intake** – None
- **Low Lift Pumping Station** – Addition of one 15.75 MLD vertical turbine pump with VFD. This results in a 94.5 MLD firm capacity with one 31.5 MLD pump out of service. No additional traveling screens required.
- **Flocculation** – No additional train required. No additional coagulant storage and dosing system required.
- **Primary Membranes** – One additional train of 24 MLD will be installed (for a total of 6 trains), reaching a firm capacity of 96 MLD.
- **Secondary Membranes** – No additional train will be required.
- **GAC Contactors** – One additional train is required, reaching a capacity of 100 MLD.
- **Reservoir and Chlorine Contact Tank** – No additional works required.
- **High Lift Pumping Station –**. No upgrades to the high lift pumping station will be required if sufficient storage is provided in the distribution system to meet fire flow demands.
- **Chemical Systems** – No upgrades of the coagulant, acid and cleaning chemicals systems will be required to provide a capacity upgrade to 90 MLD. Delivery frequency of these chemicals will be increased. One additional chlorine gas feed systems for raw water and primary chlorination will be required, but none for secondary chlorination.

Figure 5-10 illustrates the required upgrades to expand the firm capacity of the SWTP to 72 MLD in Phase 1, and then to 90 MLD in Phase 2.

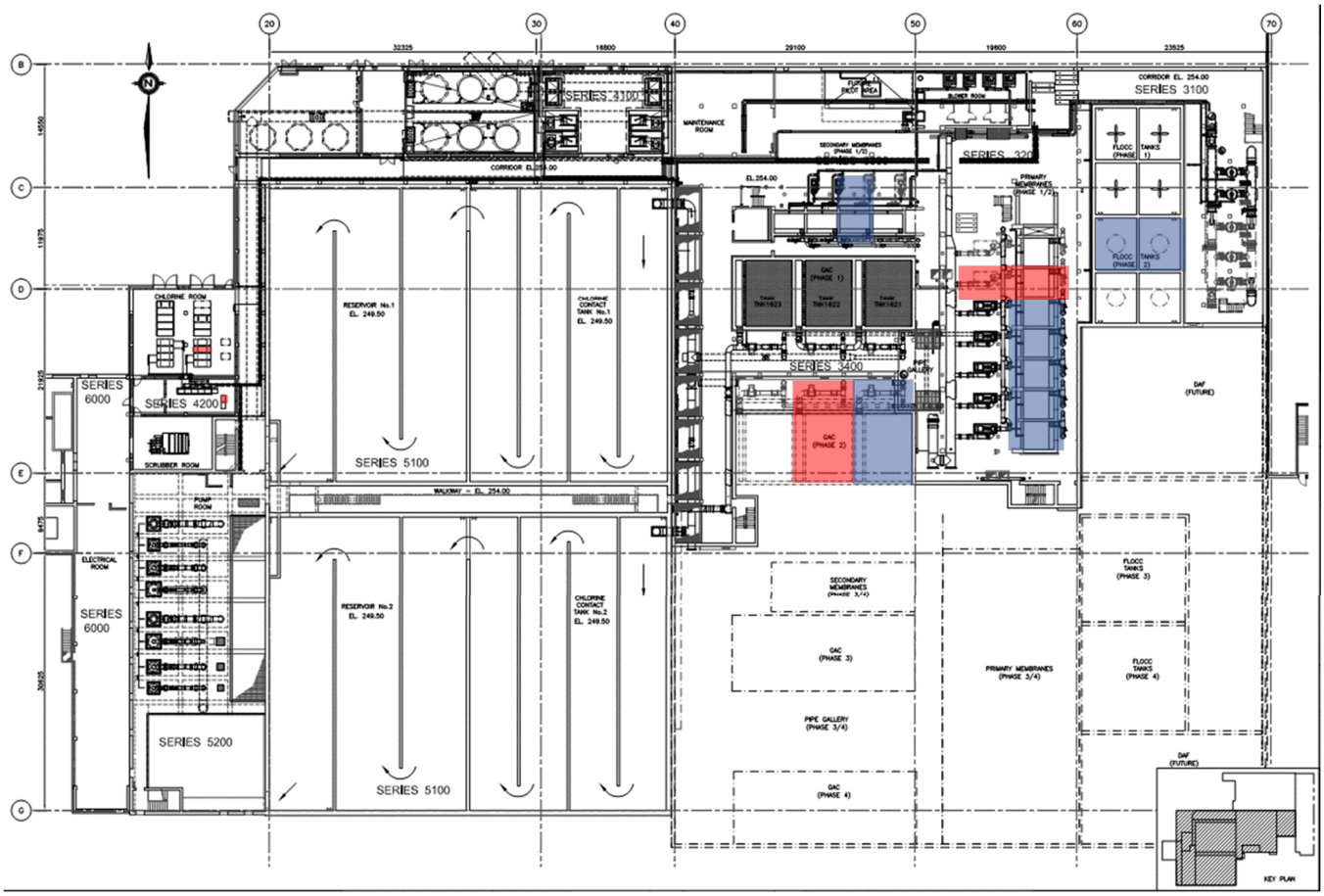


Figure 5-10 SWTP Plan View With Required Upgrades Highlighted in Blue for the Phase 1 Expansion, and in Red for the Phase 2 Expansion

Construction lead time to expand the SWTP is within the range of 1.5 to 2 years including design and installation, for each Phase. The plant was designed to incorporate modular expansion for future phases, minimizing the impacts associated with future construction activities.

Although the expansion will occur without land acquisition, a Schedule “C” Class EA will be required for each of the works. The PTTW from Lake Simcoe will need to be amended to increase its capacity to 98 MLD. An amendment of the DWWP and the MDWL will also be required.

In addition, an assessment of the groundwater systems to evaluate the need to upgrade the wells treatment in order to meet the new manganese regulation is recommended. Once the wells requiring additional treatment are identified, upgrades will be required once the new regulation come into force. The required timeline and actual effort for the upgrades is unknow. For the purpose of this study, it was considered the upgrades will be required between 2025 and 2031.

LIFE CYCLE COSTS

The life cycle cost analysis was estimated on Net Present Value (NPV). Table 5-2 and Table 5-3 present the Capital Costs and NPV related to Alternatives 4. The detailed cost estimate is presented in **Appendix D**. The capital cost analysis assumed that expansion of the SWTP would occur by 2031, four years before the water is needed. A Class D estimate of the capital costs is shown in Table 5-2.

Table 5-2 Capital Costs for Alternative 4

COMPONENT	PRELIMINARY COSTS (CAD)[1]
SWTP Optimization Study and Groundwater System Assessment	**$ 350,000**
City Project Management for Studies (5%)	$ 18,000
Construction	
SWTP Expansion Phase 1	$ 12,000,000
Water System Upgrades to Meet New Regulations	$ 1,100,000
Design/Engineering Allowance (15%)	$ 1,965,000
Contract Administration/Site Inspection (10%)	$ 1,310,000
Construction Contingency (30%)	$ 3,930,000
City Project Management (5%)	$ 655,000
Sub-Total Construction	**$ 20,960,000**
HST (1.76%)	375,000
Total Capital Costs	**$ 21,703,000**

[1] Prices are 2018 based.

The net present value of the costs associated with Alternative 4 are summarized in Table 5-3.

Table 5-3 Net Present Value Costs for Alternative 4

PARAMETER	20-YEAR LIFE CYCLE COSTS (CAD)
Capital Costs[1]	$ 16,725,000
Replacement[1]	$ 3,927,000
O&M Costs[2]	$ 184,609,000
Total Life Cycle Costs	**$ 205,261,000**

[1] Prices are 2018 based.

[2] Operation costs of each water supply are based on the average operation costs per m^3 for 2017 ($0.73/$m^3$ of treated surface water and $0.45/$m^3$ of treated groundwater), including wages, equipment and materials, chemicals, contracted staff, energy, staff training and water quality monitoring.

5.2.2 Alternative 6A – Divert Wells 17/18 to Zones 2S and 3S

DESCRIPTION OF INFRASTRUCTURE UPGRADES

To implement the diversion of the Wells 17/18 to the Zones 2S and 3S, the key proposed upgrades for this alternative are the following:

- Rehabilitation of a portion of the dedicated Ferndale Drive transmission main (1.6km of 600mm diameter, HDPE pipe) from Wells 17/18 to Harvie Reservoir by 2035.
- Construction of Wells 4A and 19 pump houses and their connection to the distribution network with a 300-mm dia. watermain by 2044.

Construction lead time of the wells pump houses is within the range of 1.5 to 2 years including design and installation.

The existing Ferndale Drive transmission main is currently in rough shape, and it may warrant complete replacement as opposed to rehabilitation or relining. Therefore, it is recommended to investigate its condition and select the preferred solution within an acceptable time frame prior to implementation of the proposed works.

A Schedule “B” Class EA will be required for each of these wells. Although the Wells 4A and 19 are part of the current PTTW, the total taking of the PTTW will need to be increased to 161.6 MLD. An amendment of the DWWP and the MDWL will also be required.

In addition, an assessment of the groundwater systems to evaluate the need to upgrade the wells treatment in order to meet the new manganese regulation is recommended. Once the wells requiring additional treatment are identified, upgrades will be required once the new regulation come into force. The required timeline and actual effort for the upgrades is unknow. For the purpose of this study, it was considered the upgrades will be required between 2025 and 2031.

Considering the blending, it is recommended to perform a feasibility study with mitigation plan for the blending of surface water and groundwater systems to better understand the compatibility of the two water sources, as well as a communication plan to inform the residential and ICI customers in Zone 2S and 3S about the potential changes in water quality due to the blending of surface water and groundwater systems.

An optimization study for the SWTP to identify opportunities to increase capacity within the current equipment is recommended. The implementation of small capital works recommended by this study could postpone other investments and increase the plant operational flexibility. For the purpose of this study, it was considered the implementation of these small upgrades will be performed between 2025 and 2031. Depending on the recommendations of the SWTP optimization study, an amendment to the PTTW, the DWWP and the MDWL may be required.

LIFE CYCLE COSTS

The life cycle cost analysis was estimated on NPV. Table 5-4 and Table 5-6 present the Capital Costs and NPV related to Alternatives 6A. The detailed estimation of costs is presented in **Appendix D**. A Class D estimate of the capital costs is shown in Table 5-4.

Table 5-4 Capital Costs for Alternative 6A

COMPONENT	PRELIMINARY COSTS (CAD)[1]
SWTP Optimization Study, Groundwater System Assessment, Blending Feasibility Study and Communication Plan	$ 500,000
City Project Management for Studies (5%)	$ 25,000
Construction	
Ferndale Transmission Main Rehabilitation	$ 5,000,000
Water System Upgrades to Meet New Regulations	$ 1,100,000
SWTP optimization implementation	$ 4,200,000
Design/Engineering Allowance (15%)	$ 1,545,000

COMPONENT	PRELIMINARY COSTS (CAD)[1]
Contract Administration/Site Inspection (10%)	$ 1,030,000
Construction Contingency (30%)	$ 3,090,000
City Project Management (5%)	$ 515,000
Sub-Total Construction	**$ 16,480,000**
HST (1.76%)	**$ 300,000**
Total Capital Costs	**$ 17,305,000**

[1] Prices are 2018 based.

The net present value of the costs associated with Alternative 6A are summarized in Table 5-5.

Table 5-5 Net Present Value Costs for Alternative 6A

PARAMETER	20-YEAR LIFE CYCLE COSTS (CAD)
Capital Costs[1]	$ 13,777,000
Replacement[1]	$ 3,890,000
O&M Costs[2]	$ 184,609,000
Total Life Cycle Costs	**$ 202,276,000**

[1] Prices are 2018 based.

[2] Operation costs of each pressure zone are based on the average operation costs per m^3 for 2017 ($0.73/$m^3$ of treated surface water for Zones 2S and 3S and $0.45/$m^3$ of treated groundwater or Zones 1, 2N and 3N), including wages, equipment and materials, chemicals, contracted staff, energy, staff training and water quality monitoring. It should be noted the O&M costs for Zones 2S and 3S considers only the surface water system costs, since less than 0.5% of the total annual consumption of these zones will be from groundwater supply by 2041.

5.2.3 Alternative 7 – Mix Surface Water Supply and Groundwater Supply

DESCRIPTION OF INFRASTRUCTURE UPGRADES

To implement the mixing surface water system and groundwater system in Zones 2S and 3S, the key proposed upgrades for this alternative are the following:

- Construction of Wells 4A and 19 pump houses and their connection to the distribution system between 2059 and 2062, to supplement the water supply for the northern zones.

Construction lead time of the wells pump houses is within the range of 1.5 to 2 years including design and installation.

A Schedule “B” Class EA will be required for each of these wells. Although the Wells 4A and 19 are part of the current PTTW, the total taking of the PTTW will need to be increased to 161.6 MLD. An amendment of the DWWP and the MDWL will also be required.

In addition, an assessment of the groundwater systems to evaluate the need to upgrade the wells treatment in order to meet the new manganese regulation is recommended. Once the wells requiring additional treatment are identified, upgrades will be required once the new regulation come into force. The required timeline and actual effort for the upgrades is unknow. For the purpose of this study, it was considered the upgrades will be required between 2025 and 2031.

Considering the blending, it is recommended to perform a feasibility study with mitigation plan for the blending of surface water and groundwater systems to better understand the compatibility of the two water sources, as well as a communication plan to inform the residential and ICI customers in Zone 2S and 3S about the potential changes in water quality due to the blending of surface water and groundwater systems.

An optimization study for the SWTP to identify opportunities to increase capacity within the current equipment is recommended. The implementation of small capital works recommended by this study could postpone other investments and increase the plant operational flexibility. For the purpose of this study, it was considered the implementation of these small upgrades will be performed between 2025 and 2031. Depending on the recommendations of the SWTP optimization study, an amendment to the PTTW, the DWWP and the MDWL may be required.

It is recommended to evaluate the best option to implement Phase 2 of Alternative 7 closer to 2041, in order to ensure the expansion of Innisfil BPS and the distribution improvements could be completed before 2059.

LIFE CYCLE COSTS

The life cycle cost analysis was estimated on NPV. Table 5-6 and Table 5-7 present the Capital Costs and NPV related to Alternative 7. The detailed estimation of costs is presented in **Appendix D**. The capital cost analysis assumed that mixing would occur by 2031, four years before the water is needed. A Class D estimate of the capital costs is shown in Table 5-6.

Table 5-6 Capital Costs for Alternative 7

COMPONENT	PRELIMINARY COSTS (CAD)[1]
SWTP Optimization Study, Groundwater System Assessment, Blending Feasibility Study and Communication Plan	$ 500,000
City Project Management for Studies (5%)	$ 25,000
Construction	
Water System Upgrades to Meet New Regulations	$ 1,100,000
SWTP optimization implementation	$ 4,200,000
Design/Engineering Allowance (15%)	$ 795,000
Contract Administration/Site Inspection (10%)	$ 530,000
Construction Contingency (30%)	$ 1,590,000
City Project Management (5%)	$ 265,000
Sub-Total Construction	**$ 8,480,000**
HST (1.76%)	$ 158,000
Total Capital Costs	**$ 9,163,000**

[1] Prices are 2018 based.

The net present value of the costs associated with Alternative 7 are summarized in Table 5-7.

Table 5-7 Net Present Value Costs for Alternative 7

PARAMETER	20-YEAR LIFE CYCLE COSTS (CAD)
Capital Costs[1]	$ 7,568,000
Replacement[1]	$ 3,890,000
O&M Costs[2]	$ 184,609,000
Total Life Cycle Costs	**$ 196,067,000**

[1] Prices are 2018 based.

[2] Operation costs of each pressure zone are based on the average operation costs per m^3 for 2017 ($0.73/$m^3$ of treated surface water for Zones 2S and 3S and $0.45/$m^3$ of treated groundwater or Zones 1, 2N and 3N), including wages, equipment and materials, chemicals, contracted staff, energy, staff training and water quality monitoring. It should be noted the O&M costs for Zones 2S and 3S considers only the surface water system costs, since less than 0.5% of the total annual consumption of these zones will be from groundwater supply by 2041.

5.3 Evaluation of Short-Listed Alternatives

The short-listed alternatives discussed in the previous section were evaluated using the criteria provided in Table 5-8. These criteria are based on the triple-bottom line approach described in the Class EA process and were established through consultation with the City of Barrie.

The proposed alternatives are evaluated based on four overarching categories: social & cultural environment; natural environment; technical; and economic. Figure 5-11 below provides examples of the specific criteria evaluated within each of the four categories. Within each category the alternatives will be scored from most impactful to most favorable. Then these rankings will be summed to provide an overall recommended solution. The criteria were then included in an evaluation matrix to conduct a comparative assessment of the alternatives to determine which solution had the greatest technical merit, had the least overall impact on the environment and resulted in the lowest cost.

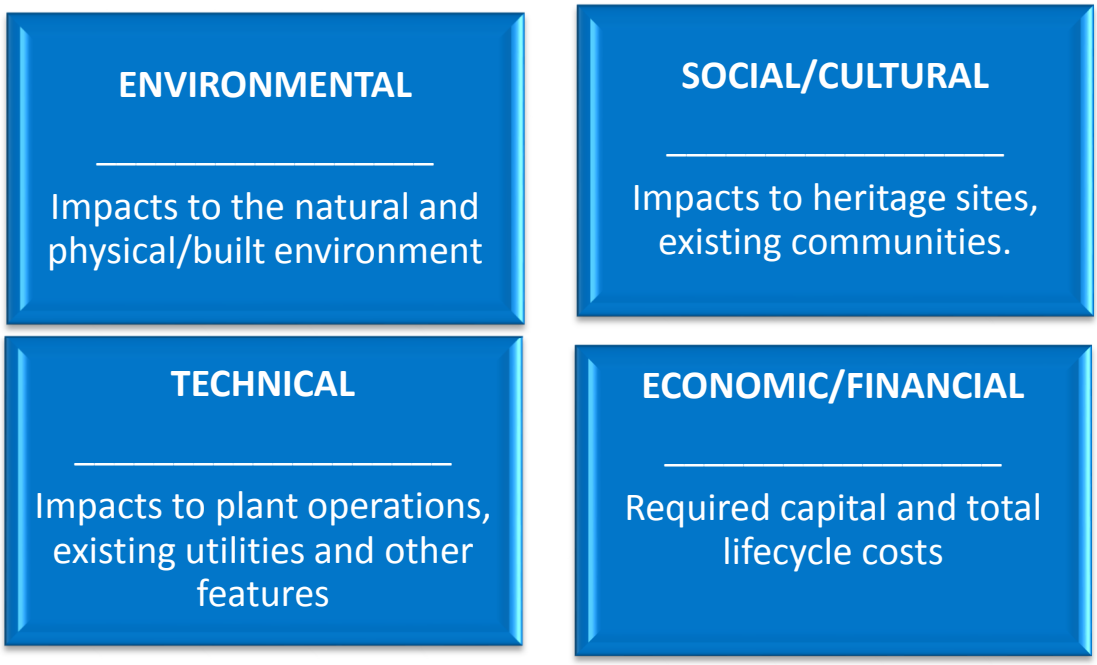


Figure 5-11 Evaluation of Alternatives Criteria Categories

Table 5-8 Evaluation Criteria

Evaluation Criteria	Weight
Natural Environment	**20**
Proximity, Size, Characteristics and Sensitivity of Significant Natural Areas, Terrestrial Ecosystems, and Wetlands	4
Potential Impact of Loss of Natural Areas, Terrestrial Ecosystems, or Wetlands	4
Potential Advserse Effect on Groundwater Quality, Surface Water Quality, Erosion, or Flood Potential	6
Impacts to Stream Morphology, Water Course Crossings and Fisheries	6
Physical (Built) Environment	**10**
Potential Advserse Effects on Existing Utilities (Water, Electricity, and Telecommunications). Opportunity to Accommodate Future Utilities	2
Impact of Crossings on Existing and Future Land Use	2
Ability of the Alternative to Adequately Handle Potential Adverse Effects Associated with Climate Change Events such as Extreme Weather Events	3
Impact on Greenhouse Gas Emissions	3

Social and Cultural Environment	**20**
Potential Impact to Residents, Community Facilities, Public Parks, Institutions, or Businesses	6
Potential Impact to Visual Aesthetic	3
Potential Effects of Traffic-Related Air and Noise on Residences Adjacent to the Study Corridor	3
Potential Adverse Impacts on Archeological and Built Heritage Resources Within or Adjacent to the Study Corridor	3
Impact on Existing Transportation Network Within the City, Including Highway 400 and Highway 11	2
Presence of First Nations Heritage Sites or Lands that Could be Impacted	3
Technical	**20**
Past Performance of the Technology in Ontario	1
Ability to Quantify Performance/Measure Results	2
Impacts on the Future Expansion of the Water Supply	4
Impacts on the Operation of the Existing Facility	5
Ability to Provide Consistent and Efficient Operation	5
Potential to Phase the Infrastructure to Best Service Growth	3
Economic/Financial	**30**
Capital Cost of the Proposed Improvements and the Feasibility of Phasing Implementation	10
The Net Present Value of the Annual Operation & Maintenance Costs for a 50-year Period (2021-2071)	10
Life Cycle Costs - The Sum of the Capital and Operation & Maintenance Costs Discounted at a Rate of 4% to Calculate the Present Value of the Alternative	10
Total Score:	**100**

The scoring of the short-listed alternatives was performed by assigning a weight to each evaluation criteria category and its sub-categories, pertinent to their relative importance in the overall decision-making process for the best alternative. In addition, each alternative was assigned a score ranging from -4 (most negative impact) to +4 (most positive impact) with respect to each evaluation criteria. The score for an evaluation criteria category was determined by determining the product of each evaluation criteria sub-category score by its corresponding weight, and then summing them up. The overall score for a given alternative was calculated as the sum of the scores for each evaluation criteria category. The relative rankings of the alternatives, ranging from 1 to 3 (1 being the most preferable alternative with the highest overall score), were determined based on their overall scores.

Table 5-9 shows a summary of the evaluation of alternatives following this methodology (see **Appendix E** for the detailed evaluation).

Table 5-9 Evaluation of Alternatives Relative to Evaluation Criteria Categories

EVALUATION CRITERIA	WEIGHT	ALTERNATIVE 4	ALTERNATIVE 6A	ALTERNATIVE 7
Natural Environment	20	-6	-12	-12
Physical (Built) Environment	10	-10	-6	6
Social and Cultural Environment	20	-9	-18	-18
Technical	20	70	41	41
Economic/Financial	30	-70	-20	-10
Score:	100	**-25**	**-15**	**7**
Relative Ranking:		**3**	**2**	**1**

5.4 Recommended Solution

From the three short-listed alternatives for the Water Supply Master Plan and based on their detailed evaluation process, the **Alternative 7. Mix Surface Water Supply and Groundwater Supply** was selected as the preferred solution for the City's water supply system with the least possible impact. This alternative was selected as preferred solution for the following reasons:

- Alternative 7 has sufficient water supply capacity to service the City beyond 2071.
- Groundwater supply for mixing is provided by existing infrastructure, having a very low impact on the natural and physical environment.

- Alternative 7 shows significant flexibility in case either the low or the high demand scenarios occur, since no additional works are required.
- Alternative 7 involves no additional capital costs and similar replacement and O&M costs to other alternatives, or even a possible small positive impact on O&M costs.

On the other hand, Alternative 7 does not maintain the City's current water supply strategy of separate surface water and groundwater zones. Public acceptance and customer complaints of temporary mixing of surface water and groundwater supplies may be a potential concern due to temporary aesthetic changes or water quality variation at Zones 2S and 3S.

The findings of this Master Plan will be used as baseline information to determine the City of Barrie's development cost charges. All capital investments related to Alternative 7 are fully related to growth and will be accounted for the development cost charges, with exception of the water system upgrades to meet new regulations. For the water system upgrades to meet new regulations costs, only 43% of the capital investment, which is the percentage of new equivalent population, will accounted for the development cost charges. Included in **Appendix F** is a summary of the projects proposed in the Master Plan and the percentage of each project allocated to growth.

6 Master Plan Implementation and Phasing

6.1 Implementation: Projects and Phasing

The **Alternative 7. Mix Surface Water Supply and Groundwater Supply** has sufficient water supply capacity to service the City beyond 2071 and has been selected as the preferred solution for the City's water supply system. However, it is also recommended to rehabilitate the damaged portion of Ferndale Drive transmission main, in order to allow Wells 17/18 to be diverted to the Zones 2S and 3S. This would increase the water supply system security, redundancy, and operational flexibility.

In meeting the service requirements of the City of Barrie based on projected water flows to 2041 and 2071, the recommended implementation plan is outlined in Table 6-1 below.

Table 6-1 Proposed Implementation Plan

STAGE	RECOMMENDED STEPS
Stage 1 (2019-2024)	– Keep the quarterly monitoring of sodium levels for Wells 3A, 9, 11, 12, 13, 14, and extend this frequently monitoring for the SWTP; – Keep the monthly monitoring of PCE and TCE levels for Wells 11, 12, 14 and 15; – Extend the monitoring of dissolved and particulate manganese at the raw water and treated water for all wells and SWTP, and along the distribution system, as well as other pertinent parameters, in order to identify systems that would require manganese removal and collect data for design purposes; – Initiate an assessment of the groundwater system; – Initiate an optimization study for the SWTP optimization study to identify opportunities to increase capacity and postpone blending; – Initiate a feasibility study with mitigation plan for the blending of surface water and groundwater systems to understand the compatibility of the two water sources, chlorine decay in the network, and discolouration potential; – Initiate a communication plan to inform the residential and ICI customers in Zone 2S and 3S about the potential changes in water quality due to the blending of surface water and groundwater systems.

STAGE	RECOMMENDED STEPS
Stage 2 (2025-2031)	– Upgrade the wells that required manganese removal to meet new regulation. – Rehabilitate the damaged portion of the Ferndale Drive transmission main (1.6km of 600mm diameter) from Wells 17/18 to Harvie Reservoir. – Implementation of small capital works recommended by the SWTP optimization study. – Amend the PTTW, the DWWP and the MDWL to regarding the SWTP small capital works if required.
Stage 3 (2032-2041)	N/A
Stage 4 (2042 and beyond)	– Evaluate best option to implement Phase 2 of Alternative 7. Mix Surface Water Supply and Groundwater Supply (through Innisfil BPS or Well17/18). – Initiate Schedule "B" Class EA for the construction of Wells 4A and 19 pump houses and their connection to the distribution system; – Design and construction of Wells 4A and 19 pump houses and their connection to the distribution system; – Amend the PTTW, the DWWP and the MDWL to include Wells 4A and 19; – Initiate Schedule "B" Class EA for the Innisfil BPS upgrades if required; – Design and construction of the Innisfil BPS upgrades if required.

6.2 Summary of costs

A Class D estimate of the capital costs is shown in Table 6-2.

Table 6-2 Capital Costs for Implementation Plan

COMPONENT	PRELIMINARY COSTS (CAD)[1]
SWTP Optimization Study, Groundwater System Assessment, Blending Feasibility Study and Communication Plan	$ 500,000
City Project Management for Studies (5%)	$ 25,000

COMPONENT	PRELIMINARY COSTS (CAD)[1]
Construction	
Ferndale Transmission Main Rehabilitation	$ 5,000,000
Water System Upgrades to Meet New Regulations	$ 1,100,000
SWTP optimization implementation	$ 4,200,000
Design/Engineering Allowance (15%)	$ 1,545,000
Contract Administration/Site Inspection (10%)	$ 1,030,000
Construction Contingency (30%)	$ 3,090,000
City Project Management (5%)	$ 515,000
Sub-Total Construction	**$ 16,480,000**
HST (1.76%)	**$ 300,000**
Total Capital Costs	**$ 17,305,000**

[1] Prices are 2018 based.

7 Glossary

ADD	Average Day Demand
AMI	Advanced Metering Infrastructure
AO	Aesthetic Objective
BPS	Booster Pumping Stations
DWWP	Drinking Water Works Permit
EAA	Environmental Assessment Act
EBCT	Empty Bed Contact Time
ESR	Environmental Study Report
GCDWQ	Guidelines for Canadian Drinking Water Quality
GAC	Granular Activated Carbon
GP	Growth Plan
HST	Harmonized Sales Tax
ICI	Institutional, Commercial and Industrial
LRSCA	Lake Simcoe Region Conservation Authority
MAC	Maximum Acceptable Concentration
MDD	Max Day Demand
MCEA	Municipal Class Environmental Assessment
MECP	Ministry of the Environment, Conservation and Parks
MDL	Maximum Detection Limit
MDWL	Municipal Drinking Water License
NPV	Net Present Value
NVCA	Nottawasaga Valley Conservation Authority
OP	Official Plan
ODWS	Ontario Drinking Water Quality Standards
PCE	Perchloroethylene
PIC	Public Information Centre
PPS	Provincial Policy Statement
PRV	Pressure Reducing Valve
PSV	Pressure Sustaining Valve

PTTW	Permit to Take Water
SWTP	Surface Water Treatment Plant
TCE	Trichloroethylene
TDH	Total Dynamic Head
VFD	Variable Frequency Drive
WS&D MP	Water Storage and Distribution Master Plan

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APPENDIX

A NOTICES AND PIC MATERIAL

Ministry of Tourism, Culture and Sport

Heritage Program Unit
Programs and Services Branch
401 Bay Street, Suite 1700
Toronto ON M7A 0A7
Tel: 416 314 7147
Fax: 416 212 1802

Ministère du Tourisme, de la Culture et du Sport

Unité des programmes patrimoine
Direction des programmes et des services
401, rue Bay, Bureau 1700
Toronto ON M7A 0A7
Tél: 416 314 7147
Téléc: 416 212 1802

Ontario

October 17, 2017 (EMAIL ONLY)

Mr. Tom Reeve, P. Eng.
Senior Infrastructure Planning Program Coordinator
City of Barrie
70 Collier Street, Box 400
Barrie, ON L4M 4T5
E: Tom.Reeve@barrie.ca

RE: MTCS file #: 0007579
Proponent: City of Barrie
Subject: Notice of Commencement
Master Plan Updates for Water Supply, Distribution and Storage, Wastewater Collection and Wastewater Treatment
Location: City of Barrie, Ontario

Dear Mr. Reeve:

Thank you for providing the Ministry of Tourism, Culture and Sport (MTCS) with the Notice of Commencement for your project. MTCS's interest in this Environmental Assessment (EA) project relates to its mandate of conserving Ontario's cultural heritage, which includes:

- Archaeological resources, including land-based and marine;
- Built heritage resources, including bridges and monuments; and,
- Cultural heritage landscapes.

Under the EA process, the proponent is required to determine a project's potential impact on cultural heritage resources. The recommendations below are for a Schedule B Municipal Class EA project, as described in the notice of study commencement. If any municipal bridges may be impacted by this project, we can provide additional screening documentation as formulated by the Municipal Engineers Association in consultation with MTCS. Realizing that this is in part a Master Plan Update, developing or reviewing inventories of known and potential cultural heritage resources within the study area can identify specific resources that may play a significant role in guiding the evaluation of alternatives for subsequent project-driven EAs.

While some cultural heritage resources may have already been formally identified, others may be identified through screening and evaluation. Aboriginal communities may have knowledge that can contribute to the identification of cultural heritage resources, and we suggest that any engagement with Aboriginal communities includes a discussion about known or potential cultural heritage resources that are of value to these communities. Municipal Heritage Committees, historical societies and other local heritage organizations may also have knowledge that contributes to the identification of cultural heritage resources.

Archaeological Resources
Your EA project may impact archaeological resources and you should screen the project with the MTCS *Criteria for Evaluating Archaeological Potential* and *Criteria for Evaluating Marine Archaeological Potential* to determine if an archaeological assessment is needed. MTCS archaeological sites data are available at *archaeology@ontario.ca*. If your EA project area exhibits archaeological potential, then an

archaeological assessment (AA) should be undertaken by an archaeologist licenced under the *OHA*, who is responsible for submitting the report directly to MTCS for review.

Built Heritage and Cultural Heritage Landscapes
The MTCS *Criteria for Evaluating Potential for Built Heritage Resources and Cultural Heritage Landscapes* should be completed to help determine whether your EA project may impact cultural heritage resources. The Clerk for the City of Barrie can provide information on property registered or designated under the *Ontario Heritage Act*. Municipal Heritage Planners can also provide information that will assist you in completing the checklist. The draft *MTO Ontario Heritage Bridge Guidelines for Provincially Owned Bridges* screening criteria have also been established for cultural heritage evaluation of bridges under the Class EA for Provincial Transportation Facilities.

A Cultural Heritage Evaluation Report (CHER) is used to determine the cultural heritage value or interest of a potential Provincial Heritage Property. If potential or known heritage resources exist, MTCS recommends that a Heritage Impact Assessment (HIA), prepared by a qualified consultant, should be completed to assess potential project impacts. Our Ministry's *Info Sheet #5: Heritage Impact Assessments and Conservation Plans* outlines the scope of HIAs. Please send the HIA to MTCS for review, and make it available to local organizations or individuals who have expressed interest in review.

Environmental Assessment Reporting
All technical heritage studies and their recommendations are to be addressed and incorporated into EA projects. Please advise MTCS whether any technical heritage studies will be completed for your EA project, and provide them to MTCS before issuing a Notice of Completion. If your screening has identified no known or potential cultural heritage resources, or no impacts to these resources, please include the completed checklists and supporting documentation in the EA report or file.

Thank you for consulting MTCS on this project: please continue to do so through the EA process, and contact me for any questions or clarification.

Sincerely,

Dan Minkin
Heritage Planner
dan.minkin@ontario.ca

Public Information Centre

City of Barrie Water and Wastewater Master Plan Update – Class Environmental Assessment (EA)

Welcome!

1. Please sign in at the Front Desk.
2. Feel free to review the boards and participate in the exercises.
3. Complete a comment sheet.
4. Staff are available to answer questions.

PROJECT INTRODUCTION

Purpose of the Project

The City of Barrie is undertaking an update to the 2013 Water and Wastewater Master Plans which were approved by Council on December 2, 2013. The existing plans have a horizon of 2031 with a long term outlook to 2051. These plans can be reviewed at www.barrie.ca and by clicking on City Hall > Growth Management > Growth Management Documents & Resources.

This update is to identify the future water and wastewater servicing needs of the City. They include:

- **Wastewater Treatment Master Plan**
- **Water Supply Master Plan**
- **Wastewater Collection Master Plan**
- **Water Distribution and Storage Master Plan**

This project has been developed to facilitate Barrie's current and projected growth to ensure that sufficient servicing can be provided to 2041, as required by the Provincial Growth Plan, and to the year 2071. It will also ensure regulatory compliance, and meet regulatory requirements and policies that govern water and wastewater supply, collection and treatment, and patterns of development.

Study Timeline

Purpose of this Event

The purpose of this Public Open House is to provide an opportunity to gain public input and feedback on the water and wastewater servicing alternatives. Following this open house, the Study Team will address the public input and feedback received into the final Master Plan deliverables.

PROJECT BACKGROUND

Infrastructure & Servicing Needs

The City of Barrie is one of Ontario's fastest growing municipalities, and is the largest urban centre in the Simcoe County area. The current Master Plans have a 2031 horizon with a preliminary outlook to 2051.

Updates to the Master Plans are required in order for the City to comply with the 2017 Provincial Growth Plan to accommodate Barrie's projected growth, and to ensure that sufficient servicing can be provided to the 2041 horizon.

However, to better anticipate long-term servicing needs, projections have been forecasted to the year 2071. This allows the City to identify constraints well in advance of the next update. Master Plans are scheduled to be updated on a 5-year cycle.

In 2016

145,800 called the City of Barrie home

73,800 people worked in the City of Barrie

Policy Framework

Various laws, regulations, guidelines, and policies govern water and wastewater supply, collection, and treatment, as well as development patterns for which those systems will be expanded to service. Several of the key regulatory requirements impacting this project include:

- *Safe Drinking Water Act, 2002*
- *Ontario Water Resources Act, R.S.O 1990*
- *Ontario Environmental Protection Act, R.S.O 1990*
- *Lake Simcoe Protection Act, 2008*
- Provincial Policy Statement, 2014
- Growth Plan for the Greater Golden Horseshoe, 2017
- City of Barrie Official Plan (January 2018 Office Consolidation)

By 2031...

210,000 people will call the City of Barrie home

101,000 people will work in the City of Barrie

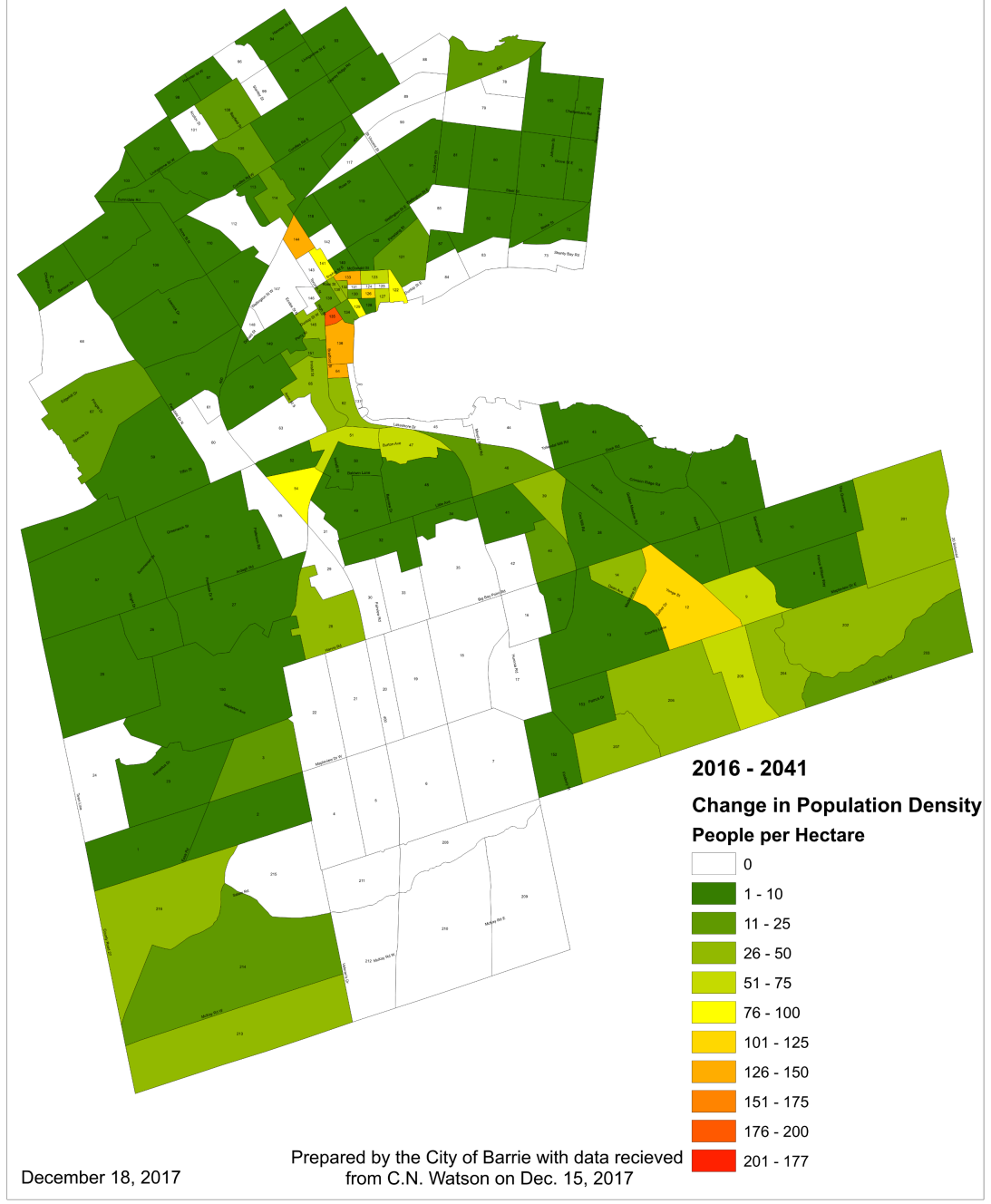
By 2041...

253,000 people will call the City of Barrie home

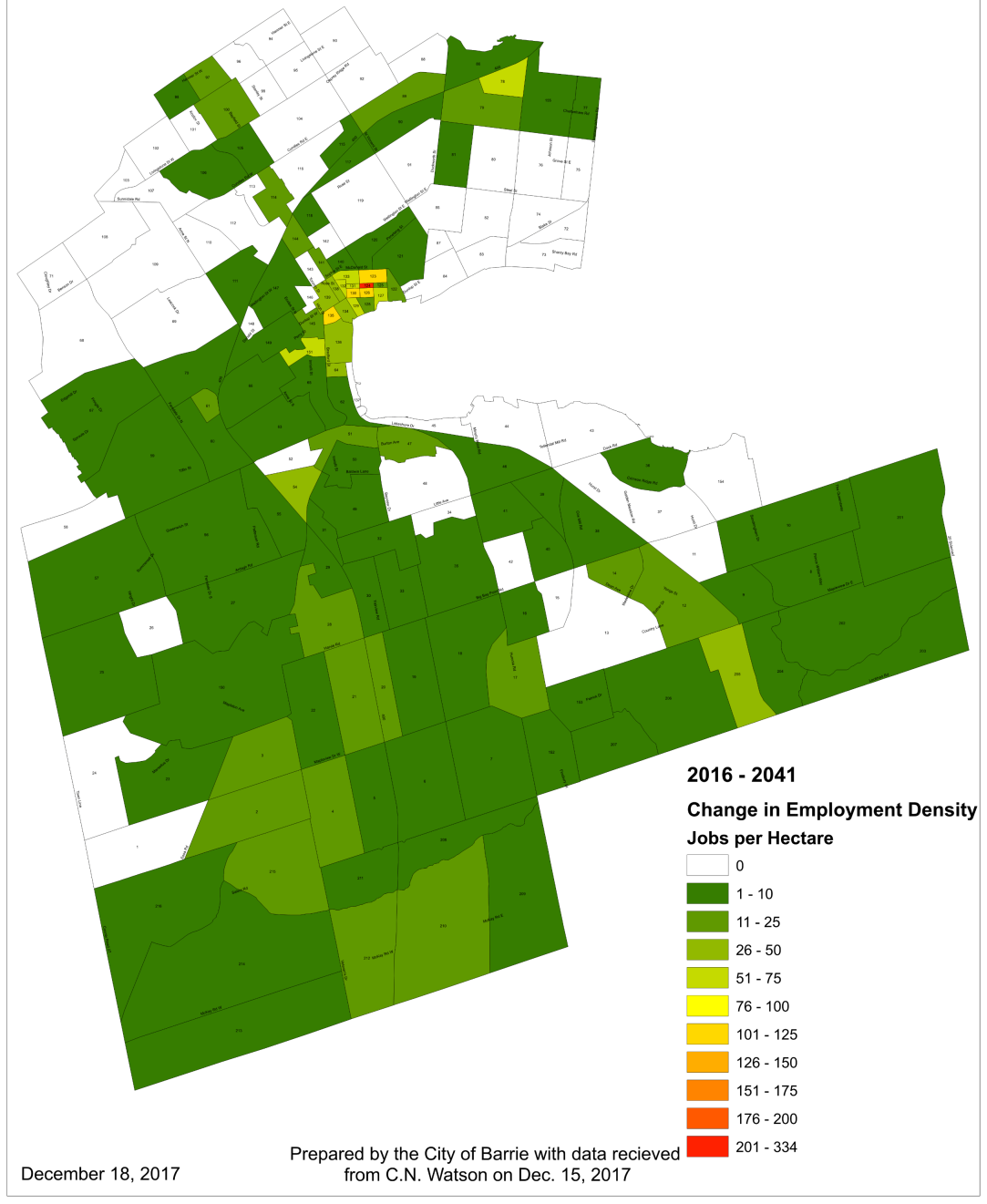
129,000 people will work in the City of Barrie

PROJECTED GROWTH

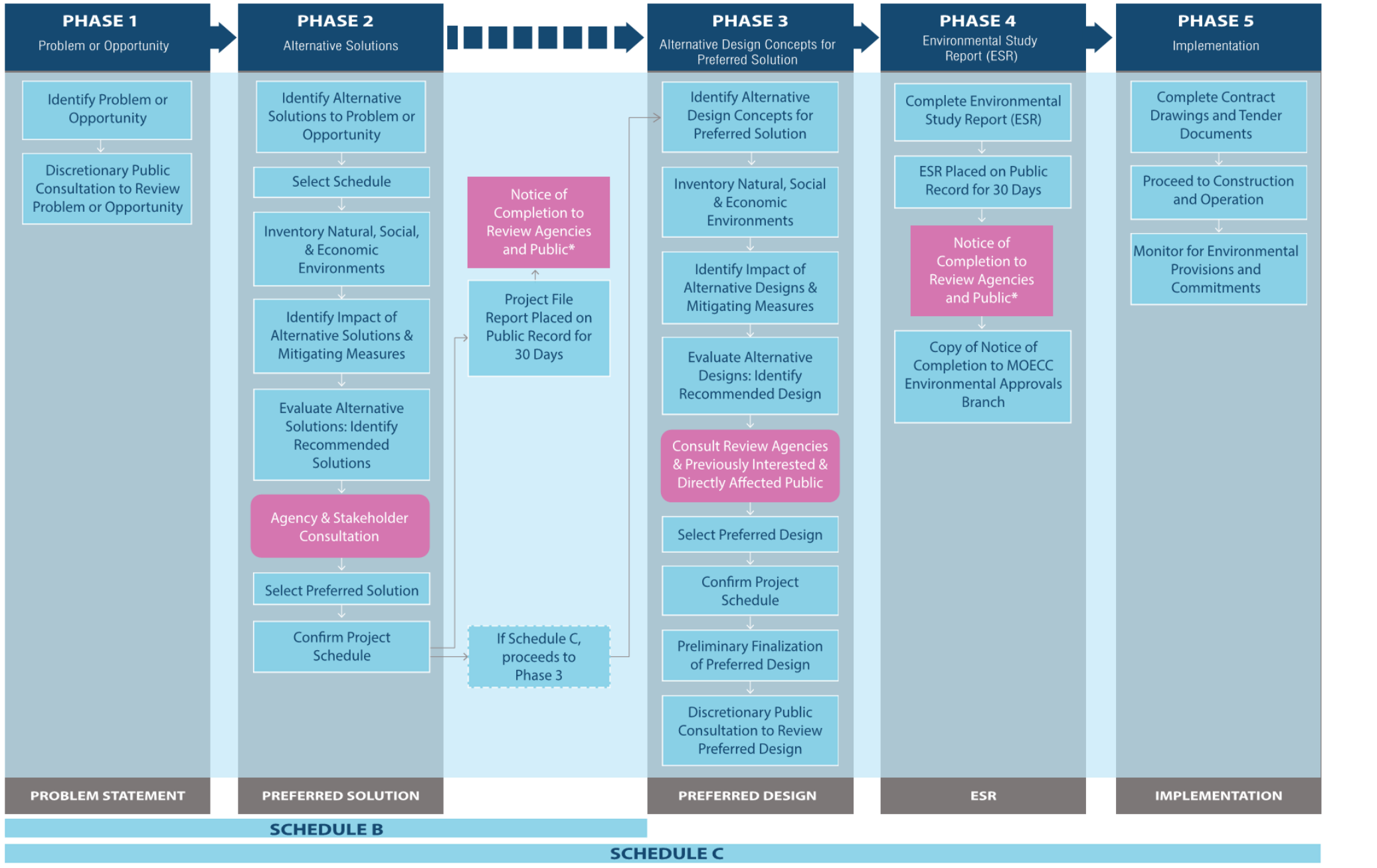
Residential Growth



Non-Residential Growth



MUNICIPAL CLASS EA PROCESS



The 2013 Master Plan and these updated Master Plans will be completed using <u>Approach 2</u> of the Class EA Master Planning Process

EA Project Schedules

Projects undertaken by the City as a result of this Master Plans Update are assigned to various project 'Schedules' according to their anticipated level of environmental impact.

Schedule A projects are limited in scale and have minimum adverse environmental effects. These projects are pre-approved and include a number of maintenance and operational activities.

Schedule A+ projects are pre-approved, however, the public is to be advised prior to project implementation.

Schedule B projects have the potential for some adverse environmental effects and require public consultation. These projects generally include improvements and minor expansions to existing facilities.

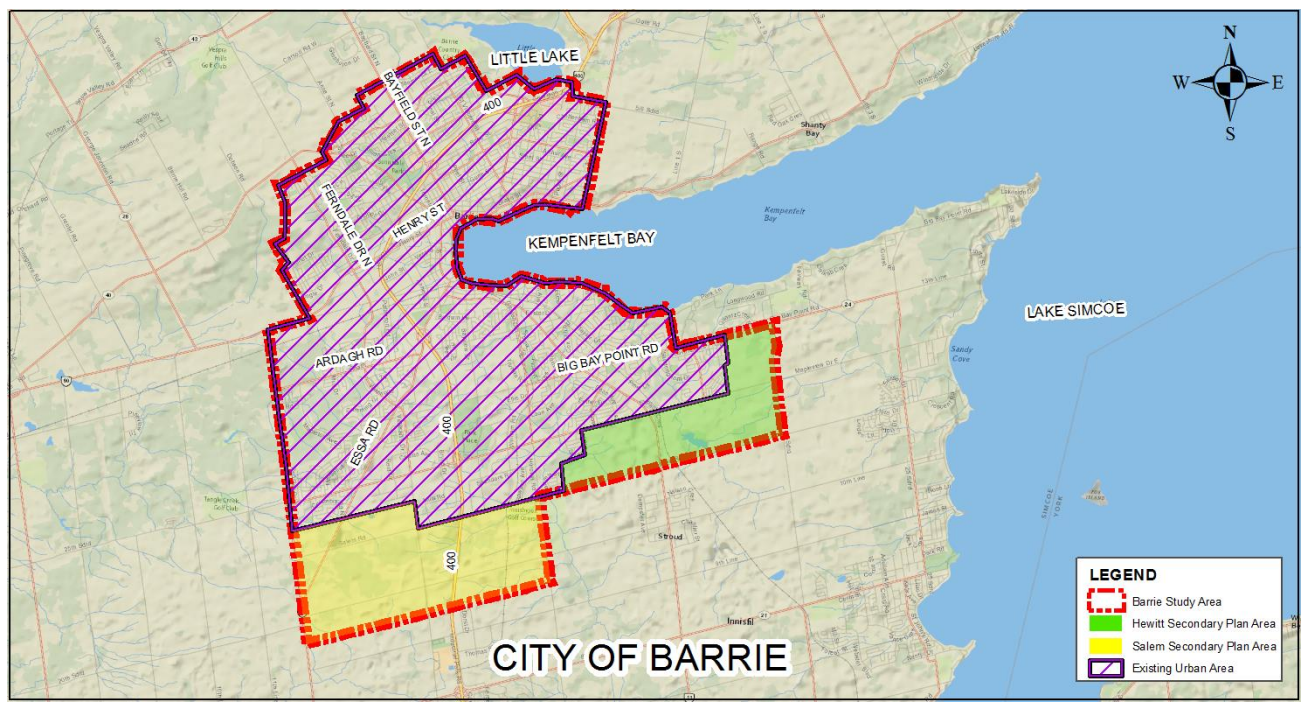
Schedule C projects have the potential for significant environmental effects and require public consultation. These projects generally include the construction of new facilities and major expansions to existing facilities.

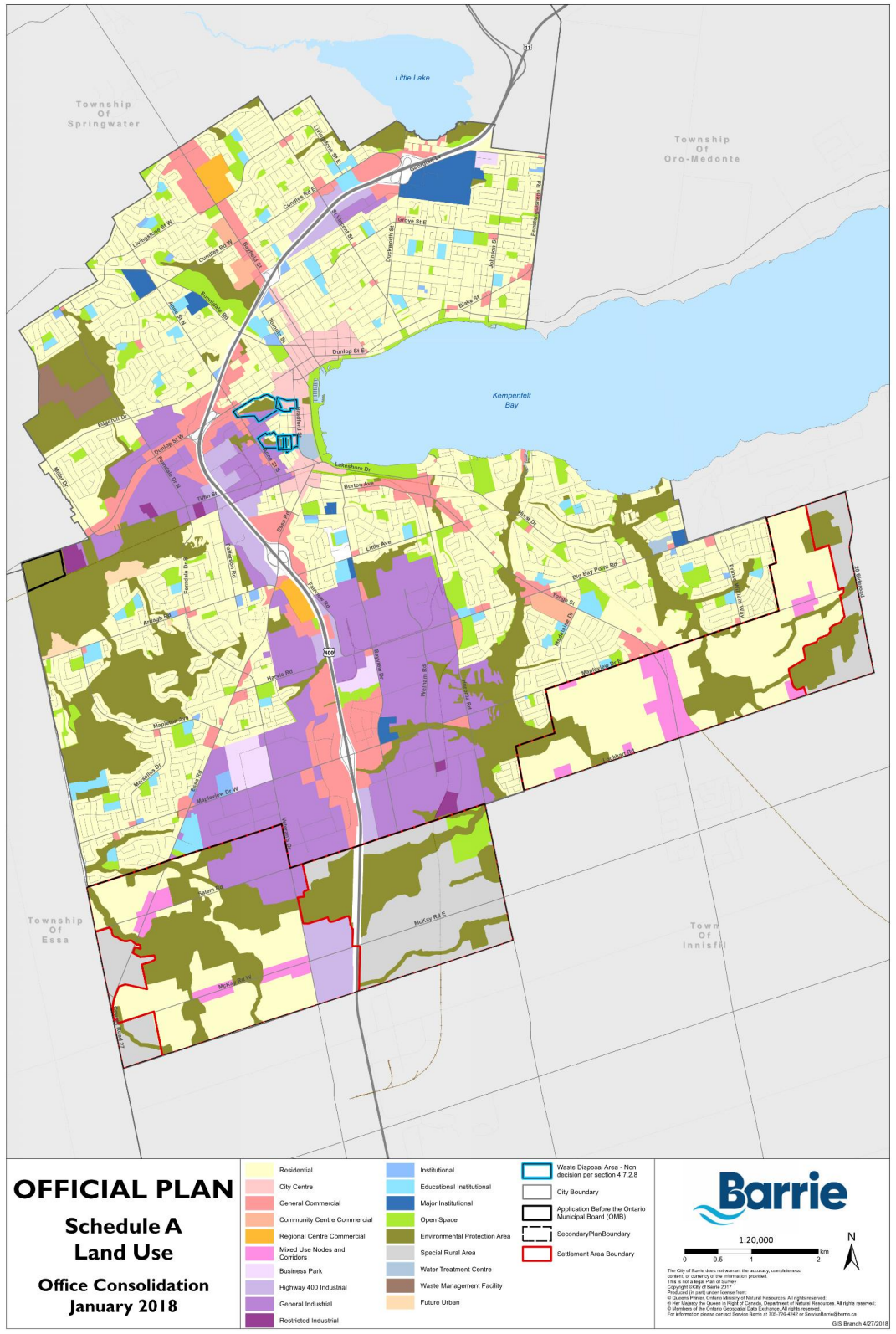
STUDY AREA

The Study Area for this project encompasses the entire City. This includes the Secondary Plan Areas located along the southern border of the City's boundary.

The City is located on the shores of Lake Simcoe and on the western extent of Kempenfelt Bay. The City boundary encompasses nearly 100 square kilometres, and as of the 2016 census, is home to about 145,800 residents. In 2010, an additional 2,293 hectares of land were annexed to the City of Barrie from the Town of Innisfil – allowing the City to accommodate a growing population.

This Project has been undertaken to facilitate Barrie's current and projected growth and to ensure that sufficient servicing can be provided to facilitate this growth to 2041. It is also important that the Lake Simcoe watershed be protected, as required under Provincial legislation.





Water Supply Master Plan

PROBLEM STATEMENT

Currently, the City water supply is provided by groundwater in the northern system zones and surface water in the southern system zones. Water demand in the southern zones will exceed the surface water treatment plant capacity prior to 2041 and **additional water supply capacity is required to accommodate the long-term growth in these zones**. Water supply in the northern zones is sufficient until approximately 2069.

Context

To provide a plan for the drinking water supply system, the system must be evaluated for its ability to meet the water demands as well as the security (redundancy) in the system. To evaluate the system, the future demands were compared to the existing supply capacities. The groundwater wells and the surface water supply drinking water system are currently operating independently and therefore, they are analyzed separately. It is important to note that there is infrastructure in place for the two systems to mix, however this only happens occasionally. Redundancy in the system is also considered.

Once the future demand and supply capacities are compared, it will be determined if the supply is sufficient or if other actions are required. This is followed by several alternatives that will be presented, evaluated, and recommended. Recommendations will also be presented for any works required to increase redundancy in the system.

LONG-LIST ALTERNATIVES

A long-list of alternative solutions to address the problem statement were identified in the early stages of the project.

1. Do Nothing
Under this alternative, the water system will continue to operate as it currently does.

2. Limit Growth
This alternative involves restricting population growth within the City. Lower growth rates would ensure the sufficient supply to accommodate future demand. However, this would include reversing past decisions regarding growth and development in the City. The province has identified Barrie as a growth center for the area.

3. Water Efficiency/Conservation
This alternative involves implementing further water conservation and reduction strategies to reduce water demand, and provide overall resiliency to the system. The focus is on reducing outdoor water usage. The City currently has a number of water conservation efforts in effect to enhance long-term sustainability.

4. Surface Water Treatment Plan (SWTP) Upgrades
This alternative involves the expansion of the SWTP to accommodate for the projected increase in water demand.

5. New Water Service Zone
This alternative considers developing a new groundwater service zone within the City. This alternative would also require significant upgrades to existing infrastructure.

6. Well Water Diversion to Southern Zones
This alternative would divert some well supply to the southern zones of the City to complement the servicing of the southern zones, but only when required to meet demand. This would be achieved using existing infrastructure.

7. Mix Surface and Groundwater Supply
This alternative would mix surface and groundwater supply to accommodate the long-term projected demand, but only when required. Since available groundwater is sufficient to meet overall water demand projections, the mixing of both water supplies would satisfy future demand. This approach has been effectively implemented in other Ontario municipalities, including York Region and the Region of Waterloo, and at times already occurs in the City of Barrie.

LONG-LIST ALTERNATIVES SCREENING

Three criteria were applied to screen the long-list of alternatives:

1. **Flexibility and Redundancy –** Flexibility and redundancy refers to alternatives that provide a foundation for future infrastructure development to service growth.

2. **Compatibility with the current policies and regulations** – An alternative that complies with Provincial and City policy related to growth and development is preferred.

3. **Addresses the problem statement** – A pass is given to an alternative that provides a solution to any of the constraints identified in the problem statement.

The screening process concluded there are three short-listed alternatives which warranted further evaluation to address the problem statement.

Alternative	Flexibility and Redundancy	Policy and Regulation Compatibility	Addresses the Problem Statement
Do Nothing	✗	✗	✗
Limit Growth	✗	✗	✗
Water Efficiency/ Conservation	✓	✓	✗
SWTP Upgrades	✓	✓	✓
New Water Service Zone	✗	✓	✗
Well Water Diversion to Southern Zones	✗	✓	✗
Mix Surface and Groundwater Supply	✓	✓	✓

SHORT-LIST ALTERNATIVES

Water Efficiency/Conservation
To further reduce the water consumption by 4%, the strategy is to focus on outdoor water usage. In addition to current programs, increased incentives to reduce outdoor water usage, promotion of automated irrigation systems, and/or the use of native and drought tolerate plants are considered.

Surface Water Treatment Plan (SWTP) Upgrades
This alternative involves the expansion of the SWTP from 60 MLD to 90 MLD to accommodate for the projected increase in water demand by 2041. Works include the addition of one low lift pump, one flocculation tank, one membrane train, and two GAC contactors. Since the SWTP design considered a modular expansion, this will occur entirely within the existing SWTP building, with minimal impacts.

Mix Surface and Groundwater Supply
This includes the diversion of groundwater supply to supplement the water needs in the southern zones using existing infrastructure. This approach was implemented successfully before the construction of the SWTP. Infrastructure required to implement this option includes minor distribution system upgrades. Mixing would require increased capacity at the Innisfill Booster Pumping Station and the addition of two wells (Wells 4A and 19). It is important to note that mixing would only occur a few days per year when the demand on the system is highest in the southern zones.

Findings from 2013 Master Plan:

Groundwater supply was sufficient to provide servicing to the northern zones through 2031. Additional water supply is needed to accommodate projected maximum day demands for the southern zones (2 MLD). Based on the detailed evaluation of five short-listed alternatives, a combination of the two highest ranking alternatives solutions were selected as preferred.:

- Alternative 1: Water Efficiency/Conservation
- Alternative 2: Phase 1 SWTP Upgrades – Optimization of Existing Processes

EVALUATION OF ALTERNATIVES

The following criteria were applied to evaluate the Alternatives.

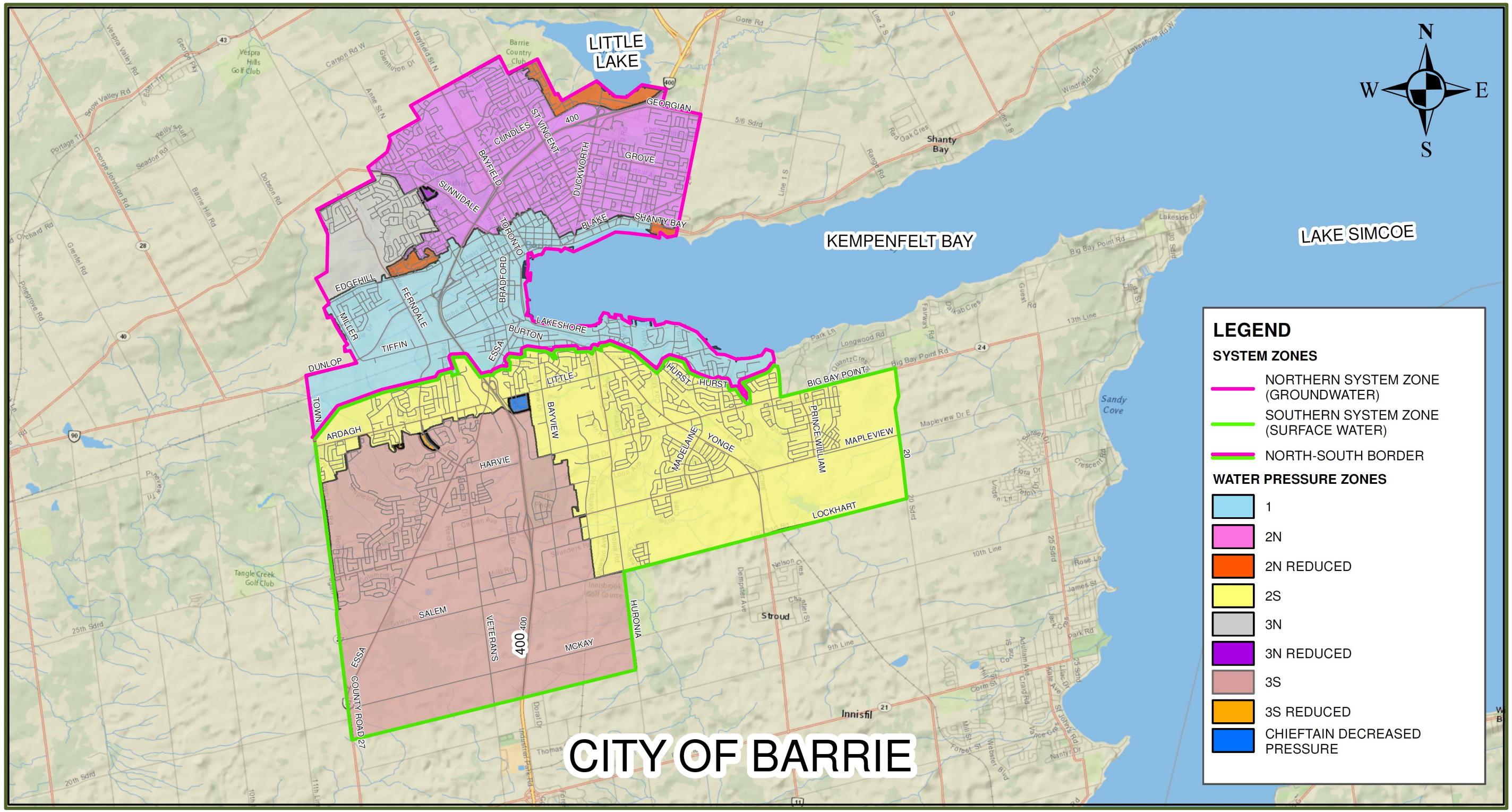
1. **Natural Environment:** Refers to any potential impact to natural areas or features, groundwater quality, surface water, erosion, and flood control.
2. **Physical/Built Environment:** Refers to any potential impact to existing utilities and infrastructure, physical structures and land uses, and ability to mitigate or adapt to climate change.
3. **Social & Cultural Environment**: Refers to any potential impact to residents, built-up areas, and regulatory requirements.
4. **Technical:** Refers to system operation, future expansion, and ability to provide consistent and efficient servicing.
5. **Economic/Financial:** Refers to the capital cost, operating cost, and phasing (implementation).

Evaluation Criteria	Water Conservation	SWTP Upgrades	Mix Surface and Groundwater
Natural Environment			
Physical/Built Environment			
Social and Cultural Environment			
Technical			
Economic/Financial			

Key
Low Impact / "Most Preferred"
Low to Moderate Impact / "Preferred"
Moderate Impact / "Less Preferred"
High Impact / "Least Preferred"

**the colour assigned to each alternative/criteria indicates a ranking*

WATER SERVICE AREAS



WE WANT YOUR INPUT!

The City wants to understand whether there are issues with the current level of water service. Please review the adjacent map to determine if your residence and/or workplace are serviced by groundwater (pink) or surface water (green).

Please use the dots to answer the questions. Use the sticky notes to provide comments.

Question	Yes	No
Is your residence/workplace located within the pink area on the map?		
While at the property, do you notice variations in the colour of your water?		
While at the property, do you notice variations in the taste of your water?		
Please provide your comments (and property address) here		

Water Distribution and Storage Master Plan

PROBLEM STATEMENT

To service the existing and future needs of the City of Barrie's Water Storage and Distribution network the following Problem Statement was adopted to guide the master planning study analysis:

To develop an infrastructure plan for the City of Barrie Water Storage and Distribution Network which meets current servicing needs and will accommodate future growth to 2041 and beyond. The Master Plan will identify a preferred solution that provides optimal design and delivery of water servicing that is maintained city-wide. The preferred alternative will also be evaluated in consideration of potential impacts to natural heritage and the environment, social and cultural considerations, technical considerations, and both economic and financial considerations. Ultimately, the Master Plan will identify the City's long-term infrastructure responsibilities to accommodate anticipated growth and resulting demand on water distribution and storage.

Existing Constraints

Future constraints, or servicing gaps, were determined to help inform the range of preliminary alternative solutions. They were identified using information gathered from available data, City consultation, and technical analysis. They include:

- Water storage: There are identified needs to accommodate growth in the existing system to the 2041 horizon.
- Water distribution: There are identified distribution gaps under the 2041 growth projections, however; infrastructure projects that are currently approved for pre-2021 construction will mitigate some of these identified distribution gaps.

DESIGN CRITERIA AND UPDATES

Design Criteria and Level of Service

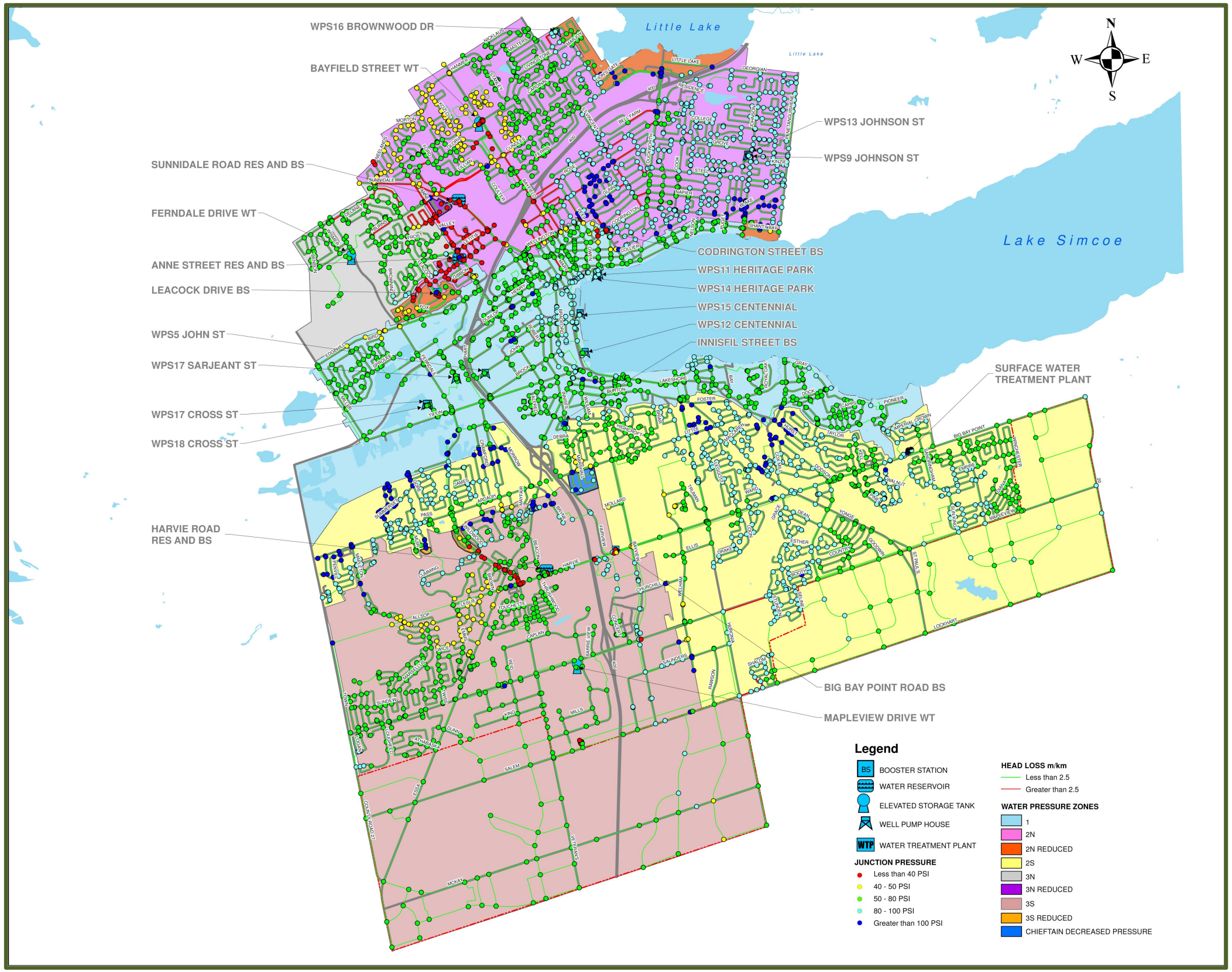
The City of Barrie Water Transmission and Distribution Policies and Design Guidelines were updated in December 2017. These new design guidelines, as well as the Ministry of Environment, Conservation and Parks (MECP) guidelines and the past Master Plans design criteria were reviewed to establish the Level of Service criteria to be followed in the Water Distribution and Storage Master Plan Update. These include:

- Water storage requirements for systems to provide regular servicing and fire flow protection and sized in accordance with MECP criteria for *Total Treated Water Storage Requirements* (Fire Storage + Equalization Storage + Emergency Storage).
- Booster Station level of service is based on the rated or 'Firm Pumping Capacity' of the station. The stations are to provide for high demand conditions with floating storage and provide for peak hour demand or fire flow conditions without floating storage.
- Head loss gradient for watermain pipes are to be under 2.5m/km during normal operating conditions. Watermain velocities to are to be maintained below 5m/s during Fire Flow conditions.
- Water pressures are to be maintained above 345 kPa (50psi) during normal conditions, above 275kPA (40psi) during high demand conditions, and above 138kPa (20psi) during fire flow conditions.

2013 Master Plan Recommendations
The City has moved forward on the immediate term recommendations from the 2013 Master Plan, which includes 14 capital projects. As part of this Master Plan all projects identified in the 2013 Master Plan have been reviewed with timing adjustments per the new growth projections.

EXISTING WATER PRESSURE

This map shows water pressure throughout the City of Barrie, including where existing water pressure is below the guideline, meets the guideline, or exceeds the guideline.



LONG-LIST ALTERNATIVES

A list of alternative solutions to address the problem statement were identified in the early stages of the project.

1. Do Nothing
"Do nothing" is an alternative required by the Class EA process. It is defined as maintaining the current capacity and operating conditions of the Water Distribution System.

2. Limit Growth
This alternative involves restricting population growth within the City to minimise the impacts on existing infrastructure and resources. Lower growth rates would ensure the sufficiency of the existing infrastructure for a longer period of time and would delay any need for expansion.

3. Water Conservation and Leakage Reduction
The water conservation and leakage reduction alternative involves implementing further water conservation strategies and reducing water leakage in the system. Together, these initiatives would decrease domestic water demand. An effective water efficiency program could defer infrastructure expansions of the water distribution system required to accommodate future growth. The City has already undertaken a number of water conservation initiatives which have improved overall water efficiency.

4. Expand / Upgrade Existing Servicing Infrastructure
This alternative involves the expansion of the City's existing water distribution system to address service population growth needs through new and upgraded infrastructure. This would involve various infrastructure upgrades to accommodate future growth.

Did you know?

The City has proactively implemented several water conservation strategies which have effectively improved overall water efficiency. These include:

- Lawn & Garden Maintenance
- Water Efficiency in Homes
- Toilet Rebate Program
- *Disconnect to Protect!*

Visit **www.barrie.ca** to find out more!

LONG-LIST ALTERNATIVES SCREENING

Pass or fail criteria were used for the screening of the long-list of alternatives as follows:

1. **Complexity** – A pass is given to any alternative that could be feasibly implemented with minimal impact to operations, City operations/activities and poses minimal risks to health and safety.
2. **Compatibility with the current policies and regulations** – A pass is given to any alternative that complies with Provincial and City policy related to growth and development.
3. **Addresses the problem statement** – A pass is given to an alternative that provides a solution to any of the constraints identified in the problem statement.

Alternative	Complexity	Policy and Regulation Compatibility	Addresses the Problem Statement
Do Nothing	✓	✗	✗
Limit Growth	✗	✗	✗
Water Conservation and Leakage	✓	✓	✓
Expand and Upgrade Existing Servicing Infrastructure	✓	✓	✓

The screening process concluded that Alternatives 3 and 4 warranted further evaluation.

EVALUATION OF ALTERNATIVES

The short-list alternatives were evaluated using the following criteria, which are based on the triple-bottom line approach outlined in the Class EA process and were established in consultation with the City of Barrie.

1. **Natural Environment:** Refers to any potential impact to natural areas or features, groundwater quality, surface water, erosion, and flood control.
2. **Physical/Built Environment:** Refers to any potential impact to existing utilities and infrastructure, physical structures and land uses, and ability to mitigate or adapt to climate change.
3. **Social & Cultural Environment**: Refers to any potential impact to residents, built-up areas, and regulatory requirements.
4. **Technical:** Refers to system operation, future expansion, and ability to provide consistent and efficient servicing.
5. **Economic/Financial:** Refers to the capital cost, operating cost, and phasing (implementation).

Evaluation Criteria	Water Conservation	System Expansion
Natural Environment		
Physical/Built Environment		
Social and Cultural Environment		
Technical		
Economic/Financial		

Key
Low Impact / "Most Preferred"
Low to Moderate Impact / "Preferred"
Moderate Impact / "Less Preferred"
High Impact / "Least Preferred"

**the colour assigned to each alternative/criteria indicates a ranking*

WE WANT YOUR INPUT!

The City wants to understand if there are any issues with the water service at your residence and/or workplace.

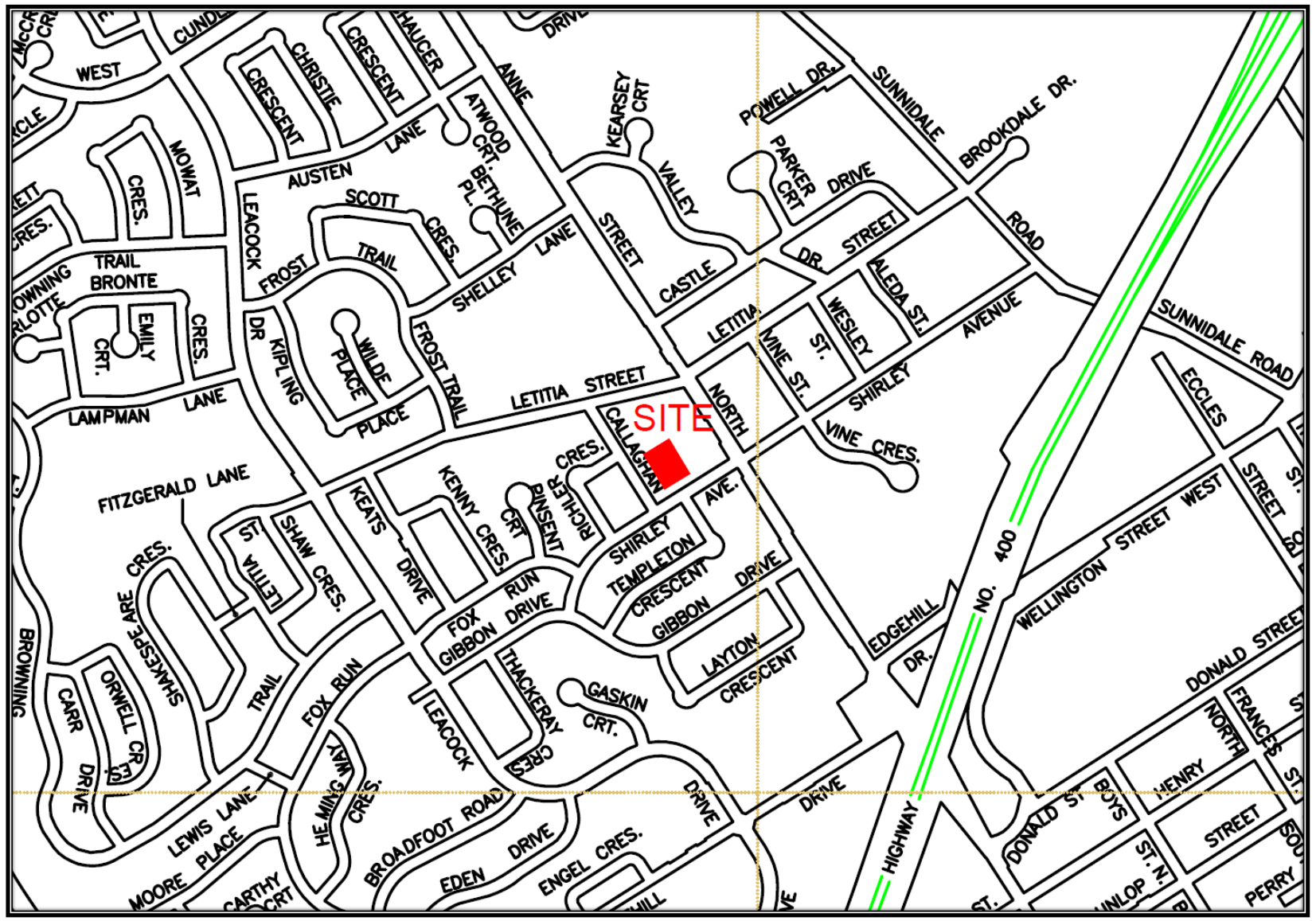
Please use the dots to answer the questions. Use the sticky notes to provide comments.

QUESTION	YES	NO	Not Applicable
Do you occasionally experience low water pressure?			
Are you aware of a water reservoir or pumping station in your neighbourhood?			
If so (above), has the water reservoir or pumping station ever caused a nuisance?			
Please provide your comments (and property address) here			

Anne Street 2N and 3N Water Booster Pumping Station

PROBLEM AND ALTERNATIVES

The Anne Street Reservoir is located within Zone 1 of the City of Barrie's Water Distribution System. There is an existing Booster Pumping Station, however due to age and condition the pumping station needs to be upgraded or replaced. The new booster station at Anne Street Reservoir will supply water to pressure zone 2N and provide redundancy and security of supply to pressure zone 3N.



LIST OF ALTERNATIVES

A list of alternative solutions to address the problem statement were identified in the early stages of the project.

1. North-East Side of Existing Reservoir

Placement of the new pumping station at the north-east side of the existing reservoir will require additional reservoir access structures due to front and side set back requirements.

2. East Side of Existing Reservoir Between the Valve Chambers

Construction of a new pumping station between the existing reservoir and inlet valve chamber, abutting the two cells in the existing reservoir. Unless the existing BPS can be completely shutdown for an extended period of time during demolition and construction (estimated to be 18 months), this option is not feasible due to the following reasons:

- The distance between the valve chamber and the reservoir is not large enough to accommodate a new structure.
- There is not enough space for shoring the deep excavation.
- The existing 400 mm watermains and 375 mm overflow lines will all need to be relocated prior to the start of excavation.

3. On-top of Existing Reservoir Cells

Placement of the new pumping station on top of the existing reservoir's two cells. This option is not recommended because the pumping station structure will add substantial load on top of the existing reservoir and therefore the existing reservoir roof would have to be strengthened.

4. West Side of Existing Reservoir

This alternative involves constructing a new pumping station against the southwest side of the existing reservoir abutting two cells.

- Construction against the exterior wall of the reservoir from the west side, abutting two cells with door access to each cell directly inside the station.
- Discharge watermains will need to be diverted around the reservoir to connect to the new and existing watermains at Anne Street.

The short-listed alternatives include Alternative 1 and Alternative 4.

EVALUATION OF ALTERNATIVES

The short-list alternatives were evaluated using the following criteria, which are based on the triple-bottom line approach outlined in the Class EA process and were established by ETO Engineering.

1. **Technical Suitability:** Refers to building footprint, estimated concrete volume, building excavation, additional structures, and additional watermain pipe.
2. **Constructability:** Refers to the potential impact of temporary work for construction staging, existing reservoir shutdown requirement, and space management.
3. **Accessibility and Operability**: Refers to the major equipment location, access to reservoir cells, and requirement of a lower level travelling bridge.
4. **Economic/Financial:** Refers to the total cost of ownership.

Evaluation Criteria	Alternative 1 - North-East Side of Existing Reservoir	Alternative 4 - Southwest Side of Existing Reservoir
Technical Suitability		
Constructability		
Accessibility and Operability		
Economic/Financial		

Key
Low Impact / "Most Preferred"
Low to Moderate Impact / "Preferred"
Moderate Impact / "Less Preferred"
High Impact / "Least Preferred"

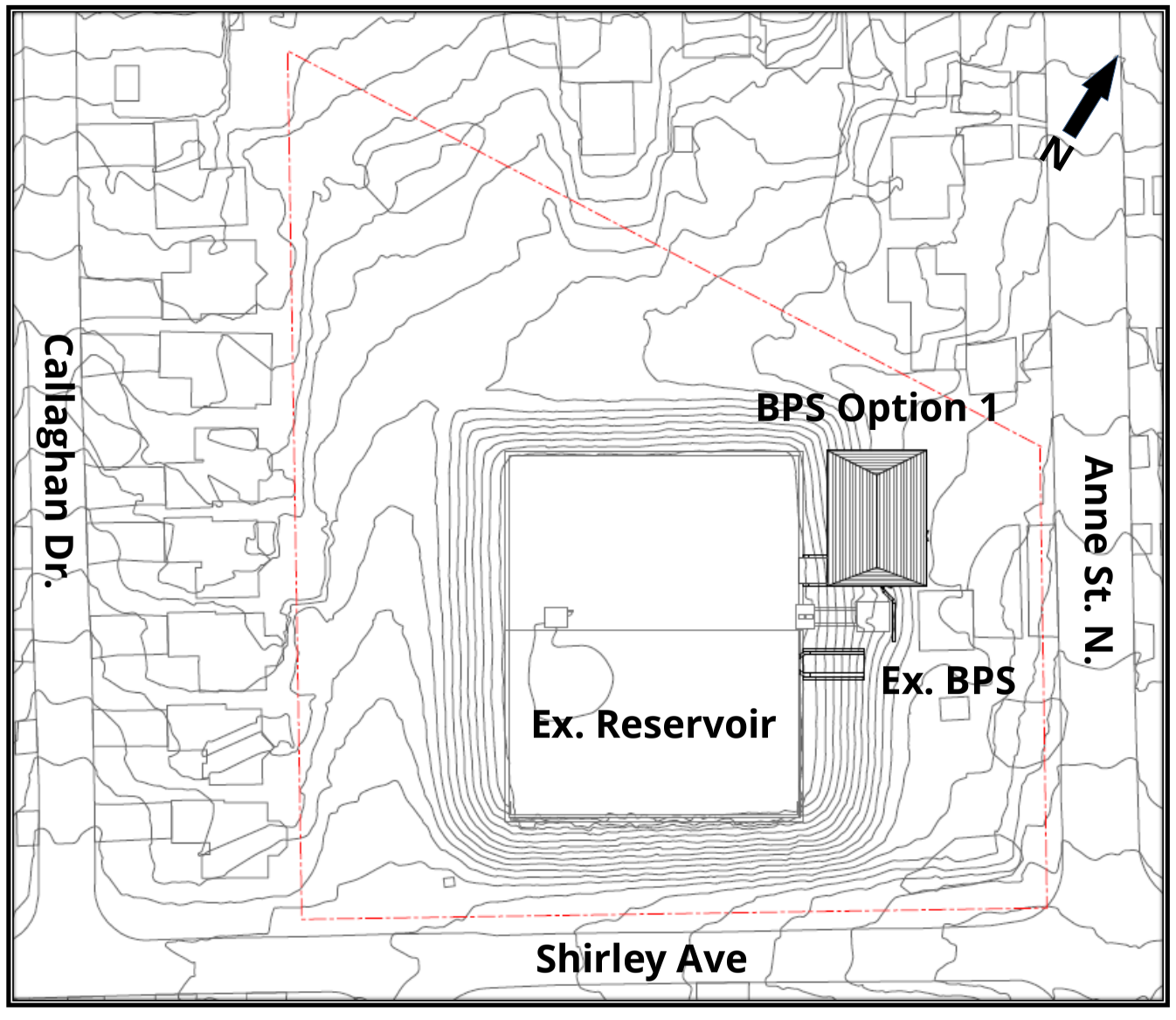
**the colour assigned to each alternative/criteria indicates a ranking*

SHORT-LISTED ALTERNATIVES

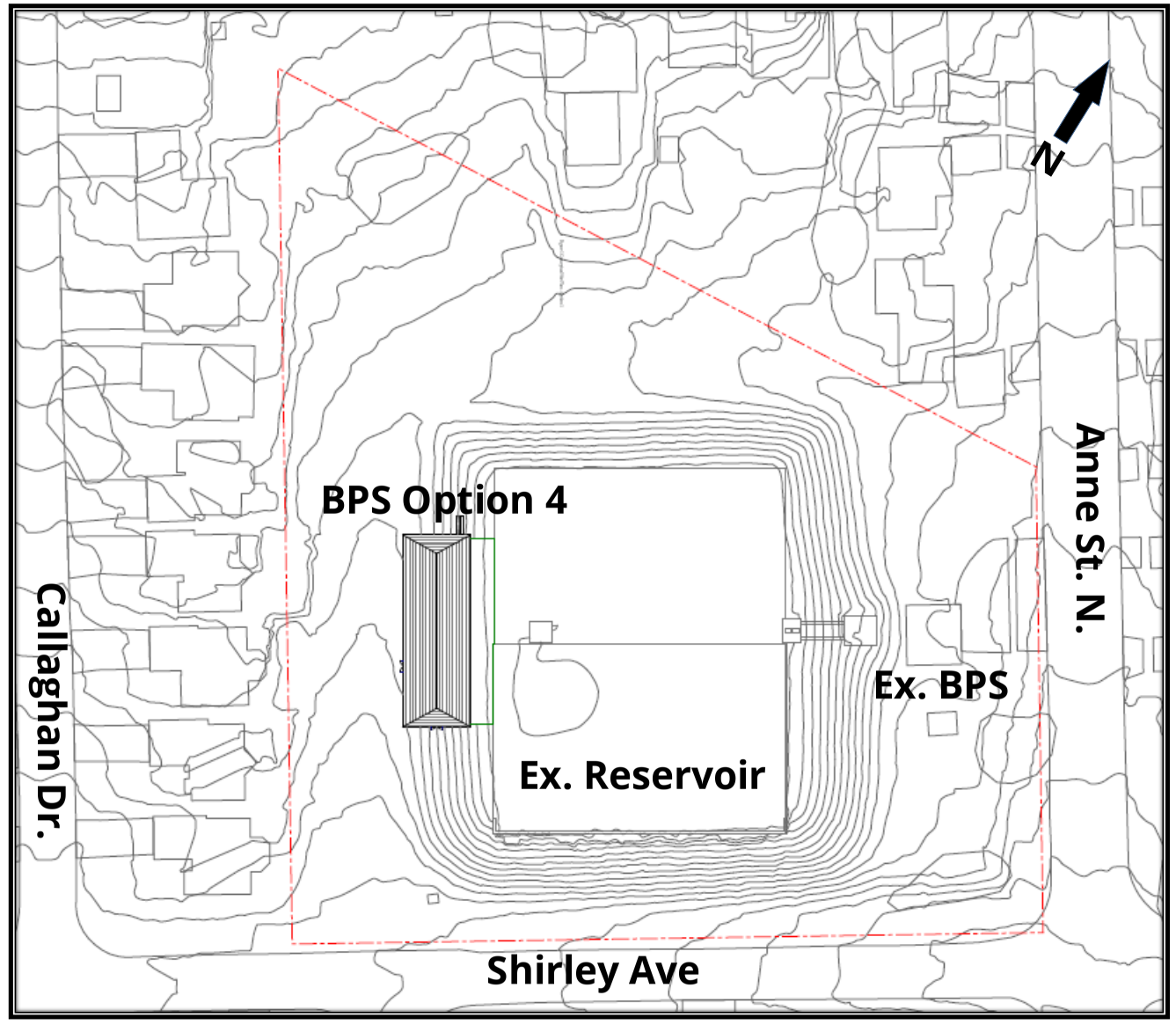
This rendering shows a conceptual design for a Booster Pumping Station, similar to what might be constructed under Alternatives 1 or 4.

SHORT LISTED ALTERNATIVES

Site Option 1 - North- East Side of Existing Reservoir



Site Option 4 - New Entry From Shirley Avenue



SHORT LISTED ALTERNATIVES

Site Option 1 - North- East Side of Existing Reservoir

Pros:
- Same orientation and entrance as the existing station facing Anne Street

Cons:
- Longer construction time overall (e.g. 6-12 months longer)
- Potential interruption to existing water services during construction
- Higher construction cost to build and maintain
- Close to 170 Anne Street

Site Option 4 - New Entry From Shirley Avenue

Pros:
- Shorter construction time overall
- No interruption to water services
- Lower construction cost to build and maintain

Cons:
- New entrance from Shirley Ave and some construction activity to occur on Shirley Ave.
- Close to existing private properties on Callaghan Drive

WE WANT YOUR INPUT!

The City wants to understand if there are any mitigating measures you would like to see included in the detailed design and construction of this project.

Please use the dots to answer the questions. Use the sticky notes to provide comments.

QUESTION	YES	NO	Not Applicable
Are you concerned about light pollution from the new booster station?			
Are you concerned about changes to recreational space?			
Are you concerned about the visual impacts of the new booster station?			
Please provide your comments (and property address) here			

Wastewater Collection Master Plan

PROBLEM AND ALTERNATIVES

Based on a detailed review of the performance of the existing wastewater collection system, and anticipated servicing requirements to accommodate future growth, it was determined that **additional wastewater collection capacity is required to accommodate long-term growth in the City of Barrie**.

Design Criteria

The City of Barrie Sanitary Sewage Collection Systems Policies and Design Guidelines were updated in October 2017. These new Design Guidelines informed the Service Levels used in the Wastewater Collection System Master Plan Update:

- During peak dry weather flow conditions, the depth of flow should not exceed 70% of the full pipe depth. No surcharging should occur.
- During a 25-year design storm event, a minimum freeboard to ground surface of 1.8m should be maintained.
- Pumping stations should have sufficient firm capacity to pump peak incoming flows during a 25-year design storm event, and sufficient wet well storage to provide storage of peak flows for a 1-hour period.

Updates from 2013 Master Plan

The City has moved forward on the immediate term recommendations from the 2013 Master Plan, which includes seven capital projects. As part of this Master Plan all projects identified in the 2013 Master Plan have been confirmed with timing adjustments per the new growth projections.

LIST OF ALTERNATIVES

A list of alternative solutions to address the problem statement were identified in the early stages of the project.

1. Do Nothing
Under this alternative, the wastewater collection system will continue to operate as it currently does.

2. Limit Growth
This alternative involves restricting population growth within the City to minimise the impacts on existing infrastructure and resources. Lower growth rates would ensure the sufficiency of the existing infrastructure for a longer period of time and would delay any need for expansion.

4. Upgrade and Expansion of Existing System
This alternative considers the implementation of improvements and expansion of the wastewater collection system, including both sewers and pumping stations, to address existing capacity issues and to accommodate future growth. This alternative will also accommodate planned growth in the Secondary Plan Areas.

3. Water Conservation and Inflow/Infiltration Reduction
This alternative considers the implementation of City-wide programs to reduce flows to the wastewater collection system while still allowing growth to occur. Flows to the wastewater collection system would be reduced through enhanced water conservation and demand management as well as implementation of infiltration and inflow reduction measures.

What is Inflow and Infiltration?

Inflow and Infiltration (I/I) is a term used to describe the ways in which stormwater and groundwater enter the sanitary collection system.

The term 'inflow' refers to water from rainfall and snow melt that is designed to enter the collection system.

The term 'infiltration' refers to unwanted water entering the collection system through different ways, as shown on the diagram to the left.

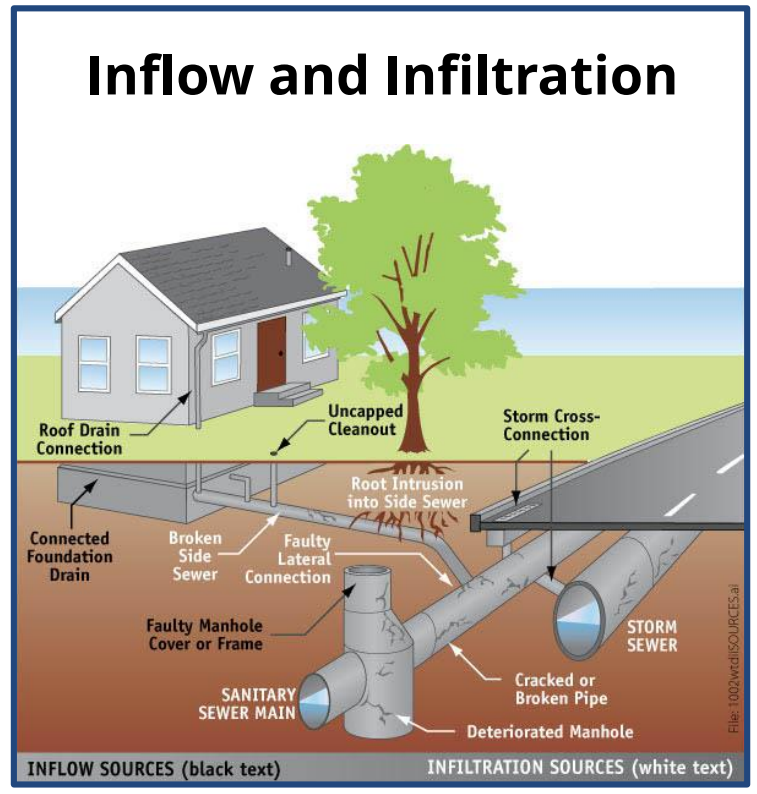


Image courtesy of Tuscarawas County

LONG-LIST ALTERNATIVES SCREENING

Pass or fail criteria were used for the screening of the long-list of alternatives as follows:

1. **Complexity** – A pass is given to any alternative that could be feasibly implemented with minimal impact to plant operations, City operations/activities and poses minimal risks to health and safety.
2. **Compatibility with the current policies and regulations** – A pass is given to any alternative that complies with Provincial and City policy related to growth and development.
3. **Addresses the problem statement** – A pass is given to an alternative that provides a solution to any of the constraints identified in the problem statement.

Alternative	Complexity	Policy and Regulation Compatibility	Addresses the Problem Statement
Do Nothing	✓	✗	✗
Limit Growth	✗	✗	✗
Upgrade and Expansion of Existing System	✓	✓	✓
Water Conservation and Inflow/Infiltration Reduction	✓	✓	✓

The screening process concluded that Alternatives 3 and 4 warranted further evaluation.

EVALUATION OF ALTERNATIVES

The alternatives were evaluated using the following criteria, which are based on the triple-bottom line approach outlined in the Class EA process and were established in consultation with the City of Barrie.

1. **Natural Environment:** Refers to any potential impact to natural areas or features, groundwater quality, surface water, erosion, and flood control.
2. **Social & Cultural Environment**: Refers to any potential impact to residents, built-up areas, and regulatory requirements.
3. **Technical:** Refers to system operation, ability to measure performance, future expansion, ability to provide consistent and efficient servicing, and phasing of required infrastructure.
4. **Constructability:** Ease of construction and requirements for new construction easements.
5. **Cost:** Refers to the capital cost, operating cost, and phasing (implementation).

Evaluation Criteria	Inflow and Infiltration	System Expansion
Natural Environment		
Social and Cultural Environment		
Technical		
Constructability		
Cost		

Key
Low Impact / “Most Preferred”
Low to Moderate Impact / “Preferred”
Moderate Impact / “Less Preferred”
High Impact / “Least Preferred”

**the colour assigned to each alternative/criteria indicates a ranking*

MANAGING WET-WEATHER FLOWS

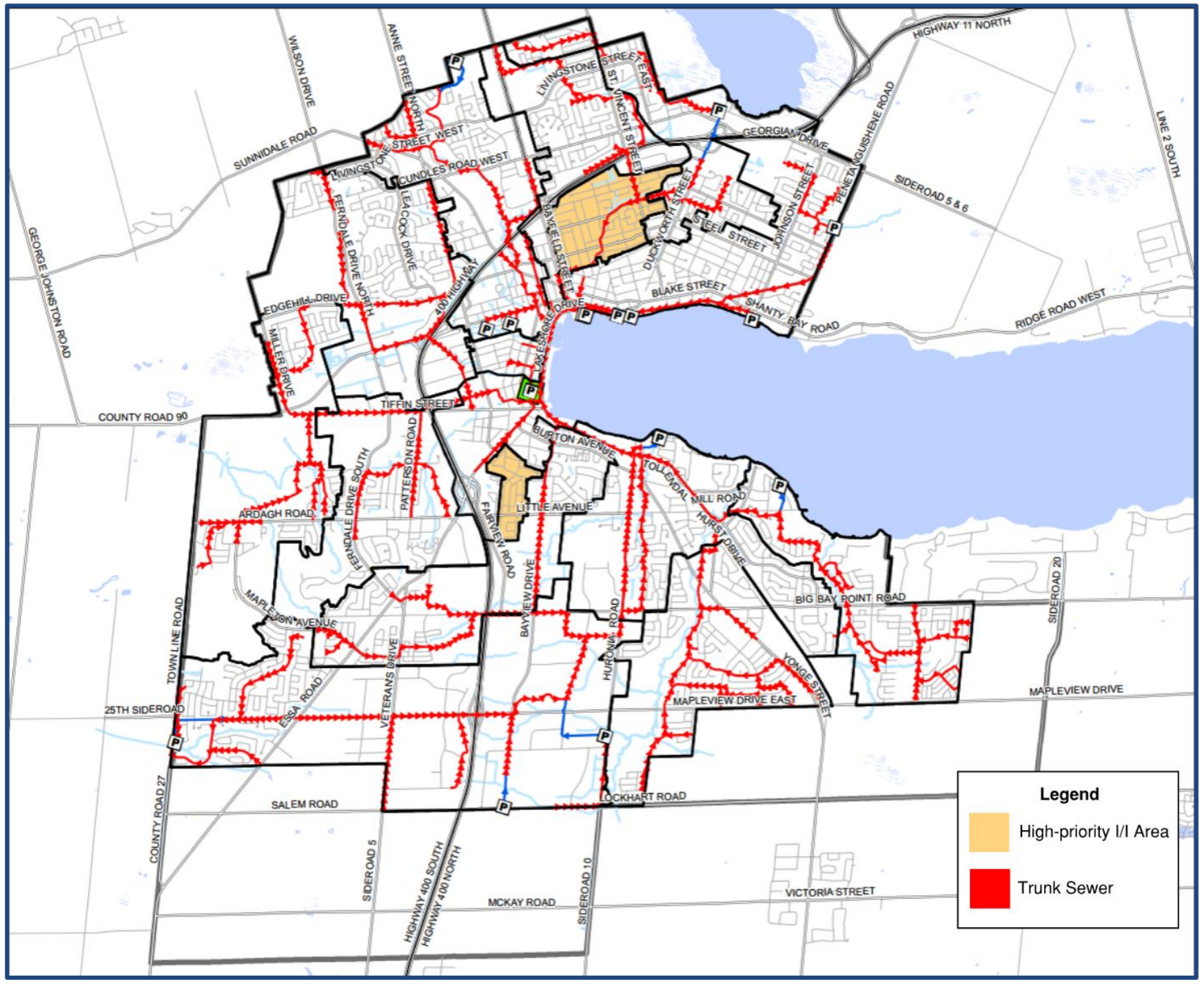
Inflow and Infiltration

Inflow
Directly connected stormwater sources.

Infiltration Groundwater entering collection system through sewer system defects.

Wet-Weather Flows

- Elevated wastewater flows during wet-weather events can result in capacity issues in local collection as well as downstream at the WwTF.
- Sanitary sewer flow data collected in 2017 identified two of the highest areas in the City that contribute excessive inflow and infiltration to the collection system during wet-weather events.
- Priority areas were identified by comparing observed wet-weather inflows from the 2017 monitoring period to the City's current design value of **0.1 L/s/ha**
- It is recommended that an aggressive inflow and infiltration reduction program be undertaken in these areas. These program could then be expanded to other areas of the City.



WE WANT YOUR INPUT!

The City wants to understand if there are any issues with wastewater collection at your residence and/or workplace.

Please use the dots to answer the questions. Use the sticky notes to provide comments.

QUESTION	YES	NO	Not Applicable
Do you have a sump pump that turns on during heavy rainfall and is connected to the sewer system?			
Has your neighbourhood experienced any odours related to the sewer system?			
Has your basement ever flooded due to sewage back-up during heavy rainfall (i.e. not from a leak through a wall or window)?			
Please provide your comments (and property address) here			

Wastewater Treatment Master Plan

PROBLEM STATEMENT

The projected growth in the City of Barrie will result in increased wastewater flows to the City's Wastewater Treatment Facility (WwTF) and will exceed the capacity of the existing plant prior to 2041.

It is **necessary to ensure sufficient capacity** is available at the wastewater treatment facility to manage the increased flows. Increased flows will also result in higher sludge production and biosolids generation.

A strategy is also required **to ensure the biosolids can be disposed of in a safe, reliable, sustainable, and cost-effective manner**, in consideration of applicable regulations, environmental constraints, and social impacts.

The WwTF operates under the Lake Simcoe Protection Plan which has restricted phosphorus loading to the Lake. This means that as flow into the WwTF increases, the concentration of phosphorous in the discharge (effluent) will need to also decrease in order to meet or exceed the Province's target.

Existing Wastewater Treatment Constraints

Given that the WwTF has a recurring operational challenge in treating peak wet weather flows during heavy rainfall events and would reach maximum capacity within the next 20 years, capacity is needed to accommodate the peak flows and to service future growth.

It is important to note that the plant consistently meets all of its regulated effluent objectives, particularly with respect to total phosphorus levels discharged into Lake Simcoe.

LONG-LIST OF ALTERNATIVES

A long-list of alternative solutions to address the problem statement were identified in the early stages of the project.

1. Do Nothing
This alternative is defined as maintaining the current operating conditions at the WwTF.

2. Limit Growth
This alternative involves restricting population growth within the City to minimise the impacts on existing infrastructure and resources. Lower growth rates would ensure the sufficiency of the existing infrastructure for a longer period of time and would delay any need for expansion. However, this would include reversing past decisions regarding growth and development in the City. The province has identified Barrie as a growth center for the area

3. Phosphorus Trading
One recommendation of the Lake Simcoe Phosphorus Reduction Strategy was the implementation of a trading system which used financial instruments to help reduce phosphorus loadings to the Lake. Trading, or offsetting, involves developing phosphorus reduction projects elsewhere in the watershed to 'offset' the phosphorus output of the plant. This could be through directly implementing a phosphorus reduction project or by contributing to funding a project implemented by others.

4. Improve Water Efficiency/Water Conservation
Improving water efficiency/water conservation involves implementing different strategies to reduce water consumption. This would reduce the volume of wastewater generated and thus conveyed to the WwTF.

5. Reduce Infiltration and Inflow
Inflow refers to water from rainfall and snow melt that enters the collection system. The City of Barrie does not have combined sanitary and storm sewers, however rainfall, snow melt, and groundwater can enter the collection system through cracks and holes. By reducing infiltration and inflow, the volume of stormwater and groundwater conveyed to the WwTF is limited.

6. Expand and Optimize Plant Capacity
To ensure the WwTF can efficiently manage the increase in wastewater flow and sludge generated at the plant, the following would be required:

1. Increase treatment capacity (by optimization and expansion);
2. Install a peak attenuation system; and,
3. Increase digestion capacity for sludge stabilization.

LONG-LIST ALTERNATIVES SCREENING

Pass or fail criteria were used for the screening of the long-list of alternatives as follows:

1. **Complexity** – A pass is given to any alternative that could be feasibly implemented with minimal impact to plant operations, City operations/activities and poses minimal risks to health and safety.
2. **Compatibility with the current policies and regulations** – A pass is given to any alternative that complies with Provincial and City policy related to growth and development.
3. **Addresses the problem statement** – A pass is given to an alternative that provides a solution to any of the constraints identified in the problem statement.

Alternative	Complexity	Policy and Regulation Compatibility	Addresses the Problem Statement
Do Nothing	✗	✗	✗
Limit Growth	✗	✗	✗
Phosphorus Trading	✗	✓	✗
Improve Water Efficiency/Water Conservation	✓	✓	✗
Reduce Inflow and Infiltration	✓	✓	✓
Optimize and Expand Plant Capacity	✓	✓	✓

The screening process concluded there are two short-listed alternatives which warranted further evaluation to address the problem statement.

SHORT LISTED ALTERNATIVES

Reduce Inflow and Infiltration

- Two high-priority areas (Allendale and Wellington) were identified within the City as locations where groundwater infiltration needs to be mitigated
- A rigorous city-wide inspection, maintenance, repair and renewal program would be required to further reduce groundwater infiltration to the existing network
- The City of Barrie's Sanitary and Drainage Guidelines should be updated to help minimize the potential for inflow and infiltration in the wastewater collection system.
- This will reduce the peak wet weather flows and allow the City to optimize peak attenuation requirements.

Optimize and Expand Plant Capacity

- The WwTF would reach its maximum treatment capacity between 2035 and 2039 depending on optimization of the plant process.
- In order to service the needs to 2071, a plant expansion is required to accommodate an additional ~ 20MLD
- A peak attenuation system is required to manage peak wet weather events.
- Digestion capacity at the WwTF is nearing capacity in 2018. Two additional primary digesters are required to ensure sufficient capacity is available when the plant reaches its maximum capacity.
- One primary digester is required as soon as possible; the other is required between 2032 – 2036.

Findings from the 2013 Master Plan

The 2013 Master Plan recommended a combination of three alternatives:

1. Implementation of water efficiency strategies
2. Reduction of Inflow and Infiltration
3. Expansion of the tertiary treatment (Phase 1): The upgrade to membrane treatment is currently underway with a projected completion date of 2024

Note: While water efficiency strategies were recommended in the 2013 Master Plan, this alternative was not shortlisted for the 2018 Master Plan Update. With the success of the City's on-going Water Efficiency/Conservation programs for reducing indoor water use, additional benefits in this area would be marginal. Future direction for the City's programs would be to reduce outdoor water use, however, this would have no impact on the flows to the WwTF.

EVALUATING ALTERNATIVES

The short-list of alternatives were evaluated using the following criteria, which are based on the triple-bottom line approach outlined in the Class EA process and were established in consultation with the City of Barrie.

1. **Natural Environment:** Refers to any potential impact to natural areas or features, groundwater quality, surface water, erosion, and flood control.
2. **Physical/Built Environment:** Refers to any potential impact to existing utilities and infrastructure, physical structures and land uses, and ability to mitigate or adapt to climate change.
3. **Social & Cultural Environment**: Refers to any potential impact to residents, built-up areas, and regulatory requirements.
4. **Technical:** Refers to system operation, ability to measure performance, future expansion, ability to provide consistent and efficient servicing, and phasing of required infrastructure.
5. **Economic/Financial:** Refers to the capital cost, operating cost, and phasing (implementation).

Evaluation Criteria	Reduce Inflow and Infiltration	Optimize and Expand Plant Capacity
Natural Environment		
Physical/Built Environment		
Social and Cultural Environment		
Technical		
Economic/Financial		

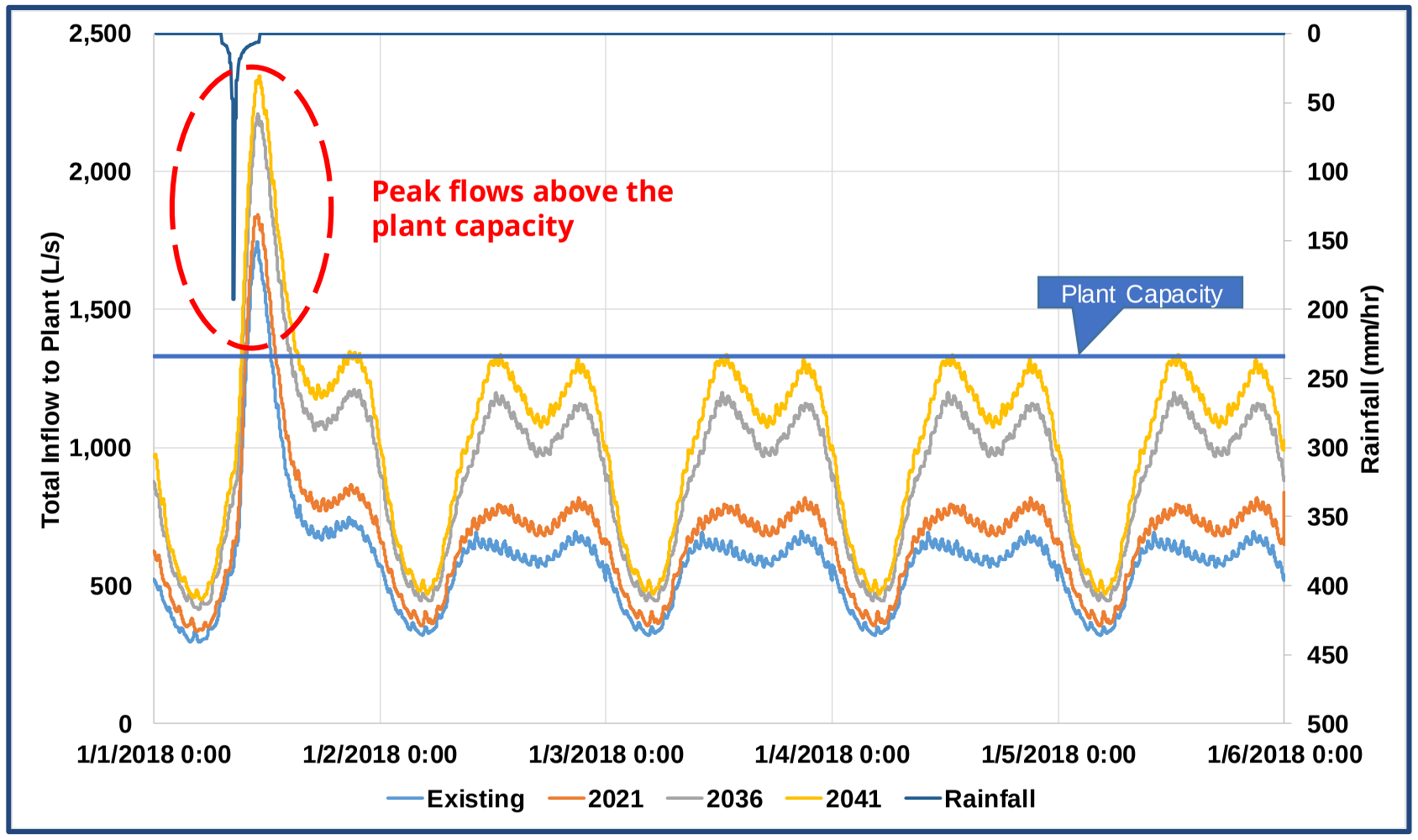
Key
Low Impact / "Most Preferred"
Low to Moderate Impact / "Preferred"
Moderate Impact / "Less Preferred"
High Impact / "Least Preferred"

**the colour assigned to each alternative/criteria indicates a ranking*

Peak Attenuation System

PROBLEM STATEMENT

Currently, the WwTF has operational issues during some large rainfall events. Based on projected future growth in the City, wastewater flows will increase. Modelling of future rainfall events, while taking into account extreme weather events due to climate change, has shown the WwTF is unable to accommodate peak flows now and in the future. It is estimated that peak flows to the wastewater treatment plant would be approximately twice the capacity the plant can currently accommodate by 2041.



This figure shows wastewater flows to the WwTF during an extreme storm event. It plots peak flows that the plant experiences currently, and for the years 2021, 2036 and 2041.

As shown, adequate storage would be required to temporarily store peak flows.

A peak attenuation system would be required to accommodate long-term growth in the City of Barrie

Peak Attenuation System

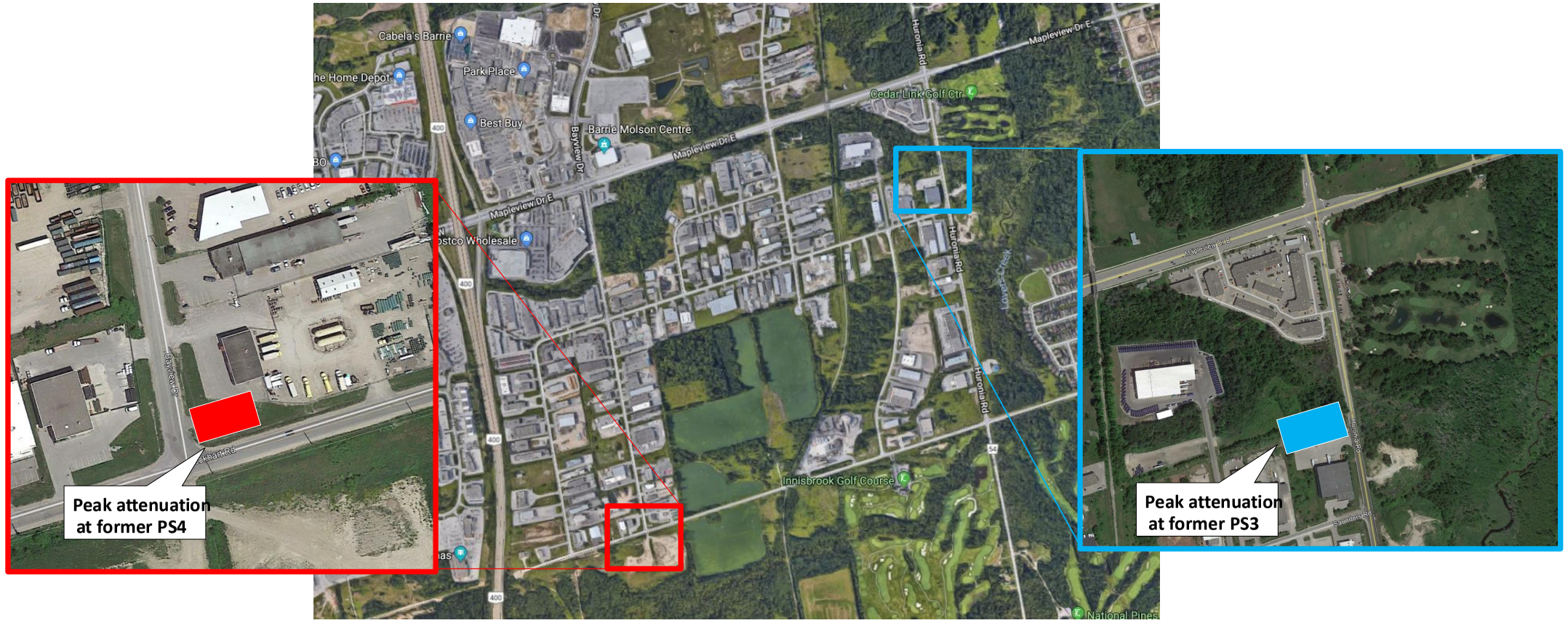
LIST OF ALTERNATIVES

In addressing the problem statement, alternatives were identified in consultation with the City.

1. Do Nothing
The current conditions in the wastewater collection system and at the WwTF will be maintained. However, this does not provide an adequate solution to the problem statement.

2. Reduce Inflow & Infiltration
This involves a rigorous City-wide rehabilitation program to repair cracks and holes, and remove any direct connections to the wastewater collection system. This would reduce the volume of extra water that enters the wastewater collection system from rainfall, snowmelts and groundwater infiltration.

3. Install Distributed Storage for Peak Attenuation
Multiple peak attenuation systems would be installed throughout the City to provide temporary storage during wet weather events. These systems would be underground concrete tanks that will be constructed at decommissioned pumping stations in the City. Tanks will be sized by considering the peak flow in the catchment area.



Distributed Peak Attenuation System

LIST OF ALTERNATIVES

In addressing the problem statement, alternatives were identified in consultation with the City.

4. Install a Single Peak Attenuation Facility
A single underground concrete tank would be constructed south of the WwTF and Hotchkiss Creek on a vacant City-owned lot between Lakeshore Drive and Bradford Street. The tank would be at a grade that allows wastewater to enter the tank by gravity during peak events. The tank would be ~ 3 m in depth and sloped towards the WwTF to allow the collected water to be directed to the inlet channel of the plant by gravity. The tank would collect peak flows from the wastewater collection system by gravity.

A cleaning system will be installed to ensure the tank is cleaned periodically to minimize buildup. Potential odour problems are addressed by constructing an underground tank, ensuring the tank is completely enclosed. As a precaution, an odour control system will also be installed.

Intermittent traffic disruptions during construction on adjacent streets are anticipated and will be mitigated with advance public notices and scheduling equipment movement outside of rush hours.

An Archaeological Assessment for the site is currently underway.

Single Peak Attenuation System

EVALUATION OF ALTERNATIVES

The alternatives were evaluated using the following criteria, which are based on the triple-bottom line approach outlined in the Class EA process and were established in consultation with the City of Barrie.

1. **Natural Environment:** Refers to any potential impact to natural areas or features, groundwater quality, surface water, erosion, and flood control.
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3. **Social & Cultural Environment**: Refers to any potential impact to residents, built-up areas, and regulatory requirements.
4. **Technical:** Refers to system operation, ability to measure performance, future expansion, ability to provide consistent and efficient servicing, and phasing of required infrastructure.
5. **Economic/Financial:** Requirements for easements for construction of new infrastructure, capital costs, operating costs and phasing of implementation.

Evaluation Criteria	Reduce Inflow & Infiltration	Distributed Storage	Single Peak Attenuation Facility
Natural Environment			
Physical/Built Environment			
Social and Cultural Environment			
Technical			
Economic/Financial			

Key
Low Impact / “Most Preferred”
Low to Moderate Impact / “Preferred”
Moderate Impact / “Less Preferred”
High Impact / “Least Preferred”

**the colour assigned to each alternative/criteria indicates a ranking*

Biosolids Management Plan

BIOSOLIDS MANAGEMENT PLAN

The Province expects that by 2041, the City of Barrie's residential population will reach 253,000, and the City is projected to have 129,000 jobs. This growth will result in increased wastewater flows to the City's Wastewater Treatment Facility and will result in an increased generation of biosolids.

A strategy is required to ensure that biosolids can be disposed of in a safe, reliable, sustainable and cost-effective manner in consideration of applicable regulations, environmental constraints and social impacts.

Did you know?

Biosolids are treated (inert), nutrient rich and organic residual of treated wastewater.

Biosolids must meet stringent provincial quality standards and are commonly used as a fertilizer for agricultural purposes!

Existing Biosolids Constraints

A number of constraints have been identified that will limit the existing biosolids management infrastructure over the planning horizon to 2041 and beyond. These include:

- Existing WwTF digestion capacity (capacity will be reached by 2018)
- Storage at the Oro-Medonte Biosolids Storage Facility (adequate capacity until 2030 – 2034)

Although the Wastewater Treatment Master Plan addresses digestion capacity constraints at the WwTF, the Biosolids Management Plan focuses on the management of generated biosolids.

LONG-LIST OF ALTERNATIVES

A long-list of alternative solutions to address the problem statement were identified in the early stages of the project.

1. Do Nothing
This is defined as maintaining the current management approach.

2. Use of Biosolids for Fertilizer Products
This involves converting biosolids into a product that can be marketed as a commercial fertilizer.

3. Incineration
This involves installing incinerators to convert sludge to ash. This would eliminate the need for digesters and the ash would be disposed of at the local landfill.

4. Transfer of Excess Biosolids to a Private Facility
Biosolids would continue to be transferred to the City owned Oro-Medonte biosolids storage facility during the winter months. However, the Oro-Medonte facility will reach capacity by 2028. When this occurs, the biosolids would be transferred to a private facility for processing and/or storage.

5. Expansion of Existing Biosolids Facility
The Oro-Medonte facility is expected to reach capacity in 2028. Expansion of the facility would be required to facilitate anticipated biosolid production. The construction of additional storage tanks on-site would be required to accommodate the storage of additional biosolids.

6. Pump Biosolids to Existing Biosolids Facility
Pumping biosolids to the Oro-Medonte facility would reduce transfer costs by eliminating the need for trucking. This alternative would require the construction of three pumping stations (one in the City of Barrie and two in the Township of Oro-Medonte) and approximately 23 km forcemain to facilitate the transfer and processing of the biosolids.

7. Biosolids Thickening
This alternative involves implementing a new system to thicken (or increase the concentration) of biosolids to between 5% and 7%. Thickening biosolids would reduce total volume and enhance long-term storage capacity at the existing biosolids facility.

8. Biosolids Dewatering
A dewatering system would increase the concentration of biosolids to between 25 and 30% and reduce volume. Upgrades to the Oro-Medonte facility would be required to handle the dewatered biosolids.

It is important to note that Alternatives 5,6,7 and 8 all result in the final biosolids being applied to land per Ontario Government Standards and Regulations.

LONG-LIST ALTERNATIVES SCREENING

Three criteria were applied to screen the long-list of alternatives:

1. **Complexity –** Complexity refers to the process of implementing new technology, facilities, approaches, integration with existing systems, and any potential risks or challenges. Less complexity is preferred.

2. **Space Constraints**– The availability of sufficient space for installing the different process units at the Wastewater Treatment Facility or the City-owned Biosolids Facility located in Oro-Medonte.

3. **Business Model Compatibility**– Maintain the City's current business model to practice land application of the biosolids.

The screening process concluded there are five short-listed alternatives which warranted further evaluation to address the problem statement.

Alternative	Complexity	Space Constraints	Compatibility with Business Model
Do Nothing	✗	✓	✗
Fertilizer Products	✗	✓	✗
Incineration	✗	✓	✓
Transfer to Private Facility	✓	✓	✓
Expansion of Existing Facility	✓	✓	✓
Pump Biosolids	✓	✓	✓
Biosolids Thickening	✓	✓	✓
Biosolids Dewatering	✓	✓	✓

2013 Master Plan
These short-listed alternatives are in-line with the alternatives and findings of the 2013 Master Plan.

EVALUATING ALTERNATIVES

The short-list of alternatives were evaluated using the following criteria, which are based on the triple-bottom line approach outlined in the Class EA process and were established in consultation with the City of Barrie.

1. **Natural Environment:** Refers to any potential impact to natural areas or features, groundwater quality, surface water, erosion, and flood control.
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5. **Economic/Financial:** Refers to the capital cost, operating cost, and phasing (implementation).

Evaluation Criteria	Transfer	Pumping	Expansion	Thickening	Dewatering
Natural Environment					
Physical/Built Environment					
Social and Cultural Environment					
Technical					
Economic/ Financial					

Key
Low Impact / "Most Preferred"
Low to Moderate Impact / "Preferred"
Moderate Impact / "Less Preferred"
High Impact / "Least Preferred"

**the colour assigned to each alternative/criteria indicates a ranking*

WE WANT YOUR INPUT!

The City wants to know what it should prioritize when expanding the WwTF.

Please use the dots to cast your vote. Use the sticky notes to provide comments.

Item	Priority?
Minimize environmental impacts on Lake Simcoe	
Minimize impact to recreational users of Lake Simcoe	
Odour reduction	
Reduction of greenhouse gas emissions	
Appearance of the Plant	
Provide your comments here:	

NEXT STEPS

Conclusions

- The Master Plans each identify a series of projects that are required to meet the growing water and wastewater needs in the City of Barrie.
- This study has used a long-term vision to understand the future conditions and requirements of the City.

Next Steps

Winter 2018 – Master Plan Reports

- These documents summarize the overall EA process and will be available for public review and comment. People who have expressed an interest to be kept informed of the project will be notified directly. There will be an opportunity to meet with project staff individually to discuss concerns.

Winter 2019 – Master Plan Approval

- Following the public comment period, the new Master Plans will be presented to Council. Members of the public will have an opportunity to make a deputation to Council as a registered delegate.
- If Council approves the Master Plan, the City will issue a Notice of Completion. The public will have a minimum 30-day period to appeal.

More Information

Visit **www.barrie.ca** to find out more!

Contact Information

Tom Reeve

Senior Infrastructure Planning Program Coordinator

City of Barrie

70 Collier Street, Box 400

Barrie, ON L4M 4T5

Tel: (705) 739-4220 Ext. 4465

Fax: (705) 739-4247

Email: Tom.Reeve@barrie.ca

CITY OF BARRIE
WATER AND WASTEWATER MASTER PLAN UPDATE

PUBLIC INFORMATION CENTRE – NOVEMBER 1ST, 2018

PLEASE SIGN IN

NAME (Please Print)		CONTACT INFORMATION				PHONE	EMAIL
First	Last	Street #	Street Name	City/Town	Postal Code	Number	Address
[redacted]							

CITY OF BARRIE
WATER AND WASTEWATER MASTER PLAN UPDATE

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CITY OF BARRIE
WATER AND WASTEWATER MASTER PLAN UPDATE

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First	Last	Street #	Street Name	City/Town	Postal Code	Number	Address
[redacted]							

Water and Wastewater Master Plans

Public Information Centre
Tuesday, November 1st, 2018
4:00 p.m. to 7:00 p.m.
Southshore Community Center (205 Lakeshore Drive, Barrie, ON)

COMMENT SHEET

Personal information on this form is collected under the authority of the Environmental Assessment Act, Chap. E18, Section 7, and will be used in the development of a Drainage Master Plan. Questions about this collection should be directed to the Director of Engineering, P.O. Box 400, 70 Collier Street, Barrie, Ontario, L4M 4T5, (705) 726-4242.

Please print all responses

NAME OF RESPONDENT: [redacted]

REPRESENTING (Agency, Municipality, Property Owner, Tenant, etc.):

ADDRESS (Including Postal Code & Telephone Number):

Street Address: [redacted] **Unit/Apt:**

Postal Code: [redacted] **Telephone Number:** [redacted]

The City of Barrie is undertaking updates to the four Master Plans for Water Supply, Water Distribution and Storage, Wastewater Collection, and Wastewater Treatment. These studies are being conducted in accordance with the requirements of the Municipal Class Environmental Assessment (EA) process, to identify the existing deficiencies, increasing system capacity and projecting future infrastructure needs throughout the City. The study area encompasses the entire City, including the annexed lands.

A copy of the Public Information Centre materials is available online on the City of Barrie web page at the following link: http://www.barrie.ca/eastudies.

Updates to the Water and Wastewater Master Plans will consider feedback received on these comment sheets as part of Public Information Centre process.

Please list below any concerns or comments you have related to the Water and Wastewater Master Plans below

Which Master Plan do your comments apply:

- ☐ Water Supply
- ☐ Water Storage and Distribution
- ☐ Wastewater Treatment
- ☐ Wastewater Collection
- ☒ All of the above

[redacted]

[redacted]

Are you satisfied with the level of detail of the information presented herein, at the Public Information Centre, and provided on the City website (http://www.barrie.ca/eastudies)?

☐	☒	☐	☐	☐
Poor (Much Improvement Required)	**Marginal** (Some Improvement Required)	**Good**	**Very Good**	**Excellent**

Please add a comment in support of your level of satisfaction below:

[redacted]

Do you wish to be informed of future Public Information Centers and of staff recommendation for the Preferred Alternative Solution?

☒ Yes ☐ No

Signature: [redacted] Date: [redacted]

Please submit this comment sheet by **Friday, December 1st, 2018** to:

Tom Reeve, P. Eng.
City of Barrie
Engineering Department
70 Collier Street, P.O. Box 400
Barrie, ON
L4M 4T5

Tel: (705) 739-4220 ext. 4465
Fax: (705) 739-4247

E-mail: Tom.Reeve@barrie.ca

Thank you for your comments

Water and Wastewater Master Plans

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REPRESENTING (Agency, Municipality, Property Owner, Tenant, etc.):

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- [x] Water Supply
- [x] Water Storage and Distribution
- [ ] Wastewater Treatment
- [ ] Wastewater Collection
- [ ] All of the above

[redacted]

Water and Wastewater Master Plans

[redacted]

Are you satisfied with the level of detail of the information presented herein, at the Public Information Centre, and provided on the City website (http://www.barrie.ca/eastudies)?

☐	☐	☐	☐	☐
Poor (Much Improvement Required)	**Marginal** (Some Improvement Required)	**Good**	**Very Good**	**Excellent**

Please add a comment in support of your level of satisfaction below:

Do you wish to be informed of future Public Information Centers and of staff recommendation for the Preferred Alternative Solution?

☒ Yes ☐ No

Signature: [redacted] Date: [redacted]

Please submit this comment sheet by **Friday, December 1st, 2018** to:

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L4M 4T5

Tel: (705) 739-4220 ext. 4465
Fax: (705) 739-4247

E-mail: Tom.Reeve@barrie.ca

Thank you for your comments

Anne Street Reservoir Project

Property Owner: 21 Callaghan Dr, Barrie, ON, L4N6E8

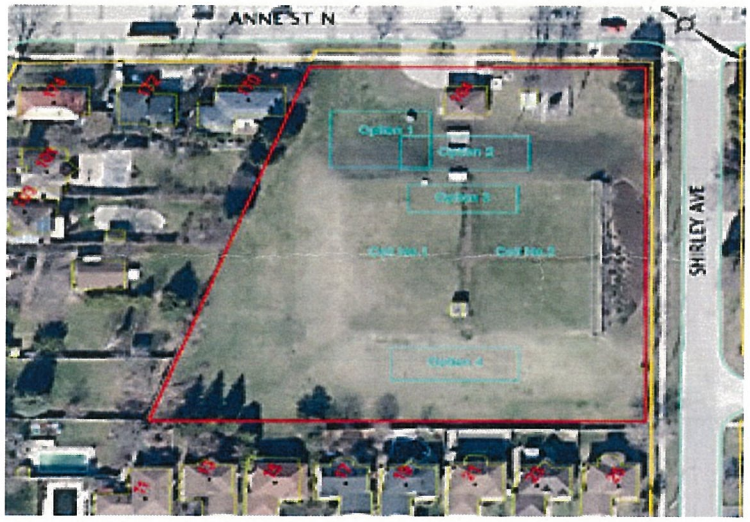
Concern: Public safety, Property Values, Neighborhood impacts

Hello

We reached out to Tom Reeve (Senior Infrastructure Planning Program Coordinator) who was able to provide us the scope of the project. We are concerned with the preliminary selection of option 4, and the impacts to our property value, public safety, and change to a 30-year tradition in our neighborhood.

We believe Option 1 or 2 would be the ideal solution to achieve the project objective to install larger pumps, and maintain the integrity and value of the neighborhood.

Scope: There will be some more information at the Public Information Centre but the main change proposed on the property is that a new pump station building is needed. The existing building on the Anne Street side houses some large pumps for distributing water but it isn't big enough for the new pumps required. Overall the property will still be a green space on top of a reservoir but a number of options for building location are being considered (see the map below). ***The preliminary preferred alternative is Option 4 due to some constraints on the Anne Street side of the property.***



Public Safety – Only safe access to the area for the public is right by option 4 proposal. As per the aerial view, the front option already has existing buildings, and Shirley avenue side has a garden and steep slopes until this entrance. Owners, including myself have pools and time from time balls, toys, etc will go over the fence and a building will add to the risk of children getting hurt. We are concerned about people hanging out behind a build at night since it will be away from the road, and out of sight from authorities.

Property Values – The first picture on the left is from 21 Callaghan backyard deck, and the proposed building will be in a direct view of the green space. We paid a premium at the time of purchase to back on to a green space, and the view will have an impact on future value if selling the property.

The distance from our house or fence to the bottom of the hill is the shortest distance, compared to the other properties surrounding the area. Note: There is no option or proposal on the North side of the property where the distance between the hill and houses are close to 200 feet away (picture on the right)

Another concern will be the lighting around the building will affect the night view, and potential impacts to sleeping habits depending on the strength of the light.

Option 1 or 2 – Has the required space to build a building without impacting any of the surrounding properties, and option 2 could hide the new building behind an existing structure.

Neighborhood Impacts: For 30 years, owners have taken their kids to play soccer, toboggan, football, school walks, and walk their dogs in the green space. Building a pump station in the middle of this area will have a negative impact to a long-standing traditions and family fun for our neighborhood.

Water and Wastewater Master Plans

Public Information Centre
Tuesday, November 1st, 2018
4:00 p.m. to 7:00 p.m.
Southshore Community Center (205 Lakeshore Drive, Barrie, ON)

COMMENT SHEET

Personal information on this form is collected under the authority of the Environmental Assessment Act, Chap. E18, Section 7, and will be used in the development of a Drainage Master Plan. Questions about this collection should be directed to the Director of Engineering, P.O. Box 400, 70 Collier Street, Barrie, Ontario, L4M 4T5, (705) 726-4242.

Please print all responses

NAME OF RESPONDENT: [redacted]

REPRESENTING (Agency, Municipality, Property Owner, Tenant, etc.): [redacted]

ADDRESS (Including Postal Code & Telephone Number):

Street Address: [redacted] **Unit/Apt:**

Postal Code: [redacted] **Telephone Number:** [redacted]

The City of Barrie is undertaking updates to the four Master Plans for Water Supply, Water Distribution and Storage, Wastewater Collection, and Wastewater Treatment. These studies are being conducted in accordance with the requirements of the Municipal Class Environmental Assessment (EA) process, to identify the existing deficiencies, increasing system capacity and projecting future infrastructure needs throughout the City. The study area encompasses the entire City, including the annexed lands.

A copy of the Public Information Centre materials is available online on the City of Barrie web page at the following link: http://www.barrie.ca/eastudies.

Updates to the Water and Wastewater Master Plans will consider feedback received on these comment sheets as part of Public Information Centre process.

Please list below any concerns or comments you have related to the Water and Wastewater Master Plans below

Which Master Plan do your comments apply:

- [x] Water Supply
- [ ] Water Storage and Distribution
- [ ] Wastewater Treatment
- [x] Wastewater Collection
- [ ] All of the above

[redacted]

[redacted]

Are you satisfied with the level of detail of the information presented herein, at the Public Information Centre, and provided on the City website (http://www.barrie.ca/eastudies)?

☐	☐	☐	☑	☐
Poor (Much Improvement Required)	**Marginal** (Some Improvement Required)	**Good**	**Very Good**	**Excellent**

Please add a comment in support of your level of satisfaction below:

Do you wish to be informed of future Public Information Centers and of staff recommendation for the Preferred Alternative Solution?

☑ Yes ☐ No

Signature: [redacted] Date: [redacted]

Please submit this comment sheet by **Friday, December 1st, 2018** to:

Tom Reeve, P. Eng.
City of Barrie
Engineering Department
70 Collier Street, P.O. Box 400
Barrie, ON
L4M 4T5

Tel: (705) 739-4220 ext. 4465
Fax: (705) 739-4247

E-mail: Tom.Reeve@barrie.ca

Thank you for your comments

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Fax: (705) 739-4247

E-mail: Tom.Reeve@barrie.ca

Thank you for your comments

FIRST NATIONS AND MÉTIS								
FN	Alderville First Nation	Chief	James	Masden		P.O. Box 46 11696 Second Line Alderville, ON K0K 2X0	(905) 352-3000	jbmarsden@aldervillle.ca
FN	Algonquins of Ontario Consultation Office	Ms.	Janet	Stavinga	Executive Director	31 Riverside Drive, Suite 101 Pembroke, ON K8A 8R6	(613) 735-3759 ext. 202	jstavinga@nrtco.net
FN	Barrie Friendship Centre	Ms.	Samantha	Kinoshameg	Executive Director	175 Bayfield Street Barrie, ON L4M 3B4	(705) 721-7689 ext. 202	executivedirector@bnfc.ca
FN	Beausoleil First Nation	Chief	Mary	McCue-King		11 O'Gemaa Miikaan Christian Island, ON L9M 0A9	(705) 247-2239	bfnchief@chimnissing.ca
FN	Chippewas of Georgina Island	Chief	Donna	Big Canoe		R.R. #2 Box N-13 Sutton West, ON L0E 1R0	(705) 437-1337	donna.bigcanoe@georginaisland.com
FN	Chippewas of RAMA First Nation	Chief	Rodney	Noganosh		5884 Rama Road, Suite 200 Rama, ON L3V 6H6	(705) 325-3611 ext. 1240	chief@ramafirstnation.ca
FN	Curve Lake First Nation	Chief	Phyllis	Williams		Government Services Building 22 Winookeedaa Road Curve Lake, ON K0L 1R0		-
FN	Georgian Bay Métis Council	Mr.	David	Dusome	President	355 Cranston Crescent, P.O. Box 4 Midland, ON L4R 4K6	(705) 526-6335	-
FN	Hiawatha First Nation	Chief	Laurie	Carr		123 Paudash Street Hiawatha, ON K0L 2G0		chiefcarr@hiawathafn.ca
FN	Métis Nation of Ontario - Métis Consultation Unit	Sir or Madam				Métis Nation of Ontario Head Office 500 Old St. Patrick, Unit D	(613) 725-422	consultations@metisnation.org

						Ottawa, ON K1N 9G4		
FN	Mississauga's of Scugog Island First Nation	Chief	Kelly	LaRocca		Administration Building 22521 Island Road Port Perry, ON L9L 1B6		klarocca@scugogfirstnation.com
FN	Moose Deer Point First Nation	Chief	Barron	King		c/o Government Services P.O. Box 119 MacTier, ON P0C 1H0		chief@moosedeerpoint.com
FN	Moon River Métis Council		Tony	Muscat	President	820 Muskoka Road South Gravenhurst ON P1P 1K2	(705) 689-3941	moonrivermetiscouncil@outlook.com
FN	Wahta Mohawk First Nation	Chief	Philips	Franks		2664 Muskoka Road #38 P.O. Box 260 Bala, ON P0C 1A0	(705) 762-2354	-
FN	William Treaties First Nation		Karry	Sandy McKenzie	Williams Treaties First Nations Process Coordinator			inquiries@williamstreatiesfirstnations.ca
EXTERNAL AGENCIES								
UT	Bell Canada	Mr.	Robert	McKay	Network Manager	136 Bayfield Street Barrie ON L4M 3B1		-
UT	Bell Canada	Ms.	Angela	Taylor	Manager, Access Network Facilities	136 Bayfield Street, 2nd Floor Barrie ON L4M 3B1		-
UT	Enbridge				Municipal Notices	500 Consumers Road Toronto ON M2J 1P8		-
UT	Hydro One Networks Inc.	Ms.	Rossella	Fazio	Manager, Transmission Lines Sustainment Investment Planning	483 Bay Street North Tower, 15th Floor Toronto ON M5G 2P5	(416) 345-6411	rossella.fazio@HydroOne.com

UT	Innisfil Hydro Distribution Systems Ltd.	Mr.	John N.	Aseerwatham	Engineering Manager	7251 Yonge Street Innisfil ON L9S 0J3	(705) 431-6870	johna@innisfilhydro.com
UT	PowerStream	Mr.	Mark	Henderson	VP Asset Management & C.O.O.	161 Cityview Boulevard Vaughan ON L4H 0A9		mhenderson@barriehydro.com
UT	PowerStream				Engineering Clerk	161 Cityview Boulevard Vaughan ON L4H 0A9		engineeringadmin@powerstream.ca
UT	Rogers Cable In.c	Mr.	Doug	Washburn	Planning Manager	1 Sperling Drive, P.O. Box 8500 Barrie ON L4M 6B8		-
FP	Ministry of Environment and Climate Change	Mr.	Rob	Dobos	Manager, Environmental Assessment Section Environmental Protection Branch - Ontario Region	867 Lakeshore Road Burlington ON L7R 4A6	(905) 336-4953	rob.dobos@canada.ca
FP	Ministry of Environment and Climate Change	Ms.	Cindy	Hood	District Manager	54 Cedar Pointe Drive Barrie ON L4N 5R7	(705) 739-6441	-
FP	Ministry of Environment and Climate Change	Mr.	Dan	Orr	Manager, Technical Support Section	Central Region 5775 Yongew Street, 8th Floor North York ON M2M 4J1	(416) 326-3740	-
FP	Ministry of Environment and Climate Change		Chunmei	Liu	EA & Planning Coordinator	Central Region 5775 Yongew Street, 8th Floor North York ON M2M 4J1	(416) 326-4886	-
FP	Ministry of Environment and Climate Change		Halyna	Perun	Director, Legal Services Branch	135 St Clair Avenue West, 10th Floor Toronto ON M4V 1P5		-
FP	Ministry of Environment and Climate Change				Project Review Unit, Environmental	135 St Clair Avenue West, 10th Floor		-

					Approvals Branch	Toronto ON M4V 1P5		
FP	Fisheries Protection Program - Department of Fisheries and Oceans					867 Lakeshore Road Burlington ON L7R 4A6		-
FP	Indigenous and Northern Affairs Canada				Environmental Assessment Unit	25 St. Clair Avenue East, 8th Floor, Toronto ON M4T 1M2		EACoordination_ON@aandc-aadnc.gc.ca
FP	Ministry of Indigenous Relations and Reconciliation	Ms.	Rachael	Manson-Smith	Manager, Ministry Partnerships Unit	Toronto ON M4T 1M2	(416) 325-7032	mma.ea.review@ontario.ca
FP	Ministry of Agricultre, Food and Rural Affairs	Ms.	Jocelyn	Beatty	Rural Planner	Elora Resource Cetnre 6484 Wellington Road 7 Elora ON N0B 1S0	(519) 846-3405	jocelyn.beatty@ontario.ca
FP	Ministry of Agricultre, Food and Rural Affairs	Mr.	Ray	Vilaitis	Rural Planner	95 Dundas Street RR#3 Brighton ON K0K 1H0	(613) 475-1630	-
FP	Ministry of Agricultre, Food and Rural Affairs	Mr.	John	Turney	Policy Advisor	1 Stone Road W, 3rd Floor Guelph ON N1G 4Y2	(519) 826-3100	-
FP	Ministry of Economic Development and Growth	Mr.	John	Bullen	Manager, Cabinet Office and Policy Support Unit	900 Bay Street, 6th Floor Hearst Block Toronto ON M7A 2E1	(416) 325-0186	john.bullen@ontario.ca
FP	Ministry of Economic Development and Growth	Mr.	Michael	Helfinger	Senior Policy Advisor, Cabinet Office Liaison and Policy Support Unit	900 Bay Street, 6th Floor Hearst Block Toronto ON M7A 2E1	(416) 325-6519	michael.helfinger@ontaro.ca
FP	Ministry of Economic Development and Growth	Mr.	Brad	Duguid	Minister of Economic Development, Employment and Infrastructure	900 Bay Street, 6th Floor Hearst Block Toronto ON M7A 2E1	(416) 325-6900	-

FP	Ministry of Energy	Mr.	Andrea	Pastori	Cabinet Liaison and Strategic Policy Branch Coordinator, Strategic Policy and Analytics Branch, Strategic, Network and Agency Policy Division	77 Grenville Street, 6th Floor Toronto ON M7A 2C1	(416) 327-7276	andrea.pastori@ontario.ca
FP	Infrastructure Ontario	Mr.	Peter	Reed	Director, Land Use Planning	1 Dundas Street. W., Suite 2000 Toronto ON M5G 2L5	(416) 578-6740	peter.reed@infrastructureontario.ca
FP	Infrastructure Ontario	Mr.	Tate	Kelly	Planning Coordinator	1 Dundas Street. W., Suite 2000 Toronto ON M5G 2L5	(416) 327-1925	tate.kelly@infrastructureontario.ca and noticereview@infrastructureontario.ca
FP	Infrastructure Ontario	Ms.	Lisa	Myslicki	Environmental Advisory	1 Dundas Street. W., Suite 2000 Toronto ON M5G 2L5	(416) 212-3768	-
FP	Ministry of Municipal Affairs	Mr.	Victor	Doyle	Manager, Planning Innovation Section - Provincial Policy Branch	77 Bay Street, 13th Floor Toronto ON M5G 2E5	(416) 585-6109	victor.doyle2ontario.ca
FP	Ministry of Municipal Affairs and Housing	Mr.	Mark	Christie	Manager Community Planning and Development, Eastern Municipal Services Office	77 Bay Street, 3rd Floor Toronto ON M5G 2E5	(416) 585-6063	mark.christie@ontario.ca
FP	Ministry of Natural Resources and Forestry	Ms.	Kim	Benner	District Planner, Midhurst District	Kemptville District 2284 Nursery Road Midhurst ON K0G 1J0	(705) 725-7534	kim.benner@ontario.ca
FP	Ministry of Natural Resources and Forestry	Mr.	Ken	Mott	District Planner, Midhurst District	Kemptville District 2284 Nursery Road Midhurst ON K0G 1J0	(705) 725-7546	Ken.mott@ontario.ca

FP	Ministry of Natural Resources and Forestry	Ms.	Katherine	Woeller	District Planner, Midhurst District	Kemptville District 2284 Nursery Road Midhurst ON K0G 1J0	(705) 725-7546	-
FP	Ministry of Natural Resources and Forestry	Ms.	Alison	MacKenzie	Director, Legal Services Branch	Legal Services Branch, 99 Wellesley St. West Toronto ON M7A 1W3		-
FP	Ministry of Tourism, Culture & Sport	Ms.	Laura	Hatcher	Team Lead - Hertiage Land Use Planning	Culture Division 401 Bay Street, Suite 1700 Toronto ON M7A 0A7		
FP	Ministry of Tourism, Culture & Sport	Ms.	Karla	Barboza	Team Lead - Heritage Program Unit	Culture Division 401 Bay Street, Suite 1700 Toronto ON M7A 0A7	(416) 314-7120	karla.barboza@ontaro.ca
FP	Ministry of Tourism, Culture & Sport	Ms.	Rosi	Zirger	Heritage Planner	401 Bay Street, Suite 1700 Toronto ON M7A 0A7	(416) 314-7159	rosi.zirger@ontario.ca
FP	Ministry of Tourism, Culture & Sport	Mr.	Dan	Minkin	Heritage Planner	401 Bay Street, Suite 1700 Toronto ON M7A 0A7	(416) 314-7159	dan.minkin@ontario.ca
FP	Ministry of Tourism, Culture & Sport	Mr.	Chris	Rosati	Manager, Central Region	400 University Avenue, 2nd Floor	416-314-6682	christopher.rosati@ontario.ca
FP	Ministry of Transportation	Mr.	Rob	Vandenberg	Senior Project Engineer	Toronto ON M7A 2R9		
FP	Ministry of Transportation	Mr.	Glenn	Higgins	Team Leader	777 Bay Street, 30th Floor, Suite 3000 Toronto ON M7A 2J8	(416) 585-7336	Glenn.Higgins@ontario.ca
FP	Ministry of Transportation	Mr.	Peter	Dorton	Senior Project Manager	MTO Central Region 159 Sir William Hearst Ave., 7th Floor Toronto ON M3M 0B7	416.235.4280	peter.dorton@ontario.ca

FP	Ministry of Transportation	Mr.	John	van Voorst	Drainage Engineer	Not provided	Not provided	Not provided
FP	Ministry of Transportation	Ms.	Olga	Garces	Area Manager, York & Simcoe	Central Region 159 Sir William Hearst Avenue, 4th Floor North York ON M3M 0B7	9416) 235-5533	-
FP	Ministry of Transportation				Director, Legal Services Branch	1201 Wilson Avenue, Building B 1st Floor Toronto ON M3M 1J8		-
FP	Ministry of Transportation	Mr.	Jason	White	Manager, Engineering Office - Central Region	Central Region 159 Sir William Hearst Avenue, 5th Floor North York ON M3M 0B7	(416) 235-5575	jason.white@ontario.ca
FP	Ontario Clean Water Agency	Mr.	M.	Tracey		100 Woodland Drive Wasaga Beach ON L0L 2P0		-
FP	Ontario Growth Secretariat	Mr.	Andrew	Theoharis	Manager, Growth Policy	777 Bay Street, 4th Floor, Suite 428	416-325-7335	andrew.theoharis@ontario.ca
FP	Ministry of Health and Long Term Care	Mr.	Tony	Amalfa	Manager, Environmental Health Policy and Programs	Toronto ON M5G 2E5	416-327-7624	tony.amalfa@ontario.ca
FP	CN Rail	Mr.	Stefan	Linder	Manager, Public Works Design and Construction	4 Welding Way off Administration Road	905-669-3264	stefan.linder@cn.ca
FP	Service Ontario				Ministry of Health Secretary	Vaughan ON L4K 1B9		-
CA	Nottawasaga Valley Conservation Authority	Mr.	Glenn	Switzer	Director, Engineering and Technical Services	John Hix Conservation Administration Centre Tiffin Conservation Area	(705) 424-1479 ext.232	gswitzer@nvca.on.ca

						8195 8th Line Utopia ON L0M 1T0		
CA	Lake Simcoe Region Conservation Authority	Mr.	Charles	Burgess	Senior Planning Coordinator	120 Bayview Parkway Newmarket ON L3Y 3W3	(905) 895-1281	cburgess@lsrca.on.ca
CA	Lake Simcoe Region Conservation Authority	Mr.	Tom	Hogenbirk	Manager, Engineering and Technical Serivces	120 Bayview Parkway Newmarket ON L3Y 3W3	(905) 895-1281	t.hogenbirk@lsrca.on.ca
CA	Lake Simcoe Region Conservation Authority	Ms.	Melinda	Bessey	Development Planner	120 Bayview Parkway Newmarket ON L3Y 3W3	(905) 895-1281	m.bessey@lsrca.on.ca
MUN	Springwater Township	Mr.	John	Dayley	Clerk	2231 Nursey Road Minesing ON L0L 1Y2	(705) 728-4784	-
MUN	Springwater Township	Mr.	Brad	Sokach	Planning & Works	2231 Nursey Road Minesing ON L0L 1Y2	(705) 728-4784 ext. 2034	-
MUN	Town of Innisfil	Mr.	Andrew	Campbell	CEO and President - InnServices Utilities Inc.	2101 Innisfil Beach Road Innisfil ON L9S 1A1		acampbell@innservices.com
MUN	Town of Innisfil	Mr.	Tim	Cane	Manager of Land Use Planning	2101 Innisfil Beach Road Innisfil ON L9S 1A1		-
MUN	Simcoe County	Ms.	Deborah Korolnek	Korolnek	General Manager, Engineering, Planning & Environmental Division	Administration Centre 1110 Highway 26 Midhurst ON L9X 1N6	(705) 726-9300	-
INTERNAL								
MUN	Environmental Advisor Committee		Mike	McCann				
MUN	Environmental Advisor Committee	Chair	Peter	Bursztyn		11 Kenny Crescent, Barrie ON L4N6CY		
MUN	Environmental Advisor Committee	Vice Chair	Alan			333 St. Vincent St., Barrie ON L4M 3Y3		
MUN	Environmental Advisor Committee		Stepan	Bollinger		6 Forestwood Lane, Barrie ON L4N 7S5		

MUN	Environmental Advisor Committee		Clinton	Reynolds		83 Burton Avenue, Barrie, ON L4N 2R5		
MUN	Environmental Advisor Committee		Gerald	Poisson		27 William Street, Barrie, ON L4N 3J4		
MUN	Environmental Advisor Committee		Wayne	Wilson		62 Eugenia Street, Barrie, ON L4M 1R1		
MUN	City of Barrie - Legislative & Court Services	Ms.	Dawn	McAlpine	Director of Legislative & Court Services	70 Collier Street, P.O. Box 400 Barrie ON L4M 4T5	(705) 739-4220 ext. 4421	Dawn.McAlpine@barrie.ca
MUN	City Of Barrie - Engineering	Mr.	Walter	Fischer	Supervisor of Parks Planning & Development	70 Collier Street, P.O. Box 400 Barrie ON L4M 4T5	(705) 739-4220 ext. 5101	Walter.Fischer@barrie.ca
MUN	City Of Barrie - Engineering	Ms.	Clare	Maher	Landscape Architectural Planner	70 Collier Street, P.O. Box 400 Barrie ON L4M 4T5		clare.maher@barrie.ca
MUN	City of Barrie - Road, Parks & Fleet	Mr.	Kevin	Rankin	Forestry Supervisor	70 Collier Street, P.O. Box 400 Barrie ON L4M 4T5		kevin.rankin@barrie.ca
MUN	City of Barrie - Road, Parks & Fleet	Ms.	Jenna	Webb	Parks & Forestry Technician	70 Collier Street, P.O. Box 400 Barrie ON L4M 4T5		jenna.webb@barrie.ca
MUN	City of Barrie - Waste Water Operations		Sandy	Coulter	Manager of Waste Water Operations	70 Collier Street, P.O. Box 400 Barrie ON L4M 4T5	(705) 739-4220 ext. 5231	sandy.coulter@barrie.ca
MUN	City of Barrie - Recreation	Ms.	Barb	Roth	Director of Recreation Services	70 Collier Street, P.O. Box 400 Barrie ON L4M 4T5	(705) 739-4220 ext. 4510	Barb.Roth@barrie.ca
MUN	City of Barrie - Facilities & Transit	Mr.	Rick	Pews	Director of Facilities & Transit	70 Collier Street, P.O. Box 400 Barrie ON L4M 4T5	(705) 739-4220 ext. 4510	
MUN	City of Barrie - Planning		Andrea	Bourrie	Director of Planning Services	70 Collier Street, P.O. Box 400 Barrie ON L4M 4T5		andrea.bourrie@barrie.ca
MUN	City of Barrie - Planning		Merwan	Kalyaniwalla	Manager of Planning Policy	70 Collier Street, P.O. Box 400	(705) 739-4220 ext. 4314	Merwan.Kalyaniwalla@barrie.ca

						Barrie ON L4M 4T5		
MUN	City of Barrie - Planning	Ms.	Stacey	Forfar	Manager of Growth Planning	70 Collier Street, P.O. Box 400 Barrie ON L4M 4T5		-
MUN	City of Barrie - Traffic	Mr.	Steve	Rose	Manager of Traffic & Parking Services	165 Ferndale Drive, P.O. Box 400 Barrie ON L4M 4T5		-
MUN	City of Barrie - Finance	Mr.	Craig	Millar	Director of Finance	70 Collier Street, P.O. Box 400 Barrie ON L4M 4T5	(705) 739-4220 ext. 4428	Craig.Millar@barrie.ca
MUN		Mr.	John	Thompson	Director of Environmental Services	70 Collier Street, P.O. Box 400 Barrie ON L4M 4T5	(705) 739-4220 ext. 4802	john.thompson@barrie.ca
EMER	Ontario Provincial Police	Mr.	Andy	Mayo	Staff Sargeant	20 Rose Street Barrie ON L4M 2T2	(705) 726-6484	-
EMER	Ontario Provincial Police	Mr.	Scott	Couse	Highway Safety Division	20 Rose Street Barrie ON L4M 2T2		-
EMER	City of Barrie - Fire	Mr.	Bill	Boyes	Fire Chief	155 Dunlop Street West, P.O. Box 400 Barrie ON L4M 4T5	(705) 739-4220 ext. 3256	bill.boyes@barrie.ca
EMER	City of Barrie - Fire	Mr.	David	Lalonde	Fire Prevention Officer	155 Dunlop Street West, P.O. Box 400 Barrie ON L4M 4T5	(705) 739-4220 ext. 3221	Sue.Dawson@barrie.ca
EMER	City of Barrie Police Department	Ms.	Kimberly	Greenwood	Police Chief	29 Sperling Drive Barrie ON L4M K9	(705) 725-7025	info@barrie.ca
SB	Simcoe County District School Board	Ms.	Holly	Spapek	Senior Planner	1170 Mighway 26 Midhurst ON L0L 1X0	(705) 728-7570	
SB	Simcoe Muskoka Catholic District School Board	Ms.	Jennifer	Sharpe	Planner	46 Alliance Blvd. Barrie ON L4M 5K3	(705) 722-3555	jsharpe@smcdsb.on.ca
OTHERS								

IG	A Channel Barrie				Station Manager	3 Beacon Road Barrie ON L4N 9J9	(705)734.3300	
IG	Albarrie	Mr.	Peter J.	Koetsier	Vice President, Administration	85 Morrow Road Barrie ON L4N 3V7	(705)737-0551	peter_koetsier@albarrie.com
IG	Canadian Home Builders Association - Simcoe County	Ms.	Sheila	Missa	Exective Director	P.O. Box 305 Barrie ON L4M 4T5		
IG	Ducks Unlimited	Mr.	William	Jones	Ontario Development Manager	740 Huronia Road, Unit 1 Barrie ON L4N 6C6	(705) 721-4444	w_jones@ducks.ca
IG	Greater Barrie Chamber of Commerce	Ms.	Sybil	Goruk	Executive Director	97 Toronto Street Barrie ON L4N 1V1		-
IG	Ontario Realty Corporation	Mr.	Anton	Pojasok	Vice President, Professional Services	1 Dundas Street W. Toronto ON M5G 2L5	(416) 327-3937	
IG	Simcoe Muskoka District Health - Barrie Office	Dr.	Charles	Gardner	Medical Officer of Health	15 Sperling Drive Barrie ON L4M 6K9		-
IG	Simcoe Muskoka District Health - Barrie Office	Ms.	Sherry	Diaz	Public Health Nurse	15 Sperling Drive Barrie ON L4M 6K9		-
IG	Tourism Barrie	Ms.	Kathleen	Trainor	Executive Director	205 Lakeshore Drive Barrie ON L4N 7Y9	(705) 739-9444 ext. 103	-
IG	Simcoe County Heavy Construction Association					c/o BCA 200 Brock Barrie ON L4N 5K3		-
GENERAL PUBLIC								
GP	NA	Mr.	Ron	Gemmell	Retired (former Manager of Environmental Services)	NP	NP	hrgemmell@rogers.com
STAKEHOLDERS								
SH	Downtown Barrie BIA	Mr.	Criag	Stevens		50 Dunlop St. E., Suite 204 Barrie ON L4M 6J9		cstevens@downtownfire.ca

SH	Transition Barrie / Living Green Barrie	Mr.	Mike	Fox				mcfox@sympatico.ca
SH	Barrie Downtown Neighbourhoods Association	Ms.	Caroline	Smith	Chair		(705) 735 1939	cstolinee.smith@reogrees.fom
SH	Annexed Land Holders Group	Mr.	Al	Steedman				asteedman@schaeffers.com
SH	Annexed Land Holders Group	Mr.	Barry	Green				b.green@rogers.com
SH	Annexed Land Holders Group	Mr.	Bryan	Richardson				bryan.richardson@rjburnside.com
SH	Annexed Land Holders Group	Mr.	Darren	Steedman				dsteedman@dggroup.ca
SH	Annexed Land Holders Group	Mr.	Don	Pratt				dpratt@prattdevelopment.ca
SH	Annexed Land Holders Group	Mr.	Eric	Lawton				ericlawton@rogers.com
SH	Annexed Land Holders Group	Mr.	Hugh	Johnston				hjohnston@prattdevelopment.ca
SH	Annexed Land Holders Group	Mr.	Jamie	Shapiro				jaime.shapiro@securekey.com
SH	Annexed Land Holders Group	Mr.	John	Tjeerdsma				john.tjeerdsma@tjconsulting.com
SH	Annexed Land Holders Group	Mr.	Katy	Schofield				katy@greatgulf.com
SH	Annexed Land Holders Group	Mr.	Keith	MacKinnon				kmackinnon@KLMPlanning.com
SH	Annexed Land Holders Group	Mr.	Mark	Resnick				markres@greatgulf.com
SH	Annexed Land Holders Group	Mr.	Paolo	Sacilotto				psacilotto@dggroup.ca
SH	Annexed Land Holders Group	Mr.	Ray	Dhuamel				rduhamel@jonesconsulting.com

Water, Wastewater, Drainage, Transportation Master Plans

NOTICE OF COMPLETION

The City of Barrie has completed the six Master Plans under the Municipal Class Environmental Assessment Master Planning Process:

- Water Supply Master Plan
- Water Storage and Distribution Master Plan
- Wastewater Treatment Master Plan
- Wastewater Collection Master Plan
- Drainage Master Plan
- Transportation Master Plan

The Master Plans follow the planning process outlined in the Municipal Engineers Association Municipal Class Environmental Assessment document (October 2000, amended in 2007, 2011 and 2015). The Master Plans inform the City of Barrie of recommendations aimed at expanding and improving its water, wastewater, transportation and drainage infrastructure to meet the demands of the City's future population and employment. This was achieved through a combination of review of existing conditions, modeling, outreach, and collaboration to determine the long-term needs and priorities of the City.

The associated Schedule A, A+, B and C projects have been recommended as part of the study to accommodate the projected growth and are documented in the Master Plans and available on the City of Barrie website at barrie.ca→ City Hall→ Environmental Assessment Studies.

With Schedule A and A+ projects being pre-approved, this Notice of Completion only pertains to the Schedule B projects. Schedule C projects will have further public consultation components in the future associated with subsequent phases under the Municipal Class Environmental Assessment process.

The Master Plans have been conducted under Approach #2 of the Municipal Class Environmental Assessment process. The project included Public Information Centres where the public and stakeholders could provide comments on the project details and recommendations. Public and review agency comments received have been considered in the development of the recommended networks and infrastructure improvements. The Master Plans and a list of the Schedule A, A+, B and C projects have been placed in the public record for review and the documents are available during regular business hours on the City of Barrie website at barrie.ca→ City Hall→ Environmental Assessment Studies. If you wish to view a paper copy, please make an appointment with Tom Reeve using the contact information below.

Questions or concerns related to the above noted Master Plans or recommendations may be directed to Tom Reeve, within thirty (30) calendar days from the date of this notice:

Tom Reeve, P. Eng.
Senior Infrastructure Planning Program Coordinator
City of Barrie
70 Collier Street, 6th Floor
Barrie, ON L4M 4T5
Tel: (705) 739-4220 Ext. 4465
Email: Tom.Reeve@barrie.ca

If concerns arise that cannot be resolved with the City of Barrie, a person or party may request that the Minister of the Environment, Conservation and Parks make an Order for the project to comply with Part II of the Environmental Assessment Act (referred to as a Part II Order), which addresses individual environmental assessments. Part II Orders cannot be submitted in respect of the Master Plan itself, but must be made in respect to individual Schedule B projects listed in association with this notice. Requests must be received by the Minister at the address provided below within thirty (30) calendar days of this notice being issued. More information on making a Part II Order request, including the Part II Order request form, can be found at: https://www.ontario.ca/page/class-environmental-assessments-part-ii-order.

If no requests are received, the City of Barrie, upon receipt of necessary approvals from the provincial ministry, plans to proceed to the implementation of the recommended Schedule A, A+ and B projects identified in the Master Plan through a phased approach, dependent on future budget approvals. Schedule C projects will require further study.

This notice issued June 6, 2019 and June 13, 2019.

Information will be collected in accordance with the Freedom of Information and Protection of Privacy Act. With the exception of personal information, all comments will become part of public record.

Wendy Cooke
City Clerk

Bala Araniyasundaran, P. Eng.
Director of Engineering

APPENDIX

B WATER SYSTEM PROCESS SCHEMATIC

BARRIE NORTH

BARRIE CENTRAL

BARRIE SOUTH

VALVES INFORMATION		
VALVE ID	STREET NAME	SETTING
V3982	AUSTIN & ANNE	10
V6651	ANNE & AUSTIN	55,10
V255	CUNDLES & OAKRIDGE	10
V249	ANNE & SHELLY	10
V1848	LETITIA	10
V1790	KENNY	10
V1793	KEATS & FOX RUN	10
V1061	HEMINGWAY & FOXRUN	30
V983	LEWIS & FOXRUN	40
V699	BERCZY & EUGENIA	10
V6748	PEEL & WELLINGTON	10
V6749	WELLINGTON & PEEL	10
V4000	MARY & WELLINGTON	10
V4003	TORONTO & WELLINGTON	10
V8189/V5731	JOHNSON & CAMPFIRE	46/51,9
V5723	JOHNSON & SHANTY BAY	10
V8156/V4953	FAIRVIEW & ESSA	80/78
V1598	WILLIAM & BALDWIN	10
V5769	PRINCESS MARGARET	45
V851	ADELAIDE	10
V8174/V4885	GOLDEN MEADOW & CRIMSON RIDGE	50,9/43,9
V8162/V4850	COX MILL & DOCK	49,3/45
V1856	CRAWFORD & ALVA	10
V1196	PATTERSON & MORROW	10
V7394/V3149	HURONIA & YONGE	50/39,9
V8119/V3443	PATTERSON & MAYFAIR	47,9/45
V8224/V3527	SAUNDERS & WELHAM	65,1/48
V1935	CHURCHILL	10
V3230	MAYFAIR & FLORENCE PARK	10
V4749/V8153	FERNDALE & HARTHORNE & WILDWOOD	39,2/52,2
V4037	SNOWSHOE & DOVE	10
V8165/V7071	LOCKHART	61,9/55
V8217	ESSA	44,2
V6458	MAPLETON	40,6

FERNDALE E.T.
(H.W.L.: 347,0m)
(L.W.L.: 334,9M)
(TOTAL VOL.: 5.70 ML)

ZONE 3N

5,700m³

BAYFIELD E.T.
(H.W.L.: 324m)
(L.W.L.: 312m)
(TOTAL VOL.: 4.54 ML)

ZONE 2N

4,536m³

ZONE 3N

REDUCED ZONE 3N

308m

297m

289m

280m

V3982 V6651 V255 V249 V3443 V1848 V1790 V1793 V1061 V983

ZONE 2N

REDUCED ZONE 2N

296m

260m

220m

LEACOCK, BPS
(12,1ML/d)

ANNE RESERVOIR
(H.W.L.: 281,18m)
(L.W.L.: 275,08m
(TOTAL VOL.: 15,90ML)

ZONE 1

15,890m³

ANNE BPS
(11,8ML/d)

SUNNIDALE BPS
(16,33ML/d)

18,400m³

SUNNIDALE
RESERVOIR
(H.W.L.: 280,83m)
(L.W.L.: 274,55m)
(TOTAL VOL.:18,40ML)

ZONE 2N

CODRINGTON BPS
(10,9ML/d)

V699

ZONE 1

202m

219m

JOHNSON 13 WPS
(R,CAP.: 6,54ML/d)
(E,CAP.: 6,31ML/d)
(P.ELEV.: 28m)
(S.ELEV.: 26m)

JOHNSON 9 WPS
(R,CAP.: 6,54ML/d)
(E,CAP.: 7,60ML/d)
(P.ELEV.: 32m)
(S.ELEV.: 26m)

BROWN WOOD 16 WPS
(R,CAP.: 7,85ML/d)
(E,CAP.: 7,60ML/d)
(P.ELEV.: 25m)
(S.ELEV.: 23m)

LITTLE LAKE: 235m~266m EDGE: 250m~260m

SHANTY BAY: 220m~259m

CONNECTS TO HARVIE RESERVOIR
(CURRENTLY NOT IN SERVICE)

V6748 V6749 V3992 V4000 V4003 V8189 V5731

CROSS 18 WPS
(R,CAP.: 11,23ML/d)
(E,CAP.: 11,08ML/d)
(P.ELEV.: 21m)
(S.ELEV.: 19,5m)

CROSS 17 WPS
(R,CAP.: 11,23ML/d)
(E,CAP.: 11,08ML/d)
(P.ELEV.: 19,8m)
(S.ELEV.: 18m)

V5723

SARJEANT 7 WPS
(R,CAP.: 6,54ML/d)
(E,CAP.: 6,31ML/d)
(P.ELEV.: 10m)
(S.ELEV.: 8m)

JOHN 5 WPS
(R,CAP.: 6,54ML/d)
(E,CAP.: 5,62ML/d)
(P.ELEV.: 8,8m)
(S.ELEV.: 7,75m)

INNISFIL ST. BPS
(12,1ML/d)

V8156 V4953 V1598 V5769 V851 V8174 V4885 V8162 V4850 V1856 V1196 V7394 V3149

HERITAGE 14 WPS
(R,CAP.: 9,10ML/d)
(E,CAP.: 8,90ML/d)
(P.ELEV.: 7m)
(S.ELEV.: +1,1m)

CENTENNIAL 15 WPS
(R,CAP.: 9,10ML/d)
(E,CAP.: 8,90ML/d)
(P.ELEV.: 3,5m)
(S.ELEV.: -1,5m)

CENTENNIAL 12 WPS
(R,CAP.: 9,10ML/d)
(E,CAP.: 8,90ML/d)
(P.ELEV.: 1,2m)
(S.ELEV.: -1,5m)

HERITAGE 11 WPS
(9,10ML/d)
(R,CAP.: 9,10ML/d)
(E,CAP.: 6,31ML/d)
(P.ELEV.: 5m)
(S.ELEV.: -1m)

ANNE 3A WPS
(R,CAP.: 6,54ML/d)
(E,CAP.: MISSING)
(P.ELEV.: MISSING)
(S.ELEV.: MISSING)

PERRY 4A WPS
(R,CAP.: 6,54ML/d)
(E,CAP.: MISSING)
(P.ELEV.: MISSING)
(S.ELEV.: MISSING)

SIMCOE 19 WPS
(R,CAP.: 7,85ML/d)
(E,CAP.: MISSING)
(P.ELEV.: MISSING)
(S.ELEV.: MISSING)

160,85m 167,76m 167m 158,38m 153,22m 137,18m 130,3m 131,22m 124,07m 134,1m 139,2m 127,72m MISSING MISSING

MAPLEVIEW E.T.
(H.W.L.= 350m)
(L.W.L.=337,5m)
(TOTAL VOL.= 5,46ML)

ZONE 3S

5,455m³

HARVIE RESERVOIR
(H.W.L.: 307,6m)
(L.W.L.: 301,7m)
(TOTAL VOL.:27,3ML)

ZONE 2S

27,300m³

CONNECTS TO CROSS 18 WPS
(NOT CURRENTLY IN SERVICE)

CONNECTS TO CROSS 17 WPS
(NOT CURRENTLY IN SERVICE)

HARVIE BPS
(34,6ML/d)

ZONE 3S

REDUCED ZONE 3S

CHIEFTAIN

316m

295m

281m

276m

273m

245m

BIG BAY BPS
(30,2ML/d)

V8119 V3443 V1935 V3230 V8224 V3527 V4749 V8153 V8165 V7071 V8217 V4037 V6458

ZONE 2S

231m

281m

SWTP HLPS
(65,2ML/d)

SURFACE WATER
TREATMENT PLANT
(H.W.L.: 255,50m)
(TOTAL VOL.: 20 ML)

ZONE 2S

LLPS
(60ML/d)

LAKE SIMCOE

22m

219m

600m

178m

LEGEND

HLPS: HIGH LIFT PUMPING STATION

LLPS: LOW LIFT PUMPING STATION

V: VALVE

H.W.L.: HIGH WATER LEVEL

L.W.L.: LOW WATER LEVEL

R. CAP.: RATED CAPACITY

E. CAP.: EFFECTIVE CAPACITY

P. ELEV.: PUMP ELEVATION

S. ELEV.: STATIC ELEVATION

BOTTOM OF WELL ELEVATION

WATERMAIN PIPE

WATERMAIN PIPE - NOT CURRENTLY IN SERVICE

BREAKLINE

GATE VALVE (GV)

THROTTLE CONTROL VALVE (TCV)

PRESSURE REDUCING VALVE (PRV)

PRESSURE SUSTAINING VALVE (PSV)

BOOSTER PUMPING STATION (BPS)

WELL PUMPING STATION (WPS)

RESERVOIR

ELEVATED STORAGE TANK (ET)

SURFACE WATER TREATMENT PLANT (SWTP)

Barrie

WSP
1224 GARDINERS ROAD, SUITE 201
KINGSTON, ONTARIO
CANADA K7P 0G2
PHONE: 613-634-7373
WWW.WSP.COM

CITY OF BARRIE WATER STORAGE & DISTRIBUTION NETWORK

FIGURE 2-2

APPENDIX

C DWWP, MDWL, PTTW

Ontario

DRINKING WATER WORKS PERMIT

Permit Number: 014-201
Issue Number: 8

Pursuant to the *Safe Drinking Water Act*, 2002, S.O. 2002, c. 32, and the regulations made thereunder and subject to the limitations thereof, this drinking water works permit is issued under Part V of the *Safe Drinking Water Act*, 2002, S.O. 2002, c. 32 to:

The Corporation of the City of Barrie

70 Collier Street
P.O. Box 400
Barrie, ON L4M 4T5

For the following municipal residential drinking water system:

Barrie Drinking Water System

This drinking water works permit includes the following:

Schedule	Description
Schedule A	Drinking Water System Description
Schedule B	General
Schedule C	All documents issued as Schedule C to this drinking water works permit which authorize alterations to the drinking water system
Schedule D	Process Flow Diagrams

DATED at TORONTO this 10th day of July, 2017

Signature

Aziz Ahmed, P.Eng.
Director
Part V, *Safe Drinking Water Act*, 2002

Schedule A: Drinking Water System Description

System Owner	**The Corporation of the City of Barrie**
Permit Number	**014-201**
Drinking Water System Name	**Barrie Drinking Water System**
Schedule A Issue Date	**July 10th, 2017**

1.0 System Description

1.1 The following is a summary description of the works comprising the above drinking water system:

Overview

The **Barrie Drinking Water System** consists of one (1) surface water treatment plant, twelve (12) groundwater wells, seven (7) booster pumping stations, three (3) in-ground storage reservoirs, three (3) elevated storage tanks, and approximately 620 kilometers of watermains and transmission mains.

Barrie Drinking Water System

Water Supply Plant

- Surface Water Treatment Plant

Groundwater Wells

- Well 3A
- Well 5
- Well 7
- Well 9
- Well 11
- Well 12
- Well 13
- Well 14
- Well 15
- Well 16
- Well 17
- Well 18

Booster Pumping Stations

- Anne North Booster Pump Station
- Big Bay Point Booster Pump Station
- Codrington Booster Pump Station
- Harvie Road Booster Pump Station
- Innisfil Booster Pump Station
- Leacock Booster Pump Station
- Sunnidale Road Booster Pump Station

Storage Reservoirs

- Anne Street North At-Grade Reservoir
- Harvie Road At-Grade Water Reservoir
- Sunnidale Road In-Ground Reservoir

Elevated Storage Tanks

- Bayfield Elevated Water Reservoir
- Ferndale North Elevated Water Reservoir
- Mapleview Elevated Water Reservoir

Surface Water Treatment Plant

Site Description

Name	City of Barrie Surface Water Treatment Plant
Street Address	20 Royal Parkside Drive, Barrie ON L4M 0C4
UTM Coordinates	NAD 83, Zone 17, +/- 3.0 m, 4913080 m N, 609500 m E
System Type	Surface water treatment
Notes	

Surface Water Supply

Intake Pipe

Description	Raw water intake pipe equipped with screened intake structure and raw water sample line extending into Lake Simcoe
Dimensions	A 1525 mm nominal diameter pipe extending approximately 750 m at a depth of approximately 26 m into the Lake Simcoe
Mussel Control	A mussel control system utilizing a chlorine gas system to inject chlorine at the intake using two (2) 50 mm HDPE carrier lines (one duty, one standby) extending the length of the intake, terminating in a diffuser at the intake structure
Intake Sampling System	Total chlorine residual and pH sampled at the intake structure downstream of the chlorine injection location and at the raw water header
	Turbidity and temperature sampled at the intake structure upstream of the chlorine injection location
Notes	N/A

Secondary Intake Pipe

Description	A second incomplete raw water intake pipe with provision for a chlorine solution injection line for mussel control and a raw water sample line, for future use if required
Dimensions	A 1525 mm nominal diameter pipe extending approximately 150 m (terminated with a blind flange)
Notes	N/A

Low Lift Works

Low Lift Pumping Station

Location	23 Camelot Square, Barrie ON
UTM Coordinates	NAD 83, UTM Zone 17, 609040 m E, 4913821 m N
Description	One (1) 20 m diameter by 14 m deep in-ground wet well structure with two (2) interconnected raw water wet well cells of equal size, with provision to isolate each cell through one (1) 1200 mm by 1800 mm isolation sluice gate. Each cell equipped with one (1) 1200 mm by 1800 mm inlet sluice gate
Equipment	One (1) travelling screen and one (1) fixed screen, one in each wet well cell, with a mesh opening size of 9.5 mm
	One (1) duty 900 mm discharge header complete with a 600 mm magnetic flow meter and surge/pressure relief valves and one (1) standby 900 mm discharge header complete with a 600 mm magnetic flow meter and surge/pressure relief valves, both connected to 900 mm and 600 mm raw water mains
Pumps	Two (2) variable speed vertical turbine raw water pumps, each rated at 31.5 ML/d at 55 m TDH
	One (1) variable speed vertical turbine raw water pump rated at 15.75 ML/d at 49 m TDH
	One (1) constant speed vertical turbine raw water pump rated at 15.75 ML/d at 49 m TDH
Chlorine	A chlorine gas system used for pre-chlorination (mussel control) and disinfection located at the low lift pumping station in one tonne chlorine gas cylinders and stored in a chlorine gas storage room
	A dry type chlorine gas scrubber capable of neutralizing 200 kg/min of chlorine gas or one (1) complete one tonne chlorine gas cylinder
Notes	N/A

Strainers

Membrane Feed Strainers

Description	Two (2) self-cleaning strainers (one duty, one standby) with mesh openings of 0.5 mm
Notes	Hydraulic pressure differential indicates need for cleaning

Flocculation

Flocculation Tanks

Description	A flocculation system consisting of two (2) basins, each with two (2) compartments. Each compartment containing one mechanical mixer
Dimensions	Each basin with a total storage volume of 670 m^3
Monitoring	A sampling station complete with temperature transmitter, turbidity analyzer and pH analyser located immediately upstream of the dynamic mixer
	One (1) ultrasonic level sensor located in the flocculation inlet channel
Notes	N/A

Primary Membrane Filtration

Filters

Description	A total of five (5) trains for a total firm production of 60 ML/day
Pumps	Five (5) variable speed centrifugal type permeate pumps (one per train), each pump capable of delivering 1,012 m^3/hour with a TDH of 15.8 m, complete with a magnetic flow meter and a sampling station on each permeate discharge monitoring turbidity
	Two (2) recirculation pumps (one duty, one standby) capable of delivering 214 m^3/hour at a TDH of 8.1 m to transfer membrane cleaning solution into the membrane tanks and to complete neutralization within the neutralization tanks. The recirculation pumps are shared with the secondary membrane system
	Two (2) heated water recirculation pumps (one duty, one standby) to circulate water within the membrane tank during a recovery clean and capable of delivering 18 m^3/hour at a TDH of 10 m. The pumps are shared with the secondary membrane system
	Two (2) backpulse pumps, (one duty, one standby) capable of delivering 1,012 m^3/hour with a TDH 16.1 m to draw water from the backpulse tanks and to reverse flow through the primary membranes to remove foulants
Tanks	Two (2) concrete equalization tanks (one duty, one standby) with volumes of 685 m^3 (Equalization tank #1) and 875 m^3 (Equalization Tank #2) used for primary membrane backwash water and GAC backwash water storage. Each tank is equipped with an ultrasonic level sensor
	Two (2) concrete neutralization tanks (one duty, one standby) with the dimensions of 2.4 m by 3.6 m by 4.7 m high and an operating volume of 35 m^3 for the neutralization of the membrane cleaning solution, and heating of water for the membrane heated cleans. Each tank is shared with the secondary membrane system and equipped with an ultrasonic level sensor
Heat Cleaning System	Heated cleaning system utilizing hot water from the building services boilers through a heat exchanger, and comprised of air separators, pressure and temperature gauges, pressure and flow switches and associated valves and piping. The heated cleaning system is shared with the secondary membrane system
Air Compressors	Two (2) air compressors (one duty, one standby) for providing compressed air to the pneumatic valves. The air compressors are shared with the secondary membrane system
Air Blowers	Two (2) air blowers (one duty, one standby) capable of delivering approximately 1100 Nm^3/h for providing scouring air to the membrane tanks

	during backwashes and chemical cleans
Air Removal System	Ejector on each primary membrane header to evacuate air from the system
Primary Membrane Feed Channel	One (1) concrete primary membrane feed channel equipped with two (2) ultrasonic level sensors
Monitoring	Operating interface that monitors membrane integrity testing, log reduction value criteria, filtrate turbidity measurements, maintenance clean sequences and operating pressures
Notes	N/A

Secondary Membrane Filtration

Filters

Description	Two (2) trains each with a production rate of 3.3 ML/day
Pumps	Two (2) variable speed centrifugal type permeate pumps (one per train) capable of delivering 1.58 ML/d each, complete with a magnetic flow meter and a sampling station on each permeate discharge pipe monitoring turbidity
Tanks	Two (2) concrete waste tanks (one duty, one standby) with the dimensions of 5.0 m by 3.2 m by 4.7 m high and 7.0 m by 3.0 m by 4.7 m high, used for temporary storage of secondary membrane backwash water, neutralized secondary membrane chemical waste and flocculation drain lines. Each tank is equipped with an ultrasonic level sensor. Turbidity and total suspended solids analyzers are located at the combined discharge of the waste tanks to sewer
Air Blowers	Two (2) air blowers (one duty, one standby) capable of delivering approximately 1100 Nm^3/h for providing scouring air to the membrane tanks during backwashes and chemical cleans
Air Removal System	Ejectors are located on each secondary membrane header to evacuate air from the system
Secondary Membrane Feed Channel	One (1) concrete secondary membrane feed channel equipped with one (1) ultrasonic level sensor
Monitoring	Operating interface that monitors membrane integrity testing, log reduction value criteria, filtrate turbidity measurements, maintenance clean sequences and operating pressures
Notes	N/A

Granular Activated Carbon Contractors

Dimensions	Three (3) granular activated carbon contactors, with a total carbon volume of 120 m^3
Backwash Pumps	Two (2) backwash pumps (one duty, one standby) capable of delivering 44 ML/day at a TDH of 12 m.
Notes	N/A

Chlorine Contact Chamber/On-Site Storage

Reservoir

Chlorine Contact Tank	Two (2) 5 ML chlorine contact tanks, each tank directly joined to the adjacent reservoir cells via a weir and equipped with a 450 mm magnetic flow meter and an ultrasonic level sensor
	A sampling station at the weir capable of monitoring pH and free chlorine
In-ground reservoir	Two (2) 5 ML in-ground interconnected reservoirs, complete with baffles and equipped with an ultrasonic level sensor for monitoring water levels in the reservoir
Notes	N/A

High Lift Works

High Lift Pumps

Description	Six (6) fixed speed vertical turbine pumps to provide a firm capacity of 72 ML/day (described below)
Pumps	Two (2) constant speed high lift pumps each rated at 29 ML/day, at a TDH of 65.5 m
	Three (3) constant speed high lift pumps each rated at 14.5 ML/day at a TDH of 65.5 m
	One (1) constant speed high lift pump rated at 7.0 ML/day at a TDH of 65.5 m for use during low demand periods
Sampling	A sampling station on the discharge of the high lift header capable of monitoring pH, temperature, free chlorine and turbidity
Notes	One (1) 900 mm discharge header complete with a 600 mm magnetic flow meter and surge/pressure relief valve and one (1) standby 900 mm discharge header complete with a 600 mm magnetic flow meter and surge/pressure relief valve, both connected to a 1200 mm watermain

Standby Power

Equipment	One (1) 2,000 kW diesel fired generator with a 25,000 L fuel tank to provide standby power requirements for Phase 1. The generator also supplies power to the low lift pumping station via a 13.8 kV feeder
Notes	N/A

Chemical Addition

Coagulant

Description	Coagulant dosing system
Feed Point	Coagulant added and mixed after the strainers using a 900 mm inline dynamic mixer
Equipment	Two (2) coagulant storage tanks 25,000 L each, complete with spill containment
	Three (3) peristaltic dosing pumps (two duty, one standby) capable of providing the appropriate dosage
Notes	N/A

Sulphuric Acid

Description	Sulphuric acid dosing system
Equipment	Two (2) sulphuric acid storage tanks, 25,000 L each, complete with spill containment
	Two (2) peristaltic dosing pumps (one duty, one standby) capable of providing the appropriate dosage
Notes	Not in use

Sodium Hypochlorite

Description	Sodium Hypochlorite dosing system
Equipment	One (1) 1,000 L sodium hypochlorite storage tank and tote, spill containment
	Two (2) peristaltic dosing pumps (one duty, one standby) capable of providing the appropriate dosage
Notes	N/A

Sodium Hydroxide

Description	Sodium Hydroxide dosing system
Equipment	One (1) 1,000 L sodium hydroxide storage tank and tote, spill containment
	Two (2) peristaltic dosing pumps (one duty, one standby) capable of providing the appropriate dosage
Notes	N/A

Citric Acid

Description	Citric acid dosing system
Equipment	One (1) 1,000 L citric acid storage tank and tote, spill containment
	Two (2) peristaltic dosing pumps (one duty, one standby) capable of providing the appropriate dosage
Notes	N/A

Calcium Thiosulfate

Description	Calcium thiosulfate dosing system
Equipment	One (1) 1,000 L calcium thiosulfate storage tank and tote, spill containment
	Two (2) peristaltic dosing pumps (one duty, one standby) for membrane cleaning neutralization capable of delivering the appropriate dosage
	Two (2) peristaltic dosing pumps (one duty, one standby) for emergency plant overflow dechlorination capable of delivering the appropriate dosage
Notes	N/A

Chlorine

Description	A chlorine gas system used for primary and secondary disinfection
Primary Feed Point	The chlorine contact tank inlet at surface water treatment plant
Secondary Feed Point	The high lift discharge header prior to entry to the distribution system at the surface water treatment plant
Equipment	Chlorine gas held in one tonne cylinders and stored in a chlorine storage room
	A dry type chlorine gas scrubber capable of neutralizing 200 kg/min of chlorine gas or one (1) complete one tonne chlorine gas cylinder
Notes	N/A

Groundwater Wells

Well 5, John Street

Location	217 John Street, Barrie ON
UTM Coordinates	NAD 83, Zone 17, +/- 3 m, Easting 602923 m and Northing 4914271 m
WWR No.	5700271
Description	Drilled groundwater well, pumphouse and appurtenances
Source Type	Non-GUDI
Dimensions	660 mm diameter, 106 m deep
Equipment	One vertical turbine well pump rated at 75.7 L/s, 76.8 m TDH, located in the well pumphouse with a 200 mm diameter discharge line connected to the well pump header and magnetic flow meter prior to entry into the distribution system
	Continuous online free chlorine residual and turbidity analyzers (raw water), including alarms and pump interlocks. Free chlorine residual is monitored prior to entry into the distribution system.
	Appurtenances and process piping, including a pump to waste connection, magnetic flowmeter and chemical injection points, prior to entry into the distribution system.
	Associated SCADA, electrical, mechanical and controls for an operable system
UV Primary Disinfection	Primary disinfection provided by a UV system (for a groundwater raw water supply in accordance with O. Reg. 170/03) composed of a UV reactor and a UV control cabinet. The UV reactor is a 300 mm cross flow design with four (4) medium pressure high intensity (MPHI) lamps, each MPHI lamp is equipped with a dedicated UV intensity sensor calibrated for 254 nm wave length. The MPHI lamps are housed in a quartz sleeve fitted with an automatic cleaning mechanism. The UV disinfection system is designed to provide a dosage of 40 mJ/cm^2 with a minimum UV transmittance of 85% and a maximum flow rate of 75.7 L/s. The UV control cabinet contains four (4) ballasts (1 ballast per each MPHI lamp) and maintains the UV dosage including controls and alarms to monitor continuous UV disinfection prior to entry into the distribution system including interlock between the UV monitors and vertical turbine well pump to shut down the vertical turbine well pump on low UV disinfection
Chlorine Secondary Disinfection	A secondary compound loop disinfection system in a separate room in the well pumphouse, consisting of two (2) chlorine gas cylinders including weigh scales, automatic switchover regulators injector, an automated control valve and a feed line and chlorine booster pump discharging into the well pump header in the well pumphouse prior to entry into the distribution system
Iron and Manganese Sequestering	A paced to flow iron and manganese sequestering system in the well pumphouse, utilizing a sodium silicate sequestering agent, consisting of a 4,540 L capacity double wall storage tank, with vacuum monitoring for secondary containment, and one automated chemical metering pump with a feed line system discharging into the pump header prior to the entry into the distribution system.
Stand-by Power	A 130 kW standby diesel generator complete with automatic transfer switch and one 1,135 L capacity diesel fuel storage tank and concrete containment crib. Standby power provided is sufficient to maintain full operation of the facility
Notes	N/A

Well 7, Sarjeant Drive

Location	44 Sarjeant Drive, Barrie ON
UTM Coordinates	NAD 83, Zone 17, +/- 3 m, Easting 602484 m and Northing 4914187 m
WWR No.	5709125
Description	Drilled groundwater well, pumphouse and appurtenances
Source Type	Non-GUDI
Dimensions	762 mm diameter, 100.7 m deep
Equipment	One vertical turbine well pump rated at 75.7 L/s at a TDH of 82.3 m located in the well pumphouse with a 200 mm diameter discharge line connected to the well pump header and magnetic flow meter prior to entry into the dedicated Chlorine Contact Pipe
	Continuous online free chlorine residual and turbidity analyzers (raw water), including alarms and pump interlocks. Free chlorine residual is monitored after the chlorine contact pipe
	Appurtenances including pump control valve and process piping
	Associated SCADA, electrical, mechanical and controls for an operable system
Chlorine Disinfection	A compound loop disinfection system in a separate room in the well pumphouse, consisting of two (2) chlorine gas cylinders including weigh scales, automatic switchover regulators injector, an automated control valve and a feed line and chlorine booster pump discharging into the pump header prior to entry into the dedicated chlorine contact pipe
	An in-ground dedicated Chlorine Contact Pipe, 2,100 mm diameter and 30.5 m long, located adjacent to the well pumphouse, including five (5) perforated baffle walls, vandal proof water tight access hatchways; dedicated to provide the required CT prior to the first customer
Iron and Manganese Sequestering	A paced to flow iron and manganese sequestering system in the well pumphouse, utilizing a sodium silicate sequestering agent, consisting of a 4,540 L capacity double wall storage tank, with vacuum monitoring for secondary containment, and one automated chemical metering pump with a feed line system discharging into the well pump header in the well pumphouse prior to the entry into the dedicated Chlorine Contact Pipe
Stand-by Power	A 130 kW standby diesel generator complete with automatic transfer switch and one 1,135 L capacity diesel fuel storage tank and concrete containment crib. Standby power provided is sufficient to maintain full operation of the facility
Notes	N/A

Well 9, Johnson Street

Location	168 Johnson Street, Barrie ON
UTM Coordinates	NAD 83, Zone 17, +/- 3 m, Easting 607034 m and Northing 4917647 m
WWR No.	5712496
Description	Drilled groundwater well, pumphouse and appurtenances
Source Type	Non-GUDI
Dimensions	610 mm diameter, 93 m deep
Equipment	A vertical turbine well pump, rated at 75.7 L/s at a TDH of 48.8 m, with a 250 mm diameter discharge line and magnetic flowmeter connected to the well pump header to the Chlorine Contact Chamber
	One (1) vertical turbine high lift water pump, with a rated capacity of 75.7 L/s at a TDH of 85 m with a 200 mm diameter discharge line and magnetic flowmeter, shared with the Well 13 high lift pump, connected to the distribution system
	Continuous online free chlorine residual and turbidity analyzers (raw water), including alarms and pump interlocks. Free chlorine residual is monitored after the chlorine contact chamber
	Appurtenances including pump control valve and process piping
	Associated SCADA, electrical, mechanical, and controls for an operable system
Chlorine Disinfection	A compound loop disinfection system in a separate room in the well pumphouse, consisting of two (2) chlorine gas cylinders including weigh scales, automatic switchover regulators injector, an automated control valve and a feed line and chlorine booster pump discharging into the well pump header in the well pumphouse prior to entry into the chlorine contact chamber
	A twin cell, in-ground Chlorine Contact Chamber having a minimum one (1) cell usable storage volume of 182 m^3 including baffle walls, dedicated to Well 9 that provides the required CT prior to the first customer
Iron and Manganese Sequestering	A paced to flow iron and manganese sequestering system utilizing a sodium silicate sequestering agent, consisting of an 8,000 L capacity storage tank, shared with Well 13, within a concrete crib for secondary containment, and one (1) dedicated automated chemical metering pump with a feed line system discharging into the pump header prior to entry into the chlorine contact chamber
Stand-by Power	A 300 kW standby diesel generator operated for either the Well 9 or Well 13 well pump and their associated systems (the other will be locked out), complete with automatic transfer switch and one (1) 900 L diesel fuel storage tank and concrete crib containment located in the Well 13 pumphouse
Notes	Second cell of in-ground chlorine contact chamber is dedicated to Well 13 treatment under normal operating conditions

Well 11, Heritage Park

Location	5 Simcoe Street, Barrie ON
UTM Coordinates	NAD 83, Zone 17, +/- 3 m, Easting 604692 m and Northing 4915824 m
WWR No.	5719246
Description	Drilled groundwater well, pumphouse and appurtenances
Source Type	Non-GUDI
Dimensions	610 mm diameter, 61.2 m deep
Equipment	A vertical turbine well pump, rated at 105.3 L/s at a TDH of 114.9 m with a 250 mm diameter discharge line and magnetic flowmeter connected to the well pump header to the supply main through a chlorine contact chamber of 18.3 m in length and 2.1 m in diameter
	Continuous online free chlorine residual and turbidity analyzers (raw water), including alarms and pump interlocks. Free chlorine residual is monitored after the chlorine contact chamber
	Appurtenances including gate valve and process piping
	Associated SCADA, electrical, mechanical, and controls for an operable system
Chlorine Disinfection	A compound loop disinfection system in a separate room in the well pumphouse, consisting of two (2) chlorine gas cylinders including weigh scales, automatic switchover regulators injector, an automated control valve and a feed line and chlorine booster pump discharging into the pump header prior to entry into the chlorine contact chamber
	An in-ground chlorine contact chamber, 2.1 m diameter and 18.3 m long equipped with baffles and vandal proof water tight hatchway, located approximately 22 m north of the well
Iron and Manganese Sequestering	A paced to flow iron and manganese sequestering system utilizing a sodium silicate sequestering agent, consisting of a 2,788 L capacity storage tank, within a fabricated steel crib for secondary containment and one (1) automated chemical metering pump with a feed line system discharging into the well pump header prior to entry into the Chlorine Contact Chamber
Stand-by Power	A 350 kW standby diesel generator operated for either the Well 11 or Well 14 well pump and their associated systems (the other will be locked out), complete with automatic transfer switch and one (1) 1,135 L diesel fuel storage tank and concrete crib containment located in the Well 14 pumphouse. Standby power provided is sufficient to maintain full operation of Well 11 or Well 14 but not both
Notes	N/A

Well 12, Centennial Park

Location	85 Lakeshore Drive, Barrie ON
UTM Coordinates	NAD 83, Zone 17, +/- 3 m, Easting 604479 m and Northing 4914589 m
WWR No.	5720696
Description	Drilled groundwater well, pumphouse and appurtenances
Source Type	Non-GUDI
Dimensions	762 mm diameter, 84 m deep
Equipment	A vertical turbine well pump, rated at 105.3 L/s at a TDH of 127.1 m, with a 300 mm diameter discharge line and magnetic flowmeter connected to the well pump header to the Chlorine Contact Pipe
	Continuous online turbidity analyzers (raw water), including alarms and pump interlocks.
	Appurtenances and process piping including a pump to waste connection, magnetic flowmeter and chemical injection points, prior to entry into the dedicated chlorine contact pipe
	Associated SCADA, electrical, mechanical, and controls for an operable system
Chlorine Disinfection	A compound loop disinfection system in a separate room in the pumphouse, consisting of two (2) chlorine gas cylinders including weigh scales, automatic switchover regulators, an automated control valve and with an injector and chlorine booster pump (located in the pump room) with a feed line discharging into the well pump header prior to entry into the Chlorine Contact Pipe
	A minimum of 750 m of 600 mm diameter transmission main which is utilized as a Chlorine Contact Pipe with a combined rated pump capacity of approximately 316 L/s
Chlorine Monitoring	Continuous online free chlorine residual including alarms and pump interlocks. Free chlorine residual is continuously monitored prior to entry into the chlorine contact pipe
	Weekly grab samples are taken at the downstream end of the chlorine contact pipe for chlorine monitoring purposes. The results of these samples are used together with upstream continuous chlorine monitoring to estimate chlorine depletion through the contact facility. The estimated chlorine depletion is factored into the SCADA algorithm to calculate CT.
Iron and Manganese Sequestering	A paced to flow iron and manganese sequestering system utilizing a sodium silicate sequestering agent, consisting of a 4,200 L capacity storage tank, within a fabricated steel crib for secondary containment, and one (1) automated chemical metering pump with a feed line system discharging into the well pump header prior to entry into the Chlorine Contact Pipe
Stand-by Power	A 210 kW standby diesel generator complete with automatic transfer switch and one (1) 900 L diesel fuel storage tank and concrete crib containment. Standby power provided is sufficient to maintain full operation of the facility
Notes	N/A

Well 13, Johnson Street

Location	168 Johnson Street, Barrie ON
UTM Coordinates	NAD 83, Zone 17, +/- 3 m, Easting 607016 m and Northing 4917663 m
WWR No.	5724686
Description	Drilled groundwater well, pumphouse and appurtenances
Source Type	Non-GUDI
Dimensions	610 mm diameter, 97.8 m deep
Equipment	A vertical turbine well pump, rated at 75.7 L/s at a TDH of 54.9 m, with a 250 mm diameter discharge line connected to the well pump header and magnetic flowmeter to a separate Chlorine Contact Chamber beneath the pumphouse building as referenced for Well 9 with a dedicated cell for the Well 13 supply
	One (1) sand separator rated at 75.7 L/s
	One (1) vertical turbine high lift water pump, with a rated capacity of 75.7 L/s at a TDH of 85 m with a 200 mm diameter discharge line and magnetic flowmeter, shared with the Well 9 high lift pump, connected to the distribution system
	Continuous online free chlorine residual and turbidity analyzers (raw water), including alarms and pump interlocks. Free chlorine residual is monitored after the chlorine contact chamber
	Appurtenances including pump control valve with isolation valve and process piping
	Associated SCADA, electrical, mechanical, and controls for an operable system
Chlorine Disinfection	A compound loop disinfection system in a separate room in the pumphouse, shared with Well 9, consisting of two (2) chlorine gas cylinders including weigh scales, automatic switchover regulators, an automated control valve, and with an injector (located in the pump room) with a feed line discharging into the well pump header prior to entry into the Chlorine Contact Chamber
	A twin cell, in-ground Chlorine Contact Chamber having a minimum one (1) cell usable storage volume of 182 m^3 including baffle walls, dedicated to Well 13 that provides the required CT prior to the first customer
Iron and Manganese Sequestering	A paced to flow iron and manganese sequestering system utilizing a sodium silicate sequestering agent, consisting of an 8,000 L capacity storage tank, shared with Well 9, within a concrete crib for secondary containment, and one (1) dedicated automated chemical metering pump with a feed line system discharging into the pump header prior to entry into the chlorine contact chamber
Stand-by Power	A 300 kW standby diesel generator operated for either the Well 9 or Well 13 well pump and their associated systems (the other will be locked out), complete with automatic transfer switch and one (1) 900 L diesel fuel storage tank and concrete crib containment located in the Well 13 pumphouse and shared with Well 9. Standby power provided is sufficient to maintain full operation of Well 9 or Well 13 but not both
Notes	First cell of in-ground chlorine contact chamber is dedicated to Well 9 treatment, under normal operating conditions

Well 14, Heritage Park

Location	19 Simcoe Street, Barrie ON
UTM Coordinates	NAD 83, Zone 17, +/- 3 m, Easting 604660 m and Northing 4915792 m
WWR No.	5727877
Description	Drilled groundwater well, pumphouse and appurtenances
Source Type	Non-GUDI
Dimensions	610 mm diameter, 61.1 m deep
Equipment	A vertical turbine well pump, rated at 105.3 L/s at a TDH of 114.3 m, with a 300 mm diameter discharge line and magnetic flowmeter connected to the well pump header to the dedicated Chlorine Contact Pipe
	One (1) sand separator rated at 106.1 L/s
	Continuous online turbidity analyzers (raw water), including alarms and pump interlocks.
	Appurtenances and process piping including a pump to waste connection, magnetic flowmeter and chemical injection points, prior to entry into the dedicated chlorine contact pipe
	Associated SCADA, electrical, mechanical, and controls for an operable system
Chlorine Disinfection	A compound loop disinfection system in a separate room in the pumphouse, consisting of two (2) chlorine gas cylinders including weigh scales and automatic switchover regulators, an automated control valve, and with an injector and chlorine booster pump (located in the pump room) with a feed line discharging into the well pump header prior to entry into the dedicated chlorine contact pipe
	Common 900 m of 450 mm diameter dedicated chlorine contact pipe and 150 m of 400 mm diameter dedicated chlorine contact pipe with a rated pump capacity of approximately 105 L/s
Chlorine Monitoring	Continuous online free chlorine residual including alarms and pump interlocks. Free chlorine residual is continuously monitored prior to entry into the chlorine contact pipe
	Weekly grab samples are taken at the downstream end of the chlorine contact pipe for chlorine monitoring purposes. The results of these samples are used together with upstream continuous chlorine monitoring to estimate chlorine depletion through the contact facility. The estimated chlorine depletion is factored into the SCADA algorithm to calculate CT.
Iron and Manganese Sequestering	A paced to flow iron and manganese sequestering system utilizing a sodium silicate sequestering agent, consisting of a 2,788 L capacity storage tank, within a fabricated steel crib for secondary containment, and one (1) automated chemical metering pump with a feed line system discharging into the well pump header prior to entry into the dedicated Chlorine Contact Pipe
Stand-by Power	A 350 kW standby diesel generator operated for either the Well 11 or Well 14 well pump and their associated systems (the other will be locked out) complete with automatic transfer switch and one (1) 1,135 L diesel fuel storage tank with concrete crib containment located in the Well 14 pumphouse and shared with Well 11. Standby power provided is sufficient to maintain full operation of Well 11 or Well 14 but not both
Notes	N/A

Well 15, Centennial Park

Location	55 Lakeshore Drive, Barrie ON
UTM Coordinates	NAD 83, Zone 17, +/- 3 m, Easting 604425 m and Northing 4915194 m
WWR No.	5728705
Description	Drilled groundwater well, pumphouse and appurtenances
Source Type	Non-GUDI
Dimensions	610 mm diameter, 61.1 m deep
Equipment	A vertical turbine well pump, rated at 105.3 L/s at a TDH of 127.1 m, with a 300 mm diameter discharge line and magnetic flowmeter connected to the well pump header to the dedicated Chlorine Contact Pipe
	Continuous online turbidity analyzers (raw water), including alarms and pump interlocks.
	Appurtenances and process piping including a pump to waste connection, magnetic flowmeter and chemical injection points, prior to entry into the dedicated chlorine contact pipe
	Associated SCADA, electrical, mechanical, and controls for an operable system
Chlorine Disinfection	A compound loop disinfection system in a separate room in the pumphouse, consisting of two (2) chlorine gas cylinders including weigh scales and automatic switchover regulators, an automated control valve and with an injector and chlorine booster pump (located in the pump room) with a feed line discharging into the well pump header prior to entry into the dedicated chlorine contact pipe
	A minimum of 715 m of 500 mm and 600 mm Transmission Main that is utilized as Chlorine Contact Pipe, with a combined minimum pump capacity of 210 L/s.
Chlorine Monitoring	Continuous online free chlorine residual including alarms and pump interlocks. Free chlorine residual is continuously monitored prior to entry into the chlorine contact pipe
	Weekly grab samples are taken at the downstream end of the chlorine contact pipe for chlorine monitoring purposes. The results of these samples are used together with upstream continuous chlorine monitoring to estimate chlorine depletion through the contact facility. The estimated chlorine depletion is factored into the SCADA algorithm to calculate CT.
Iron and Manganese Sequestering	A paced to flow iron and manganese sequestering system utilizing a sodium silicate sequestering agent, consisting of a 2,788 L capacity storage tank, within a fabricated steel crib for secondary containment, and one (1) automated chemical metering pump with a feed line system discharging into the well pump header prior to entry into the dedicated Chlorine Contact Pipe
Stand-by Power	A 230 kW standby diesel generator complete with automatic transfer switch and one (1) 900 L diesel fuel storage tank and concrete crib containment. Standby power provided is sufficient to maintain full operation of the facility
Notes	N/A

Well 16, Brown Wood Drive

Location	101 Brown Wood Drive, Barrie ON
UTM Coordinates	NAD 83, Zone 17, +/- 3 m, Easting 604025 m and Northing 4919588 m
WWR No.	5733545
Description	Drilled groundwater well, pumphouse and appurtenances
Source Type	Non-GUDI
Dimensions	600 mm diameter, 74.7 m deep
Equipment	A vertical turbine well pump, rated at 90.8 L/s at a TDH of 42.67 m, with a 300 mm diameter discharge line and magnetic flowmeter connected to the well pump header to the Chlorine Contact Chamber
	One (1) vertical turbine variable frequency drive high lift water pump, with a rated capacity of 90.8 L/s at a TDH of 82.55 m with a 300 mm diameter discharge line and magnetic flowmeter connected to the distribution system
	Continuous online free chlorine residual and turbidity analyzers (raw water), including alarms and pump interlocks. Free chlorine residual is monitored after the chlorine contact chamber
	Appurtenances including pump check valve and process piping
	Associated SCADA, electrical, mechanical, and controls for an operable system
Chlorine Disinfection	A compound loop disinfection system in a separate room in the pumphouse, consisting of two (2) chlorine gas cylinders including weigh scales and automatic switchover regulators, with an injector, an automated control valve, and a feed line discharging into the well pump header prior to entry into the chlorine contact chamber
	A single cell, in-ground Chlorine Contact Chamber having a minimum usable storage volume of 141 m^3 including baffle walls, ultrasonic liquid level transmitter with alarms, vents complete with insect screen overflow complete with air gap, vandal proof water tight access hatchways; dedicated to provide the required CT prior to the first customer
Iron and Manganese Sequestering	A paced to flow iron and manganese sequestering system utilizing a sodium silicate sequestering agent, consisting of a 3,300 L capacity storage tank, within a fabricated steel crib for secondary containment, and one (1) automated chemical metering pump with a feed line system discharging into the well pump header prior to entry into the chlorine contact chamber
Stand-by Power	A 275 kW standby diesel generator complete with automatic transfer switch and one (1) 948 L diesel fuel storage tank and concrete crib containment. Standby power provided is sufficient to maintain full operation of the facility
Notes	N/A

Well 17, Cross Street

Location	34 Cross Street, Barrie ON
UTM Coordinates	NAD 83 Zone 17 +/- 3 m, Easting 602045m and Northing 4913788m
WWR No.	5737406
Description	Drilled groundwater well, pumphouse and appurtenances
Source Type	Non-GUDI
Dimensions	600 mm diameter, 105.2 m deep
Equipment	A vertical turbine well pump rated at 130 L/s, 121 m TDH, located in the well pumphouse with a 250 mm diameter discharge line connected to the well pump header and magnetic flow meter prior to entry into the dedicated Chlorine Contact Pipe
	One sand separator rated at 130 L/s
	Continuous online turbidity analyzers (raw water), including alarms and pump interlocks.
	Appurtenances and process piping including a pump to waste connection, magnetic flowmeter and chemical injection points, prior to entry into the dedicated chlorine contact pipe
	Associated SCADA, electrical, mechanical and controls for an operable system
	Process piping, including magnetic flowmeter and chemical injection points, prior to entry into the dedicated chlorine contact pipe
Chlorine Disinfection	A compound loop disinfection system dedicated to Well 17, in a separate room shared with Well 18 works, in the well pumphouse, consisting of two (2) chlorine gas cylinders including weigh scales, automatic switchover regulators injector, an automated control valve and with a feed line and chlorine booster pump discharging into the Well 17 well pump header in the well pumphouse prior to entry into the dedicated Chlorine Contact Pipe
	432 m of dedicated Chlorine Contact Pipe, comprising of 600 mm diameter and 900 mm diameter, to provide the required CT prior to the first customer at the combined flow of 260 L/s from Well 17 and Well 18
Chlorine Monitoring	Continuous online free chlorine residual including alarms and pump interlocks. Free chlorine residual is continuously monitored prior to entry into the shared chlorine contact pipe for Wells 17 & 18
	Weekly grab samples are taken at the downstream end of the chlorine contact pipe for chlorine monitoring purposes. The results of these samples are used together with upstream continuous chlorine monitoring to estimate chlorine depletion through the contact facility. The estimated chlorine depletion is factored into the SCADA algorithm to calculate CT.
Iron and Manganese Sequestering	A paced to flow iron and manganese sequestering system, in the well pumphouse, utilizing a sodium silicate sequestering agent, consisting of two 10,500 L capacity double walled storage tanks (one dedicated to Well 18), with vacuum monitoring for secondary containment, and two automated chemical metering pumps (one dedicated to Well 18), with a feed line system discharging into the Well 17 well pump header in the well pumphouse prior to entry into the dedicated chlorine contact pipe
Stand-by Power	A 400 kW standby diesel generator, operated for either the Well 17 or Well 18 well pump and their associated systems (the other will be locked out), complete with automatic transfer switch and one 3,100 L capacity double walled diesel fuel storage tank, with vacuum monitoring for secondary containment. Standby power provided is sufficient to maintain full operation of Well 17 or Well 18 but not both
Notes	N/A

Well 18, Cross Street

Location	34 Cross Street, Barrie ON
UTM Coordinates	NAD 83, Zone 17, +/- 3 m, Easting 602013 m and Northing 4918140 m
WWR No.	5739442
Description	Drilled groundwater well, pumphouse and appurtenances
Source Type	Non-GUDI
Dimensions	600 mm diameter, 106.1 m deep
Equipment	One vertical turbine well pump rated at 130 L/s at a TDH of 121 m located in the well pumphouse with a 250 mm diameter discharge line connected to 300 mm diameter yard piping discharging to process piping in the Well 17 pumphouse, including magnetic flowmeter, prior to entry into the dedicated Chlorine Contact Pipe
	Continuous online turbidity analyzers (raw water), including alarms and pump interlocks
	Appurtenances and process piping including a pump to waste connection, magnetic flowmeter and chemical injection points, prior to entry into the dedicated chlorine contact pipe
	Associated SCADA, electrical mechanical and controls for an operable system
Chlorine Disinfection	A compound loop disinfection system dedicated to Well 18 in a separate room, shared with Well 17 works, in the Well 17 pumphouse, consisting of two (2) chlorine gas cylinders including weigh scales, automatic switchover regulators injector, an automated control valve and with a feed line and chlorine booster pump discharging into the Well 18 pump header in the Well 17 pumphouse prior to entry into the dedicated chlorine contact pipe
	432 m of dedicated Chlorine Contact Pipe, comprising 600 mm diameter and 900 mm diameter, to provide the required CT prior to the first customer at the combined flow of 260 L/s from Well 17 and Well 18
Chlorine Monitoring	Continuous online free chlorine residual including alarms and pump interlocks. Free chlorine residual is continuously monitored prior to entry into the shared chlorine contact pipe for Wells 17 & 18
	Weekly grab samples are taken at the downstream end of the chlorine contact pipe for chlorine monitoring purposes. The results of these samples are used together with upstream continuous chlorine monitoring to estimate chlorine depletion through the contact facility. The estimated chlorine depletion is factored into the SCADA algorithm to calculate CT.
Iron and Manganese Sequestering	A paced to flow iron and manganese sequestering system in the Well 17 pumphouse, utilizing a sodium silicate sequestering agent, consisting of, under normal operating conditions, a 10,500 L capacity double wall storage tank, with vacuum monitoring for secondary containment, and an automated chemical metering pump with a feed line system discharging into the Well 18 well pump header in the well pumphouse prior to the entry into the dedicated chlorine contact pipe
Stand-by Power	A 400 kW standby diesel generator, operated for either the Well 17 or Well 18 well pump and their associated systems (the other will be locked out), complete with automatic transfer switch and one 3,100 L capacity double walled diesel fuel storage tank, with vacuum monitoring for secondary containment. Standby power provided is sufficient to maintain full operation of Well 17 or Well 18 but not both
Notes	N/A

City of Barrie Water Distribution System

Pumping Stations and Reservoirs

Anne Street North Booster Pump Station

Location	164 Anne Street North, Barrie ON
UTM Coordinates	NAD 83, Zone 17, +/- 3 m, Easting 602535 m and Northing 4916070 m
Equipment	Two (2) vertical turbine pumps rated at 67 L/s, 56 m TDH
	One (1) vertical turbine pump rated at 90 L/s, 60.3 m TDH
Standby Power	200 kW standby diesel generator (stationary)
Notes	N/A

Anne Street North At-Grade Reservoir

Location	164 Anne Street North, Barrie ON
UTM Coordinates	NAD 83, Zone 17, +/- 3 m, Easting 602535 m and Northing 4916070 m
Description	An at-grade concrete reservoir with two isolation cells designed for fire storage, equalization storage and emergency storage
Capacity	Operating capacity of 15,890 m^3
Equipment	Two (2) continuous on-line chlorine residual analyzers, including alarms, to control the compound loop chlorine injection; one prior to re-entry into the distribution system for Zone 1 and one prior to being pumped into the distribution system for Zone 2N
	One (1) magnetic direct bury flowmeter on the reservoir common draw/fill line to Zone 1 and one (1) venturi direct bury flow transmitter on the discharge main to Zone 2N
	All additional piping and appurtenances for the above-noted works
	Associated SCADA, electrical, mechanical and controls for an operable system
Rechlorination	A compound loop controlled re-chlorination system for the Zone 1 distribution system water consisting of two (2) chlorine gas cylinders (located in a separate room), with automatic switchover, weigh scale, gas chlorinator, regulators, injectors and automated control valve, complete with process piping to add chlorine at the Zone 1 discharge
	A compound loop controlled re-chlorination system for the Zone 2N distribution system water consisting of two (2) chlorine gas cylinders (located in a separate room), with automatic switchover, weigh scale, gas chlorinator, regulators, injectors and automated control valve, complete with process piping to add chlorine at the Zone 2N discharge
Standby Power	None
Notes	N/A

Big Bay Point Booster Pump Station

Location	20 Big Bay Point Road, Barrie ON
UTM Coordinates	NAD 83, Zone 17, +/- 3 m, Easting 604960 m and Northing 4911520 m
Equipment	Two (2) centrifugal pumps rated at 100 L/s, 47 m TDH
	Two (2) centrifugal pumps rated at 150 L/s, 47 m TDH
	A continuous on-line chlorine residual analyzer, including alarms, to monitor and record free chlorine residuals prior to being pumped into the distribution system for Zone 3S
	Associated SCADA, electrical mechanical controls for an operable system.
Standby Power	325 kW standby diesel generator (stationary)
Notes	N/A

Codrington Booster Pump Station

Location	64 Codrington Street, Barrie ON
UTM Coordinates	NAD 83, Zone 17, +/- 3 m, Easting 604815 m and Northing 4916510 m
Equipment	Two (2) vertical turbine pumps rated at 63 L/s, 51.8 m TDH
	A continuous on-line chlorine residual analyzer, including alarms, to monitor and record free chlorine residuals prior to being pumped into the distribution system for Zone 2N
	Associated SCADA, electrical mechanical controls for an operable system.
	Control valve and process piping.
Standby Power	None
Notes	N/A

Harvie Road Booster Pump Station

Location	70 Harvie Road, Barrie ON
UTM Coordinates	NAD 83, Zone 17, +/- 3 m, Easting 603850 m and Northing 4911175 m
Equipment	Four (4) vertical turbine pumps (3 duty, 1 standby) each rated at 133.3 L/s at 45 m TDH with a discharge line and flowmeter connected to the distribution system
	Three (3) continuous on-line chlorine residual analyzers including alarms to monitor and record free chlorine residual; one on the discharge line to Zone 3S, one on the line drawing from Well 17 and Well 18, and one drawing from the inlet line from Zone 2 South
	A storage reservoir (clear well) with a total volume of approximately 500 m^3
	Appurtenances including pump control valve, and process piping
	Associated SCADA and instrumentation including three (3) chlorine residual analyzers and three (3) magnetic flowmeters, electrical, mechanical and controls for an operable system.
Standby Power	A 450 kW stand-by diesel generator set complete with automatic transfer switch and a duel celled 2,500 L dual walled, indoor fuel storage tank with vacuum between tank walls
Notes	N/A

Harvie Road At-Grade Water Reservoir

Location	70 Harvie Road, Barrie ON
UTM Coordinates	NAD 83, Zone 17, Easting 603890.00 m and Northing 4911170.00 m
Description	An at-grade concrete reservoir with six (6) isolation cells designed for fire storage, equalization storage and emergency storage
Capacity	Total capacity of 27,300 m^3
Equipment	Continuous on-line chlorine residual analyzer including alarms, to control the compound loop chlorine injection prior to re-entry into the distribution system
	Appurtenances include one magnetic flowmeter, drain to waste connection with isolation valve, and process piping
	Associated SCADA, electrical, mechanical and controls for an operable system
Rechlorination	A compound loop controlled rechlorination system consisting of two (2) chlorine gas cylinders, located in a separate room, with automatic switchover, weigh scale, gas chlorinator, regulators and process piping to the injectors
	An injector with an automated control valve and feed line discharging into the outflow header located in the valve room
Standby Power	None
Notes	N/A

Innisfil Booster Pump Station

Location	380 Innisfil Street, Barrie ON
UTM Coordinates	NAD 83, Zone 17, +/- 3 m, Easting 604170 m and Northing 4913500 m
Equipment	Three (3) vertical turbine pumps rated at 70 L/s, 73.5 m TDH
	A continuous on-line chlorine residual analyzer, including alarms, to monitor and record free chlorine residuals prior to being pumped into the distribution system for Zone 2S.
	Associated SCADA, electrical mechanical controls for an operable system.
Standby Power	None
Notes	N/A

Leacock Booster Pump Station

Location	319 Leacock Drive, Barrie ON
UTM Coordinates	NAD 83, Zone 17, +/- 3 m, Easting 604160 m and Northing 4913510 m
Equipment	One (1) vertical turbine pump rated at 20 L/s, 82 m TDH
	One (1) vertical turbine pump rated at 45 L/s, 82 m TDH
	Two (2) vertical turbine pumps rated at 75 L/s, 77 m TDH
	A continuous on-line chlorine residual analyzer, including alarms, to monitor and record free chlorine residuals prior to being pumped into the distribution system for Zone 3N
	Associated SCADA, electrical mechanical controls for an operable system.
Standby Power	A 200 kW standby diesel generator (stationary)
Notes	N/A

Sunnidale Booster Pumping Station

Location	245 Sunnidale Road, Barrie ON
UTM Coordinates	NAD 83, Zone 17, Easting 602487 m and Northing 4916953 m
Equipment	Four (4) in-line vertical turbine pumps (three duty, one standby), each rated at 63 L/s for Zone 2 North supply.
	Associated SCADA, electrical mechanical controls for an operable system.
Firm Pumping Capacity	189 L/s
Chlorination	Two gas chlorination systems complete with emergency cylinder valve closure system: one for Zone 2 North pressure zone; one for Zone 1 pressure zone. Chlorination rates are controlled by compound loop control and chlorine residual set points
	Two (2) injection points, one at the discharge header (Zone 2 North) and one at the Reservoir inlet/outlet pipe (Zone 1)
	Two (2) 150 pounds per day vacuum chlorinators, one for Zone 2 North pressure zone and one for Zone 1 pressure zone
	Two (2) chlorine booster pumps (one duty, one standby) for injecting chlorine solution at the Zone 2 North discharge header. Injection at the Reservoir inlet/outlet controlled by a solenoid valve.
	A dry type chlorine gas scrubber
Stand-by Power	One (1) 300 kW diesel generator set which provides standby power for the three (3) operating vertical turbine pumps, chlorination and building services
Notes	N/A

Sunnidale Park Reservoir

Location	245 Sunnidale Road, Barrie ON
UTM Coordinates	NAD 83, Zone 17, Easting 602487 m and Northing 4916953 m
Description	Two (2) cells, each measuring 38.5 m x 45.5 m x 6.0 m depth and each providing a working capacity of 10,500 m^3
Notes	The two cells are capable of working independently or jointly

Elevated Storage Tanks

Bayfield Elevated Water Reservoir

Location	444 Bayfield Street, Barrie ON
UTM Coordinates	NAD 83, Zone 17, Easting 602834.00 m and Northing 4918140.00 m
Description	An elevated reservoir designed for fire storage, equalization storage and emergency storage
Dimensions	Total capacity of 4,536 m^3
Equipment	Continuous on-line chlorine residual analyzer, including alarms, to control the compound loop chlorine injection prior to reentry into the distribution system
	Appurtenances include one magnetic flowmeter and process piping
	Associated SCADA, electrical, mechanical and controls for an operable system
Rechlorination	A compound loop controlled rechlorination system consisting of two (2) chlorine gas cylinders, located in a separate room, with automatic switchover, weigh scale, gas chlorinator, regulators and process piping to the injectors
	An injector, chlorine booster pump with a feed line discharging into the inflow/outflow header located in the main valve room
Standby Power	None
Notes	N/A

Ferndale North Elevated Water Reservoir

Location	434 Ferndale Drive North, Barrie ON
UTM Coordinates	NAD 83, Zone 17, Easting 600840.00 m and Northing 4916060.00 m
Description	An elevated reservoir designed for fire storage, equalization storage and emergency storage
Dimensions	Total capacity of 5,700 m^3
Equipment	Continuous on-line chlorine residual analyzers, including alarms, to control the compound loop chlorine injection prior to reentry into the distribution system
	Appurtenances include one magnetic flowmeter, drain to waste connection with isolation valve and process piping
	Associated SCADA, electrical, mechanical and controls for an operable system
Rechlorination	A compound loop controlled rechlorination system consisting of two (2) chlorine gas cylinders, located in a separate room, with automatic switchover, weigh scale, gas chlorinator, regulators and process piping to the injectors
	An injector, chlorine booster pump with a feed line discharging into the inflow/outflow header located in the main valve room
Standby Power	None
Notes	N/A

Mapleview Elevated Water Reservoir

Location	65 Mapleview Drive, Barrie ON
UTM Coordinates	NAD 83, Zone 17, Easting 604350.00 m and Northing 4909684.00 m
Description	An elevated reservoir designed for fire storage, equalization storage and emergency storage
Dimensions	Total capacity of 5,455 m^3
Equipment	Continuous on-line chlorine residual analyzer including alarms, to control the compound loop chlorine injection prior to reentry into the distribution system
	Appurtenances include one magnetic flowmeter and process piping
	Associated SCADA, electrical, mechanical and controls for an operable system
Rechlorination	A compound loop controlled rechlorination system consisting of two (2) chlorine gas cylinders, located in a separate room, with automatic switchover, weigh scale, gas chlorinator, regulators and process piping to the injectors
	An injector, chlorine booster pump with a feed line discharging into the inflow/outflow header located in the main valve room
Standby Power	None
Notes	N/A

Watermains

1.2 Watermains within the distribution system comprise:

1.2.1 Watermains that have been set out in each document or file identified in column 1 of Table 1.

Table 1: Watermains

Column 1 Document or File Name	Column 2 Date
MDWL_Water_Map_2014-01-01	January 1, 2014

1.2.2 Watermains that have been added, modified, replaced or extended further to the provisions of Schedule C of this drinking water works permit on or after the date identified in column 2 of Table 1 for each document or file identified in column 1.

1.2.3 Watermains that have been added, modified, replaced or extended further to an authorization by the Director on or after the date identified in column 2 of Table 1 for each document or file identified in column 1.

Schedule B: General

System Owner	**The Corporation of the City of Barrie**
Permit Number	**014-201**
Drinking Water System Name	**Barrie Drinking Water System**
Schedule B Issue Date	**July 10th, 2017**

1.0 Applicability

1.1 In addition to any other requirements, the drinking water system identified above shall be altered and operated in accordance with the conditions of this drinking water works permit and the licence.

1.2 The definitions and conditions of the licence shall also apply to this drinking water works permit.

2.0 Alterations to the Drinking Water System

2.1 Any document issued by the Director as a Schedule C to this drinking water works permit shall provide authority to alter the drinking water system in accordance, where applicable, with the conditions of this drinking water works permit and the licence.

2.2 All Schedule C documents issued by the Director for the drinking water system shall form part of this drinking water works permit.

2.3 All parts of the drinking water system in contact with drinking water which are:

2.3.1 Added, modified, replaced, extended; or

2.3.2 Taken out of service for inspection, repair or other activities that may lead to contamination,

shall be disinfected before being put into service in accordance with a procedure approved by the Director or in accordance with the applicable provisions of the following documents:

a) The ministry's Watermain Disinfection Procedure, effective the November 26, 2017;
b) AWWA C652 – Standard for Disinfection of Water-Storage Facilities;
c) AWWA C653 – Standard for Disinfection of Water Treatment Plants; and
d) AWWA C654 – Standard for Disinfection of Wells.

2.4 The owner shall notify the Director within thirty (30) days of the placing into service or the completion of any addition, modification, replacement or extension of the drinking water system which had been authorized through:

2.4.1 Schedule B to this drinking water works permit which would require an alteration of the description of a drinking water system component described in Schedule A of this drinking water works permit;

2.4.2 Any Schedule C to this drinking water works permit respecting works other than watermains; or

2.4.3 Any approval issued prior to the issue date of the first drinking water works permit respecting works other than watermains which were not in service at the time of the issuance of the first drinking water works permit.

2.5 For greater certainty, the notification requirements set out in condition 2.4 do not apply to any addition, modification, replacement or extension in respect of the drinking water system which:

2.5.1 Is exempt from subsection 31(1) of the SDWA by subsection 9.(2) of O. Reg. 170/03;

2.5.2 Constitutes maintenance or repair of the drinking water system; or

2.5.3 Is a watermain authorized by condition 3.1 of Schedule B of this drinking water works permit.

2.6 The owner shall notify the legal owner of any part of the drinking water system that is prescribed as a municipal drinking water system by section 2 of O. Reg. 172/03 of the requirements of the licence and this drinking water works permit as applicable to the prescribed system.

2.7 For greater certainty, any alteration to the drinking water system made in accordance with this drinking water works permit may only be carried out after other legal obligations have been complied with including those arising from the *Environmental Assessment Act*, *Niagara Escarpment Planning and Development Act*, *Oak Ridges Moraine Conservation Act, 2001* and *Greenbelt Act, 2005*.

3.0 Watermain Additions, Modifications, Replacements and Extensions

3.1 The drinking water system may be altered by adding, modifying, replacing or extending a watermain within the distribution system subject to the following conditions:

3.1.1 The design of the watermain addition, modification, replacement or extension:

a) Has been prepared by a Professional Engineer;

b) Has been designed only to transmit water and has not been designed to treat water;

c) Satisfies the design criteria set out in the Ministry of the Environment and Climate Change publication “Watermain Design Criteria for Future Alterations Authorized under a Drinking Water Works Permit – June 2012”, as amended from time to time; and

d) Is consistent with or otherwise addresses the design objectives contained within the Ministry of the Environment and Climate Change publication “Design Guidelines for Drinking Water Systems, 2008”, as amended from time to time.

3.1.2 The maximum demand for water exerted by consumers who are serviced by the addition, modification, replacement or extension of the watermain will not result in an exceedance of the rated capacity of a treatment subsystem or the maximum flow rate for a treatment subsystem component as specified in the licence, or the creation of adverse conditions within the drinking water system.

3.1.3 The watermain addition, modification, replacement or extension will not adversely affect the distribution system's ability to maintain a minimum pressure of 140 kPa at ground level at all points in the distribution system under maximum day demand plus fire flow conditions.

3.1.4 Secondary disinfection will be provided to water within the added, modified, replaced or extended watermain to meet the requirements of O. Reg. 170/03.

3.1.5 The watermain addition, modification, replacement or extension is wholly located within the municipal boundary over which the owner has jurisdiction.

3.1.6 The owner of the drinking water system consents in writing to the watermain addition, modification, replacement or extension.

3.1.7 A Professional Engineer has verified in writing that the watermain addition, modification, replacement or extension meets the requirements of condition 3.1.1.

3.1.8 The owner of the drinking water system has verified in writing that the watermain addition, modification, replacement or extension meets the requirements of conditions 3.1.2 to 3.1.6.

3.2 The authorization for the addition, modification, replacement or extension of a watermain provided for in condition 3.1 does not include the addition, modification, replacement or extension of a watermain that:

3.2.1 Passes under or through a body of surface water, unless trenchless construction methods are used;

3.2.2 Has a nominal diameter greater than 1200 mm;

3.2.3 Results in the fragmentation of the drinking water system; or

3.2.4 Connects to another drinking water system, unless:

a) Prior to construction, the owner of the drinking water system seeking the connection obtains written consent from the owner or owner's delegate of the drinking water system being connected to; and

b) The owner of the drinking water system seeking the connection retains a copy of the written consent from the owner or owner's delegate of the drinking water system being connected to as part of the record that is recorded and retained under condition 3.3.

3.3 The verifications required in conditions 3.1.7 and 3.1.8 shall be:

3.3.1 Recorded on "Form 1 – Record of Watermains Authorized as a Future Alteration", as published by the Ministry of the Environment and Climate Change, prior to the watermain addition, modification, replacement or extension being placed into service; and

3.3.2 Retained for a period of ten (10) years by the owner.

3.4 For greater certainty, the verification requirements set out in condition 3.3 do not apply to any addition, modification, replacement or extension in respect of the drinking water system which:

3.4.1 Is exempt from subsection 31(1) of the SDWA by subsection 9.(2) of O. Reg. 170/03; or

3.4.2 Constitutes maintenance or repair of the drinking water system.

3.5 The document or file referenced in Column 1 of Table 1 of Schedule A of this drinking water works permit that sets out watermains shall be retained by the owner and shall be updated to include watermain additions, modifications, replacements and extensions within 12 months of the addition, modification, replacement or extension.

3.6 The updates required by condition 3.5 shall include watermain location relative to named streets or easements and watermain diameter.

4.0 Minor Modifications to the Drinking Water System

4.1 The drinking water system may be altered by adding, modifying or replacing the following components in the drinking water system:

4.1.1 Raw water pumps and treatment process pumps in the treatment system;

4.1.2 Coagulant feed systems in the treatment system, including the location and number of dosing points;

4.1.3 Valves;

4.1.4 Instrumentation and controls, including SCADA systems, and software associated with these devices;

4.1.5 Filter media, backwashing equipment and under-drains in the treatment system; or,

4.1.6 Spill containment works.

4.2 The drinking water system may be altered by adding, modifying, replacing or removing the following components in the drinking water system:

4.2.1 Treated water pumps and associated equipment;

4.2.2 Re-circulation devices within distribution system storage facilities;

4.2.3 In-line mixing equipment;

4.2.4 Chemical metering pumps and chemical handling pumps;

4.2.5 Chemical storage tanks (excluding fuel storage tanks) and associated equipment; or,

4.2.6 Measuring and monitoring devices that are not required by regulation, by a condition in the Drinking Water Works Permit, or by a condition otherwise imposed by the Ministry of the Environment and Climate Change.

4.3 The drinking water system may be altered by replacing the following:

4.3.1 Raw water piping, treatment process piping or treated water piping within the treatment subsystem;

4.3.2 Fuel storage tanks and spill containment works, and associated equipment; or

4.3.3 Coagulants and pH adjustment chemicals, where the replacement chemicals perform the same function;

a) Prior to making any alteration to the drinking water system under condition 4.3.3, the owner shall undertake a review of the impacts that the alteration might have on corrosion control or other treatment processes; and

b) The owner shall notify the Director in writing within thirty (30) days of any alteration made under condition 4.3.3 and shall provide the Director with a copy of the review.

4.4 Any alteration of the drinking water system made under conditions 4.1, 4.2 or 4.3 shall not result in:

4.4.1 An exceedance of a treatment subsystem rated capacity or a treatment subsystem component maximum flow rate as specified in the licence;

4.4.2 The bypassing of any unit process within a treatment subsystem;

4.4.3 A deterioration in the quality of drinking water provided to consumers;

4.4.4 A reduction in the reliability or redundancy of any component of the drinking water system;

4.4.5 A negative impact on the ability to undertake compliance and other monitoring necessary for the operation of the drinking water system; or

4.4.6 An adverse effect on the environment.

4.5 The owner shall verify in writing that any addition, modification, replacement or removal of drinking water system components in accordance with conditions 4.1, 4.2 or 4.3 has met the requirements of the conditions listed in condition 4.4.

4.6 The verifications and documentation required in condition 4.5 shall be:

4.6.1 Recorded on "Form 2 – Record of Minor Modifications or Replacements to the Drinking Water System", as published by the Ministry of the Environment and Climate Change, prior to the modified or replaced components being placed into service; and

4.6.2 Retained for a period of ten (10) years by the owner.

4.7 For greater certainty, the verification requirements set out in conditions 4.5 and 4.6 do not apply to any addition, modification, replacement or removal in respect of the drinking water system which:

4.7.1 Is exempt from subsection 31(1) of the SDWA by subsection 9.(2) of O. Reg. 170/03; or

4.7.2 Constitutes maintenance or repair of the drinking water system.

4.8 The owner shall update any drawings maintained for the drinking water system to reflect the modification or replacement of the works, where applicable.

5.0 Equipment with Emissions to the Air

5.1 The drinking water system may be altered by adding, modifying or replacing any of the following drinking water system components that may discharge or alter the rate or manner of a discharge of a compound of concern to the atmosphere:

5.1.1 Any equipment, apparatus, mechanism or thing that is used for the transfer of outdoor air into a building or structure that is not a cooling tower;

5.1.2 Any equipment, apparatus, mechanism or thing that is used for the transfer of indoor air out of a space used for the production, processing, repair, maintenance or storage of goods or materials, including chemical storage;

5.1.3 Laboratory fume hoods used for drinking water testing, quality control and quality assurance purposes;

5.1.4 Low temperature handling of compounds with a vapor pressure of less than 1 kilopascal;

5.1.5 Maintenance welding stations;

5.1.6 Minor painting operations used for maintenance purposes;

5.1.7 Parts washers for maintenance shops;

5.1.8 Emergency chlorine and ammonia gas scrubbers and absorbers;

5.1.9 Venting for activated carbon units for drinking water taste and odour control;

5.1.10 Venting for a stripping unit for methane removal from a groundwater supply;

5.1.11 Venting for an ozone treatment unit;

5.1.12 Natural gas or propane fired boilers, water heaters, space heaters and make-up air units with a total facility-wide heat input rating of less than 20 million kilojoules per hour, and with an individual fuel energy input of less than or equal to 10.5 gigajoules per hour; or

5.1.13 Emergency generators that fire No. 2 fuel oil (diesel fuel) with a sulphur content of 0.5 per cent or less measured by weight, natural gas, propane, gasoline or biofuel, and that are used for emergency duty only with periodic testing.

5.2 The owner shall not add, modify or replace a drinking water system component set out in condition 5.1 for an activity that is not directly related to the treatment and/or distribution of drinking water.

5.3 The emergency generators identified in condition 5.1.13 shall not be used for non-emergency purposes including the generation of electricity for sale or for peak shaving purposes.

5.4 The owner shall prepare an emission summary table for nitrogen oxide emissions only, for each addition, modification or replacement of emergency generators identified in condition 5.1.13.

Performance Limits

5.5 The owner shall ensure that a drinking water system component identified in conditions 5.1.1 to 5.1.13 is operated at all times to comply with the following limits:

5.5.1 For equipment other than emergency generators, the maximum concentration of any compound of concern at a point of impingement shall not exceed the corresponding point of impingement limit;

5.5.2 For emergency generators, the maximum concentration of nitrogen oxides at sensitive populations shall not exceed the applicable point of impingement limit, and at non-sensitive populations shall not exceed the Ministry of the Environment and Climate Change half-hourly screening level of 1880 ug/m^3 as amended; and

5.5.3 The noise emissions comply at all times with the limits set out in publication NPC-300, as applicable.

5.6 The owner shall verify in writing that any addition, modification or replacement of works in accordance with condition 5.1 has met the requirements of the conditions listed in condition 5.5.

5.7 The owner shall document how compliance with the performance limits outlined in condition 5.5.3 is being achieved, through noise abatement equipment and/or operational procedures.

5.8 The verifications and documentation required in conditions 5.6 and 5.7 shall be:

5.8.1 Recorded on “Form 3 – Record of Addition, Modification or Replacement of Equipment Discharging a Contaminant of Concern to the Atmosphere”, as published by the Ministry of the Environment and Climate Change, prior to the additional, modified or replacement equipment being placed into service; and

5.8.2 Retained for a period of ten (10) years by the owner.

5.9 For greater certainty, the verification and documentation requirements set out in conditions 5.6 and 5.8 do not apply to any addition, modification or replacement in respect of the drinking water system which:

5.9.1 Is exempt from subsection 31(1) of the SDWA by subsection 9.(2) of O. Reg. 170/03; or

5.9.2 Constitutes maintenance or repair of the drinking water system.

5.10 The owner shall update any drawings maintained for the works to reflect the addition, modification or replacement of the works, where applicable.

6.0 Previously Approved Works

6.1 The owner may add, modify, replace or extend, and operate part of a municipal drinking water system if:

6.1.1 An approval was issued after January 1, 2004 under section 36 of the SDWA in respect of the addition, modification, replacement or extension and operation of that part of the municipal drinking water system;

6.1.2 The approval expired by virtue of subsection 36(4) of the SDWA; and

6.1.3 The addition, modification, replacement or extension commenced within five years of the date that activity was approved by the expired approval.

7.0 System-Specific Conditions

7.1 No site specific requirements.

8.0 Source Protection

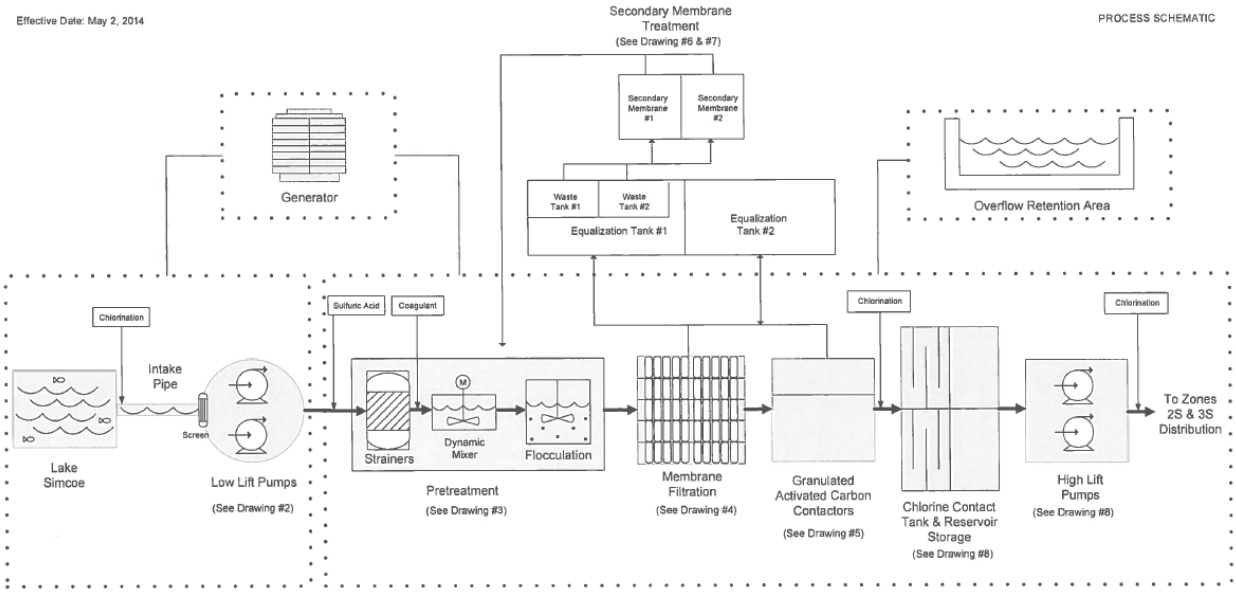
8.1 No source water protection requirements.

Schedule D: Process Flow Diagrams

System Owner	**The Corporation of the City of Barrie**
Permit Number	**014-201**
Drinking Water System Name	**Barrie Drinking Water System**
Schedule D Issue Date	**July 10th, 2017**

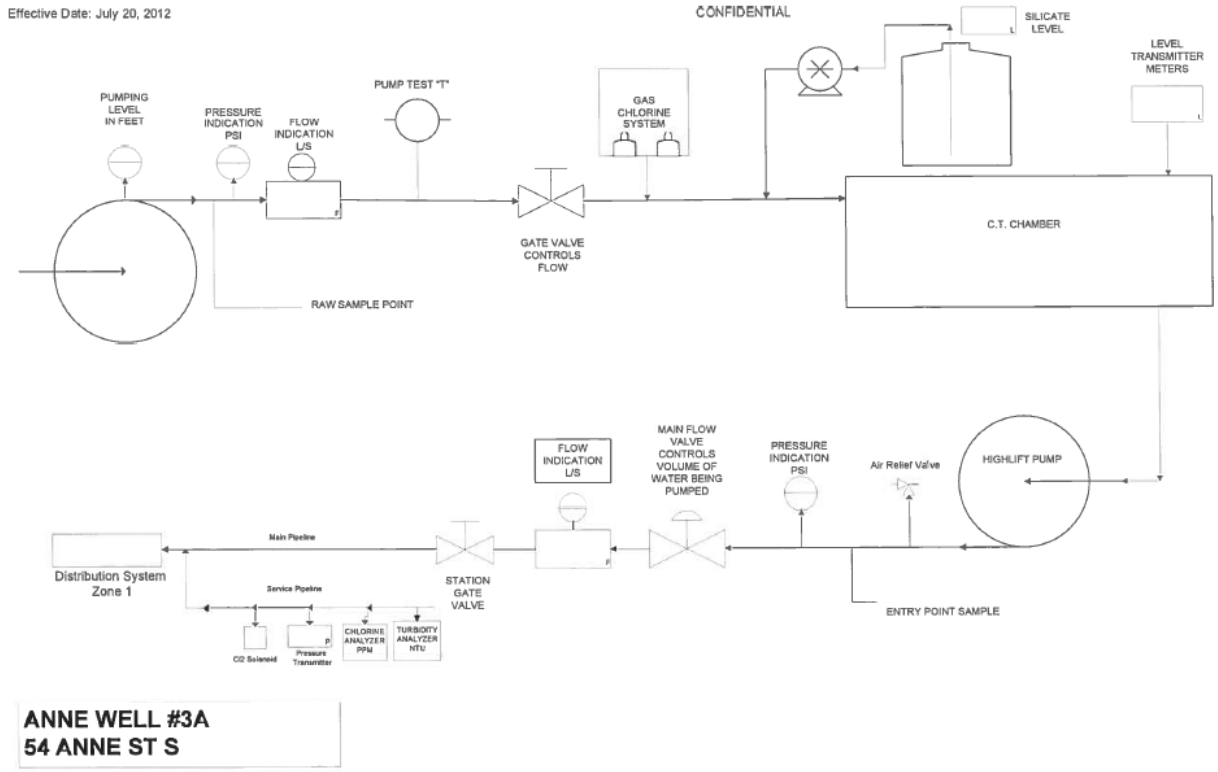
1.0 Process Flow Diagrams

Surface Water Treatment Plant



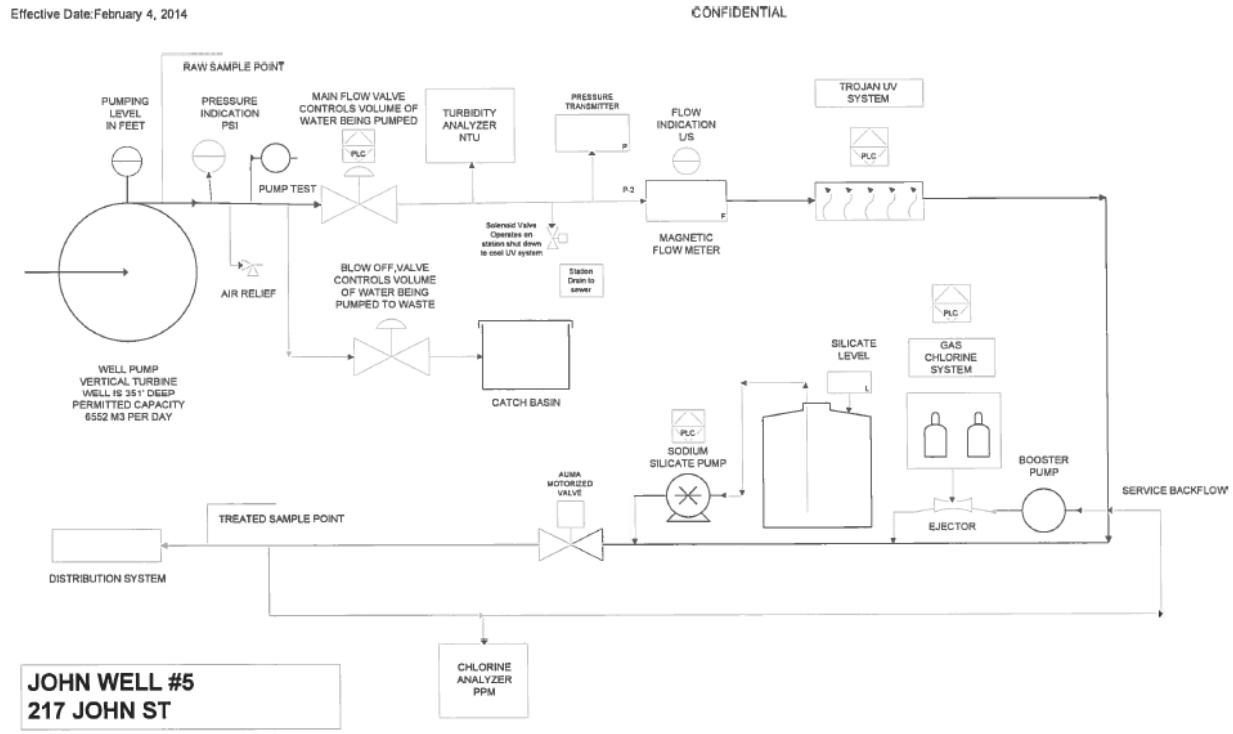
[Source: City of Barrie Drinking Water System Operational Plan, Revision 5.57, May 9, 2014]

Well 3A, Anne Street



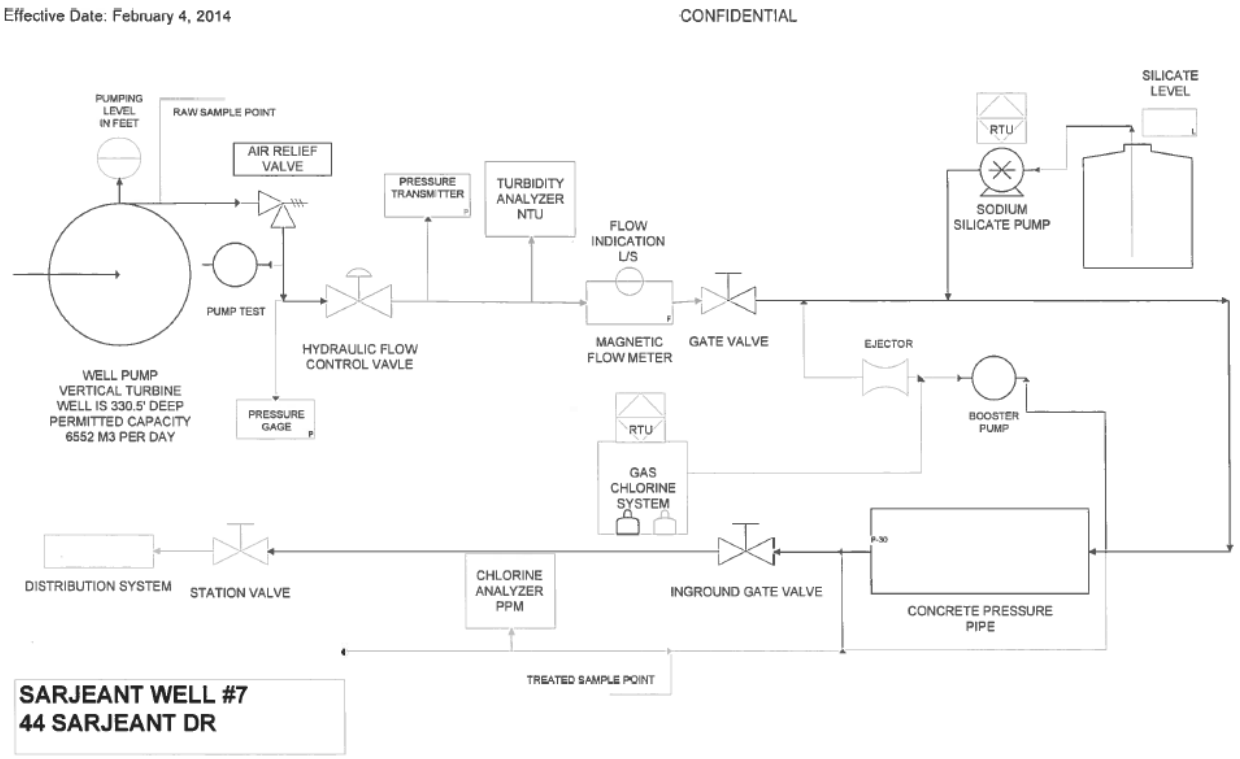
[Source: City of Barrie Drinking Water System Operational Plan, Revision 5.57, May 9, 2014]

Well 5, John Street



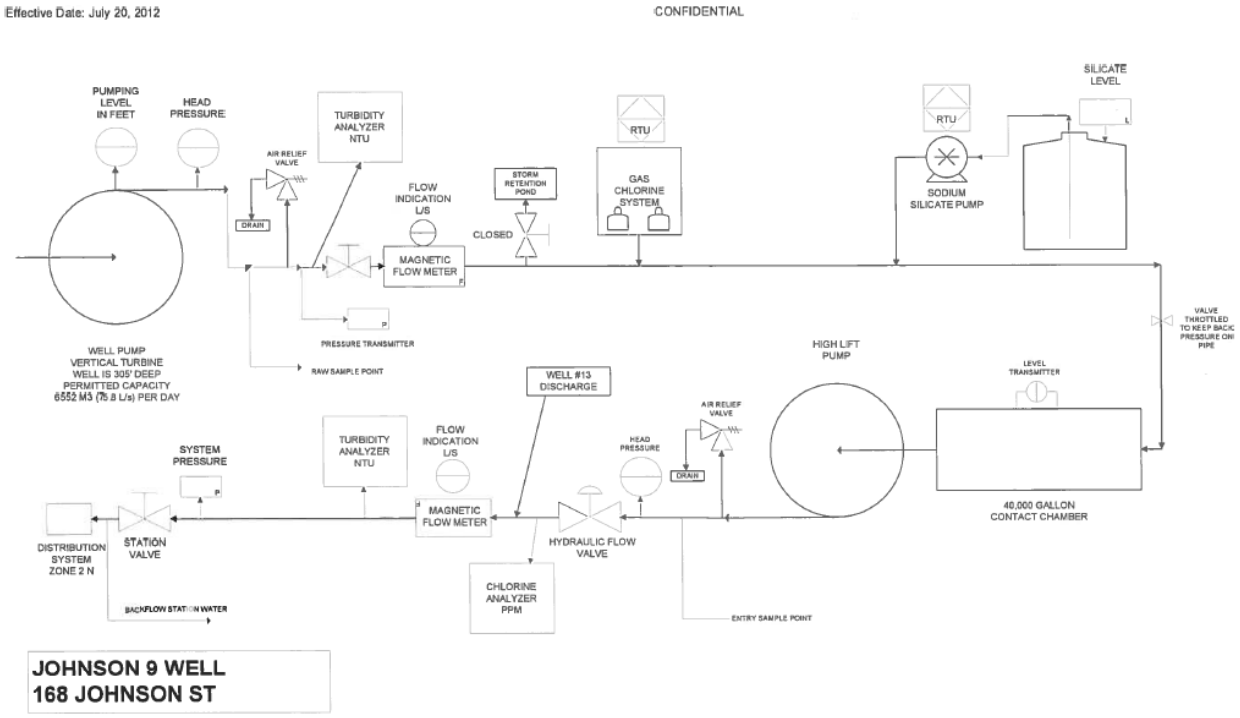
[Source: City of Barrie Drinking Water System Operational Plan, Revision 5.57, May 9, 2014]

Well 7, Sarjeant Street



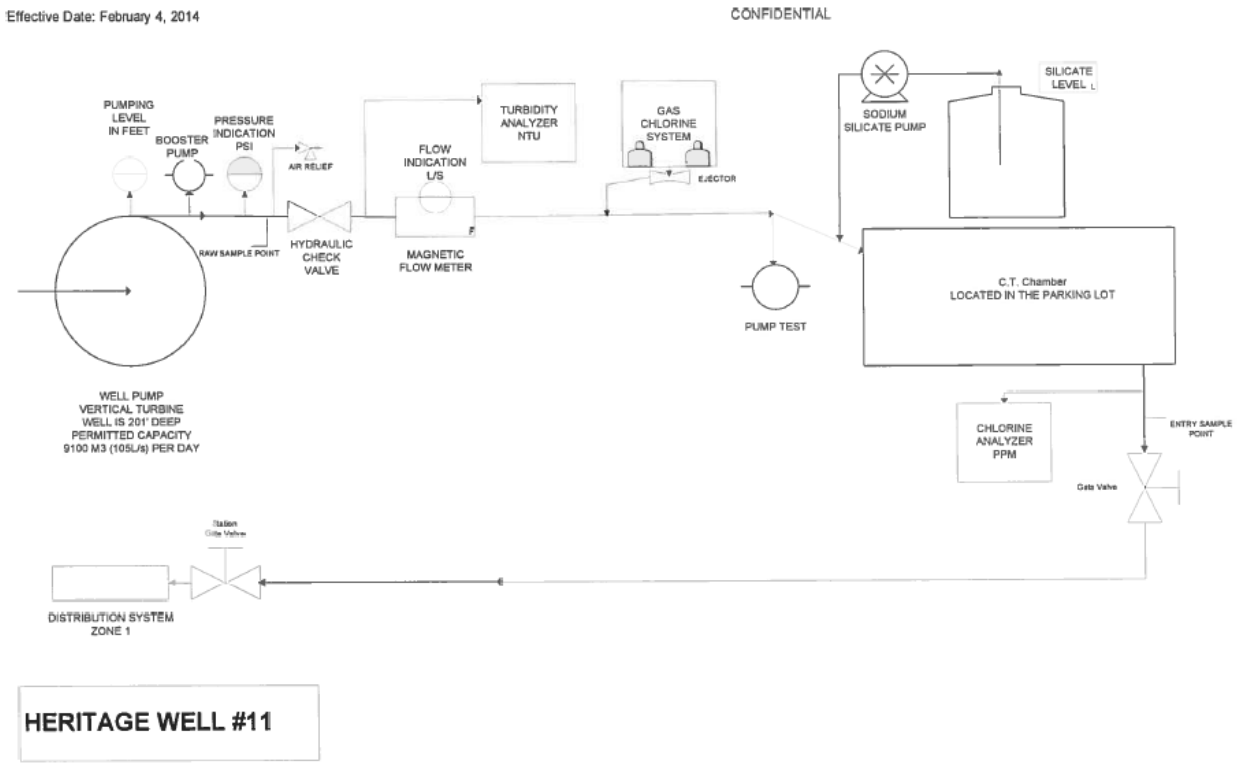
[Source: City of Barrie Drinking Water System Operational Plan, Revision 5.57, May 9, 2014]

Well 9, Johnson Street



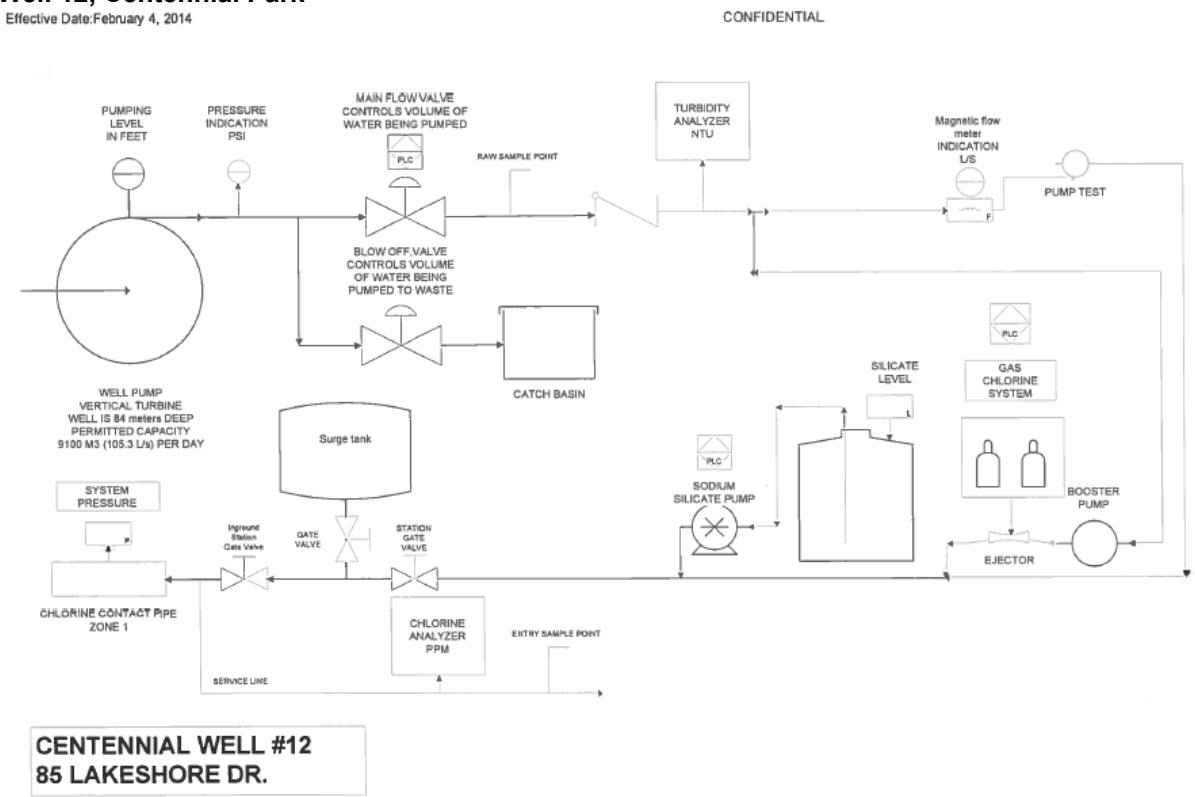
[Source: City of Barrie Drinking Water System Operational Plan, Revision 5.57, May 9, 2014]

Well 11, Heritage Park



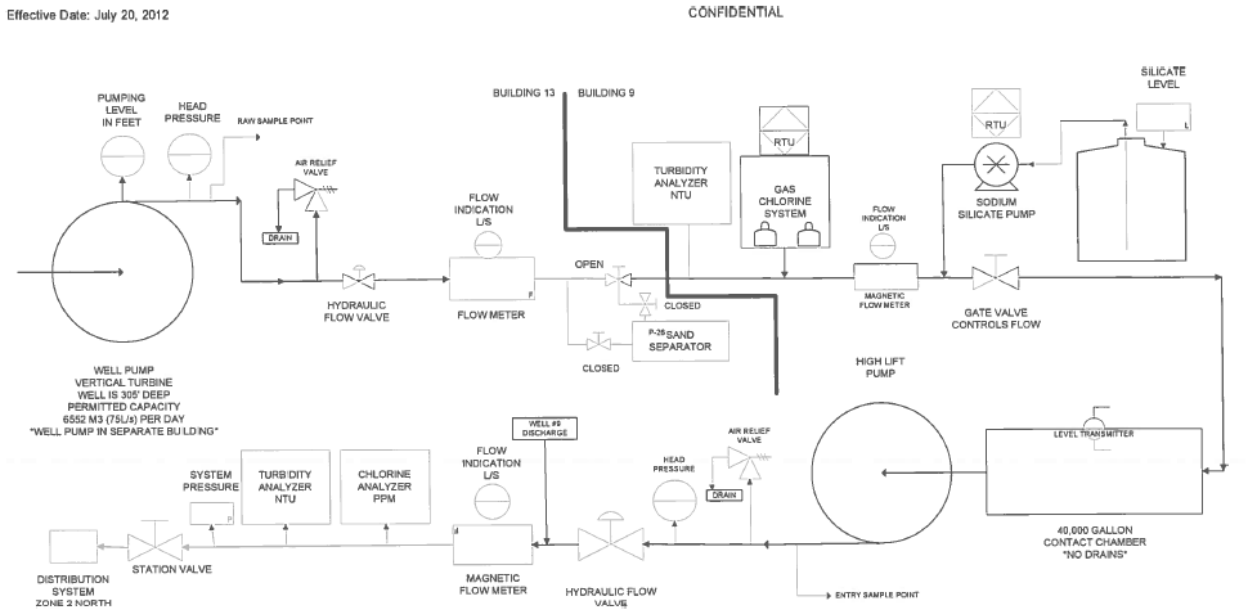
[Source: City of Barrie Drinking Water System Operational Plan, Revision 5.57, May 9, 2014]

Well 12, Centennial Park



[Source: City of Barrie Drinking Water System Operational Plan, Revision 5.57, May 9, 2014]

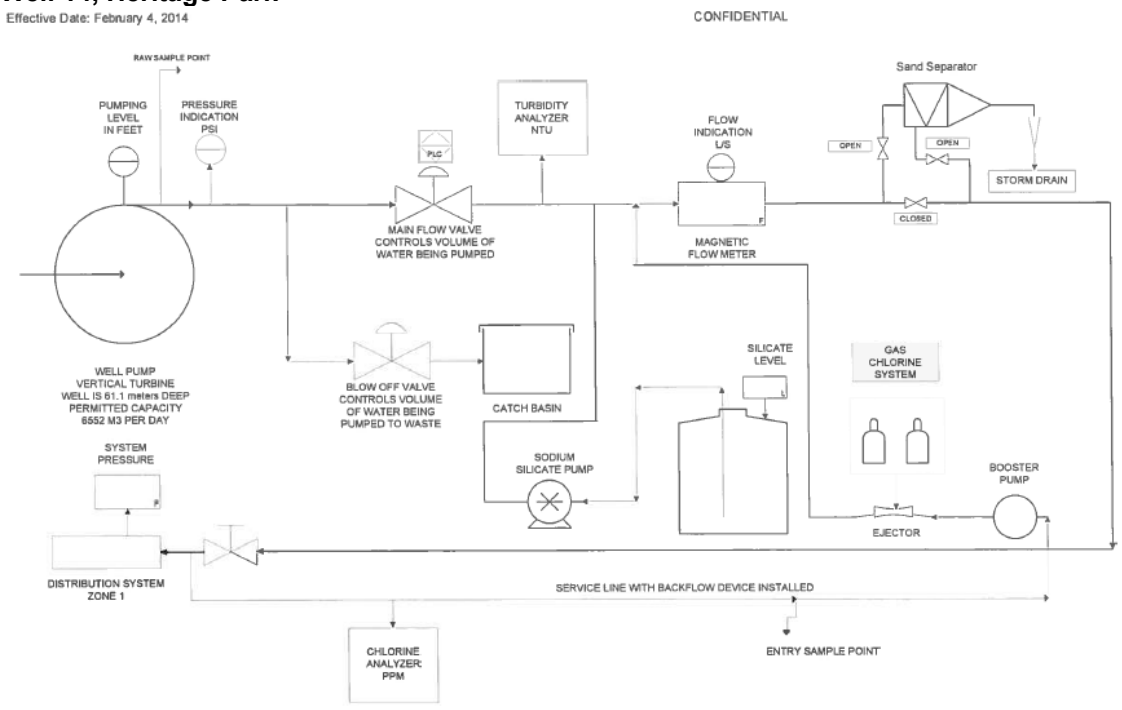
Well 13, Johnson Street



JOHNSON 13 WELL
168 JOHNSON ST

[Source: City of Barrie Drinking Water System Operational Plan, Revision 5.57, May 9, 2014]

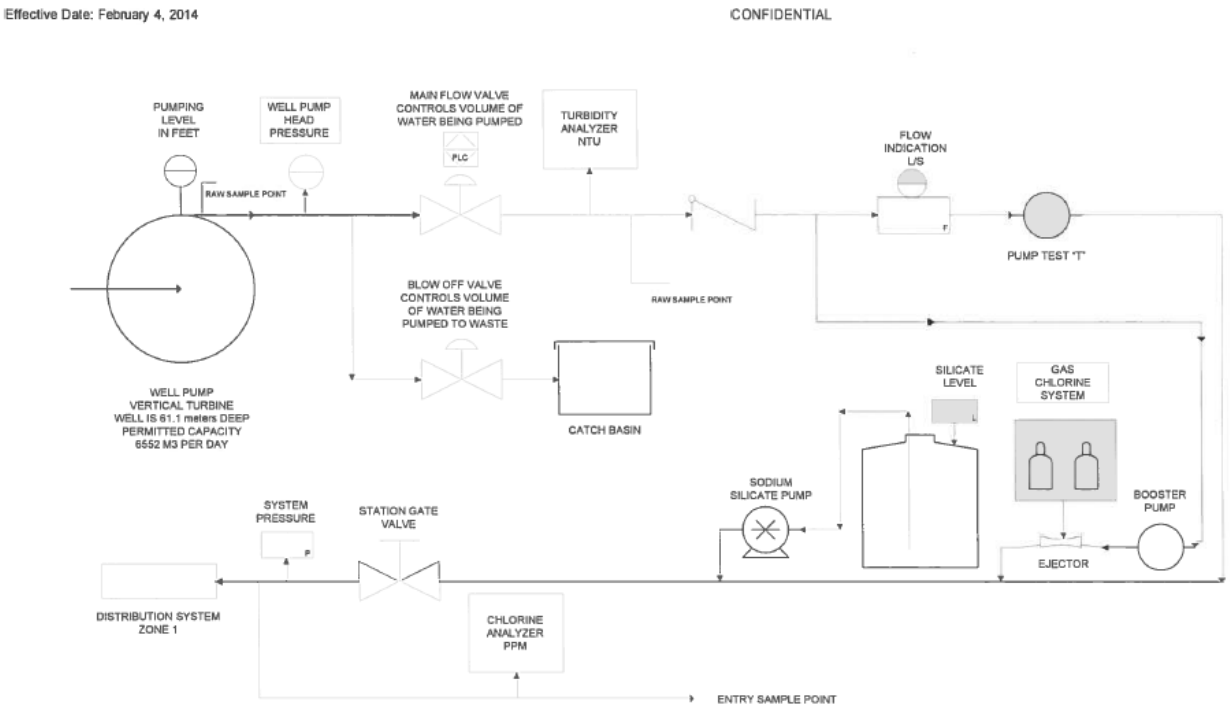
Well 14, Heritage Park



HERITAGE PARK WELL #14
15 LAKESHORE DR.

[Source: City of Barrie Drinking Water System Operational Plan, Revision 5.57, May 9, 2014]

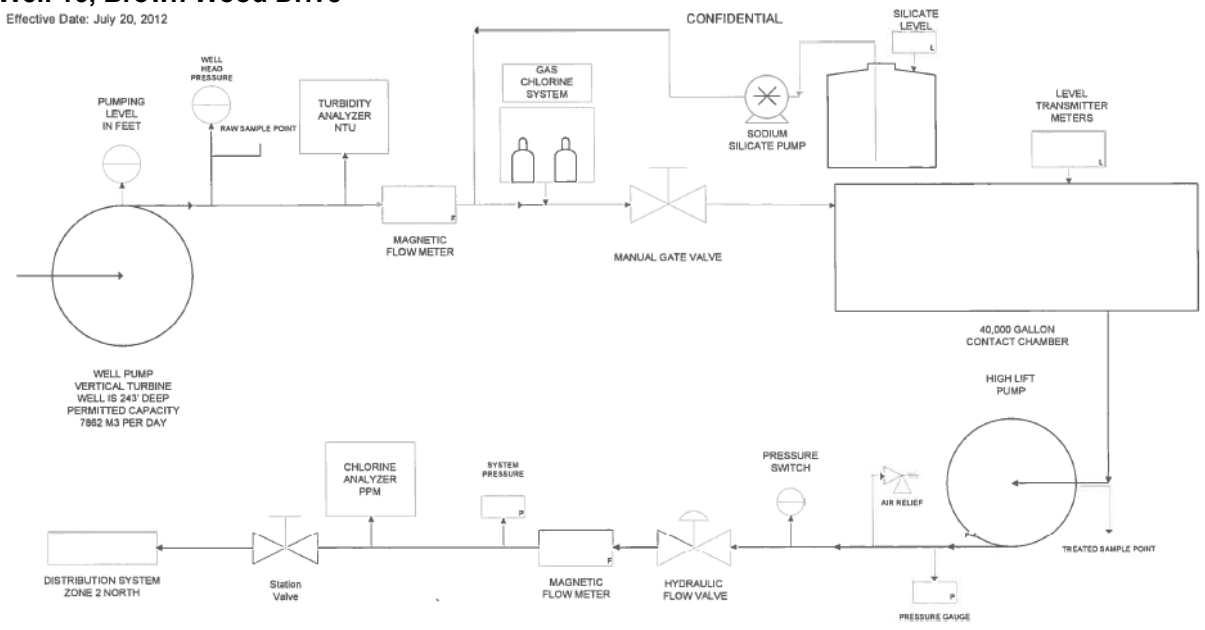
Well 15, Centennial Park



CENTENNIAL WELL #15
55 LAKESHORE DR.

[Source: City of Barrie Drinking Water System Operational Plan, Revision 5.57, May 9, 2014]

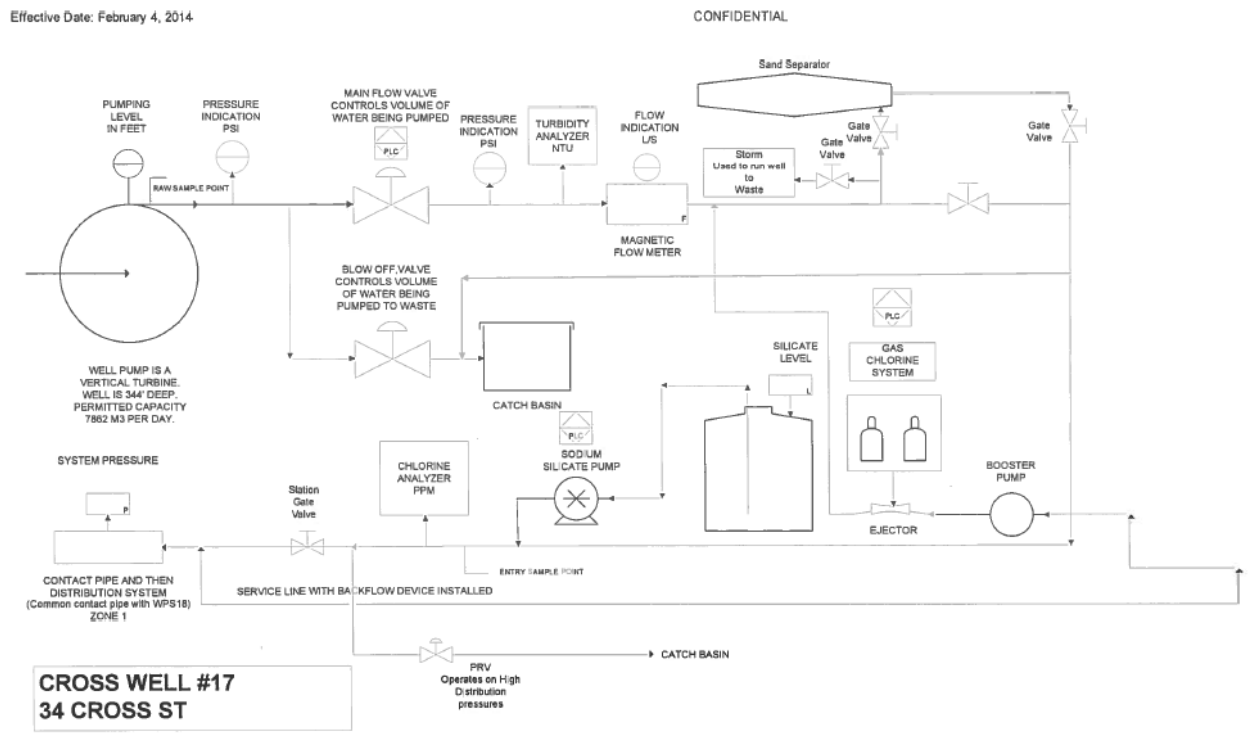
Well 16, Brown Wood Drive



BROWNWOOD WELL #16
101 BROWNWOOD DR.

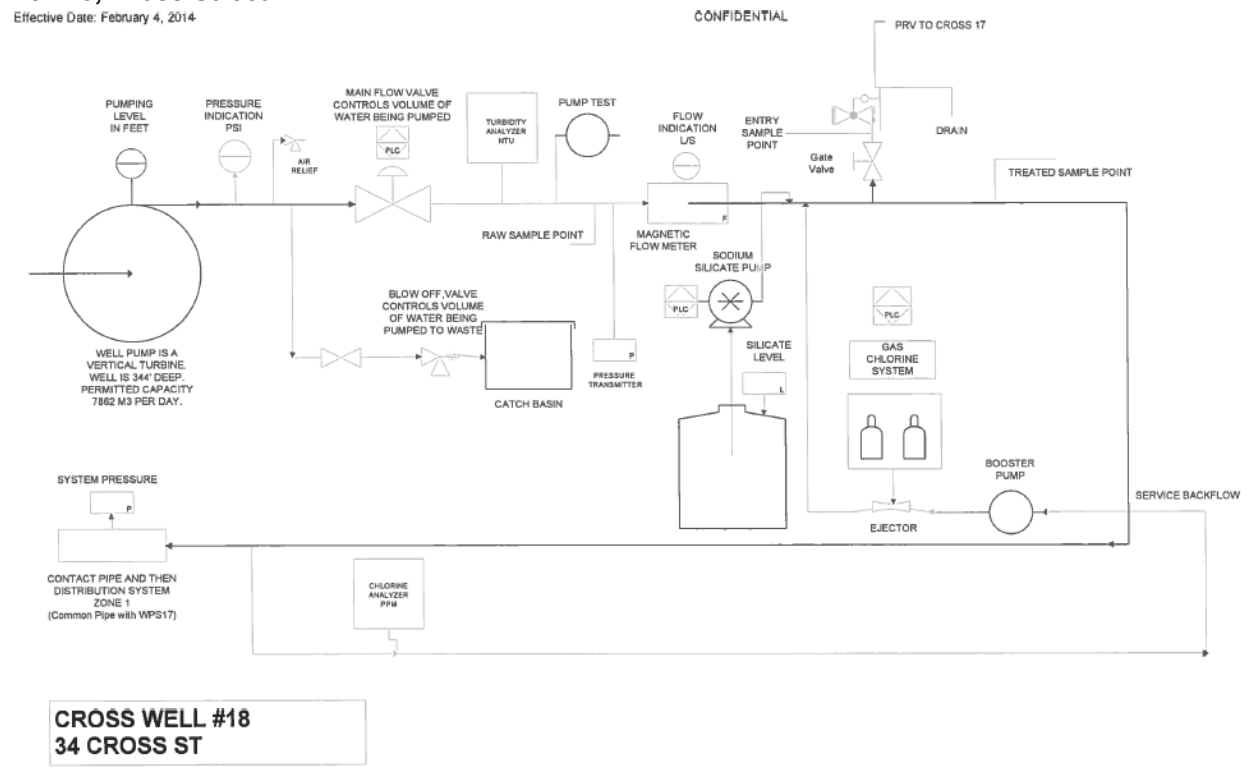
[Source: City of Barrie Drinking Water System Operational Plan, Revision 5.57, May 9, 2014]

Well 17, Cross Street



[Source: City of Barrie Drinking Water System Operational Plan, Revision 5.57, May 9, 2014]

Well 18, Cross Street



[Source: City of Barrie Drinking Water System Operational Plan, Revision 5.57, May 9, 2014]

Ontario

MUNICIPAL DRINKING WATER LICENCE

Licence Number: 014-101
Issue Number: 3

Pursuant to the *Safe Drinking Water Act*, 2002, S.O. 2002, c. 32, and the regulations made thereunder and subject to the limitations thereof, this municipal drinking water licence is issued under Part V of the *Safe Drinking Water Act*, 2002, S.O. 2002, c. 32 to:

The Corporation of the City of Barrie

70 Collier Street
P.O. Box 400
Barrie ON L4M 4T5

For the following municipal residential drinking water system:

Barrie Drinking Water System

This municipal drinking water licence includes the following:

Schedule	Description
Schedule A	Drinking Water System Information
Schedule B	General Conditions
Schedule C	System-Specific Conditions
Schedule D	Conditions for Relief from Regulatory Requirements
Schedule E	Pathogen Log Removal/Inactivation Credits

DATED at TORONTO this 21st day of October, 2014

Signature

Indra R. Prashad, P.Eng.
Director
Part V, *Safe Drinking Water Act*, 2002

Schedule A: Drinking Water System Information

System Owner	**The Corporation of the City of Barrie**
Licence Number	**014-101**
Drinking Water System Name	**Barrie Drinking Water System**
Schedule A Issue Date	**October 21, 2014**

The following information is applicable to the above drinking water system and forms part of this licence:

Licence

Licence Issue Date	October 21, 2014
Licence Expiry Date	October 20, 2019
Application for Licence Renewal Date	April 20, 2019

Drinking Water Works Permit

Drinking Water System Name	Permit Number	Issue Date
Barrie Drinking Water System	014-201	October 16, 2014

Permits to Take Water

Water Taking Location	Permit Number	Issue Date
Wells 3A, 4A, 5, 7, 9, 11, 12, 13, 14, 15, 16, 17, 18, 19 and Lake Simcoe	5183-8EZKMA	May 18, 2011

Financial Plans

The Financial Plan Number for the Financial Plan required to be developed for this drinking water system in accordance with O. Reg. 453/07 shall be:	014-301
Alternately, if one Financial Plan is developed for all drinking water systems owned by the owner, the Financial Plan Number shall be:	014-301A

Accredited Operating Authority

Drinking Water System or Operational Subsystems	Accredited Operating Authority	Operational Plan No.	Operating Authority No.
Barrie Drinking Water System	The Corporation of the City of Barrie	014-401	014-OA1

Schedule B: General Conditions

System Owner	**The Corporation of the City of Barrie**
Licence Number	**014-101**
Drinking Water System Name	**Barrie Drinking Water System**
Schedule B Issue Date	**October 21, 2014**

1.0 Definitions

1.1 Words and phrases not defined in this licence and the associated drinking water works permit shall be given the same meaning as those set out in the SDWA and any regulations made in accordance with that act, unless the context requires otherwise.

1.2 In this licence and the associated drinking water works permit:

"**adverse effect**", "**contaminant**" and "**natural environment**" shall have the same meanings as in the EPA;

"**alteration**" may include the following in respect of this drinking water system:

(a) An addition to the system,
(b) A modification of the system,
(c) A replacement of part of the system, and
(d) An extension of the system;

"**compound of concern**" means a contaminant that, based on generally available information, may be emitted from a component of the drinking water system to the atmosphere in a quantity that is significant either in comparison to the relevant point of impingement limit or if a point of impingement limit is not available for the compound, then based on generally available toxicological information, the compound has the potential to cause an adverse effect as defined by the EPA at a point of impingement;

"**Director**" means a Director appointed pursuant to section 6 of the SDWA for the purposes of Part V of the SDWA;

"**drinking water works permit**" means the drinking water works permit for the drinking water system, as identified in Schedule A of this licence and as amended from time to time;

"emission summary table" means the table that was prepared by a Professional Engineer in accordance with O. Reg. 419/05 and the procedure document listing the appropriate point of impingement concentrations of each compound of concern emitted from a component of the drinking water system and providing comparison to the corresponding point of impingement limit;

"EPA" means the *Environmental Protection Act*, R.S.O. 1990, c. E.19;

"**financial plan**" means the financial plan required by O. Reg. 453/07 and the conditions of this licence;

"**licence**" means this municipal drinking water licence for the municipal drinking water system identified in Schedule A of this licence;

"**operational plan**" means an operational plan developed in accordance with the Director's Directions – Minimum Requirements for Operational Plans made under the authority of subsection 15(1) of the SDWA;

"**owner**" means the owner of the drinking water system as identified in Schedule A of this licence;

"**permit to take water**" means the permit to take water that is associated with the taking of water for purposes of the operation of the drinking water system, as identified in Schedule A of this licence and as amended from time to time;

"**point of impingement**" means any point in the natural environment that is not on the same property as the source of the contaminant and as defined by section 2 of O. Reg. 419/05;

"**point of impingement limit**" means the appropriate standard from Schedule 1, 2 or 3 of O. Reg. 419/05 and if a standard is not provided for a compound of concern, the appropriate criteria listed in the Ministry of the Environment publication titled "Summary of Standards and Guidelines to support Ontario Regulation 419: Air Pollution – Local Air Quality (including Schedule 6 of O. Reg. 419 on Upper Risk Thresholds)", dated February 2008, as amended;

"**procedure document**" means the Ministry of the Environment procedure titled "Procedure for Preparing an Emission Summary and Dispersion Modelling Report" dated July 2005, as amended;

"**Professional Engineer**" means a Professional Engineer who has been licenced to practice in the Province of Ontario;

"**provincial officer**" means a provincial officer appointed pursuant to section 8 of the SDWA;

"**publication NPC-300**" means the Ministry of the Environment publication titled "Environmental Noise Guideline: Stationary and Transportation Sources – Approval and Planning" dated August 2013, as amended;

"**SDWA**" means the *Safe Drinking Water* Act, 2002, S.O. 2002, c. 32;

"**sensitive populations**" means any one or a combination of the following locations where the health effects of nitrogen oxides emissions from emergency generator(s) shall be considered using the point of impingement limit instead of the Ministry of the Environment screening level for emergency generator(s):

(a) health care units (e.g., hospitals and nursing homes),
(b) primary/junior public schools,
(c) day-care facilities, and
(d) playgrounds;

"**subsystem**" has the same meaning as in Ontario Regulation 128/04 (Certification of Drinking Water System Operators and Water Quality Analysts);

"**surface water**" means water bodies (lakes, wetlands, ponds - including dug-outs), water courses (rivers, streams, water-filled drainage ditches), infiltration trenches, and areas of seasonal wetlands;

2.0 Applicability

2.1 In addition to any other requirements, the drinking water system identified above shall be established, altered and operated in accordance with the conditions of the drinking water works permit and this licence.

3.0 Licence Expiry

3.1 This licence expires on the date identified as the licence expiry date in Schedule A of this licence.

4.0 Licence Renewal

4.1 Any application to renew this licence shall be made on or before the date identified as the application for licence renewal date set out in Schedule A of this licence.

5.0 Compliance

5.1 The owner and operating authority shall ensure that any person authorized to carry out work on or to operate any aspect of the drinking water system has been informed of the SDWA, all applicable regulations made in accordance with that act, the drinking water works permit and this licence and shall take all reasonable measures to ensure any such person complies with the same.

6.0 Licence and Drinking Water Works Permit Availability

6.1 At least one copy of this licence and the drinking water works permit shall be stored in such a manner that they are readily viewable by all persons involved in the operation of the drinking water system.

7.0 Permit to Take Water and Drinking Water Works Permit

7.1 A permit to take water identified in Schedule A of this licence is the applicable permit on the date identified as the Schedule A Issue Date.

7.2 A drinking water works permit identified in Schedule A of this licence is the applicable permit on the date identified as the Schedule A Issue Date.

8.0 Financial Plan

8.1 For every financial plan prepared in accordance with subsections 2(1) and 3(1) of O. Reg. 453/07, the owner of the drinking water system shall:

8.1.1 Ensure that the financial plan contains on the front page of the financial plan, the appropriate financial plan number as set out in Schedule A of this licence; and

8.1.2 Submit a copy of the financial plan to the Ministry of Municipal Affairs and Housing within three (3) months of receiving approval by a resolution of municipal council or the governing body of the owner.

9.0 Interpretation

9.1 Where there is a conflict between the provisions of this licence and any other document, the following hierarchy shall be used to determine the provision that takes precedence:

9.1.1 The SDWA*;*

9.1.2 A condition imposed in this licence that explicitly overrides a prescribed regulatory requirement;

9.1.3 A condition imposed in the drinking water works permit that explicitly overrides a prescribed regulatory requirement;

9.1.4 Any regulation made under the SDWA;

9.1.5 Any provision of this licence that does not explicitly override a prescribed regulatory requirement;

9.1.6 Any provision of the drinking water works permit that does not explicitly override a prescribed regulatory requirement;

9.1.7 Any application documents listed in this licence, or the drinking water works permit from the most recent to the earliest; and

9.1.8 All other documents listed in this licence, or the drinking water works permit from the most recent to the earliest.

9.2 If any requirement of this licence or the drinking water works permit is found to be invalid by a court of competent jurisdiction, the remaining requirements of this licence and the drinking water works permit shall continue to apply.

9.3 The issuance of and compliance with the conditions of this licence and the drinking water works permit does not:

9.3.1 Relieve any person of any obligation to comply with any provision of any applicable statute, regulation or other legal requirement, including the *Environmental Assessment Act*, R.S.O. 1990, c. E.18; and

9.3.2 Limit in any way the authority of the appointed Directors and provincial officers of the Ministry of the Environment to require certain steps be taken or to require the owner to furnish any further information related to compliance with the conditions of this licence or the drinking water works permit.

9.4 For greater certainty, nothing in this licence or the drinking water works permit shall be read to provide relief from regulatory requirements in accordance with section 46 of the SDWA, except as expressly provided in the licence or the drinking water works permit.

10.0 Adverse Effects

10.1 Nothing in this licence or the drinking water works permit shall be read as to permit:

10.1.1 The discharge of a contaminant into the natural environment that causes or is likely to cause an adverse effect; or

10.1.2 The discharge of any material of any kind into or in any waters or on any shore or bank thereof or into or in any place that may impair the quality of the water of any waters.

10.2 All reasonable steps shall be taken to minimize and ameliorate any adverse effect on the natural environment or impairment of the quality of water of any waters resulting from the operation of the drinking water system including such accelerated or additional monitoring as may be necessary to determine the nature and extent of the effect or impairment.

10.3 Fulfillment of one or more conditions imposed by this licence or the drinking water works permit does not eliminate the requirement to fulfill any other condition of this licence or the drinking water works permit.

11.0 Change of Owner or Operating Authority

11.1 This licence is not transferable without the prior written consent of the Director.

11.2 The owner shall notify the Director in writing at least 30 days prior to a change of any operating authority identified in Schedule A of this licence.

11.2.1 Where the change of operating authority is the result of an emergency situation, the owner shall notify the Director in writing of the change as soon as practicable.

12.0 Information to be Provided

12.1 Any information requested by a Director or a provincial officer concerning the drinking water system and its operation, including but not limited to any records required to be kept by this licence or the drinking water works permit, shall be provided upon request.

13.0 Records Retention

13.1 Except as otherwise required in this licence or the drinking water works permit, any records required by or created in accordance with this licence or the drinking water works permit, other than the records specifically referenced in section 12 of O. Reg. 170/03, shall be retained for at least 5 years and made available for inspection by a provincial officer, upon request.

14.0 Chemicals and Materials

14.1 All chemicals and materials used in the alteration or operation of the drinking water system that come into contact with water within the system shall meet all applicable standards set by both the American Water Works Association ("AWWA") and the American National Standards Institute ("ANSI") safety criteria standards NSF/60, NSF/61, and NSF 372.

14.1.1 In the event that the standards are updated, the owner may request authorization from the Director to use any on hand chemicals and materials that previously met the applicable standards.

14.1.2 The requirement for the owner to comply with NSF 372 shall come into force no later than October 17, 2016.

14.2 The most current chemical and material product registration documentation from a testing institution accredited by either the Standards Council of Canada or by the American National Standards Institution ("ANSI") shall be available at all times for each chemical and material used in the operation of the drinking water system that comes into contact with water within the system.

14.3 Conditions 14.1 and 14.2 do not apply in the case of the following:

14.3.1 Water pipe and pipe fittings meeting AWWA specifications made from ductile iron, cast iron, PVC, fibre and/or steel wire reinforced cement pipe or high density polyethylene (HDPE);

14.3.2 Articles made from stainless steel, glass, HDPE or Teflon®;

14.3.3 Cement mortar for watermain lining and for water contacting surfaces of concrete structures made from washed aggregates and Portland cement;

14.3.4 Gaskets that are made from NSF approved materials;

14.3.5 Food grade oils and lubricants, food grade anti-freeze, and other food grade chemicals and materials that are compatible for drinking water use; or

14.3.6 Any particular chemical or material where the owner has written documentation signed by the Director that indicates that the Ministry of the Environment is satisfied that the chemical or material is acceptable for use within the drinking water system and the chemical or material is only used as permitted by the documentation.

15.0 Drawings

15.1 All drawings and diagrams in the possession of the owner that show any treatment subsystem as constructed shall be retained by the owner unless the drawings and diagrams are replaced by a revised or updated version showing the subsystem as constructed subsequent to the alteration.

15.2 Any alteration to any treatment subsystem shall be incorporated into process flow diagrams, process and instrumentation diagrams, and record drawings and diagrams within one year of the substantial completion of the alteration.

15.3 Process flow diagrams and process and instrumentation diagrams for any treatment subsystem shall be kept in a place, or made available in such a manner, that they may be readily viewed by all persons responsible for all or part of the operation of the drinking water system.

16.0 Operations and Maintenance Manual

16.1 An up-to-date operations and maintenance manual or manuals shall be maintained and applicable parts of the manual or manuals shall be made available for reference by all persons responsible for all or part of the operation or maintenance of the drinking water system.

16.2 The operations and maintenance manual or manuals, shall include at a minimum:

16.2.1 The requirements of this licence and associated procedures;

16.2.2 The requirements of the drinking water works permit for the drinking water system;

16.2.3 A description of the processes used to achieve primary and secondary disinfection within the drinking water system;

16.2.4 Procedures for monitoring and recording the in-process parameters necessary for the control of any treatment subsystem and for assessing the performance of the drinking water system;

16.2.5 Procedures for the operation and maintenance of monitoring equipment;

16.2.6 Contingency plans and procedures for the provision of adequate equipment and material to deal with emergencies, upset conditions and equipment breakdown;

16.2.7 Procedures for dealing with complaints related to the drinking water system, including the recording of the nature of the complaint and any investigation and corrective action taken in respect of the complaint;

16.2.8 An inspection schedule for all wells associated with the drinking water system, including all production wells, standby wells, test wells and monitoring wells;

16.2.9 Well inspection and maintenance procedures for the entire well structure of each well including all above and below grade well components; and

16.2.10 Remedial action plans for situations where an inspection indicates non-compliance with respect to regulatory requirements and/or risk to raw well water quality.

16.3 Procedures necessary for the operation and maintenance of any alterations to the drinking water system shall be incorporated into the operations and maintenance manual or manuals prior to those alterations coming into operation.

Schedule C: System-Specific Conditions

System Owner	**The Corporation of the City of Barrie**
Licence Number	**014-101**
Drinking Water System Name	**Barrie Drinking Water System**
Schedule C Issue Date	**October 21, 2014**

1.0 Performance Limits

Rated Capacity

1.1 For each treatment subsystem listed in column 1 of Table 1, the maximum daily volume of treated water that flows from the treatment subsystem to the distribution system shall not exceed the value identified as the rated capacity in column 2 of the same row.

Table 1: Rated Capacity

Column 1 Treatment Subsystem Name	Column 2 Rated Capacity (m^3/day)
Surface Water Treatment Plant	60,000
Well 3A, Anne Street	6,552
Well 5, John Street	6,552
Well 7, Tiffin Street	6,552
Well 9, Johnson Street	6,552
Well 11, Heritage Park	9,100
Well 12, Centennial Park	9,100
Well 13, Johnson Street	6,552
Well 14, Heritage Park	9,100
Well 15, Centennial Park	9,100
Well 16, Brown Wood Drive	7,862
Well 17, Cross Street	11,232
Well 18, Cross Street	11,232

Maximum Flow Rates

1.2 For each treatment subsystem listed in column 1 of Table 2, the maximum flow rate of water that flows into a treatment subsystem component listed in column 2 shall not exceed the value listed in column 3 of the same row.

Table 2: Maximum Flow Rates

Column 1 Treatment Subsystem Name	Column 2 Treatment Subsystem Component	Column 3 Maximum Flow Rate (L/s)
Not Applicable	Not Applicable	Not Applicable

1.3 Despite conditions 1.1 and 1.2, a treatment subsystem may be operated temporarily at a maximum daily volume and/or a maximum flow rate above the values set out in column 2 of Table 1 and column 3 of Table 2 respectively for the purposes of fighting a large fire or for the maintenance of the drinking water system.

1.4 Condition 1.3 does not authorize the discharge into the distribution system of any water that does not meet all of the requirements of this licence and all other regulatory requirements, including compliance with the Ontario Drinking Water Quality Standards.

Residue Management

1.5 In respect of an effluent discharged into the natural environment from a treatment subsystem or treatment subsystem component listed in column 1 of Table 3:

1.5.1 The annual average concentration of a test parameter identified in column 2 shall not exceed the value in column 3 of the same row; and

1.5.2 The maximum concentration of a test parameter identified in column 2 shall not exceed the value in column 4 of the same row.

Table 3: Residue Management

Column 1 Treatment Subsystem or Treatment Subsystem Component Name	Column 2 Test Parameter	Column 3 Annual Average Concentration (mg/L)	Column 4 Maximum Concentration (mg/L)
Not Applicable	Not Applicable	Not Applicable	Not Applicable

UV Disinfection Equipment Performance

1.6 For each treatment subsystem or treatment subsystem component listed in column 1 of Table 4:

1.6.1 The UV disinfection equipment while directing water to the distribution system shall be operated such that a continuous pass-through UV dose is maintained throughout the life time of the UV lamp(s) that is at least the minimum continuous pass-through UV dose set out in column 2 of the same row;

1.6.2 The UV disinfection equipment shall be operated within validated operating conditions;

1.6.3 The UV sensors shall be verified with a reference UV sensor according to the manufacturer's recommended verification frequency, or otherwise at least once each month that the UV disinfection equipment is in operation;

1.6.4 The UV disinfection equipment shall be calibrated according to the manufacturer's recommended calibration frequency or otherwise at least once every 12 months during which the drinking water system is in operation; and

1.6.5 Further to condition 1.6.4, the UV disinfection equipment shall be calibrated not more than 30 days before or after the next calibration due date.

Table 4: UV Disinfection Equipment Performance

Column 1 Treatment Subsystem or Treatment Subsystem Component Name	Column 2 Minimum Continuous Pass-Through UV Dose (mJ/cm^2)
Well 5, John Street	40

2.0 Flow Measurement and Recording Requirements

2.1 For each treatment subsystem identified in column 1 of Table 1 and in addition to any other flow measurement and recording that may be required, continuous flow measurement and recording shall be undertaken for:

2.1.1 The flow rate and daily volume of treated water that flows from the treatment subsystem to the distribution system.

2.1.2 The flow rate and daily volume of water that flows into the treatment subsystem.

2.2 For each treatment subsystem component identified in column 2 of Table 2 and in addition to any other flow measurement and recording that may be required, continuous flow measurement and recording shall be undertaken for the flow rate and daily volume of water that flows into the treatment subsystem component.

2.3 Where a rated capacity from Table 1 or a maximum flow rate from Table 2 is exceeded, the following shall be recorded:

2.3.1 The difference between the measured amount and the applicable rated capacity or maximum flow rate specified in Table 1 or Table 2;

2.3.2 The time and date of the measurement;

2.3.3 The reason for the exceedance; and

2.3.4 The duration of time that lapses between the applicable rated capacity or maximum flow rate first being exceeded and the next measurement where the applicable rated capacity or maximum flow rate is no longer exceeded.

3.0 Calibration of Flow Measuring Devices

3.1 All flow measuring devices must be checked and calibrated in accordance with the manufacturer's instructions.

3.2 If the manufacturer's instructions do not indicate how often to check and calibrate a flow measuring device, the equipment must be checked and calibrated at least once every 12 months during which the drinking water system is in operation.

3.2.1 For greater certainty, if condition 3.2 applies, the equipment shall be checked and calibrated not more than 30 days before or after the first anniversary of the day the equipment was checked and calibrated in the previous 12-month period.

4.0 Additional Sampling, Testing and Monitoring

Drinking Water Health and Non-Health Related Parameters

4.1 For each treatment subsystem or treatment subsystem component identified in column 1 of Tables 5 and 6 and in addition to any other sampling, testing and monitoring that may be required, sampling, testing and monitoring shall be undertaken for a test parameter listed in column 2 at the sampling frequency listed in column 3 and at the monitoring location listed in column 4 of the same row.

Table 5: Drinking Water Health Related Parameters

Column 1 Treatment Subsystem or Treatment Subsystem Component Name	Column 2 Test Parameter	Column 3 Sampling Frequency	Column 4 Monitoring Location
Well 11, Heritage Park	VOCs[1]	Monthly	Raw Water
Well 12, Centennial Park	VOCs[1]	Monthly	Raw Water
Well 14, Heritage Park	VOCs[1]	Monthly	Raw Water
Well 15, Centennial Park	VOCs[1]	Monthly	Raw Water

[1] VOCs include:

- 1,2-dichlorobenzene
- 1,4-dichlorobenzene
- 1,2-dichloroethane
- 1,1-dichloroethylene
- Benzene
- Carbon tetrachloride
- Dichloromethane
- Monochlorobenzene
- Tetrachloroethylene
- Trichloroethylene
- Vinyl chloride

Table 6: Drinking Water Non-Health Related Parameters			
Column 1 Treatment Subsystem or Treatment Subsystem Component Name	**Column 2 Test Parameter**	**Column 3 Sampling Frequency**	**Column 4 Monitoring Location**
Well 3A, Anne Street	Sodium	Quarterly	Raw Water
Well 9, Johnson Street	Sodium	Quarterly	Raw Water
Well 11, Heritage Park	Sodium	Quarterly	Raw Water
Well 12, Centennial Park	Sodium	Quarterly	Raw Water
Well 13, Johnson Street	Sodium	Quarterly	Raw Water
Well 14, Heritage Park	Sodium	Quarterly	Raw Water

Environmental Discharge Parameters

4.2 For each treatment subsystem or treatment subsystem component identified in column 1 of Table 7 and in addition to any other sampling, testing and monitoring that may be required, sampling, testing and monitoring shall be undertaken for a test parameter listed in column 2 using the sample type identified in column 3 at the sampling frequency listed in column 4 and at the monitoring location listed in column 5 of the same row.

4.3 For the purposes of Table 7:

4.3.1 Manual Composite means the mean of at least three grab samples taken during a discharge event, with one sample being taken immediately following the commencement of the discharge event, one sample being taken approximately at the mid-point of the discharge event and one sample being taken immediately before the end of the discharge event; and

4.3.2 Automated Composite means samples must be taken during a discharge event by an automated sampler at a minimum sampling frequency of once per hour.

4.4 Any sampling, testing and monitoring for the test parameter Total Suspended Solids shall be performed in accordance with the requirements set out in the publication “Standard Methods for the Examination of Water and Wastewater”, 21st Edition, 2005, or as amended from time to time by more recently published editions.

Table 7: Environmental Discharge Parameters				
Column 1 Treatment Subsystem or Treatment Subsystem Component Name	**Column 2 Test Parameter**	**Column 3 Sample Type**	**Column 4 Sampling Frequency**	**Column 5 Monitoring Location**
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

4.5 Pursuant to Condition 10 of Schedule B of this licence, the owner may undertake the following environmental discharges, associated with the maintenance and repair of the drinking water system:

4.5.1 Discharge of potable water from watermains to roads or storm sewers;

4.5.2 Discharge of non-potable water from watermains, that has been dechlorinated, to roads or storm sewers;

4.5.3 Direct discharge of potable water from reservoirs, elevated tanks, storage tanks, and pumping stations

4.5.3.1 To roads or storm sewers; and

4.5.3.2 To a watercourse, where the discharge has been dechlorinated, and if necessary sediment and erosion control measures have been implemented.

4.5.4 Discharge of raw water from groundwater wells, where if necessary sediment and erosion control measures have been implemented.

4.5.5 Discharges of raw water or potable water from the treatment subsystem to the environment, where if necessary the discharge has been dechlorinated and sediment and erosion control measures have been implemented.

UV Disinfection Equipment

4.6 For each treatment subsystem or treatment subsystem component listed in column 1 of Table 8 and in addition to any other sampling, analysis and recording that may be required, continuous monitoring and recording with a minimum testing/reading and recording frequency of every four (4) hours shall be carried out for the test parameters set out in column 3 of the same row.

Table 8: UV Disinfection Equipment

Column 1 Treatment Subsystem or Treatment Subsystem Component Name	Column 2 Control Strategy	Column 3 Test Parameter
Well 5, John Street	Calculated Dose	Calculated UV Dose
		Flow Rate
		UV Intensity
		UV Lamp Status

4.7 For Well 5, John Street and in addition to any other sampling, analysis and recording that may be required, weekly monitoring and recording shall be carried out for the test parameter UV transmittance.

5.0 Studies Required

5.1 No studies required.

6.0 Source Protection

6.1 No source water protection requirements.

Schedule D: Conditions for Relief from Regulatory Requirements

System Owner	**The Corporation of the City of Barrie**
Licence Number	**014-101**
Drinking Water System Name	**Barrie Drinking Water System**
Schedule D Issue Date	**October 21, 2014**

1.0 Lead Regulatory Relief

1.1 Any relief from regulatory requirements previously authorized by the Director in respect of the drinking water system under section 38 of the SDWA in relation to the sampling, testing or monitoring requirements contained in Schedule 15.1 of O. Reg. 170/03 shall remain in force until such time as Schedule 15.1 of O. Reg. 170/03 is amended after June 1, 2009.

1.2 In addition to condition 1.1, for a drinking water system or drinking water subsystem identified by columns 1 and 2 of Table 1 and notwithstanding the provisions of Schedule 15.1 of O. Reg. 170/03, the owner is not required to comply with the sampling requirements of columns 3, 4 and 5 of the same row.

Table 1: Number of Sampling Points Required for Compliance with Schedule 15.1 of O. Reg. 170/03

Column 1 Drinking Water System or Drinking Water Subsystem Name	Column 2 DWS Number	Column 3 Number of Sampling Points in Plumbing that Serves Private Residences	Column 4 Number of Sampling Points in Plumbing that Does Not Serve Private Residences	Column 5 Number of Sampling Points in Distribution System
Barrie Drinking Water System	220001192	50	5	10

1.3 For a drinking water system or drinking water subsystem identified by columns 1 and 2 of Table 2 and in exchange for any relief from regulatory requirements granted in condition 1.2 and subject to any other applicable conditions of this licence and drinking water works permit, the owner is required to comply with the sampling requirements of columns 3, 4 and 5 of the same row.

Table 2: Number of Sampling Points Required for Relief from Regulatory Requirements

Column 1 Drinking Water System or Drinking Water Subsystem Name	Column 2 DWS Number	Column 3 Number of Sampling Points in Plumbing that Serves Private Residences	Column 4 Number of Sampling Points in Plumbing that Does Not Serve Private Residences	Column 5 Number of Sampling Points in Distribution System
Barrie Drinking Water System	220001192	0	5	10

1.4 For a drinking water system or drinking water subsystem identified by columns 1 and 2 of Table 3, the relief from regulatory requirements granted in condition 1.2 is in effect for the sampling period identified in column 3 of the same row.

Table 3: Sampling Periods

Column 1 Drinking Water System or Drinking Water Subsystem Name	Column 2 DWS Number	Column 3 Sampling Period
Barrie Drinking Water System	220001192	June 15, 2014 to October 15, 2014 December 15, 2014 to April 15, 2015 June 15, 2015 to October 15, 2015 December 15, 2015 to April 15, 2016 June 15, 2016 to October 15, 2016 December 15, 2016 to April 15, 2017 June 15, 2017 to October 15, 2017 December 15, 2017 to April 15, 2018 June 15, 2018 to October 15, 2018 December 15, 2018 to April 15, 2019 June 15, 2019 to October 15, 2019

1.5 In the event O. Reg. 170/03 is amended to require fewer sampling locations than specified under the relief granted in accordance with condition 1.2, then the regulation shall prevail.

1.6 Subsection 15.1 – 5 (Reduced Sampling) of O. Reg. 170/03 does not apply to the drinking water system or drinking water subsystems identified in this licence as long as the relief from regulatory requirements granted in accordance with condition 1.2 remains in effect.

2.0 Other Regulatory Relief

2.1 Not applicable.

Schedule E: Pathogen Log Removal/Inactivation Credits

System Owner	**The Corporation of the City of Barrie**
Licence Number	**014-101**
Drinking Water System Name	**Barrie Drinking Water System**
Schedule E Issue Date	**October 21, 2014**

1.0 Primary Disinfection Pathogen Log Removal/Inactivation Credits

Surface Water Treatment Plant [SURFACE WATER]

Log Removal/Inactivation Required	Cryptosporidium Oocysts	Giardia Cysts	Viruses
Surface Water Treatment Plant	2	3	4

Log Removal/Inactivation Credits Assigned	Cryptosporidium Oocysts	Giardia Cysts	Viruses
Primary Membrane Filtration	2	2.5	2.0
Chlorine Disinfection	0	0.5	2.0

Well 3A, Anne Street [GROUNDWATER]

Log Removal/Inactivation Required	Cryptosporidium Oocysts	Giardia Cysts	Viruses
Well 3A, Anne Street	0	0	2

Log Removal/Inactivation Credits Assigned	Cryptosporidium Oocysts	Giardia Cysts	Viruses
Chlorine Disinfection	0	0	2

Well 5, John Street [GROUNDWATER]

Log Removal/Inactivation Required	Cryptosporidium Oocysts	Giardia Cysts	Viruses
Well 5, John Street	0	0	2

Log Removal/Inactivation Credits Assigned	Cryptosporidium Oocysts	Giardia Cysts	Viruses
UV Treatment	0	0	2

Well 7, Tiffin Street [GROUNDWATER]

Log Removal/Inactivation Required	Cryptosporidium Oocysts	Giardia Cysts	Viruses
Well 7, Tiffin Street	0	0	2

Log Removal/Inactivation Credits Assigned	Cryptosporidium Oocysts	Giardia Cysts	Viruses
Chlorine Disinfection	0	0	2

Well 9, Johnson Street [GROUNDWATER]

Log Removal/Inactivation Required	Cryptosporidium Oocysts	Giardia Cysts	Viruses
Well 9, Johnson Street	0	0	2

Log Removal/Inactivation Credits Assigned	Cryptosporidium Oocysts	Giardia Cysts	Viruses
Chlorine Disinfection	0	0	2

Well 11, Heritage Park [GROUNDWATER]

Log Removal/Inactivation Required	Cryptosporidium Oocysts	Giardia Cysts	Viruses
Well 11, Heritage Park	0	0	2

Log Removal/Inactivation Credits Assigned	Cryptosporidium Oocysts	Giardia Cysts	Viruses
Chlorine Disinfection	0	0	2

Well 12, Centennial Park [GROUNDWATER]

Log Removal/Inactivation Required	Cryptosporidium Oocysts	Giardia Cysts	Viruses
Well 12, Centennial Park	0	0	2

Log Removal/Inactivation Credits Assigned	Cryptosporidium Oocysts	Giardia Cysts	Viruses
Chlorine Disinfection	0	0	2

Well 13, Johnson Street [GROUNDWATER]

Log Removal/Inactivation Required	Cryptosporidium Oocysts	Giardia Cysts	Viruses
Well 13, Johnson Street	0	0	2

Log Removal/Inactivation Credits Assigned	Cryptosporidium Oocysts	Giardia Cysts	Viruses
Chlorine Disinfection	0	0	2

Well 14, Heritage Park [GROUNDWATER]

Log Removal/Inactivation Required	Cryptosporidium Oocysts	Giardia Cysts	Viruses
Well 14, Heritage Park	0	0	2

Log Removal/Inactivation Credits Assigned	Cryptosporidium Oocysts	Giardia Cysts	Viruses
Chlorine Disinfection	0	0	2

Well 15, Centennial Park [GROUNDWATER]

Log Removal/Inactivation Required	Cryptosporidium Oocysts	Giardia Cysts	Viruses
Well 15, Centennial Park	**0**	**0**	**2**

Log Removal/Inactivation Credits Assigned	Cryptosporidium Oocysts	Giardia Cysts	Viruses
Chlorine Disinfection	0	0	2

Well 16, Brown Wood Drive [GROUNDWATER]

Log Removal/Inactivation Required	Cryptosporidium Oocysts	Giardia Cysts	Viruses
Well 16, Brown Wood Drive	0	0	2

Log Removal/Inactivation Credits Assigned	Cryptosporidium Oocysts	Giardia Cysts	Viruses
Chlorine Disinfection	0	0	2

Well 17, Cross Street [GROUNDWATER]

Log Removal/Inactivation Required	Cryptosporidium Oocysts	Giardia Cysts	Viruses
Well 17, Cross Street	0	0	2

Log Removal/Inactivation Credits Assigned	Cryptosporidium Oocysts	Giardia Cysts	Viruses
Chlorine Disinfection	0	0	2

Well 18, Cross Street [GROUNDWATER]

Log Removal/Inactivation Required	Cryptosporidium Oocysts	Giardia Cysts	Viruses
Well 18, Cross Street	0	0	2

Log Removal/Inactivation Credits Assigned	Cryptosporidium Oocysts	Giardia Cysts	Viruses
Chlorine Disinfection	0	0	2

Ontario

Ministry of the Environment
Ministère de l'Environnement

AMENDED PERMIT TO TAKE WATER
Surface and Ground Water
NUMBER 5183-8EZKMA

Pursuant to Section 34 of the Ontario Water Resources Act, R.S.O. 1990 this Permit To Take Water is hereby issued to:

The Corporation of the City of Barrie
70 Collier St
Barrie, Ontario, L4M 4T5
Canada

For the water taking from: Well 3A, Well 4A, Well 5, Well 7, Well 9, Well 11, Well 12, Well 13, Well 14, Well 15, Well 16, Well 17, Well 18, Well 19, Lake Simcoe

Located at:
54 Anne St Well Record 5732108
Barrie, County of Simcoe

83 Perry St (no WWR)
Barrie, County of Simcoe

217 John St Well Record 5700271
Barrie, County of Simcoe

44 Sarjeant Dr Well Record 5709125
Barrie, County of Simcoe

168 Johnson St Well Record 5712496
Barrie, County of Simcoe

5 Simcoe St Well Record 5719246
Barrie, County of Simcoe

85 Lakeshore Dr Well Record 5720696
Barrie, County of Simcoe

168 Johnson St Well Record 5720696
Barrie, County of Simcoe

19 Simcoe St Well Record 5720696
Barrie, County of Simcoe

55 Lakeshore Dr Well Record 5720696
Barrie, County of Simcoe

101 Brown Wood Well Record 5733545
Barrie, County of Simcoe

34 Cross St Well Record 5737406, 5739442
Barrie, County of Simcoe

5 Boulton Crt
Barrie, County of Simcoe

Lot 15, Concession 3
Barrie, County of Simcoe

For the purposes of this Permit, and the terms and conditions specified below, the following definitions apply:

DEFINITIONS

(a) "Director" means any person appointed in writing as a Director pursuant to section 5 of the OWRA for the purposes of section 34, OWRA.

(b) "Provincial Officer" means any person designated in writing by the Minister as a Provincial Officer pursuant to section 5 of the OWRA.

(c) "Ministry" means Ontario Ministry of the Environment.

(d) "District Office" means the Barrie District Office.

(e) "Permit" means this Permit to Take Water No. 5183-8EZKMA including its Schedules, if any, issued in accordance with Section 34 of the OWRA.

(f) "Permit Holder" means The Corporation of the City of Barrie.

(g) "OWRA " means the *Ontario Water Resources Act*, R.S.O. 1990, c. O. 40, as amended.

You are hereby notified that this Permit is issued subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1. Compliance with Permit

1.1 Except where modified by this Permit, the water taking shall be in accordance with the application for this Permit To Take Water, dated February 1, 2011 and signed by Dawn A. McAlpine, and all Schedules included in this Permit.

1.2 The Permit Holder shall ensure that any person authorized by the Permit Holder to take water under this Permit is provided with a copy of this Permit and shall take all reasonable measures to ensure that any such person complies with the conditions of this Permit.

1.3 Any person authorized by the Permit Holder to take water under this Permit shall comply with the conditions of this Permit.

1.4 This Permit is not transferable to another person.

1.5 This Permit provides the Permit Holder with permission to take water in accordance with the conditions of this Permit, up to the date of the expiry of this Permit. This Permit does not constitute a legal right, vested or otherwise, to a water allocation, and the issuance of this Permit does not guarantee that, upon its expiry, it will be renewed.

1.6 The Permit Holder shall keep this Permit available at all times at or near the site of the taking, and shall produce this Permit immediately for inspection by a Provincial Officer upon his or her request.

1.7 The Permit Holder shall report any changes of address to the Director within thirty days of any such change. The Permit Holder shall report any change of ownership of the property for which this Permit is issued within thirty days of any such change. A change in ownership in the property shall cause this Permit to be cancelled.

2. General Conditions and Interpretation

2.1 Inspections
The Permit Holder must forthwith, upon presentation of credentials, permit a Provincial Officer to carry out any and all inspections authorized by the OWRA, the *Environmental Protection Act* , R.S.O. 1990, the *Pesticides Act* , R.S.O. 1990, or the *Safe Drinking Water Act*, S. O. 2002.

2.2 Other Approvals
The issuance of, and compliance with this Permit, does not:

(a) relieve the Permit Holder or any other person from any obligation to comply with any other applicable legal requirements, including the provisions of the *Ontario Water Resources Act* , and

the *Environmental Protection Act* , and any regulations made thereunder; or

(b) limit in any way any authority of the Ministry, a Director, or a Provincial Officer, including the authority to require certain steps be taken or to require the Permit Holder to furnish any further information related to this Permit.

2.3 Information

The receipt of any information by the Ministry, the failure of the Ministry to take any action or require any person to take any action in relation to the information, or the failure of a Provincial Officer to prosecute any person in relation to the information, shall not be construed as:

(a) an approval, waiver or justification by the Ministry of any act or omission of any person that contravenes this Permit or other legal requirement; or

(b) acceptance by the Ministry of the information's completeness or accuracy.

2.4 Rights of Action

The issuance of, and compliance with this Permit shall not be construed as precluding or limiting any legal claims or rights of action that any person, including the Crown in right of Ontario or any agency thereof, has or may have against the Permit Holder, its officers, employees, agents, and contractors.

2.5 Severability

The requirements of this Permit are severable. If any requirements of this Permit, or the application of any requirements of this Permit to any circumstance, is held invalid or unenforceable, the application of such requirements to other circumstances and the remainder of this Permit shall not be affected thereby.

2.6 Conflicts

Where there is a conflict between a provision of any submitted document referred to in this Permit, including its Schedules, and the conditions of this Permit, the conditions in this Permit shall take precedence.

3. Water Takings Authorized by This Permit

3.1 **Expiry**

This Permit expires on **April 30, 2021**. No water shall be taken under authority of this Permit after the expiry date.

3.2 Amounts of Taking Permitted

The Permit Holder shall only take water from the source, during the periods and at the rates and amounts of taking specified in Table A. Water takings are authorized only for the purposes specified in Table A.

Table A

	Source Name / Description:	Source: Type:	Taking Specific Purpose:	Taking Major Category:	Max. Taken per Minute (litres):	Max. Num. of Hrs Taken per Day:	Max. Taken per Day (litres):	Max. Num. of Days Taken per Year:	Zone/ Easting/ Northing:
1	Well 3A	Well Drilled	Municipal	Water Supply	4,550	24	6,552,000	365	17 603352 4914735
2	Well 4A	Well Drilled	Municipal	Water Supply	4,550	24	6,552,000	365	17 603325 4915145
3	Well 5	Well Drilled	Municipal	Water Supply	4,550	24	6,552,000	365	17 602928 4914269
4	Well 7	Well Drilled	Municipal	Water Supply	4,550	24	6,552,000	365	17 602474 4914188
5	Well 9	Well Drilled	Municipal	Water Supply	4,550	24	6,552,000	365	17 607042 4917657
6	Well 11	Well Drilled	Municipal	Water Supply	6,370	24	9,100,000	365	17 604689 4915818
7	Well 12	Well Drilled	Municipal	Water Supply	6,370	24	9,100,000	365	17 604479 4914596
8	Well 13	Well Drilled	Municipal	Water Supply	4,550	24	6,552,000	365	17 607041 4917649
9	Well 14	Well Drilled	Municipal	Water Supply	6,370	24	9,100,000	365	17 604661 4915784
10	Well 15	Well Drilled	Municipal	Water Supply	6,370	24	9,100,000	365	17 604402 4915201
11	Well 16	Well Drilled	Municipal	Water Supply	5,460.0	24	7,862,400	365	17 604025 4919597
12	Well 17	Well Drilled	Municipal	Water Supply	7,800	24	11,232,000	365	17 602043 4913787
13	Well 18	Well Drilled	Municipal	Water Supply	7,800	24	11,232,000	365	17 602013 4913780
14	Well 19	Well Drilled	Municipal	Water Supply	5,460	24	7,862,400	365	17 601393 4913017
15	Lake Simcoe	Lake	Municipal	Water Supply	203,750	24	65,200,000	365	17 609042 4913821
						Total Taking:	148,264,000		

4. Monitoring

4.1 The Permit Holder shall maintain a record of all water takings. This record shall include the dates and times of water takings, and the total measured amounts of water pumped per day for each day that water is taken under the authorization of this Permit. The total amount of water pumped into the distribution system shall be measured using an in-line flow monitoring device. The sources that have a pump to waste provision on start up shall have the total amount of water pumped to waste calculated by multiplying the litre per section flow rate by the time flowing to waste. A separate record shall be maintained for each source. The Permit Holder shall keep all required records up to date and available at or near the site of the taking and shall produce the records immediately for inspection by a Provincial Officer upon his or her request.

4.2 By December 31, 2011, the Permit Holder shall install a data logger to measure and record static and/or pumping water levels in each production well on a continuous basis. Until the dataloggers are installed the Permit Holder shall continue with weekly water level measurements.

4.3 By December 31, 2011, the Permit Holder shall install data loggers to measure and record water levels in the following observation wells on a continuous basis: TW1/83, TW9/59, TW1/02 and TW3/88. Until the dataloggers are installed the Permit Holder shall continue with monthly water level measurements.

4.4 Any request for a future amendment or renewal of this Permit shall be supported by a report prepared by a Qualified Person (P.Geo or equivalent) assessing all information collected under the Conditions of this Permit. The report shall include an electronic version of the data collected but Ministry staff may at any time request an electronic version of the information required under the Permit.

5. Impacts of the Water Taking

5.1 Notification

The Permit Holder shall immediately notify the local District Office of any complaint arising from the taking of water authorized under this Permit and shall report any action which has been taken or is proposed with regard to such complaint. The Permit Holder shall immediately notify the local District Office if the taking of water is observed to have any significant impact on the surrounding waters. After hours, calls shall be directed to the Ministry's Spills Action Centre at 1-800-268-6060.

5.2 For Surface-Water Takings

The taking of water (including the taking of water into storage and the subsequent or simultaneous withdrawal from storage) shall be carried out in such a manner that streamflow is not stopped and is not reduced to a rate that will cause interference with downstream uses of water or with the natural functions of the stream.

For Groundwater Takings

If the taking of water is observed to cause any negative impact to other water supplies obtained from any adequate sources that were in use prior to initial issuance of a Permit for this water taking, the Permit Holder shall take such action necessary to make available to those affected, a supply of water equivalent in quantity and quality to their normal takings, or shall compensate such persons for their reasonable costs of so doing, or shall reduce the rate and amount of taking to prevent or alleviate the observed negative impact. Pending permanent restoration of the affected supplies, the Permit Holder shall provide, to those affected, temporary water supplies adequate to meet their normal requirements, or shall compensate such persons for their reasonable costs of doing so.

If permanent interference is caused by the water taking, the Permit Holder shall restore the water supplies of those permanently affected.

6. **Director May Amend Permit**
The Director may amend this Permit by letter requiring the Permit Holder to suspend or reduce the taking to an amount or threshold specified by the Director in the letter. The suspension or reduction in taking shall be effective immediately and may be revoked at any time upon notification by the Director. This condition does not affect your right to appeal the suspension or reduction in taking to the Environmental Review Tribunal under the *Ontario Water Resources Act* , Section 100 (4).

The reasons for the imposition of these terms and conditions are as follows:

1. Condition 1 is included to ensure that the conditions in this Permit are complied with and can be enforced.

2. Condition 2 is included to clarify the legal interpretation of aspects of this Permit.

3. Conditions 3 through 6 are included to protect the quality of the natural environment so as to safeguard the ecosystem and human health and foster efficient use and conservation of waters. These conditions allow for the beneficial use of waters while ensuring the fair sharing, conservation and sustainable use of the waters of Ontario. The conditions also specify the water takings that are authorized by this Permit and the scope of this Permit.

In accordance with Section 100 of the Ontario Water Resources Act, R.S.O. 1990, you may by written Notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 101 of the Ontario Water Resources Act, R.S.O. 1990, as amended, provides that the Notice requiring the hearing shall state:

1. The portions of the Permit or each term or condition in the Permit in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

In addition to these legal requirements, the Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The Permit to Take Water number;
6. The date of the Permit to Take Water;
7. The name of the Director;
8. The municipality within which the works are located;

This notice must be served upon:

The Secretary
Environmental Review Tribunal
655 Bay Street, 15th Floor
Toronto ON
M5G 1E5

AND

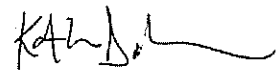
The Director, Section 34
Ministry of the Environment
8th Floor
5775 Yonge St
Toronto ON M2M 4J1
Fax: (416)325-6347

Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal:

by telephone at (416) 314-4600 ***by fax at (416) 314-4506*** ***by e-mail at www.ert.gov.on.ca***

This Permit cancels and replaces Permit Number 2353-7SLPRF, issued on 22/06/2009 12:00:00 AM.

Dated at Toronto this 18th day of May, 2011.



Kathryn Baker
Director, Section 34
Ontario Water Resources Act , R.S.O. 1990

Schedule A

This Schedule "A" forms part of Permit To Take Water 5183-8EZKMA, dated May 18, 2011.

1. The Application for Permit to Take Water signed by Dawn A. McAlpine and dated February 1, 2011.

2. The Well 4A Construction and Testing Report, prepared by Golder Associates Ltd, dated December 2010, and signed by Mike Fairbanks and Paul Dewaele.

3. Email correspondence between Lyndsay Kean and Mike Fairbanks, dated March 3, 2011 and March 15, 2011.

APPENDIX

D LIFE CYCLE COSTS

171-07636-00 Barrie W&WW Master Plans Update - Water Supply
DISCOUNTED CASH FLOW
ALTERNATIVE 4- SWTP EXPANSION

Interest rate	*5.0%*
Inflation rate	*2.0%*

Year		Capital cost	Replacement Cost	Operations Cost	TOTAL	Discount rate	Total Discounted value	Capital Discounted	Replacement Discounted	Operations Discounted
0	2021	93,492 $	244,000 $	$ 9,269,675	$ 9,607,167	1.00	$ 9,607,167	$ 93,492	$ 244,000	$ 9,269,675
1	2022	93,492 $	243,750 $	$ 9,521,119	$ 9,858,361	0.97	$ 9,576,694	$ 90,821	$ 236,786	$ 9,249,087
2	2023	93,492 $	243,750 $	$ 9,781,342	$ 10,118,584	0.94	$ 9,548,640	$ 88,226	$ 230,020	$ 9,230,393
3	2024	93,492 $	243,750 $	$ 10,050,669	$ 10,387,911	0.92	$ 9,522,716	$ 85,705	$ 223,448	$ 9,213,562
4	2025	255,854 $	243,750 $	$ 10,329,434	$ 10,829,037	0.89	$ 9,643,470	$ 227,843	$ 217,064	$ 9,198,563
5	2026	255,854 $	243,750 $	$ 10,617,985	$ 11,117,589	0.87	$ 9,617,561	$ 221,333	$ 210,862	$ 9,185,366
6	2027	255,854 $	243,750 $	$ 10,843,715	$ 11,343,319	0.84	$ 9,532,468	$ 215,009	$ 204,838	$ 9,112,621
7	2028	255,854 $	243,750 $	$ 11,075,061	$ 11,574,665	0.82	$ 9,448,971	$ 208,866	$ 198,985	$ 9,041,120
8	2029	2,209,646 $	243,750 $	$ 11,312,173	$ 13,765,569	0.79	$ 10,916,443	$ 1,752,305	$ 193,300	$ 8,970,838
9	2030	9,047,918 $	243,750 $	$ 11,555,204	$ 20,846,872	0.77	$ 16,059,749	$ 6,970,220	$ 187,777	$ 8,901,752
10	2031	9,047,918 $	243,750 $	$ 11,804,311	$ 21,095,979	0.75	$ 15,787,320	$ 6,771,071	$ 182,412	$ 8,833,837
11	2032	0 $	250,000 $	$ 12,046,416	$ 12,296,416	0.73	$ 8,939,189	$ -	$ 181,744	$ 8,757,446
12	2033	0 $	250,000 $	$ 12,294,015	$ 12,544,015	0.71	$ 8,858,640	$ -	$ 176,551	$ 8,682,089
13	2034	0 $	250,000 $	$ 12,547,240	$ 12,797,240	0.69	$ 8,779,255	$ -	$ 171,507	$ 8,607,748
14	2035	0 $	250,000 $	$ 12,806,224	$ 13,056,224	0.67	$ 8,701,013	$ -	$ 166,607	$ 8,534,406
15	2036	0 $	250,000 $	$ 13,071,105	$ 13,321,105	0.65	$ 8,623,892	$ -	$ 161,846	$ 8,462,046
16	2037	0 $	250,000 $	$ 13,365,443	$ 13,615,443	0.63	$ 8,562,602	$ -	$ 157,222	$ 8,405,379
17	2038	0 $	250,000 $	$ 13,666,870	$ 13,916,870	0.61	$ 8,502,104	$ -	$ 152,730	$ 8,349,374
18	2039	0 $	250,000 $	$ 13,975,562	$ 14,225,562	0.59	$ 8,442,385	$ -	$ 148,366	$ 8,294,018
19	2040	0 $	250,000 $	$ 14,291,700	$ 14,541,700	0.58	$ 8,383,430	$ -	$ 144,127	$ 8,239,303
20	**2041**	**0 $**	**243,750 $**	**$ 14,410,346**	**$ 14,654,096**	**0.56**	**$ 8,206,850**	**$ -**	**$ 136,509**	**$ 8,070,341**
		$ 21,702,864		$ -		**TOTAL 20 years**	**$ 205,260,559**	**$ 16,724,891**	**$ 3,926,703**	**$ 184,608,965**

171-07636-00 Barrie W&WW Master Plans Update - Water Supply
DISCOUNTED CASH FLOW
ALTERNATIVE 6A DIVERT WELLS 17/18 TO ZONE 2S AND 3S

Interest rate	*5.0%*
Inflation rate	*2.0%*

Year		Capital cost	Replacement Cost	Operations Cost	TOTAL	Discount rate	Total Discounted value	Capital Discounted	Replacement Discounted	Operations Discounted
0	2021	133,560 $	243,750 $	$ 9,269,675	$ 9,646,985	1.00	$ 9,646,985	$ 133,560	$ 243,750	$ 9,269,675
1	2022	133,560 $	243,750 $	$ 9,521,119	$ 9,898,429	0.97	$ 9,615,617	$ 129,744	$ 236,786	$ 9,249,087
2	2023	133,560 $	243,750 $	$ 9,781,342	$ 10,158,652	0.94	$ 9,586,451	$ 126,037	$ 230,020	$ 9,230,393
3	2024	133,560 $	243,750 $	$ 10,050,669	$ 10,427,979	0.92	$ 9,559,447	$ 122,436	$ 223,448	$ 9,213,562
4	2025	1,232,750 $	243,750 $	$ 10,329,434	$ 11,805,933	0.89	$ 10,513,415	$ 1,097,788	$ 217,064	$ 9,198,563
5	2026	1,232,750 $	243,750 $	$ 10,617,985	$ 12,094,485	0.87	$ 10,462,651	$ 1,066,422	$ 210,862	$ 9,185,366
6	2027	1,232,750 $	243,750 $	$ 10,843,715	$ 12,320,215	0.84	$ 10,353,412	$ 1,035,953	$ 204,838	$ 9,112,621
7	2028	1,232,750 $	243,750 $	$ 11,075,061	$ 12,551,561	0.82	$ 10,246,460	$ 1,006,355	$ 198,985	$ 9,041,120
8	2029	2,046,830 $	243,750 $	$ 11,312,173	$ 13,602,753	0.79	$ 10,787,326	$ 1,623,188	$ 193,300	$ 8,970,838
9	2030	4,896,110 $	243,750 $	$ 11,555,204	$ 16,695,064	0.77	$ 12,861,332	$ 3,771,803	$ 187,777	$ 8,901,752
10	2031	4,896,110 $	243,750 $	$ 11,804,311	$ 16,944,171	0.75	$ 12,680,286	$ 3,664,037	$ 182,412	$ 8,833,837
11	2032	0 $	243,750 $	$ 12,046,416	$ 12,290,166	0.73	$ 8,934,646	$ -	$ 177,200	$ 8,757,446
12	2033	0 $	243,750 $	$ 12,294,015	$ 12,537,765	0.71	$ 8,854,226	$ -	$ 172,137	$ 8,682,089
13	2034	0 $	243,750 $	$ 12,547,240	$ 12,790,990	0.69	$ 8,774,967	$ -	$ 167,219	$ 8,607,748
14	2035	0 $	243,750 $	$ 12,806,224	$ 13,049,974	0.67	$ 8,696,848	$ -	$ 162,441	$ 8,534,406
15	2036	0 $	243,750 $	$ 13,071,105	$ 13,314,855	0.65	$ 8,619,846	$ -	$ 157,800	$ 8,462,046
16	2037	0 $	243,750 $	$ 13,365,443	$ 13,609,193	0.63	$ 8,558,671	$ -	$ 153,292	$ 8,405,379
17	2038	0 $	243,750 $	$ 13,666,870	$ 13,910,620	0.61	$ 8,498,286	$ -	$ 148,912	$ 8,349,374
18	2039	0 $	243,750 $	$ 13,975,562	$ 14,219,312	0.59	$ 8,438,676	$ -	$ 144,657	$ 8,294,018
19	2040	0 $	243,750 $	$ 14,291,700	$ 14,535,450	0.58	$ 8,379,827	$ -	$ 140,524	$ 8,239,303
20	**2041**	**0 $**	**243,750 $**	$ 14,410,346	**$ 14,654,096**	**0.56**	**$ 8,206,850**	**$ -**	**$ 136,509**	**$ 8,070,341**
		$ 17,304,288				**TOTAL 20 years**	**$ 202,276,223**	**$ 13,777,323**	**$ 3,889,936**	**$ 184,608,965**

171-07636-00 Barrie W&WW Master Plans Update - Water Supply
DISCOUNTED CASH FLOW
ALTERNATIVE 7 MIX SURFACE WATER SUPPLY AND GROUNDWATER SUPPLY

Interest rate	*5.0%*
Inflation rate	*2.0%*

Year		Capital cost	Replacement Cost	Operations Cost	TOTAL	Discount rate	Total Discounted value	Capital Discounted	Replacement Discounted	Operations Discounted
0	2021	133,560 $	243,750 $	$ 9,269,675	$ 9,646,985	1.00	$ 9,646,985	$ 133,560	$ 243,750	$ 9,269,675
1	2022	133,560 $	243,750 $	$ 9,521,119	$ 9,898,429	0.97	$ 9,615,617	$ 129,744	$ 236,786	$ 9,249,087
2	2023	133,560 $	243,750 $	$ 9,781,342	$ 10,158,652	0.94	$ 9,586,451	$ 126,037	$ 230,020	$ 9,230,393
3	2024	133,560 $	243,750 $	$ 10,050,669	$ 10,427,979	0.92	$ 9,559,447	$ 122,436	$ 223,448	$ 9,213,562
4	2025	1,232,750 $	243,750 $	$ 10,329,434	$ 11,805,933	0.89	$ 10,513,415	$ 1,097,788	$ 217,064	$ 9,198,563
5	2026	1,232,750 $	243,750 $	$ 10,617,985	$ 12,094,485	0.87	$ 10,462,651	$ 1,066,422	$ 210,862	$ 9,185,366
6	2027	1,232,750 $	243,750 $	$ 10,843,715	$ 12,320,215	0.84	$ 10,353,412	$ 1,035,953	$ 204,838	$ 9,112,621
7	2028	1,232,750 $	243,750 $	$ 11,075,061	$ 12,551,561	0.82	$ 10,246,460	$ 1,006,355	$ 198,985	$ 9,041,120
8	2029	1,232,750 $	243,750 $	$ 11,312,173	$ 12,788,673	0.79	$ 10,141,740	$ 977,602	$ 193,300	$ 8,970,838
9	2030	1,232,750 $	243,750 $	$ 11,555,204	$ 13,031,704	0.77	$ 10,039,199	$ 949,670	$ 187,777	$ 8,901,752
10	2031	1,232,750 $	243,750 $	$ 11,804,311	$ 13,280,811	0.75	$ 9,938,786	$ 922,537	$ 182,412	$ 8,833,837
11	2032	0 $	243,750 $	$ 12,046,416	$ 12,290,166	0.73	$ 8,934,646	$ -	$ 177,200	$ 8,757,446
12	2033	0 $	243,750 $	$ 12,294,015	$ 12,537,765	0.71	$ 8,854,226	$ -	$ 172,137	$ 8,682,089
13	2034	0 $	243,750 $	$ 12,547,240	$ 12,790,990	0.69	$ 8,774,967	$ -	$ 167,219	$ 8,607,748
14	2035	0 $	243,750 $	$ 12,806,224	$ 13,049,974	0.67	$ 8,696,848	$ -	$ 162,441	$ 8,534,406
15	2036	0 $	243,750 $	$ 13,071,105	$ 13,314,855	0.65	$ 8,619,846	$ -	$ 157,800	$ 8,462,046
16	2037	0 $	243,750 $	$ 13,365,443	$ 13,609,193	0.63	$ 8,558,671	$ -	$ 153,292	$ 8,405,379
17	2038	0 $	243,750 $	$ 13,666,870	$ 13,910,620	0.61	$ 8,498,286	$ -	$ 148,912	$ 8,349,374
18	2039	0 $	243,750 $	$ 13,975,562	$ 14,219,312	0.59	$ 8,438,676	$ -	$ 144,657	$ 8,294,018
19	2040	0 $	243,750 $	$ 14,291,700	$ 14,535,450	0.58	$ 8,379,827	$ -	$ 140,524	$ 8,239,303
20	**2041**	**0 $**	**243,750 $**	**$ 14,410,346**	**$ 14,654,096**	**0.56**	**$ 8,206,850**	**$ -**	**$ 136,509**	**$ 8,070,341**
		$ 9,163,488		$ -		**TOTAL 20 years**	**$ 196,067,004**	**$ 7,568,103**	**$ 3,889,936**	**$ 184,608,965**

APPENDIX

E DETAILED EVALUATION MATRIX

Evaluation Criteria	Weight	**Alternative 4** Surface Water Treatment Plant Upgrades	**Alternative 6A** Divert Wells 17/18 to Southern Zones	**Alternative 7** Mix Surface Water Supply and Groundwater Supply
Natural Environment	**20**			
Proximity, Size, Characteristics and Sensitivity of Significant Natural Areas, Terrestrial Ecosystems, and Wetlands		Modular expansion of processes will occur entirely within the existing SWTP building on the existing property. No anticipated impacts on natural areas, vegetation or wildlife.	Diversion of wells using existing valves and watermains of the distribution system. No anticipated impacts on natural areas, vegetation or wildlife.	Groundwater supply to zone 2S and 3S is provided by existing infrastructure. No anticipated impacts on natural areas, vegetation or wildlife.
	4	0	0	0
Potential Impact of Loss of Natural Areas, Terrestrial Ecosystems, or Wetlands		Modular expansion of processes will occur entirely within the existing SWTP building on the existing property. No anticipated impacts non loss of natural areas.	Diversion of wells using existing valves and watermains of the distribution system. No anticipated impacts on loss of natural areas.	Groundwater supply to zone 2S and 3S is provided by existing infrastructure. No anticipated impacts on loss of natural areas.
	4	0	0	0
Potential Advserse Effect on Groundwater Quality, Surface Water Quality, Erosion, or Flood Potential		Increase of PTTW of Lake Simcoe required. No intake upgrades required.	Increases the stress on the groundwater system. Increase of overall PTTW.	Increases the stress on the groundwater system. Increase of overall PTTW.
	6	-1	-2	-2
Impacts to Stream Morphology, Water Course Crossings and Fisheries		Modular expansion of processes will occur entirely within the existing SWTP building on the existing property. No anticipated impacts on stream morphology or fisheries.	No anticipated impacts on stream morphology or fisheries.	No anticipated impacts on stream morphology or fisheries.
	6	0	0	0
Physical (Built) Environment	**10**			
Potential Advserse Effects on Existing Utilities (Water, Electricity, and Telecommunications). Opportunity to Accommodate Future Utilities		Modular expansion of processes will occur entirely within the existing SWTP building on the existing property. No anticipated impact on existing utilities, but increase in electricity infrastructure for SWTP expansion.	Diversion of wells using existing valves and watermains of the distribution system. No anticipated impact on existing utilities.	Groundwater supply to zone 2S and 3S is provided by existing infrastructure. No anticipated impact on existing utilities.
	2	-2	0	0
Impact of Crossings on Existing and Future Land Use		No anticipated impact on land use.	No anticipated impact on land use.	No anticipated impact on land use.
	2	0	0	0
Ability of the Alternative to Adequately Handle Potential Adverse Effects Associated with Climate Change Events such as Extreme Weather Events		Warmer summers can increase the number of algae blooms events in the Lake Simcoe, requiring the addition of a specific treatment step. Original design of the plant considered the possibility of future DAF installation. Reliance on two water sources and additional production capacity, giving more flexibility of operation.	Low potential concern related to the aquifer recharge. Higher reliance on the groundwater system, with potential to cause additional stress to the groundwater system.	Low potential concern related to the aquifer recharge. Reliance on two water sources, giving flexibility of operation.
	3	0	-2	2
Impact on Greenhouse Gas Emissions		Negative impact on green house emissions since the expansion of the plant involves concrete.	Diversion of wells using existing valves and watermains of the distribution system. No anticipated impacts on gas emissions.	Groundwater supply for to zone 2S and 3S is provided by existing infrastructure. No anticipated impacts on gas emissions.
	3	-2	0	0

Evaluation Criteria	Weight	**Alternative 4** Surface Water Treatment Plant Upgrades	**Alternative 6A** Divert Wells 17/18 to Southern Zones	**Alternative 7** Mix Surface Water Supply and Groundwater Supply
Social and Cultural Environment	**20**			
Potential Impact to Residents, Community Facilities, Public Parks, Institutions, or Businesses		Alternative maintains City's current water supply strategy of separate surface water and groundwater zones. Public acceptance of additional SWTP upgrades may be a potential concern, given the available combined surface water and groundwater supplies currently available in the City.	Alternative does not maintain City's current water supply strategy of separate surface water and groundwater zones. Public acceptance and customer complaints of temporary mixing of surface water and groundwater supplies may be a potential concern due to temporary aesthetic changes or water quality variation at Zone 3S mainly.	Alternative does not maintain City's current water supply strategy of separate surface water and groundwater zones. Public acceptance and customer complaints of temporary mixing of surface water and groundwater supplies may be a potential concern due to temporary aesthetic changes or water quality variation at Zones 2S and 3S.
	6	-1	-2	-3
Potential Impact to Visual Aesthetic		Alternative has no anticipated impact on visual aesthetic.	Alternative has no anticipated impact on visual aesthetic.	Alternative has no anticipated impact on visual aesthetic.
	3	0	0	0
Potential Effects of Traffic-Related Air and Noise on Residences Adjacent to the Study Corridor		Minor impacts to air and noise possible during SWTP expansion. However, impacts will be minimized since the expansion will occur within the existing building.	Minor impacts to air and noise possible during upgrades. However, impacts will be minimized since the expansion will occur within the existing infrastructure.	No impacts since the expansion is provided by existing infrastructure.
	3	-1	-2	0
Potential Adverse Impacts on Archeological and Built Heritage Resources Within or Adjacent to the Study Corridor		Modular expansion will occur entirely within the existing SWTP building. Alternative has no anticipated impact on archaeology and heritage resources.	Diversion of wells using existing valves and watermains of the distribution system. No anticipated impacts on archaeology and heritage resources.	Groundwater supply to zone 2S and 3S is provided by existing infrastructure. No anticipated impacts on archaeology and heritage resources.
	3	0	0	0
Impact on Existing Transportation Network Within the City, Including Highway 400 and Highway 11		Modular expansion will occur entirely within the existing SWTP building. There may be minor impacts on traffic around the SWTP during construction. Temporary impacts to site access during construction are possible.	Diversion of wells using existing valves and watermains of the distribution system. Temporary traffic interruptions are possible during valve manipulation and upgrades.	Groundwater supply to zone 2S and 3S is provided by existing infrastructure. Temporary traffic interruptions are possible during valve manipulation and upgrades, to allow for mixing between surface water and groundwater zones.
	2	0	0	0
Presence of First Nations Heritage Sites or Lands that Could be Impacted		Alternative has no anticipated impact on First Nations.	Alternative has no anticipated impact on First Nations.	Alternative has no anticipated impact on First Nations.
	3	0	0	0

Evaluation Criteria	Weight	Alternative 4 Surface Water Treatment Plant Upgrades	Alternative 6A Divert Wells 17/18 to Southern Zones	Alternative 7 Mix Surface Water Supply and Groundwater Supply
Technical	**20**			
Past Performance of the Technology in Ontario		High confidence level. Technologies have been implemented successfully during Phase 1 of the SWTP. Proven track record.	High confidence level. Technologies have been implemented successfully. Proven track record.	High confidence level. Technologies have been implemented successfully. Proven track record.
	1	4	3	3
Ability to Quantify Performance/Measure Results		High confidence level. Technologies have been implemented successfully during Phase 1 of the SWTP. Proven track record.	Jar testing is required to ensure the compatibility of the two water sources. Medium to high confidence level since jar testing is required to ensure the compatibility of the two water sources based on parameters such as turbidity, temperature, alkalinity, hardness and pH. However, the Harvie Road Booster Pumping Station and Wells have been previously installed and operated successfully in distribution system when the entire network was serviced by groundwater.	Jar testing is required to ensure the compatibility of the two water sources. Medium to high confidence level since jar testing is required to ensure the compatibility of the two water sources based on parameters such as turbidity, temperature, alkalinity, hardness and pH. However, the Innisfil Booster Pumping Station and Wells have been previously installed and operated successfully in distribution system when the entire network was serviced by groundwater.
	2	4	3	3
Impacts on the Future Expansion of the Water Supply		Modular expansion up to 240 MLD considered in original design.	Addition of Wells 4A and 19 by 2044.	Addition of Wells 4A and 19 by 2062.
	4	4	2	2
Impacts on the Operation of the Existing Facility		Technologies have been implemented successfully during Phase 1 of the SWTP, but the operation needs will increase with a higher flow.	Reliance on Well 11 and 14 with chlorinated solvents contamination, however, these wells can be replaced by other.	Reliance on Well 11 and 14 with chlorinated solvents contamination, however, these wells can be replaced by other.
	5	2	-1	-1
Ability to Provide Consistent and Efficient Operation		Based on demand projections, the existing SWTP could meet demands in Zones 2S and 3S beyond 2041 if expanded to 72 MLD.	Based on demand projections, diversion of wells 17/18 to meet maximum day demands provides water supply by 2041 planning horizon.	Based on demand projections, mixing surface water and groundwater supplies to meet maximum day demands provides water supply by 2041 planning horizon.
	5	4	4	4
Potential to Phase the Infrastructure to Best Service Growth		Additional capacity of 30 MLD for the SWTP through expansion in 2 phases. Modular expansion up to 240 MLD considered in original design.	Addition of Wells 4A and 19 by 2044.	Addition of Wells 4A and 19 by 2062.
	3	4	3	3

Evaluation Criteria	Weight	**Alternative 4** Surface Water Treatment Plant Upgrades	**Alternative 6A** Divert Wells 17/18 to Southern Zones	**Alternative 7** Mix Surface Water Supply and Groundwater Supply
Economic/Financial	**30**			
Capital Cost of the Proposed Improvements and the Feasibility of Phasing Implementation		$21M High capital costs	$17M Moderate capital costs	$9M Low capital costs
	10	-4	-3	-2
The Net Present Value of the Annual Operation & Maintenance Costs for a 20-year Period (2021-2051)		Similar replacement and O&M costs to other alternatives. Possible small negative impact on O&M costs.	Similar replacement and O&M costs to other alternatives. Possible small positive impact on O&M costs.	Similar replacement and O&M costs to other alternatives. Possible small positive impact on O&M costs.
	10	-1	1	1
Life Cycle Costs - The Sum of the Capital and Operation & Maintenance Costs Discounted		Life cycle costs slightly higher than other alternatives.	Similar life cycle costs to Alternative 7.	Similar life cycle costs to other alternatives.
	10	-2	0	0
Score:	**100**	**-25**	**-15**	**7**
Relative Ranking:		**3**	**2**	**1**

APPENDIX

F WATER SUPPLY CAPITAL BUDGET FORECAST

City of Barrie
Water Service
Capital Budget Forecast
2019 Base
Uninflated $ - HST Included

Description	Budget 2019	Total	2019	2020	2021	2022	2023	2024-2031	2032-2041	Post 2041 Benefit	Growth %	Growth % (2014 MP)
Water System Optimization Studies	534,000	534,000		106,800	106,800	106,800	106,800	106,800			100%	100%
Water system upgrades due to new WQ regulations	1,791,000	1,791,000						1,791,000			43%	Not included
SWTP optimization implementation	6,838,000							6,838,000			100%	100%
		-										
		-										
Total Capital Expenditures	**9,163,000**	**2,325,000**	**-**	**106,800**	**106,800**	**106,800**	**106,800**	**8,735,800**	**-**	**-**		