2022 YORK REGION WATER AND WASTEWATER MASTER PLAN

Appendix A
Infrastructure

york.ca/waterplan

York Region

VOLUME 1

Appendix A

Infrastructure

CONTENTS

APPENDIX A.1 NATURAL ENVIRONMENTAL FEATURES

Summary

This document showcases a series of maps developed through the Municipal Comprehensive Review characterizing the natural environment within York Region.

Disclaimer

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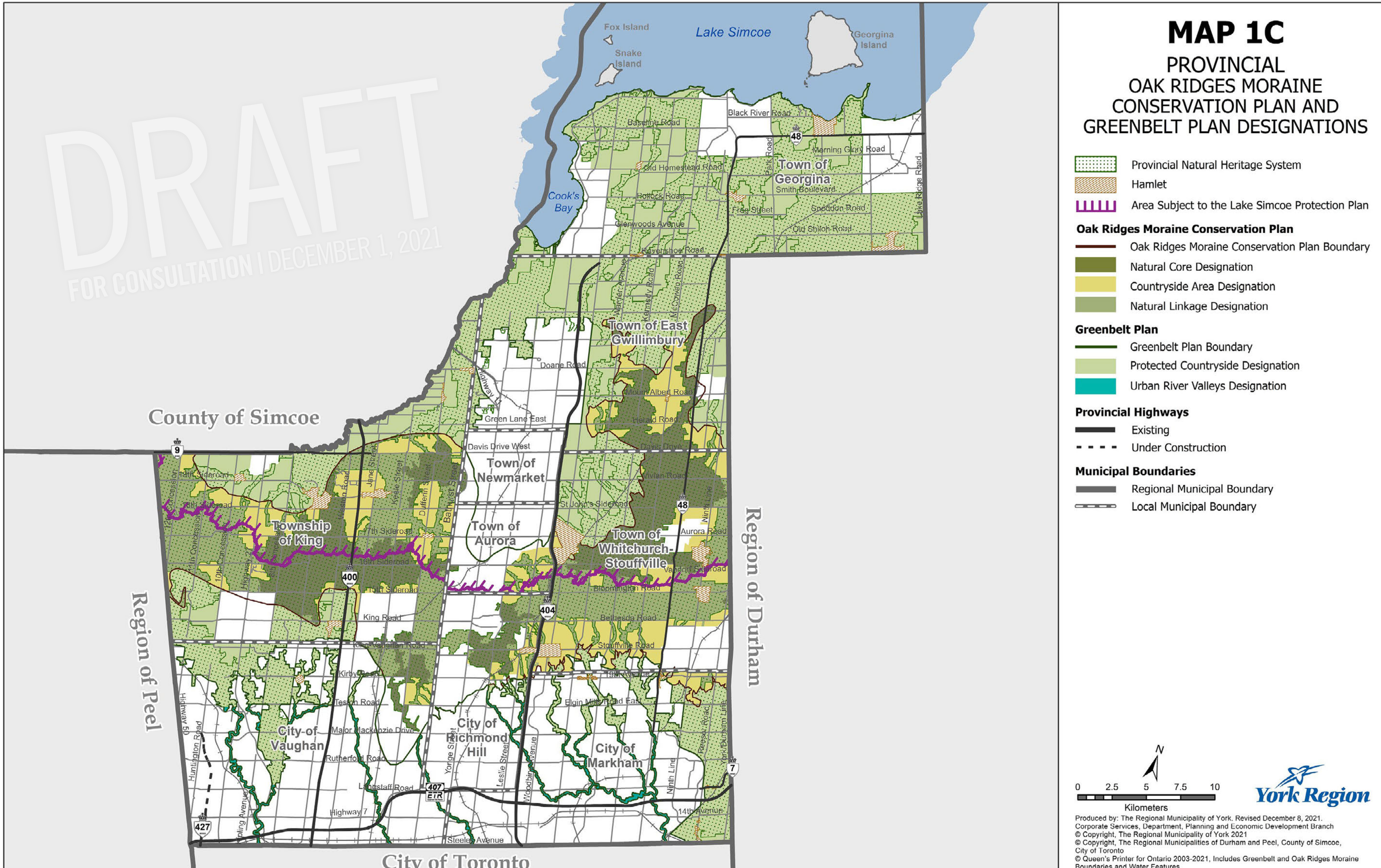
December 1, 2021

York Region


MAP 1C
PROVINCIAL
OAK RIDGES MORAINE
CONSERVATION PLAN AND
GREENBELT PLAN DESIGNATIONS
Provincial Natural Heritage System
Hamlet
Area Subject to the Lake Simcoe Protection Plan
Oak Ridges Moraine Conservation Plan
Oak Ridges Moraine Conservation Plan Boundary
Natural Core Designation
Countryside Area Designation
Natural Linkage Designation
Greenbelt Plan
Greenbelt Plan Boundary
Protected Countryside Designation
Urban River Valleys Designation
Provincial Highways
Existing
Under Construction
Municipal Boundaries
Regional Municipal Boundary
Local Municipal Boundary
0 2.5 5 7.5 10
Kilometers
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York Region
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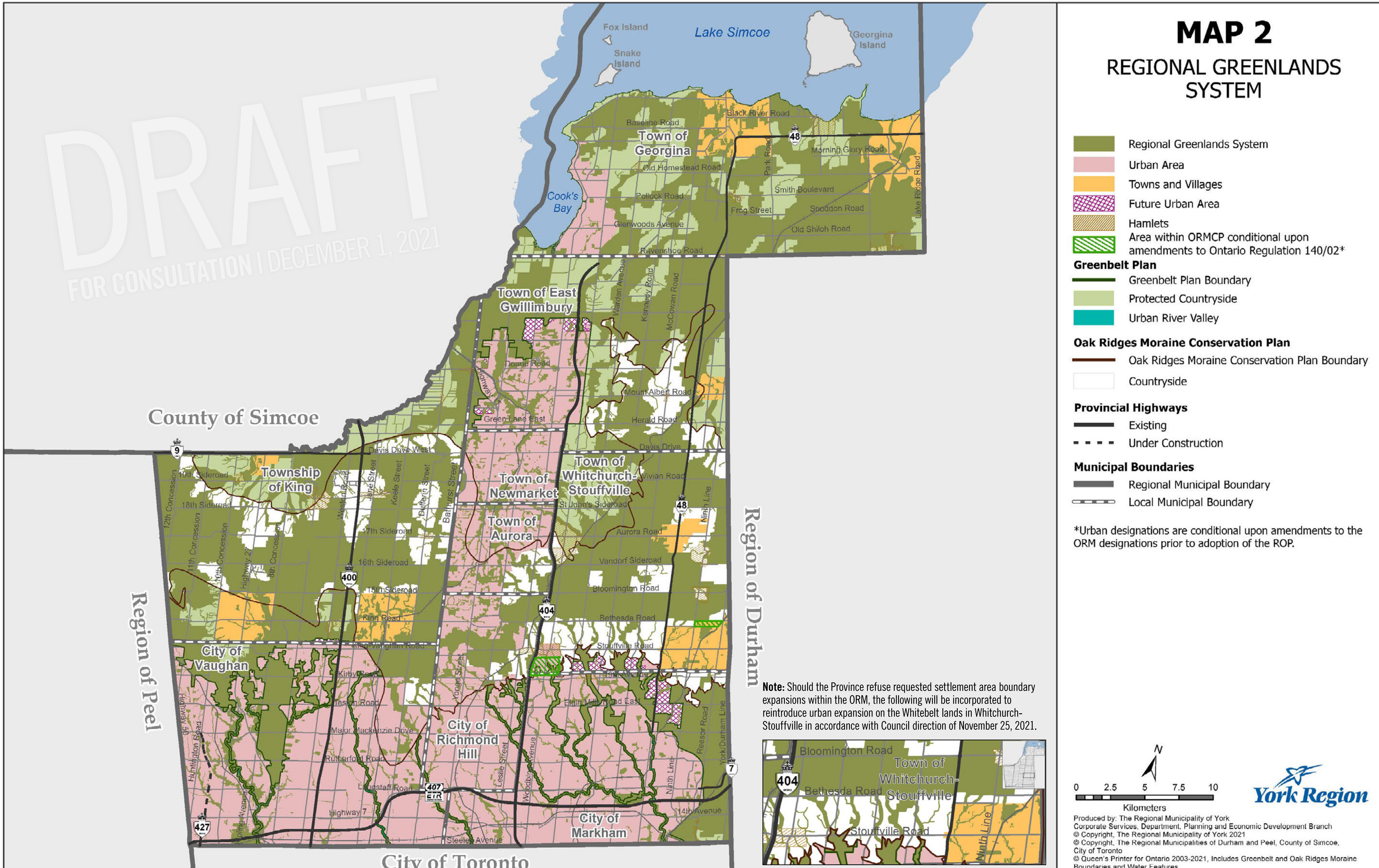
DRAFT
FOR CONSULTATION | DECEMBER 1, 2021
Lake Simcoe
Fox Island
Snake Island
Georgina Island
Cook's Bay
Town of Georgina
Town of East Gwillimbury
Town of Newmarket
Town of Aurora
Town of Whitchurch-Stouffville
Township of King
City of Vaughan
City of Richmond Hill
City of Markham
County of Simcoe
Region of Peel
Region of Durham
City of Toronto


MAP 2
REGIONAL GREENLANDS SYSTEM
Regional Greenlands System
Urban Area
Towns and Villages
Future Urban Area
Hamlets
Area within ORMCP conditional upon amendments to Ontario Regulation 140/02*
Greenbelt Plan
Greenbelt Plan Boundary
Protected Countryside
Urban River Valley
Oak Ridges Moraine Conservation Plan
Oak Ridges Moraine Conservation Plan Boundary
Countryside
Provincial Highways
Existing
Under Construction
Municipal Boundaries
Regional Municipal Boundary
Local Municipal Boundary
*Urban designations are conditional upon amendments to the ORM designations prior to adoption of the ROP.
DRAFT
FOR CONSULTATION | DECEMBER 1, 2021
Lake Simcoe
Fox Island
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Georgina Island
Cook's Bay
Town of Georgina
Town of East Gwillimbury
Township of King
Town of Newmarket
Town of Whitchurch-Stouffville
Town of Aurora
City of Vaughan
City of Richmond Hill
City of Markham
County of Simcoe
Region of Peel
Region of Durham
City of Toronto
Note: Should the Province refuse requested settlement area boundary expansions within the ORM, the following will be incorporated to reintroduce urban expansion on the Whitebelt lands in Whitchurch-Stouffville in accordance with Council direction of November 25, 2021.
Bloomington Road
Bethesda Road
Stouffville Road
Ninth Line
Town of Whitchurch-Stouffville
0 2.5 5 7.5 10
Kilometers
N
York Region
Produced by: The Regional Municipality of York
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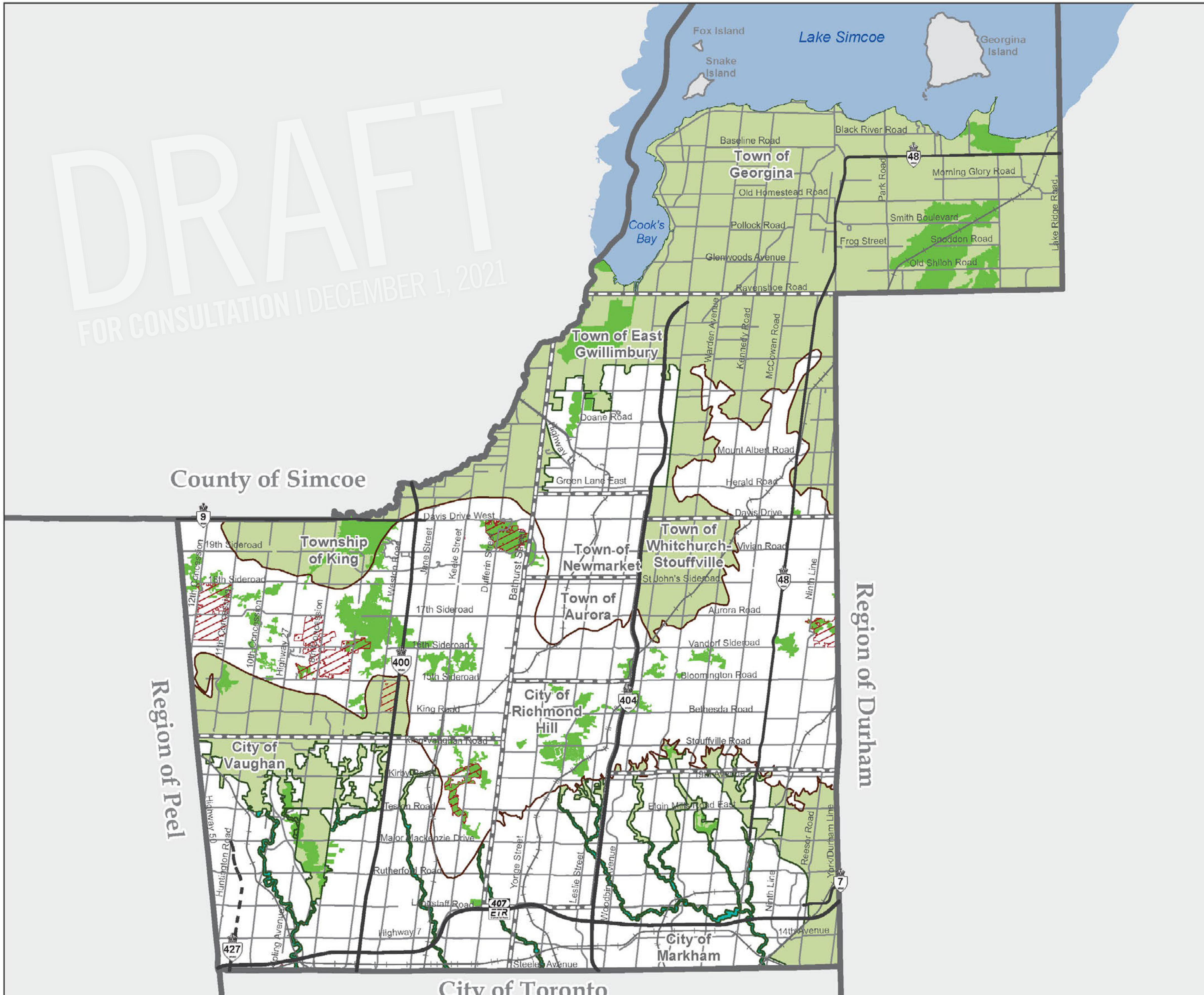

MAP 3

AREAS OF NATURAL AND SCIENTIFIC INTEREST

Areas of Natural and Scientific Interest - Earth Science

Areas of Natural and Scientific Interest - Life Science

Greenbelt Plan

Greenbelt Plan Boundary

Protected Countryside

Urban River Valley

Oak Ridges Moraine Conservation Plan

Oak Ridges Moraine Conservation Plan Boundary

Provincial Highways

Existing

Under Construction

Municipal Boundaries

Regional Municipal Boundary

Local Municipal Boundary

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Kilometers

York Region

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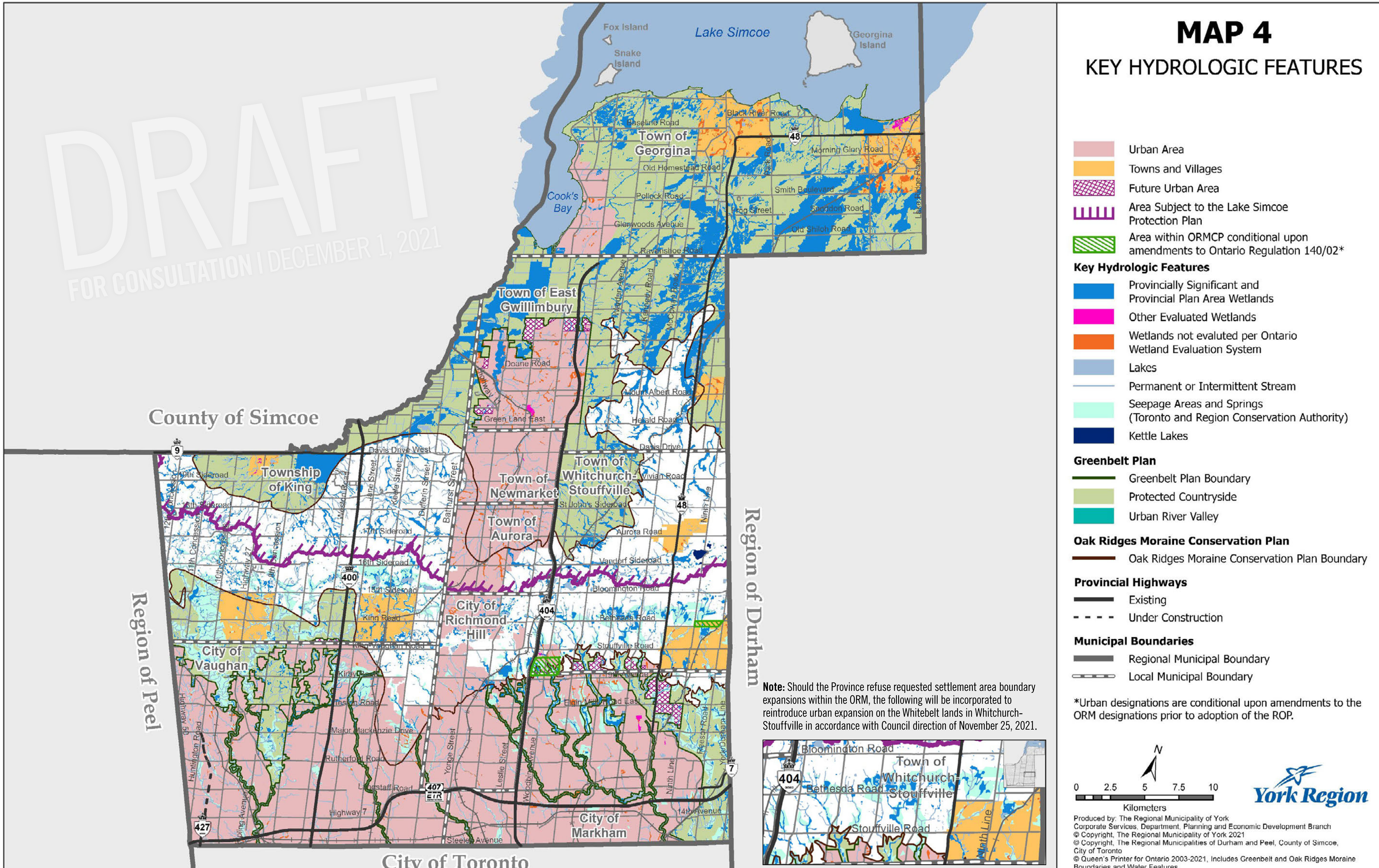
A higher resolution version of this map will be available on york.ca in December 2021.



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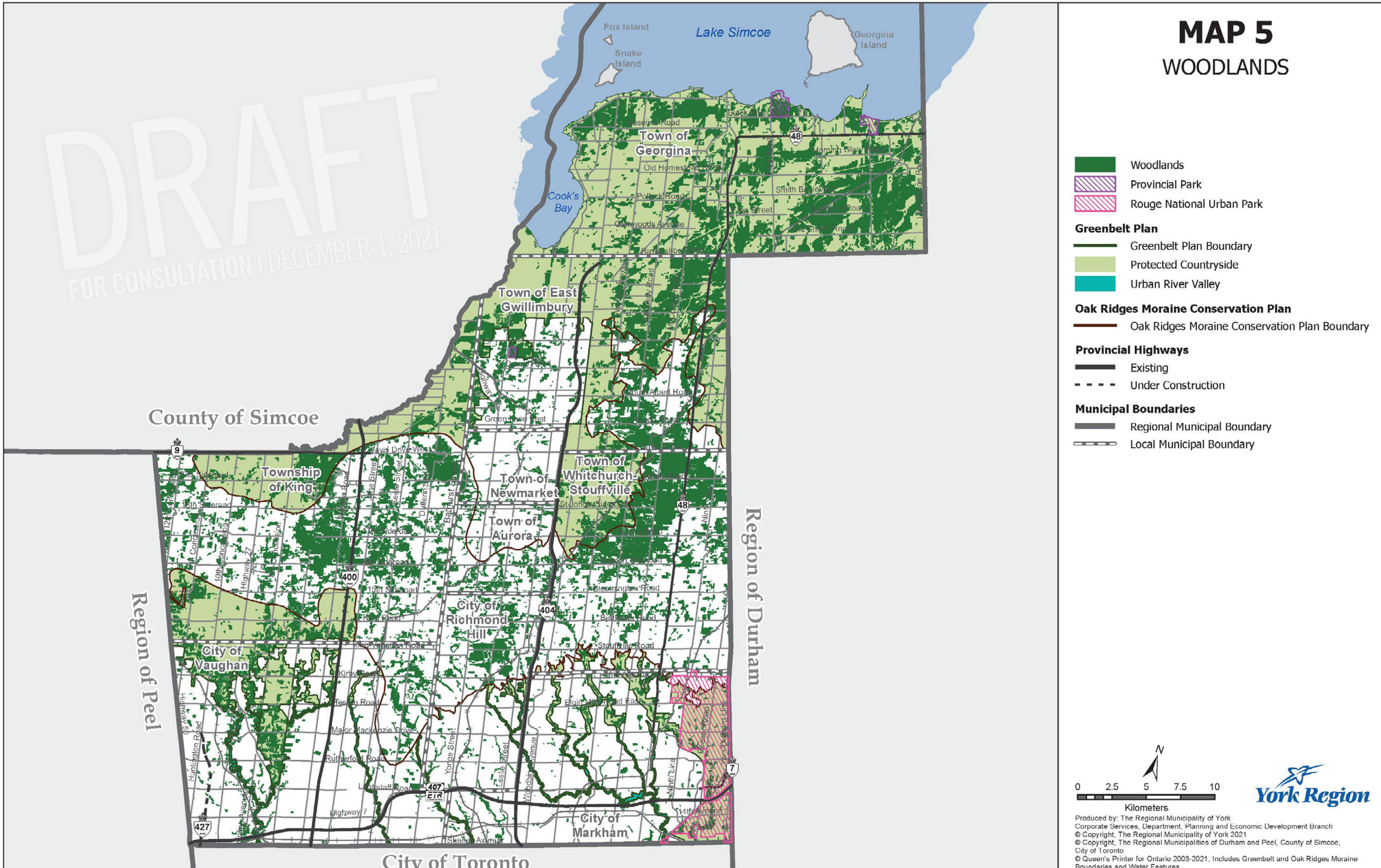

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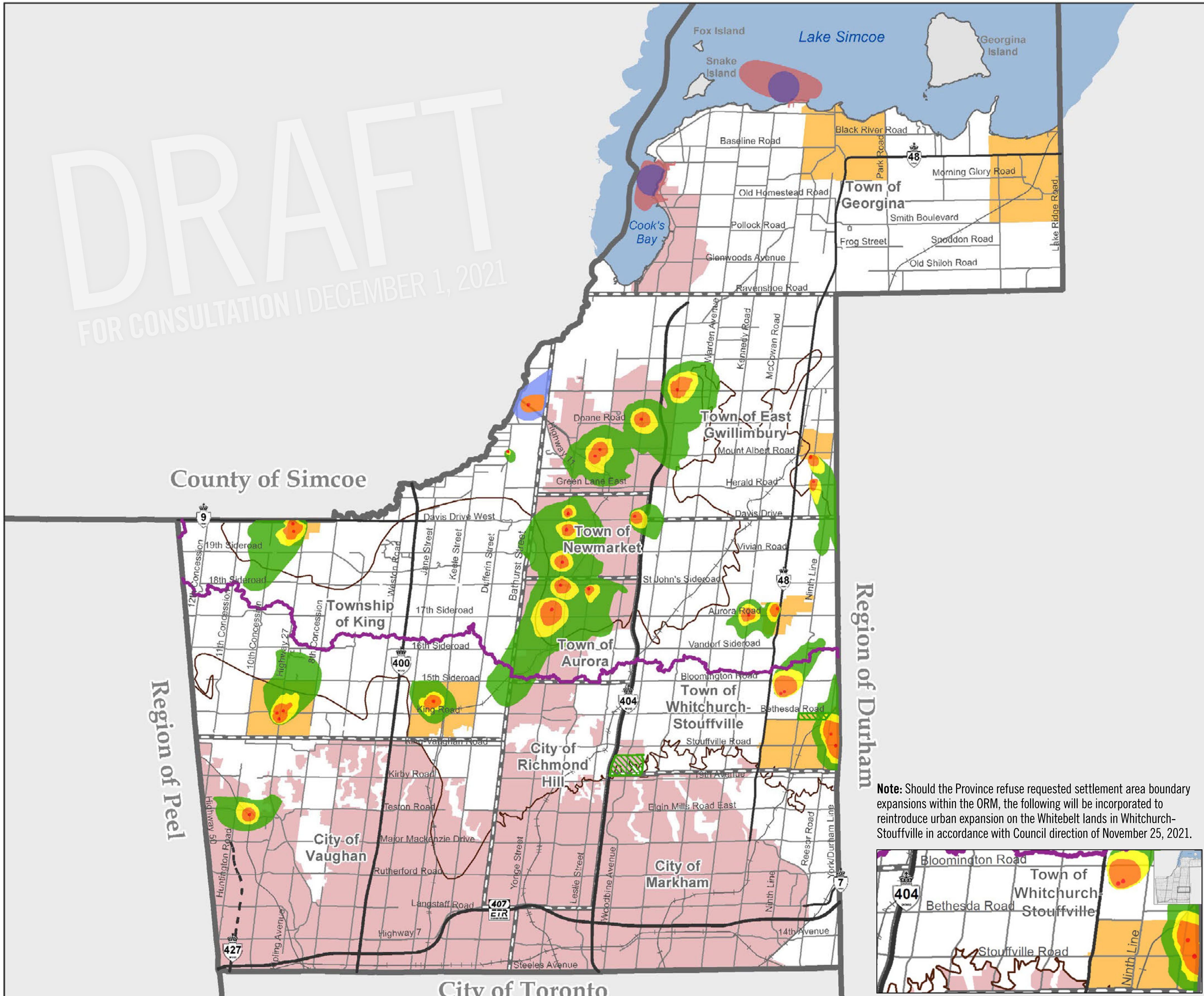

Note: Should the Province refuse requested settlement area boundary expansions within the ORM, the following will be incorporated to reintroduce urban expansion on the Whitebelt lands in Whitchurch-Stouffville in accordance with Council direction of November 25, 2021.

MAP 6

WELLHEAD PROTECTION AREAS (WHPA) AND INTAKE PROTECTION ZONES

- 100m Zone/WHPA-A
- 0 to 2 Year Zone/WHPA-B
- 2 to 5 Year Zone/WHPA-C
- 2 to 10 Year Zone/WHPA-C1
- 5 to 25 Year Zone/WHPA-D
- Intake Protection Zone 1
- Intake Protection Zone 2
- Urban Area
- Towns and Villages
- Source Protection Plan Boundary

Oak Ridges Moraine Conservation Plan

- Oak Ridges Moraine Conservation Plan Boundary

Provincial Highways

- Existing
- Under Construction

Municipal Boundaries

- Regional Municipal Boundary
- Local Municipal Boundary
- Area within ORMCP conditional upon amendments to Ontario Regulation 140/02*

*Urban designations are conditional upon amendments to the ORM designations prior to adoption of the ROP.

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0 2.5 5 7.5 10
Kilometers

York Region

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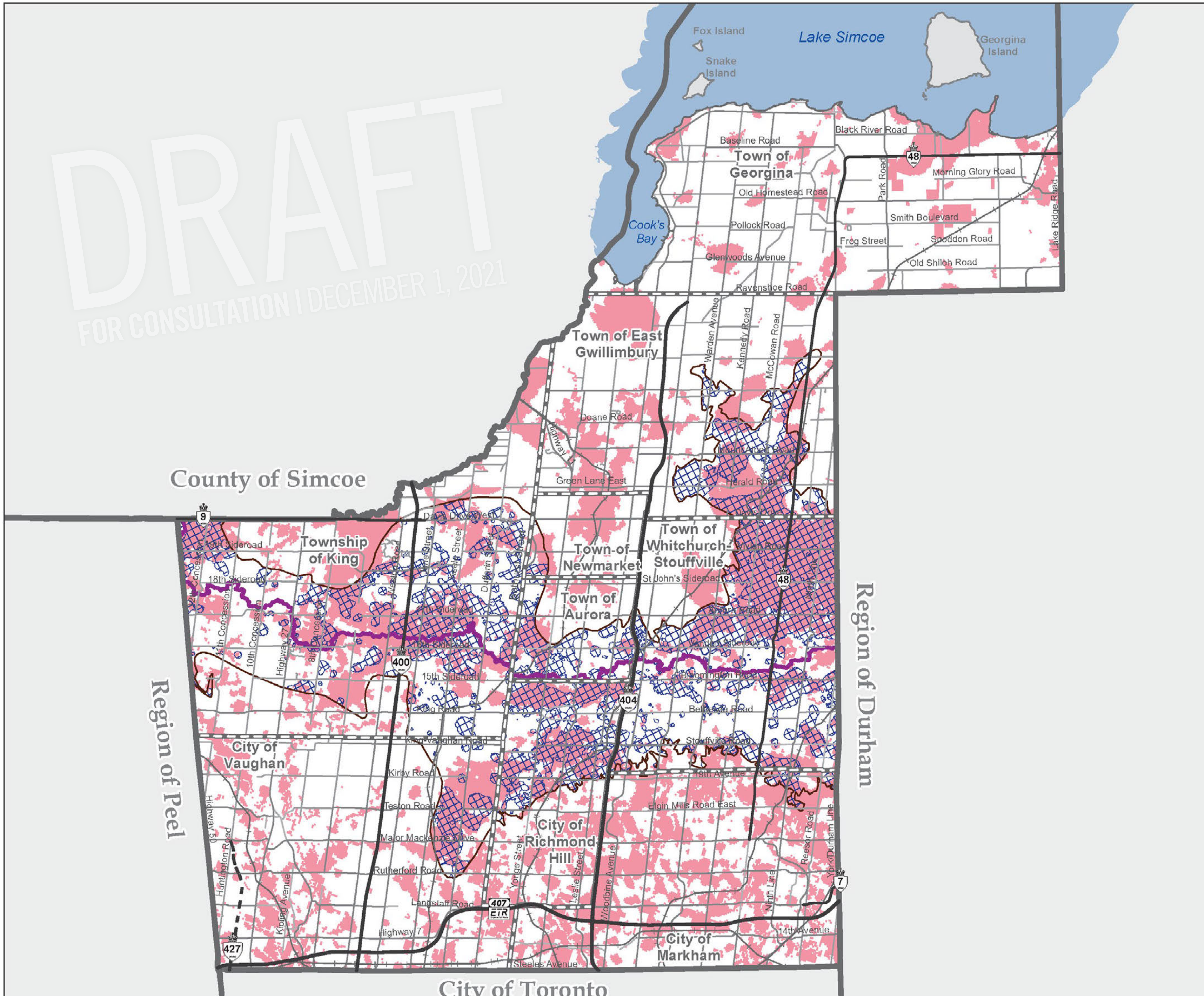

MAP 7

VULNERABLE AQUIFERS WITHIN THE OAK RIDGES MORAINE CONSERVATION PLAN AREA AND CLEAN WATER ACT

- Highly Vulnerable Aquifers, Clean Water Act
- Area of High Aquifer Vulnerability, Oak Ridges Moraine Conservation Plan
- Source Protection Plan Boundary*

Oak Ridges Moraine Conservation Plan

- Oak Ridges Moraine Conservation Plan Boundary

Provincial Highways

- Existing
- Under Construction

Municipal Boundaries

- Regional Municipal Boundary
- Local Municipal Boundary

*Area north of Source Protection Plan boundary is subject to the South Georgian Bay Lake Simcoe Source Protection Plan and area to south is subject to the Credit Valley, Toronto and Region & Central Lake Ontario Source Protection Plan

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0 2.5 5 7.5 10
Kilometers

York Region

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APPENDIX A.2 BASELINE REGIONAL WATER AND WASTEWATER SYSTEMS

Summary

The understanding of water and wastewater systems and how their components work together to deliver the services today is instrumental in the assessment of system capacity which informs the development of the long-term strategy and infrastructure program. This document baselines the Region's systems to the year 2021 and documents key changes that have occurred since completion of the 2016 Master Plan.

Disclaimer

March 15, 2022

York Region

Purpose

This appendix provides an overview of the current regional water and wastewater systems including existing and committed infrastructure as of the end of 2021. Committed infrastructure relates to works currently under construction and expected to be commissioned within the next year or so. It also documents major changes to the systems since the completion of the 2016 Master Plan update.

Background

Since York Region's inception in 1971, water and wastewater systems have evolved to meet the increasing servicing needs of York's growing communities. The introduction of infrastructure has primarily occurred based on recommendations made by several master plans and subsequent planning studies. This Master Plan continues to build on the mature and robust Regional systems that exist today as well as infrastructure under delivery as described in this document.

Regional Water System

Historically, the Regional water system has been divided into three major systems: York Water System, Georgina Water System and Stand-alone Water systems (see **Figure 1**).

Each Regional water system consists of different types of infrastructure designed to provide drinking water of sufficient quantity and quality at a suitable pressure for distribution to end users by local municipalities. Currently, the Regional water system consists of two surface water treatment plants, 40 groundwater wells, 22 water pumping stations, 44 storage facilities and approximately 360 kilometres (km) of watermain. York Region's baseline water infrastructure systems in 2021 is shown in **Figure 2**. This infrastructure network is organized into two core components:

- Water supply: Produces and enables the provision of drinking water to each of the Regional systems at its designed capacity. Supply In York Region comes from three major sources: Lake Ontario, Lake Simcoe and local groundwater. Most of the water supply to the York Water System comes from Lake Ontario as per established servicing agreements with the City of Toronto and the Region of Peel, with a portion sourced from groundwater wells. The Georgina Water System receives supply from Lake Simcoe via two surface water treatment plants, and the Stand-alone Water Systems are supplied from groundwater wells. In 2021, approximately 90% of the Region's total water supply came from Lake Ontario, 3% from Lake Simcoe and 7% from groundwater wells.
- Delivery System (also referred to as Transmission System): Allows the safe and efficient delivery of drinking water to specific service areas through infrastructure sized and organized to accomplish servicing objectives. It includes pumping stations, storage facilities as well as watermains, and connects to the distribution system owned and operated by local municipalities. Water delivery is organized in pressure districts generally established on approximate 30 metre (m) elevation intervals. Some pressure districts also include sub-pressure districts, separated either because of geographic constraints where undeveloped portions of land separate areas of similar elevation, or because topographic constraints require pressure reduction or boosting to the sub-pressure district. **Figure 3** shows a map of all pressure districts

in York Region. The next section provides an overview of the current pressure districts by water system.

Figure 1 - Regional Water Systems

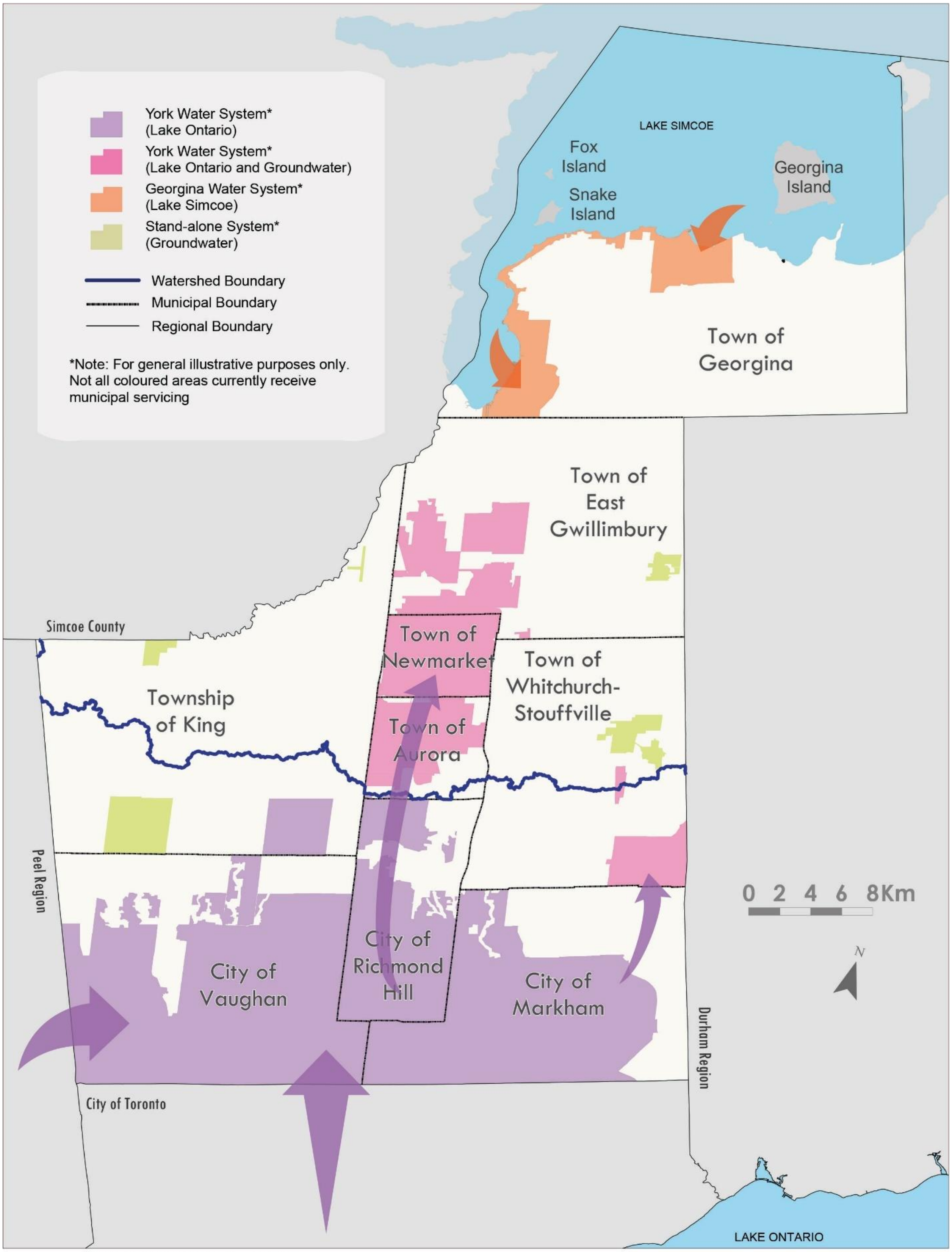


Figure 2 - York Region's Baseline Water Infrastructure Systems in 2021

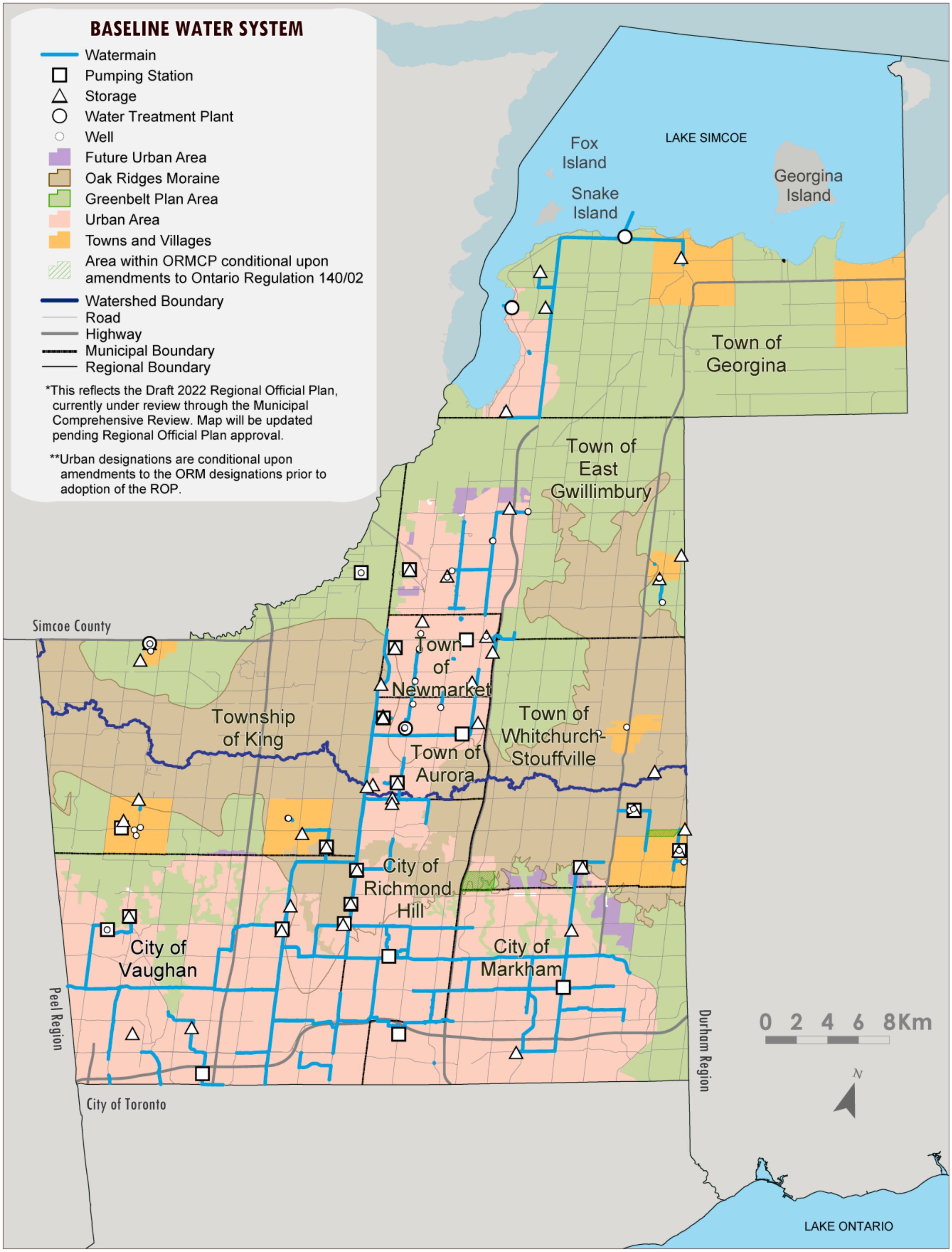
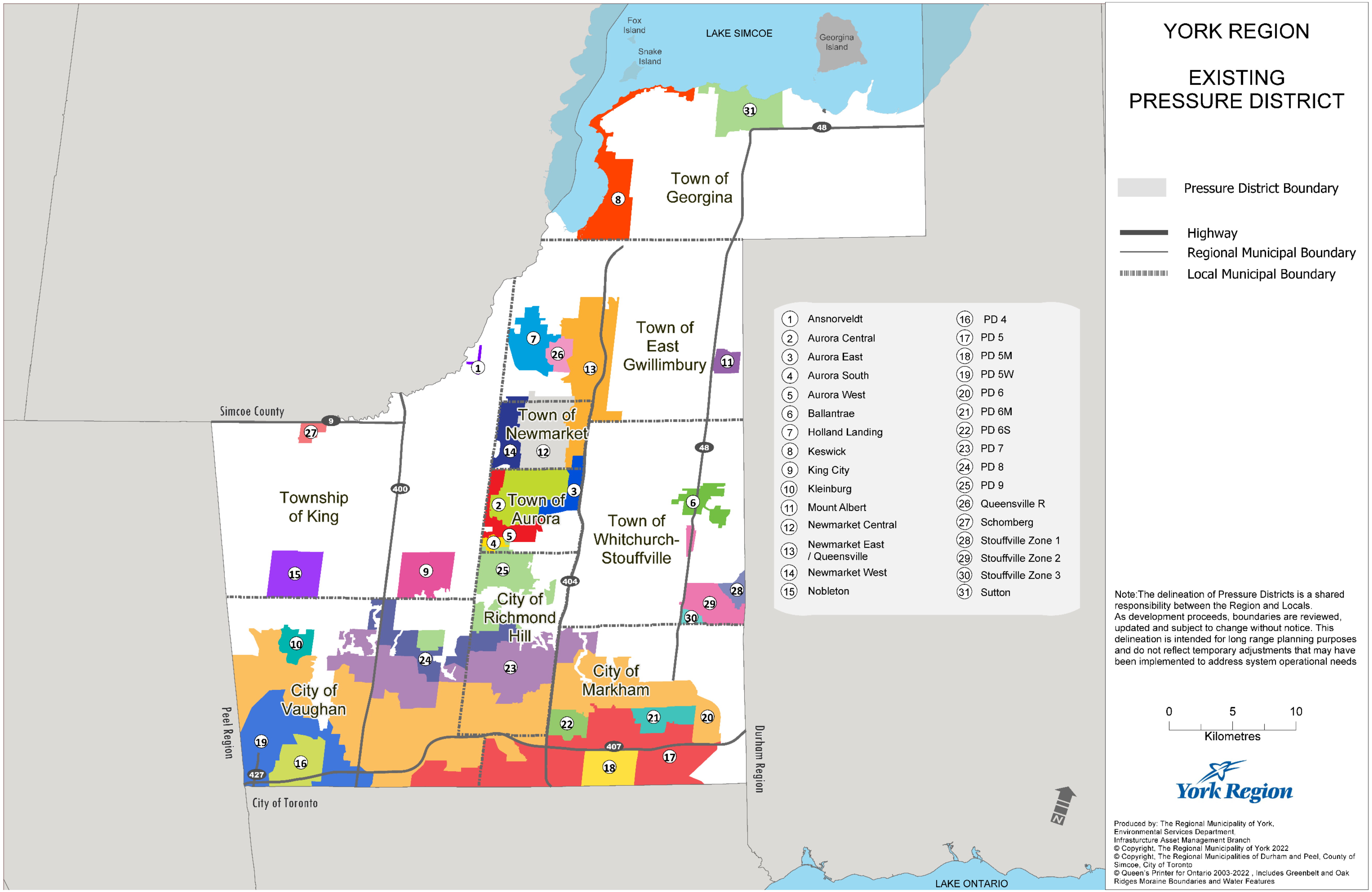


Figure 3 - Pressure Districts in York Region



YORK WATER SYSTEM

The York Water System currently services 11 communities in eight local municipalities. Communities within the Lake Ontario watershed, also known as “south service area”, receive supply primarily from Toronto and Peel Water Systems except for the community of Stouffville, which is supplemented by local groundwater wells. Groundwater supply is also available in King City (Township of King) and Kleinburg (City of Vaughan) for security of supply. Communities in the Lake Huron watershed, also known as “north service area”, are supplied by a combination of Lake Ontario and groundwater through the Yonge Street Aquifer wells.

The Region’s 2022 Water and Wastewater Master Plan update considered the following planned supply capacities for the York Water System:

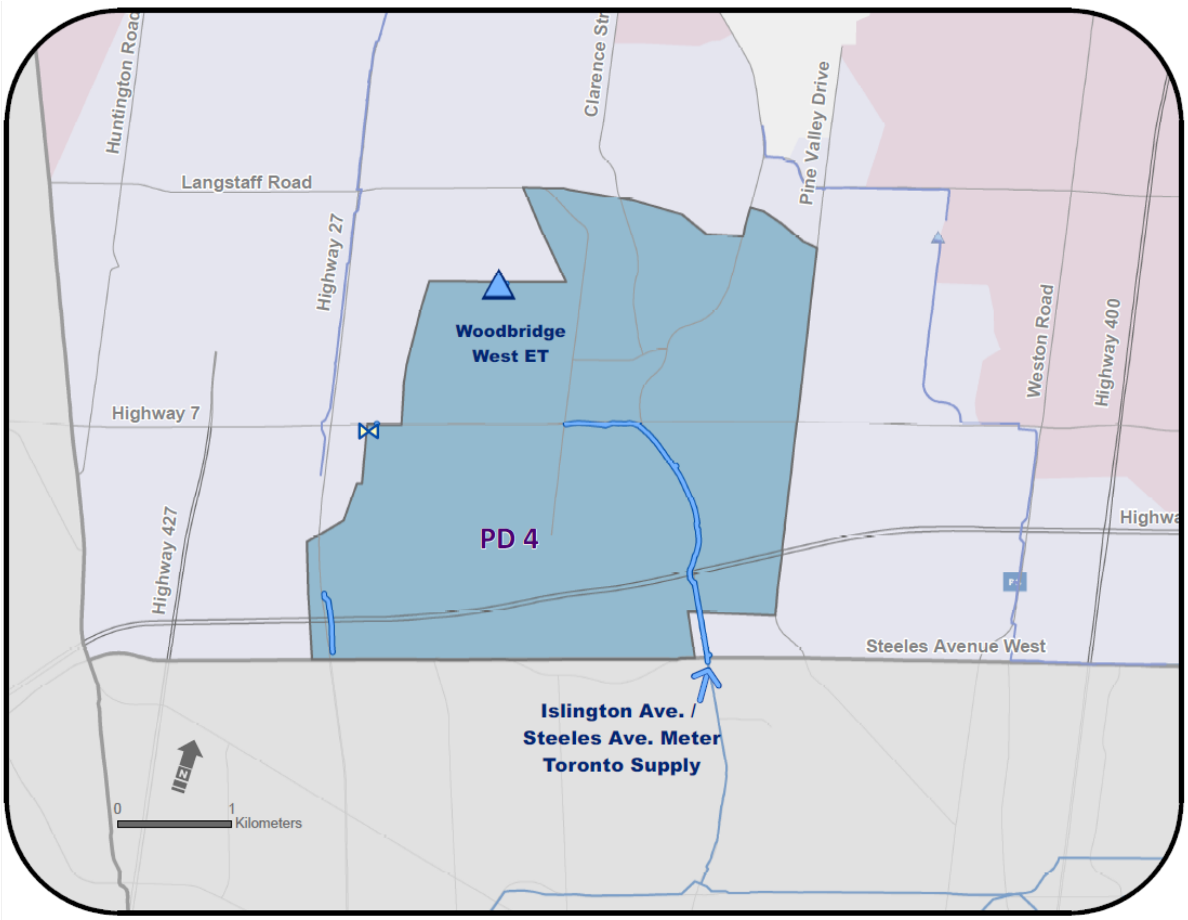
- Supply from the City of Toronto to gradually increase to 535 million litres per day (ML/d) by 2031 in conformity with current servicing agreement and contingent upon implementation of cost shared projects
- Supply from the Region of Peel to gradually increase to 331 ML/d by 2031 in conformity with servicing agreement and contingent upon implementation of cost shared projects
- Supply from Yonge Street Aquifer wells with taking not to exceed 42 ML/d on average every year as per Permit to Take Water with a maximum operational taking during peak flow conditions of 62 ML/d
- Supply from Stouffville groundwater well system with a maximum operational taking of 12 ML/d
- Kleinburg wells with a capacity of 5.2 ML/d and King City wells with a capacity of 4.6 ML/d, are not included in the analysis as they are intended to operate as emergency supply only as per the current Permits to Take Water

Delivery of water in the York Water System currently occurs via 21 pressure districts and three sub-pressure districts. Connections among different pressure districts provide operational flexibility and security of supply as discussed below.

Woodbridge Pressure District 4 (PD4)

Pressure District 4 (PD4) services a small area in the southwest corner of York Region in the City of Vaughan (**Figure 4**). PD4 is integrated with the City of Toronto system and supplied through a single watermain along Islington Avenue. Security of supply is provided through interconnections with Pressure District 5 Woodbridge. Woodbridge West Elevated Tank provides storage capacity. No capacity upgrades have been implemented in this pressure district since the 2016 Water and Wastewater Master Plan update.

Figure 4 - Pressure District 4



Pressure District 5 (PD5)

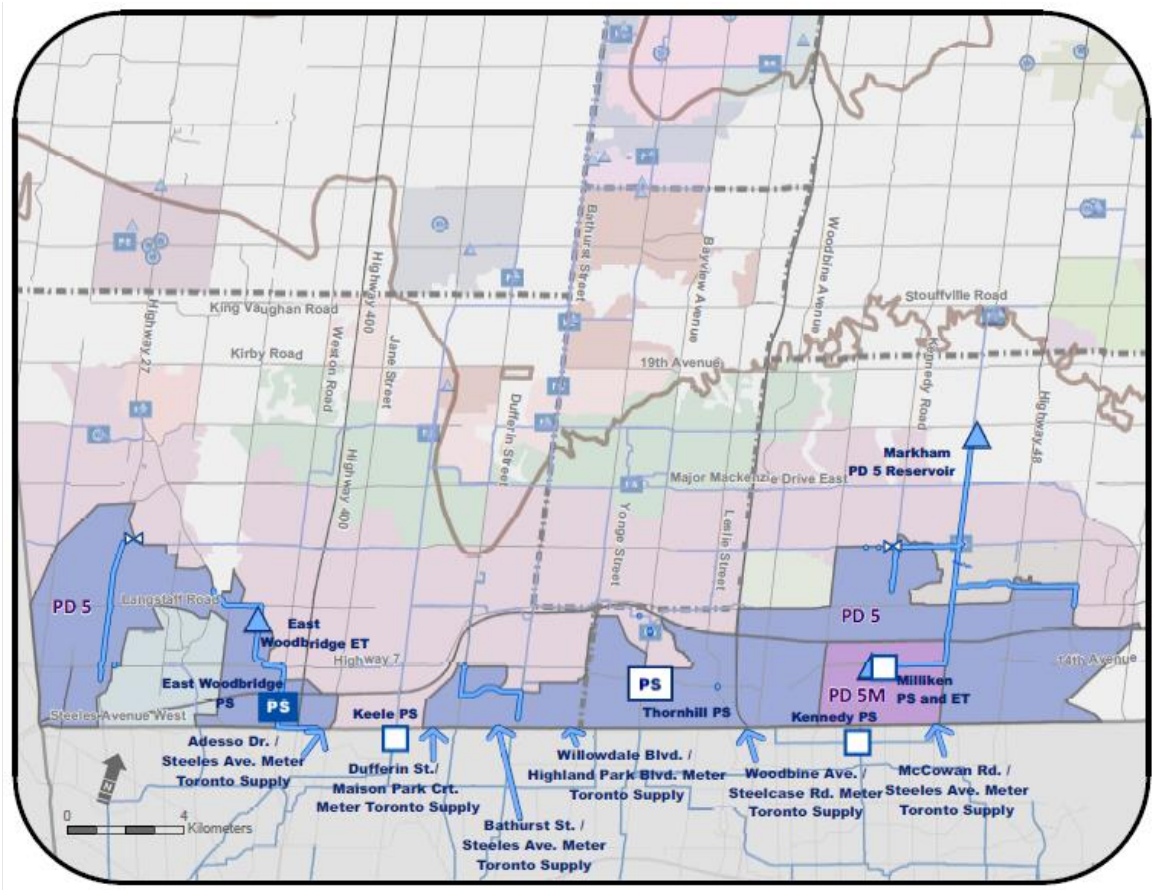
Woodbridge PD5W services the area generally bounded by Rutherford Road to the north, Steeles Avenue to the south, Highway 50 to the west and Highway 400 to the east. PD5W is also integrated with the City of Toronto system and supplied through the Adesso Drive watermain connection. Additional supply is available by a PD6 interconnection on Rutherford Road and Highway 27 servicing the west side of the pressure district. PD5W is interconnected with PD4 on Highway 7 near Highway 27. The East Woodbridge Elevated Tank provides storage capacity. While still in place, the East Woodbridge Pumping Station is no longer in operation and has been recommended for decommissioning in previous master plans.

Milliken PD5M services a mature area in Markham generally bounded by Highway 407 to the north, Steeles Avenue to the south, Warden Avenue to the west, McCowan Road to the east. PD5M is supplied by Toronto-owned Milliken Pumping Station, and the only Regional facility in this pressure district is the Milliken Elevated Tank, originally designed to provide equalization storage and pump control.

York PD5Y spans across the southern portion of York Region between 16th Avenue and Steeles Avenue, to service parts of Vaughan and Markham generally from Dufferin Street to the west and Reesor Road to the east. PD5Y is integrated with the City of Toronto water system through seven connection points which also support servicing of PD6. Markham Reservoir provides storage capacity.

PD5 is shown in **Figure 5**. No capacity upgrades have been implemented in this district since 2016.

Figure 5 - Pressure District 5



York Pressure District 6 (PD6)

Pressure District 6 (PD6) is the largest district in the York Water System servicing a large portion of Markham, Richmond Hill and Vaughan (**Figure 6**). PD6 spans across the southern area of York Region and is bounded by PD7 to the north, PD5Y and PD5W to the south, the Region of Peel boundary to the west, and the Region of Durham boundary to the east. PD6 is fully supplied by Lake Ontario via Toronto-owned pumping stations - Milliken PD6, Bayview and Keele PD6 pumping stations - as well as Peel-owned Airport Road Pumping Station. South Richmond Hill Reservoir, South Maple Reservoir and North Markham Reservoir provide storage capacity. Markham Pumping Station provides security of supply.

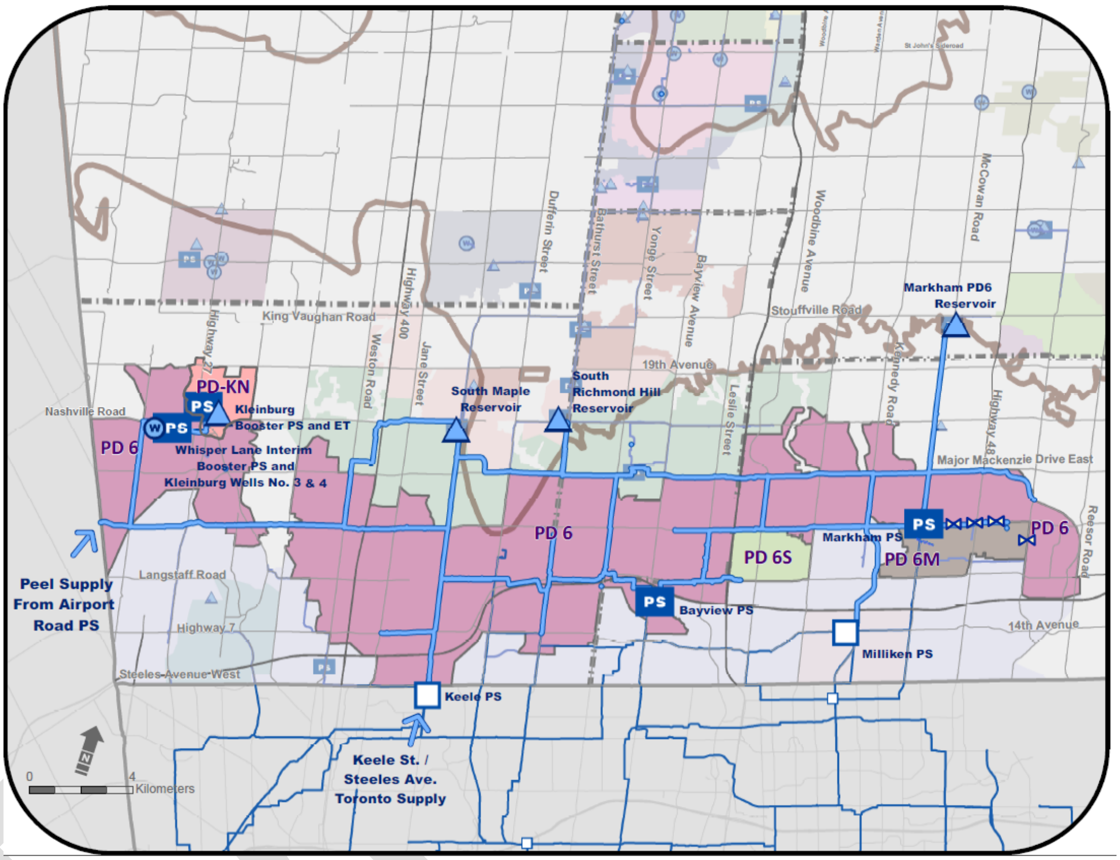
PD6 provides supply to other York pressure districts and directly services two sub-pressure districts:

- **PD6M (Markham)** which is supplied by pressure reducing valves along 16th Avenue at McCowan Road, Peter Street and Mintleaf Gate
- **PD6S (Buttonville area)** receiving supply primarily from Bayview Pumping Station via a pressure reducing valve at Allstate Parkway and Highway 7

No capacity upgrades have been implemented in PD6, PD6M or PD6S since 2016.

Kleinburg-Nashville communities started to receive supply from PD6 when Huntington watermain was built in 2013. Since then, lands south of Nashville Road are generally serviced directly by PD6 and areas north through **Kleinburg pressure district (PDKN)**. PDKN receives supply from PD6 and is serviced by Kleinburg Booster Pumping Station with Kleinburg wells 3 and 4 providing security of supply. Alternatively, supply to PDKN can be provided by the Whisper Lane Pumping Station at the existing wells 3 and 4 site designed to provide peak hour demands before additional storage is introduced to the service area. The Kleinburg Elevated Tank provides storage capacity. Since 2016, a connection between PDKN and PD7 has been implemented by the City of Vaughan to service lands on the northeast side of PDKN.

Figure 6 - Pressure District 6



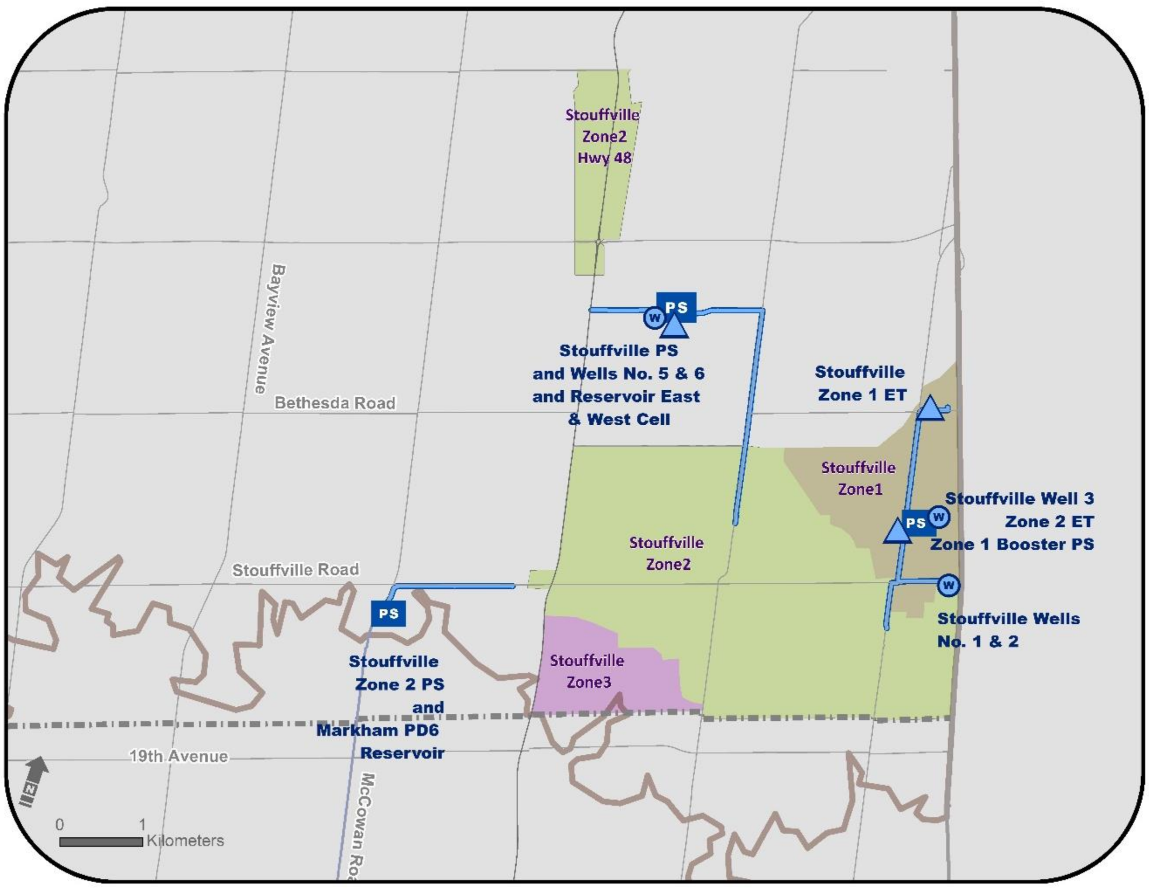
In 2010, Lake Ontario supply was introduced to the **Stouffville Water System** with the commissioning of Stouffville Zone 2 Pumping Station, which draws water from the Markham PD6 Reservoir. The existing five groundwater wells remain in place to support long term drinking water requirements. Delivery of supply in Stouffville is accomplished through three pressure zones:

- Zone 2 receives supply from the Stouffville Zone 2 Pumping Station and five groundwater wells. Stouffville Zone 2 Elevated Tank provides storage capacity. Stouffville Zone 2 Reservoir assists in water treatment of groundwater wells 5 and 6, feeds the Stouffville High Lift Pumping Station and supports servicing of a few residences on Highway 48 via the Highway 48 Pumping Station
- Zone 3 operates as a pressure reduced zone and receives water from Zone 2 through two unmetered pressure reducing valves

- Zone 1 operates as a pressure boosted zone and is serviced by the Stouffville Zone 1 Booster Pumping Station drawing water from the Stouffville Zone 2 System. Stouffville Zone 1 Elevated Tank provides storage capacity

A class environmental assessment study completed in 2020 identified upgrades to continue to provide supply and storage needs to support growth to 2041. The Stouffville Water System is shown in **Figure 7**.

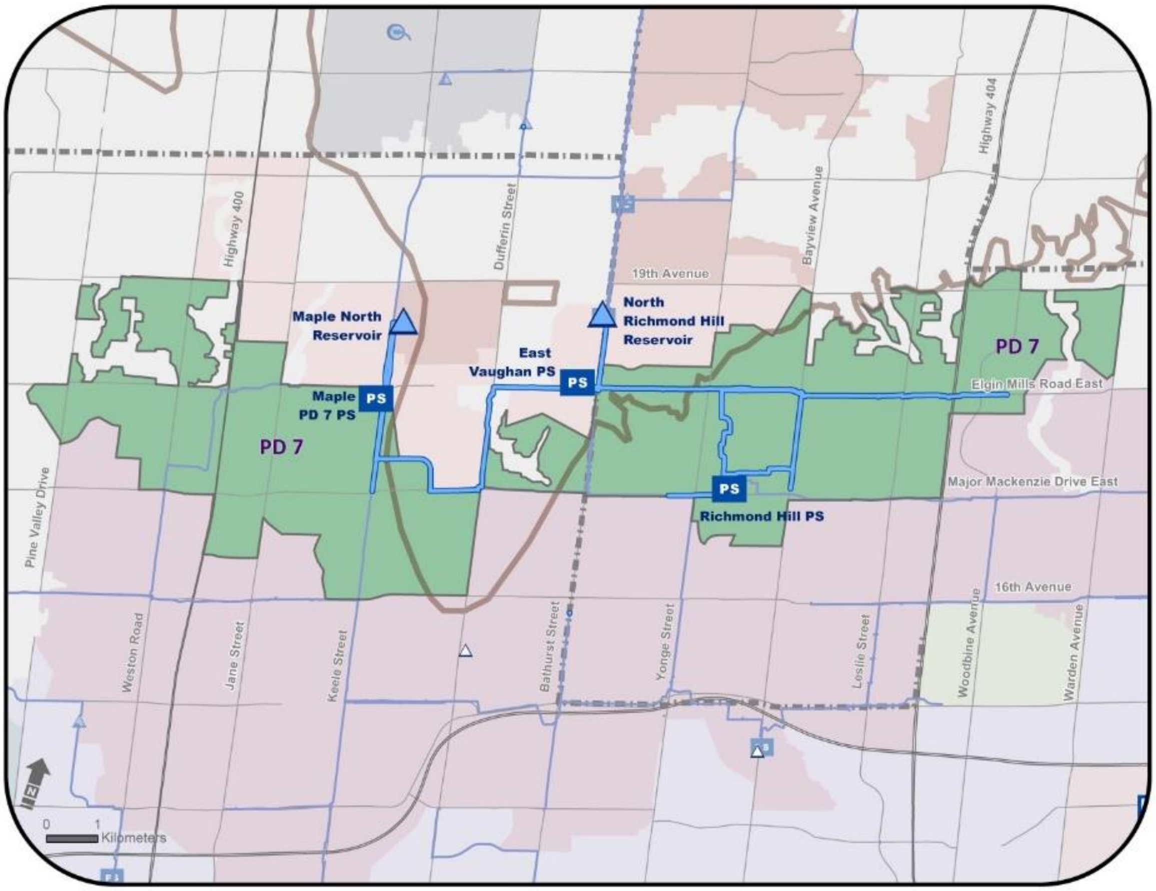
Figure 7 - Stouffville Water System



York Pressure District 7 (PD7)

Pressure District 7 (PD7) services lands within parts of Vaughan, Richmond Hill and Markham and is generally bounded by 19th Avenue to the north, 16th Avenue to the south, Pine Valley Drive to the west, and Warden Avenue to the east (**Figure 8**). PD7 is supplied by PD6 through the Maple PD7, East Vaughan PD7 and Richmond Hill (Pugsley) pumping stations. Maple North and North Richmond Hill reservoirs provide storage capacity. In turn, PD7 supplies PD9V (Vaughan) and PD8 through unmetered local connections. No capacity upgrades have been implemented in this pressure district since 2016.

Figure 8 - Pressure District 7

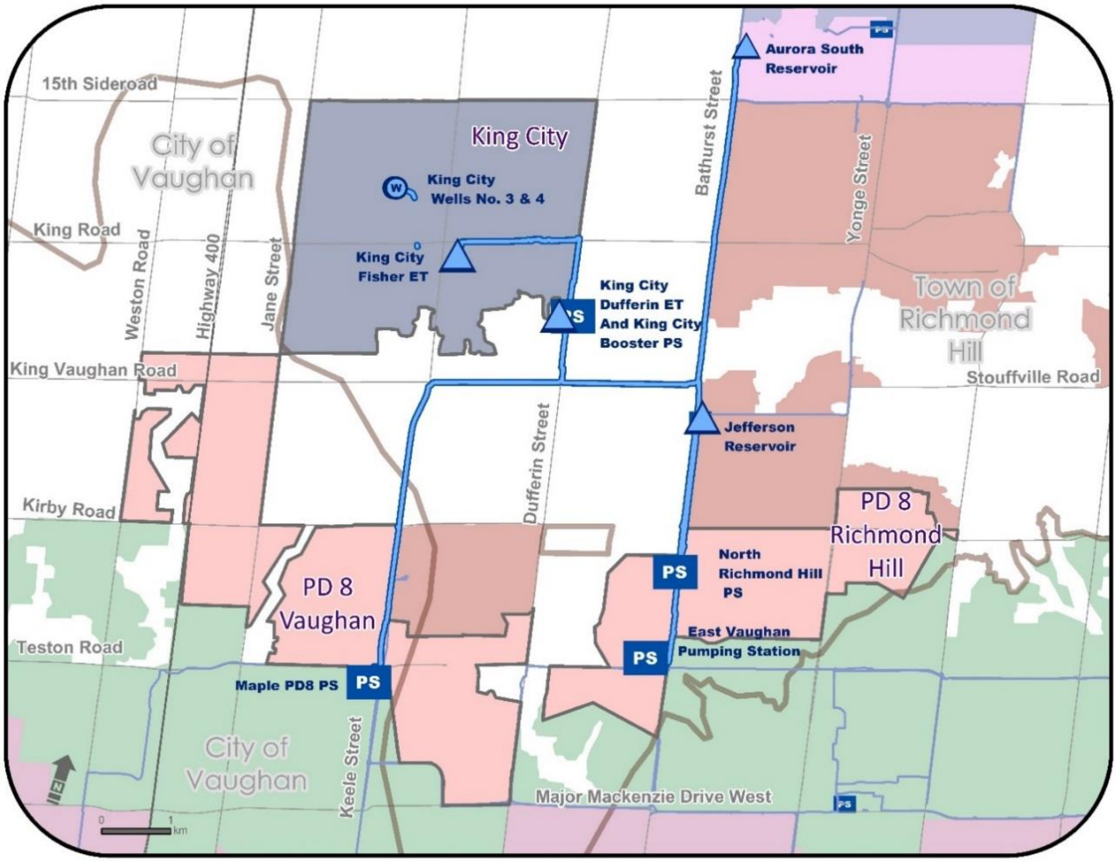


York Pressure District 8 (PD8)

Pressure District 8 (PD8) services parts of Richmond Hill and Vaughan and is also the primary source of Lake Ontario supply to King City and the North Service Area. (**Figure 9**). **PD8 Richmond Hill (PD8RH)** is supplied by PD6 through the Maple PD8 and East Vaughan PD8 Pumping Stations. Jefferson Reservoir provides storage capacity. This system is interconnected with PD9 Vaughan through an unmetered connection. North Richmond Hill Pumping Station, while still in place, is no longer in service since introduction of the East Vaughan Pumping Station in 2016. **PD8 Vaughan (PD8V)** receives supply from PD6 through Maple PD8 Pumping Station which also feeds King City water system and the Aurora South Reservoir in the North Service Area. There is currently no storage in PD8 Vaughan. Since 2016, a fourth pump has been added to Maple PD8 Pumping Station as recommended by the Northeast Vaughan Class Environmental Assessment completed in 2019.

King City Water System services the area bounded by 15th Sideroad to the north, King Vaughan Line to the south, Jane Street to the west, and Dufferin Street to the east. The system is supplied by PD8V through the King City Booster Pumping Station and two groundwater wells with on-site treatment provide security of supply. Fisher and Dufferin elevated tanks provide storage capacity. Since 2016, King City Booster Pumping Station has been commissioned to support growth in King City.

Figure 9 - Pressure District 8



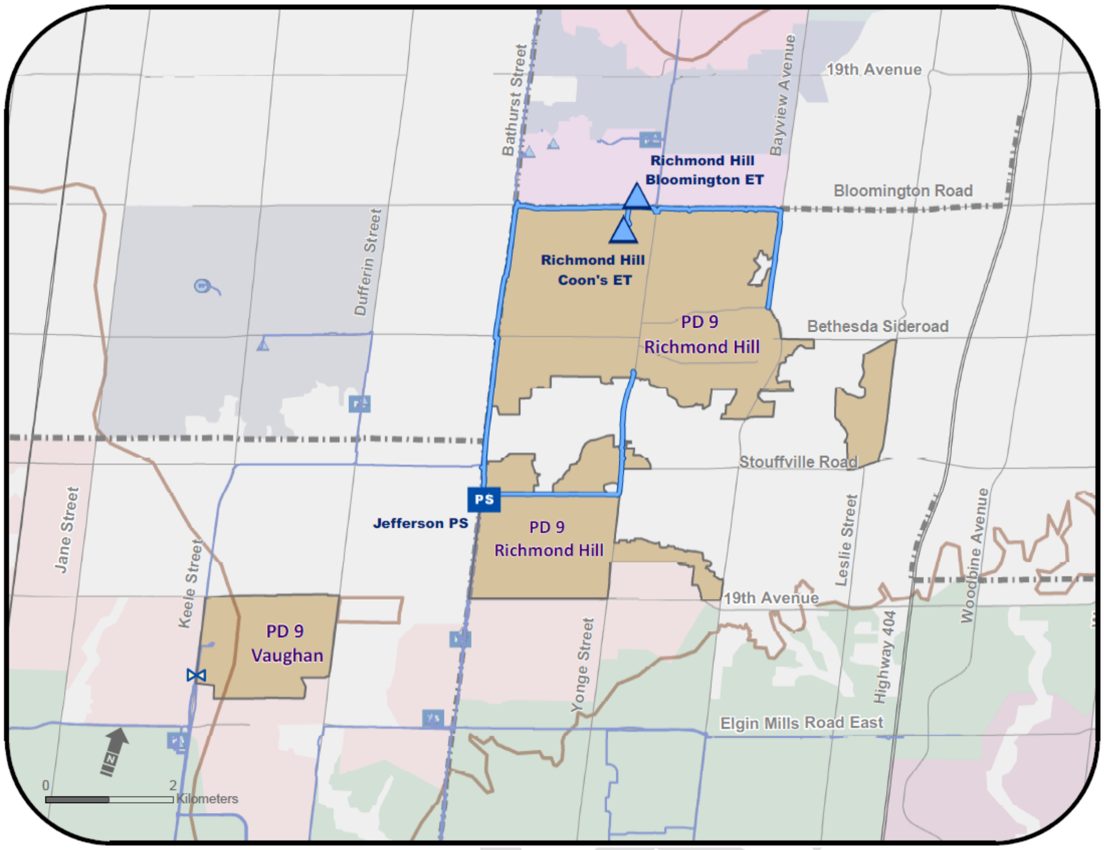
York Pressure District 9 (PD9)

Pressure District 9 Richmond Hill (PD9RH) services the area generally bounded by Bloomington Road to the north, 19th Avenue to the south, Bathurst Street to the west and Bayview Avenue to the east. PD9RH is supplied by PD8RH through the Jefferson Pumping Station. The North Richmond Hill (Bloomington) and Coons elevated tanks provide storage capacity. PD9RH is also interconnected with to Aurora central pressure district on Bloomington Road and Yonge Street. No capacity upgrades have been implemented in PD9RH since 2016.

Pressure District 9 Vaughan (PD9V) services a small residential area bounded by Kirby Road to the north, Teston Road to the south, Keele Street to the west and Dufferin Street to the east. The pressure district is supplied by the City of Vaughan's PD9 Pumping Station drawing water from the Region's North Maple PD7 Reservoir. Unmetered connections to PD8V via pressure sustaining valves provide security of supply. In 2019, the Region completed the Northeast Vaughan Class Environmental Assessment which recommended construction of water pumping station to accommodate growth in PD9V.

PD9 Richmond and Vaughan are shown in **Figure 10**.

Figure 10 - Pressure District 9



Aurora Pressure Districts

Aurora Central Pressure District (ACPD) services the area generally bounded by St. John's Sideroad to the north, Vandorf Sideroad to the south, Bathurst Street to the west and Leslie Street to the east and is also the main Lake Ontario supply to other pressure districts in the North Service Area. ACPD is supplied by PD8V, PD9RH and six Yonge Street Aquifer wells. Orchard Heights and Ridge Road reservoirs provide storage capacity. Aurora South Reservoir functions as a pressure breaker facility between the north and south service areas and primary Lake Ontario supply point to the north service area.

Aurora South Pressure District (ASPD) services the area bounded by McClellan Way to the north, Bloomington Road to the south, Bathurst Street to the west, and Yonge Street to the east. Supply to ASPD is delivered by Ridge Road Pumping Station which draws water from Ridge Road Reservoir. Aurora Southwest Elevated Tank provides storage capacity. ASPD also supplies Aurora West PD via a valve connection.

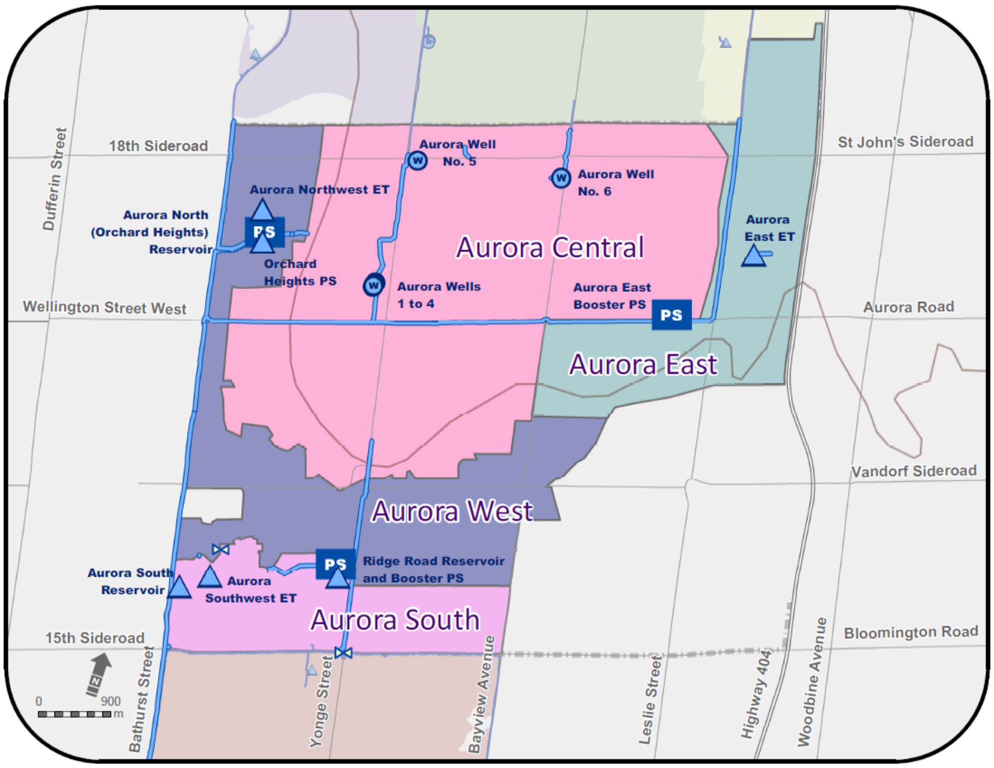
Aurora West Pressure District (AWPD) services mostly the western parts of the Town of Aurora. The pressure district is supplied by Orchard Heights Pumping Station and an interconnection with ASPD. Aurora Northwest Elevated Tank provides storage capacity.

Aurora East Pressure District (AEPD) services the area east of Leslie Street and is generally bounded by Kingsdale Road to the north, south of Wellington Road, Bayview Avenue to the west and Highway 404 to the east. The pressure district is supplied by the Aurora East Pumping Station. Aurora East Elevated Tank provides storage capacity. AEPD is connected to Newmarket

East/Queensville/Sharon PD through the Leslie Street Watermain. Since 2016, the Aurora East Elevated Tank has been commissioned and expansion of Aurora East Pumping Station is in progress to service growth and facilitate filling of the new storage facility.

Aurora Pressure Districts are shown in **Figure 11.**

Figure 11 - Aurora Pressure Districts



Newmarket and East Gwillimbury Pressure Districts

Note: In response to water quality challenges, a revised delineation of pressure districts has been implemented in Newmarket System. Given that this revised delineation is expected to be temporary, the description below captures the pressure district boundaries as per system design and does not necessarily correspond to how the system is being operated in the short term.

Newmarket Central Pressure District (NCPD) services the central area of the Town of Newmarket generally bounded by Green Lane West to the north, St John's Sideroad to the south, Yonge Street to the west, and Leslie Street to the east. The pressure district was designed to receive supply from ACPD via connections on Yonge Street and Bayview Avenue as well as five Yonge Street Aquifer wells. Glenway Reservoir, London Road and Newmarket Southeast Elevated Tanks provide storage capacity. NCPD is interconnected with NEQPD via Timberbank and Davis Drive valves and provides supply to Newmarket West PD.

Newmarket East/Queensville/Sharon Pressure District (NEQPD) services the eastern area of the Town of Newmarket and the Queensville and Sharon communities in the Town of East Gwillimbury. NEQPD is supplied by the Aurora East Booster Pumping Station and four Yonge Street Aquifer wells in Queensville. Newmarket East, Newmarket Northeast and Queensville No 1 elevated tanks provide storage capacity. This pressure district supports servicing of NCPD and Holland Landing PD.

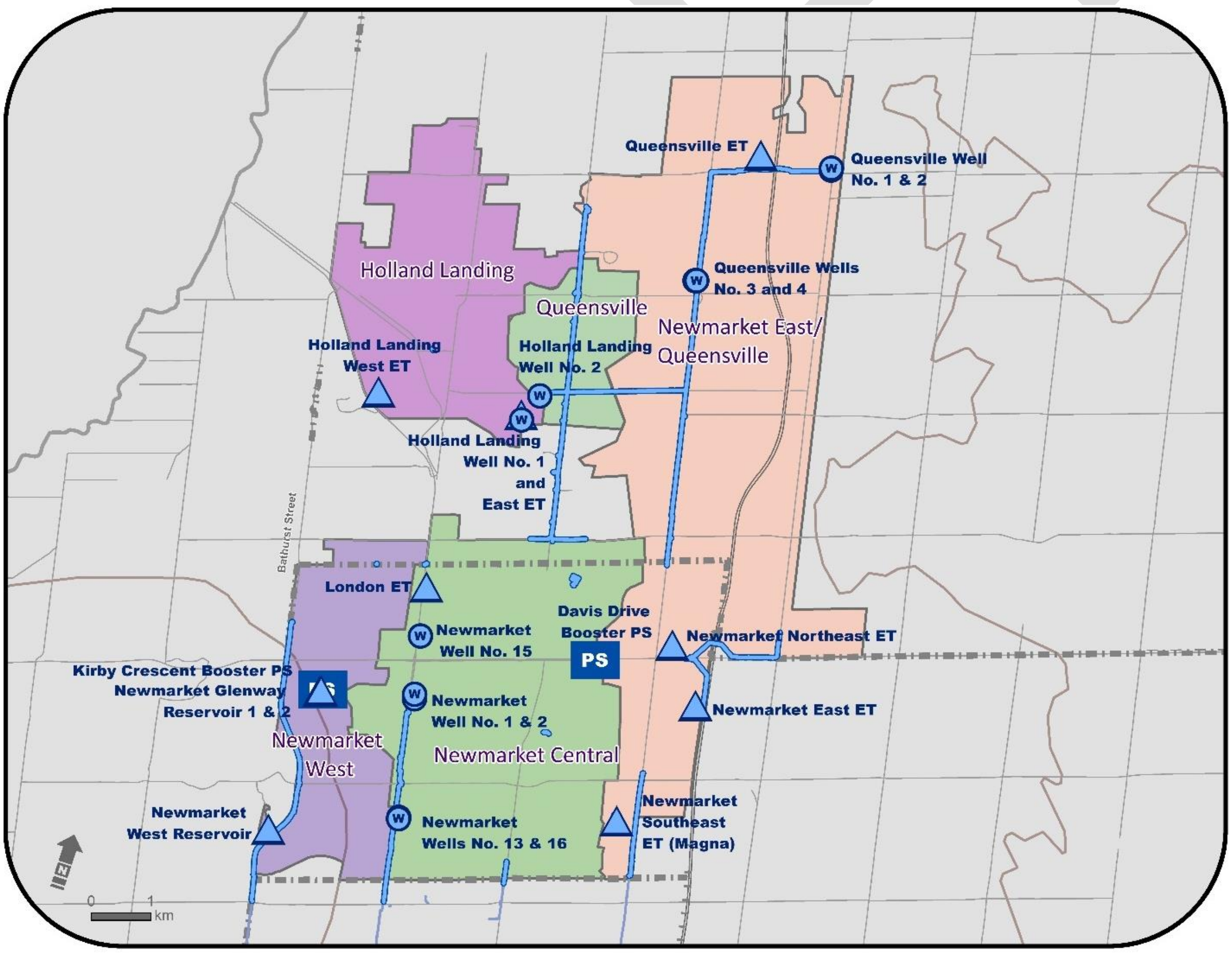
Newmarket West Pressure District (NWPD) services the area generally bounded by Green Lane West to the north, Aurora/Newmarket municipal boundary to the south, Bathurst Street to the west, and Yonge Street to the east. NWPD is supplied by the Orchard Heights Pumping Station via Kirby Crescent Booster Pumping Station. Newmarket West Reservoir provides storage capacity.

Holland Landing Pressure District (HLPD) services the Holland Landing community in Town of East Gwillimbury. HLPD is supplied by two Yonge Street Aquifer wells and an interconnection with NEQPD on Mount Albert Road. Holland Landing East and Holland Landing West elevated tanks provide storage capacity. In 2014, the Second Concession watermain was introduced to HLPD and is partially in service until the proposed Green Lane watermain is constructed to bring additional supply to this community.

Since 2016, a groundwater treatment strategy has been developed to remove iron and manganese from the well supply system. Introduction of a new Green Lane Well is also in progress through the asset management program to recover lost capacity in the Yonge Street Aquifer system.

Newmarket and East Gwillimbury Pressure Districts are shown in **Figure 12.**

Figure 12 - Newmarket and East Gwillimbury Pressure Districts



GEORGINA WATER SYSTEM

The Georgina Water System currently services Keswick, Sutton and Willow Beach communities in the Town of Georgina. The system receives supply from Lake Simcoe in the Lake Huron watershed via the

Georgina and Keswick water treatment plants. The current operational treatment capacity of the system is approximately 42 ML/d, of which 30 ML/d are provided by Georgina Water Treatment Plant and the remaining 12 ML/d from Keswick Water Treatment Plant. The permitted capacity of these plants is 50 and 18 ML/d respectively, subject to future upgrades.

Water delivery occurs via two interconnected pressure districts further described in the next section.

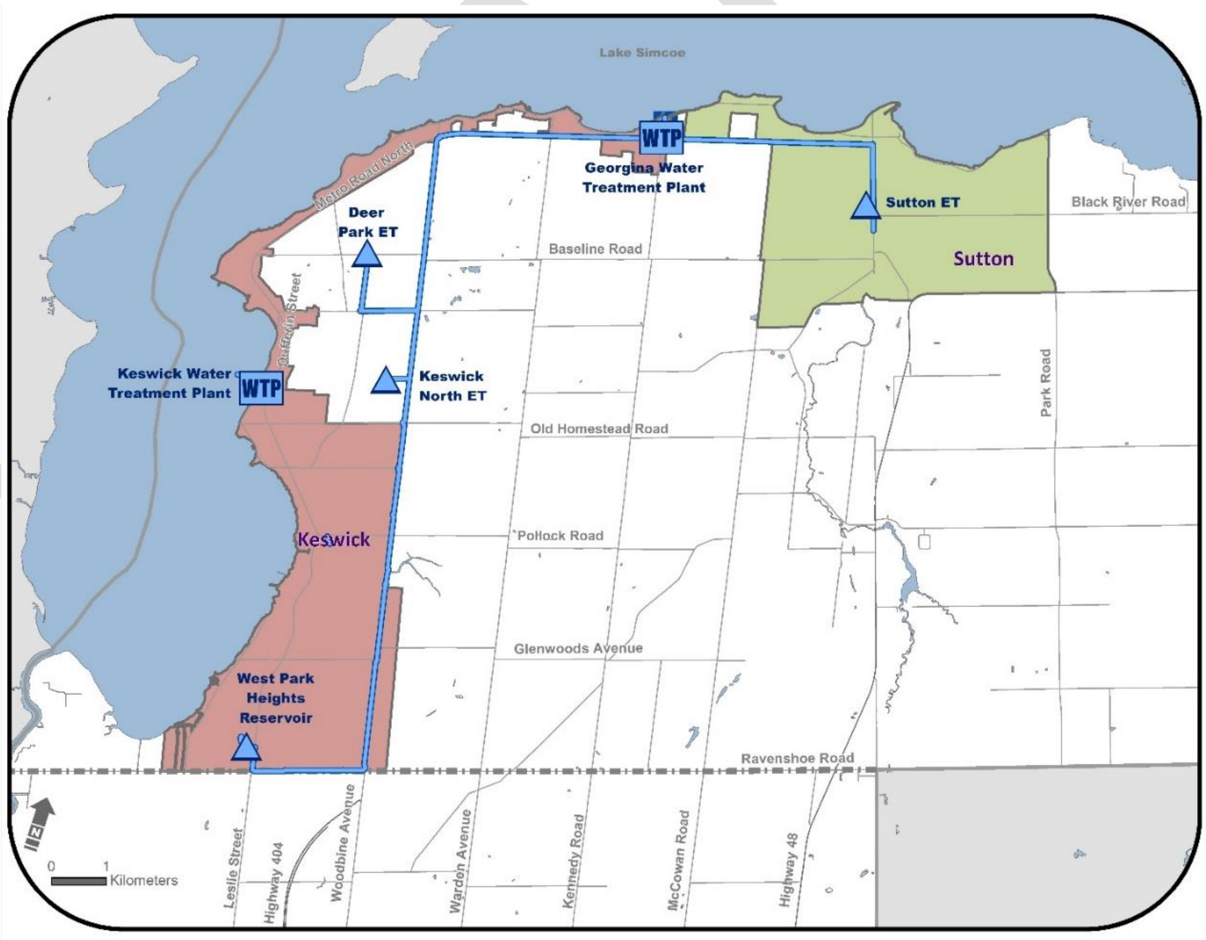
Keswick and Sutton Pressure Districts

Keswick PD services the western area in the Town of Georgina along the east shore of Cooks Bay. Keswick PD is supplied by Keswick and Georgina water treatment plants which draw water from Lake Simcoe. West Park Heights, Deer Park and Keswick North Elevated Tanks provide storage capacity.

Sutton PD services the community of Sutton along the south shore of Lake. Sutton PD is also supplied by Keswick and Georgina water treatment plants and interconnected to Keswick PD via Metro Road watermain. Sutton Elevated Tank provides storage capacity. In 2016, the Dalton Road watermain was introduced to Sutton to support growth in this community.

The Keswick and Sutton Pressure Districts are shown in **Figure 13**.

Figure 13 - Keswick and Sutton Pressure Districts



STAND-ALONE WATER SYSTEMS

The communities of Ansnorveldt (Township of King), Ballantrae-Musselman's Lake (Town of Whitchurch-Stouffville), Mount Albert (Town of East Gwillimbury), Nobleton and Schomberg (Township of King) are serviced by individual water systems supplied by local groundwater wells. Most of these systems are located within the Lake Huron watershed except for Nobleton, which lies within the Lake Ontario watershed. Since 2016, a groundwater treatment strategy has been developed to remove iron and manganese from the well supply systems if necessary.

Ansnorveldt Water System

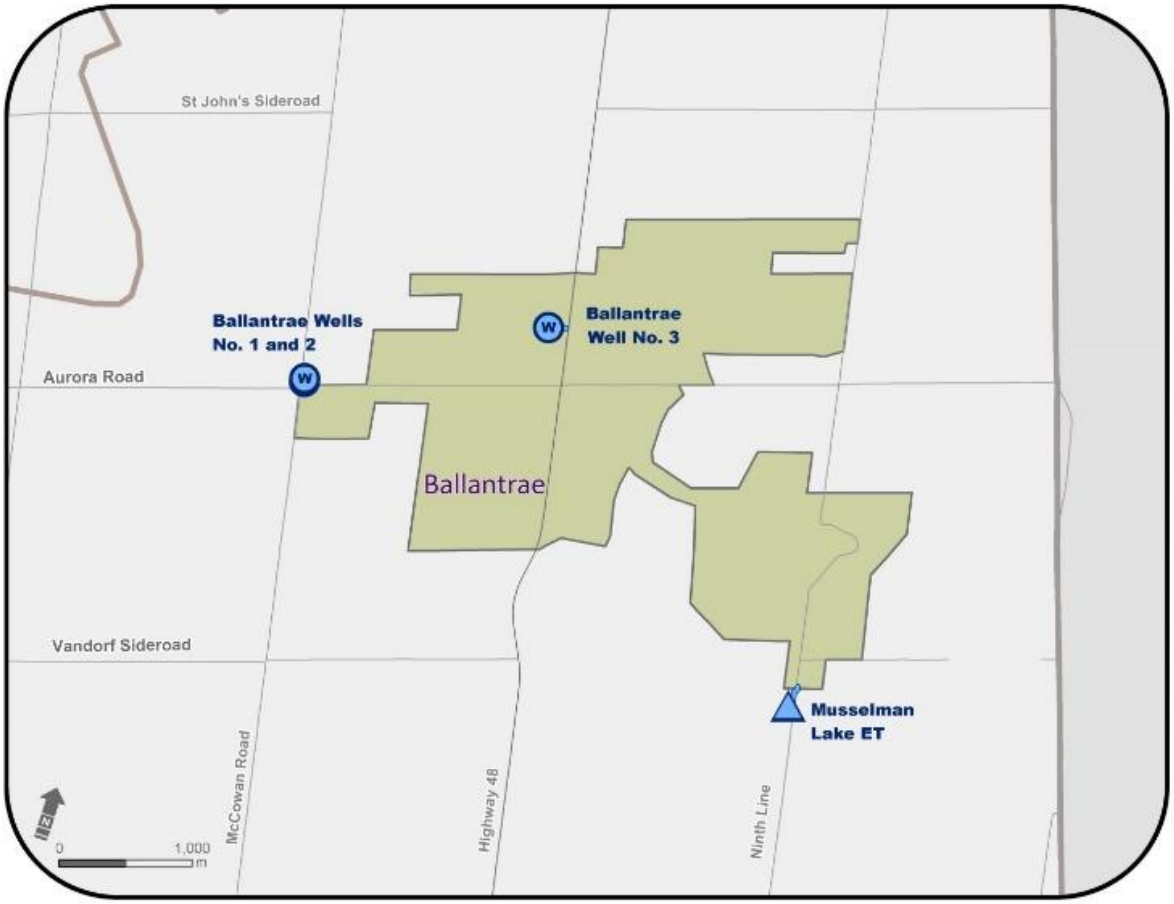
The Ansnorveldt Water System services a small community in the northeast corner of Township of King (**Figure 14**). Ansnorveldt is supplied by two groundwater wells with a permitted capacity of 0.3 ML/d and a reservoir. No capacity upgrades have been implemented in this system since 2016.

Figure 14 - Ansnorveldt Water System

Ballantrae-Musselman's Lake Water System

The Ballantrae-Musselman's Lake Water System services the area between McCowan Road and Ninth Line on both sides of Aurora Road in the Town of Whitchurch-Stouffville (**Figure 15**). The system is supplied by three groundwater wells with a maximum combined permitted capacity of 4.6 ML/d. Musselman's Lake Elevated Tank provides storage capacity. Since 2016, a Class Environmental Assessment has been completed and the recommended increase in the Permit to Take Water limit to 5.42 ML/d is under implementation to support growth.

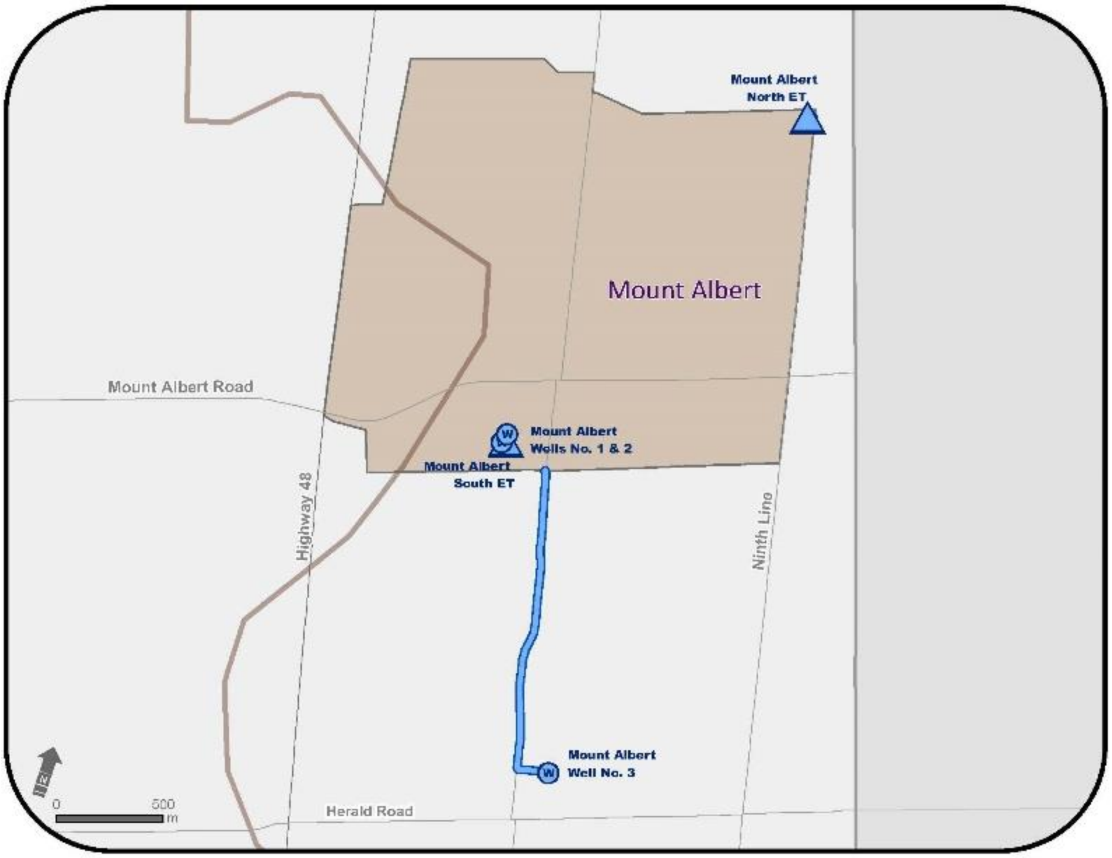
Figure 15 - Ballantrae-Musselman's Lake Water System



Mount Albert Water System

The Mount Albert Water System services the area bounded by Doane Road to the north, Mount Albert Road to the south, Highway 48 to the west and Ninth Line to the east in the Town of East Gwillimbury (**Figure 16**). The system is supplied by three groundwater wells with a permitted capacity of 5 ML/d. Mount Albert North Elevated Tank provides storage capacity and Mount Albert South Elevated Tank is no longer in service. No capacity upgrades have been implemented in this system since 2016.

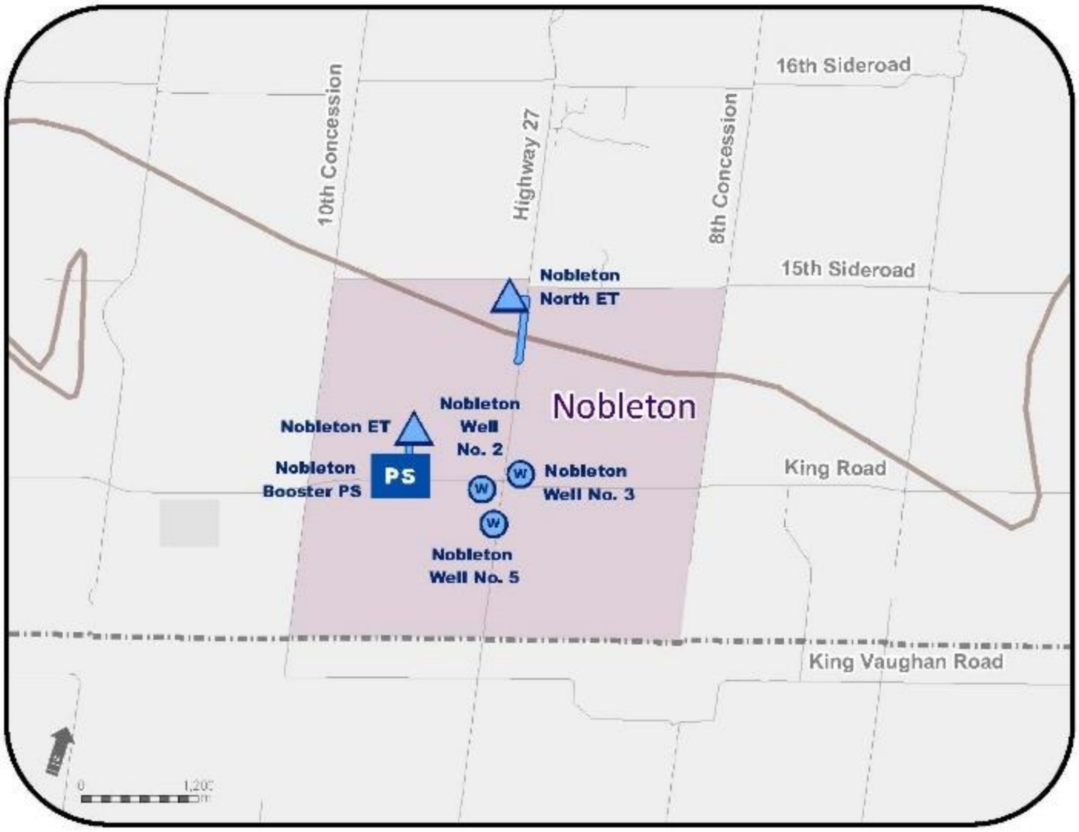
Figure 16 - Mount Albert Water System



Nobleton Water System

The Nobleton Water System services the area bounded by 15th Sideroad to the north, King Vaughan Road to the south, 10th Concession to the west, and 8th Concession to the east in the Township of King (**Figure 17**). The system is supplied by three groundwater wells with a permitted capacity of 4.5 ML/d. The Nobleton and Nobleton North Elevated Tanks provide storage capacity. Since 2016, the Class Environmental Assessment to accommodate additional growth in Nobleton was completed and asset jurisdiction of the Nobleton Booster Pumping Station is under review for transfer to Township of King.

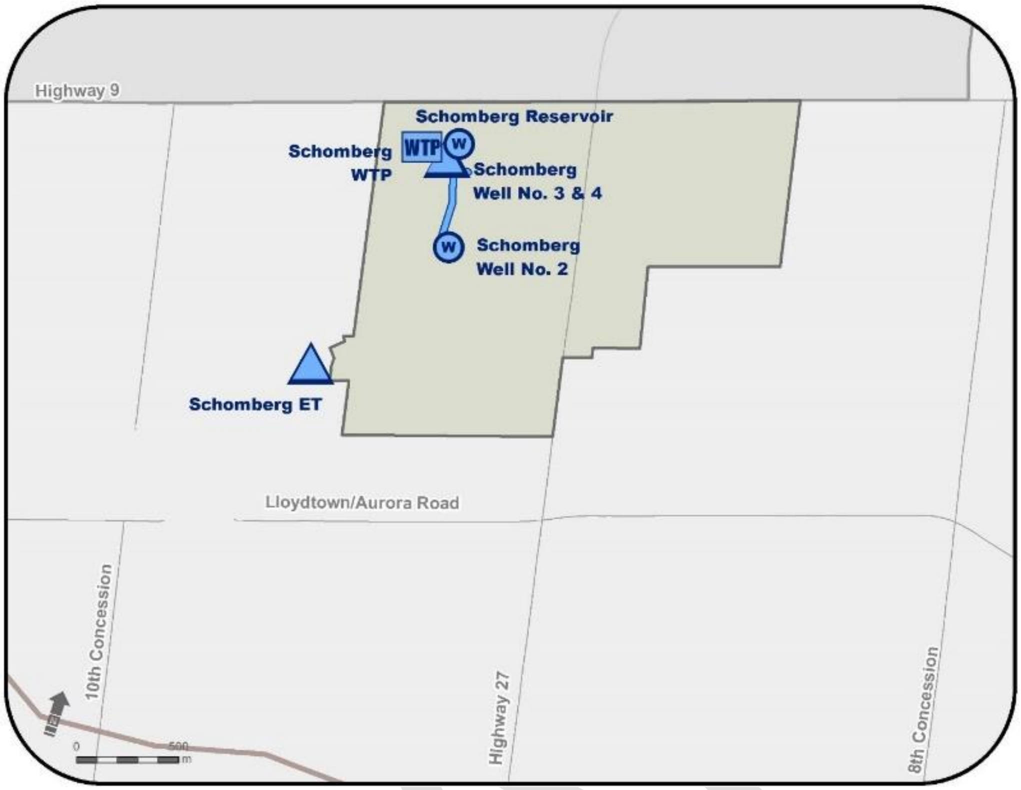
Figure 17 - Nobleton Water System



Schomberg Water System

The Schomberg Water System services the area around the intersections of Highway 27 and Highway 9, just south of the border with Simcoe County in the Township of King (**Figure 18**). The system is supplied by three groundwater wells and the Schomberg Water Treatment Plant with a capacity of 5.4 ML/d. The Schomberg Reservoir and Elevated Tank provide storage capacity. No capacity upgrades have been implemented in this system since 2016.

Figure 18 - Schomberg Water System



Regional Wastewater System

Historically, wastewater servicing in York Region has been provided through three major systems: York Durham Sewage System (YDSS) including Peel Diversion, Georgina Wastewater System and Stand-alone Wastewater Systems as illustrated in **Figure 19**.

Each of the wastewater systems consists of different types of infrastructure designed to convey wastewater collected by the local system and regional facilities to treatment plants. Currently, the Regional Wastewater System consists of seven water resource recovery facilities, 21 sewage pumping stations, two equalization tanks, three air management facilities and approximately 335 km of sewer. York Region also co-owns some infrastructure with Durham Region, including the Duffin Creek Water Pollution Control Plant (Duffin Creek WPCP), six odour control facilities and over 30 km of trunk sewer. York Region's baseline water infrastructure systems in 2021 is shown in **Figure 20**. This infrastructure network is organized into two core components:

- Wastewater Treatment: Enables treatment of wastewater at a designed capacity before returning flows to the environment. In general, wastewater generated in the YDSS is treated at the Duffin Creek WPCP with a small portion diverted to Peel for treatment at G.E. Booth Wastewater Treatment Plant. In Georgina, sewage flows are treated at Keswick and Sutton Water Resource Recovery Facilities. Individual water resource recovery facilities treat wastewater in Holland Landing (Town of East Gwillimbury), Kleinburg (City of Vaughan), Mount Albert (Town of East Gwillimbury), Nobleton, and Schomberg (both Township of King). In 2020, approximately 95% of the wastewater was treated at facilities returning flows to Lake Ontario via the YDSS and Peel Diversion, and the remaining 5% at Region-operated water resource recovery facilities.

- Conveyance System: Safe and efficient conveyance of wastewater flows is accomplished through infrastructure sized and organized to service specific areas referred as sewersheds. Regional infrastructure within sewersheds may include pumping stations, storage and trunk sewers primarily designed to convey flows from collection systems owned and operated by local municipalities to the treatment facility. **Figure 21** presents the general delineation of sewersheds in York Region.

Figure 19 - Regional Wastewater Systems

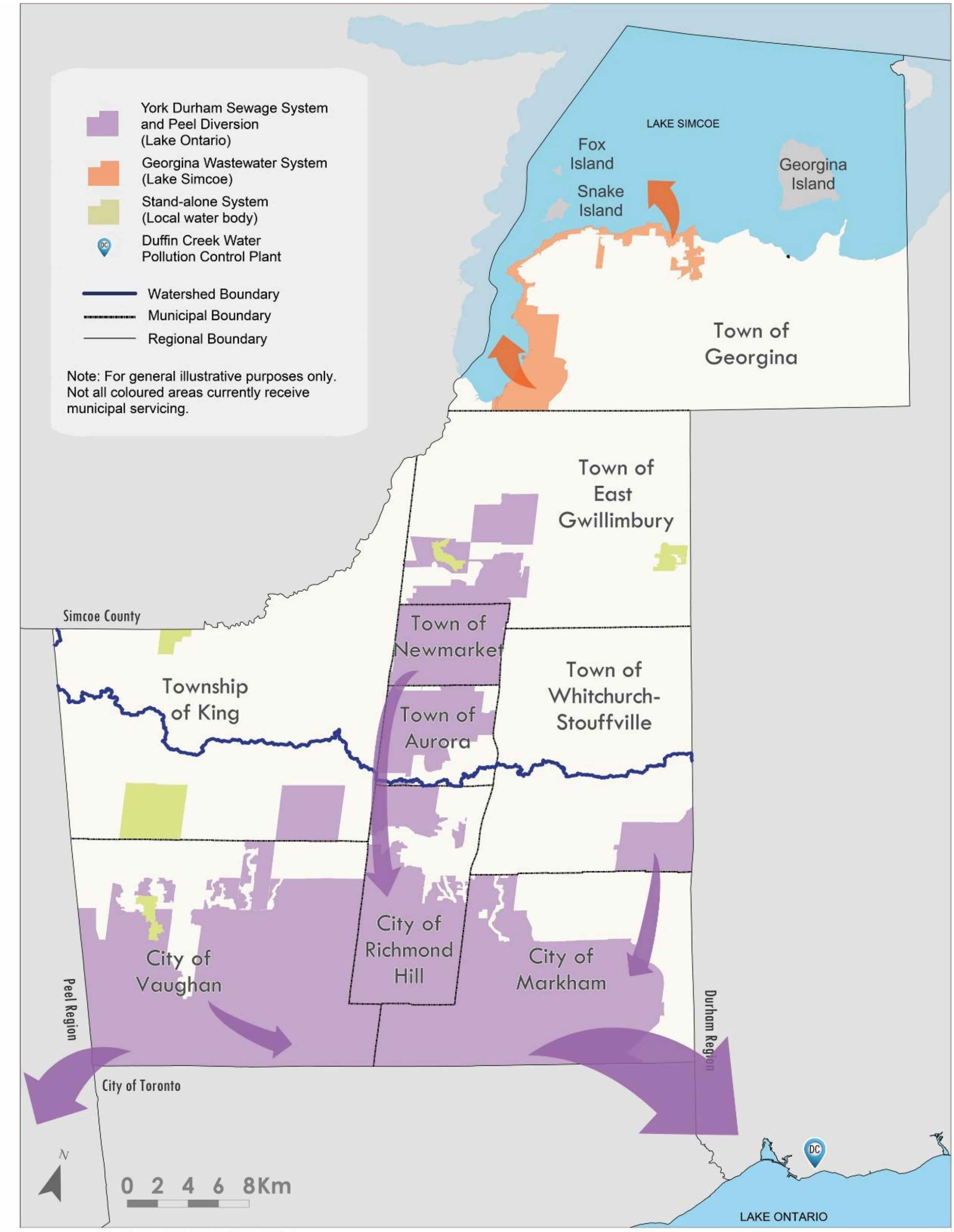


Figure 20 - York Region's Baseline Wastewater Infrastructure Systems in 2021

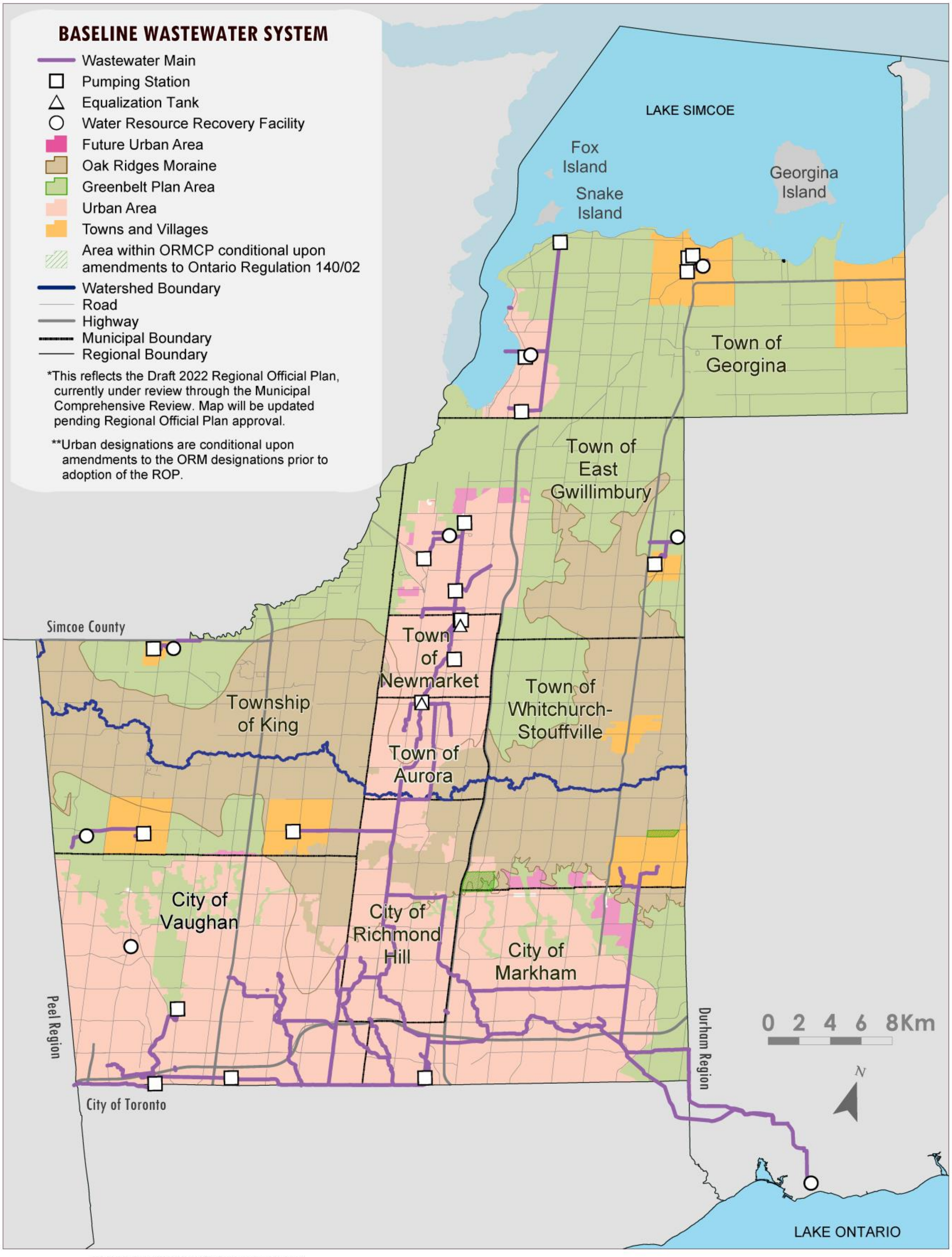
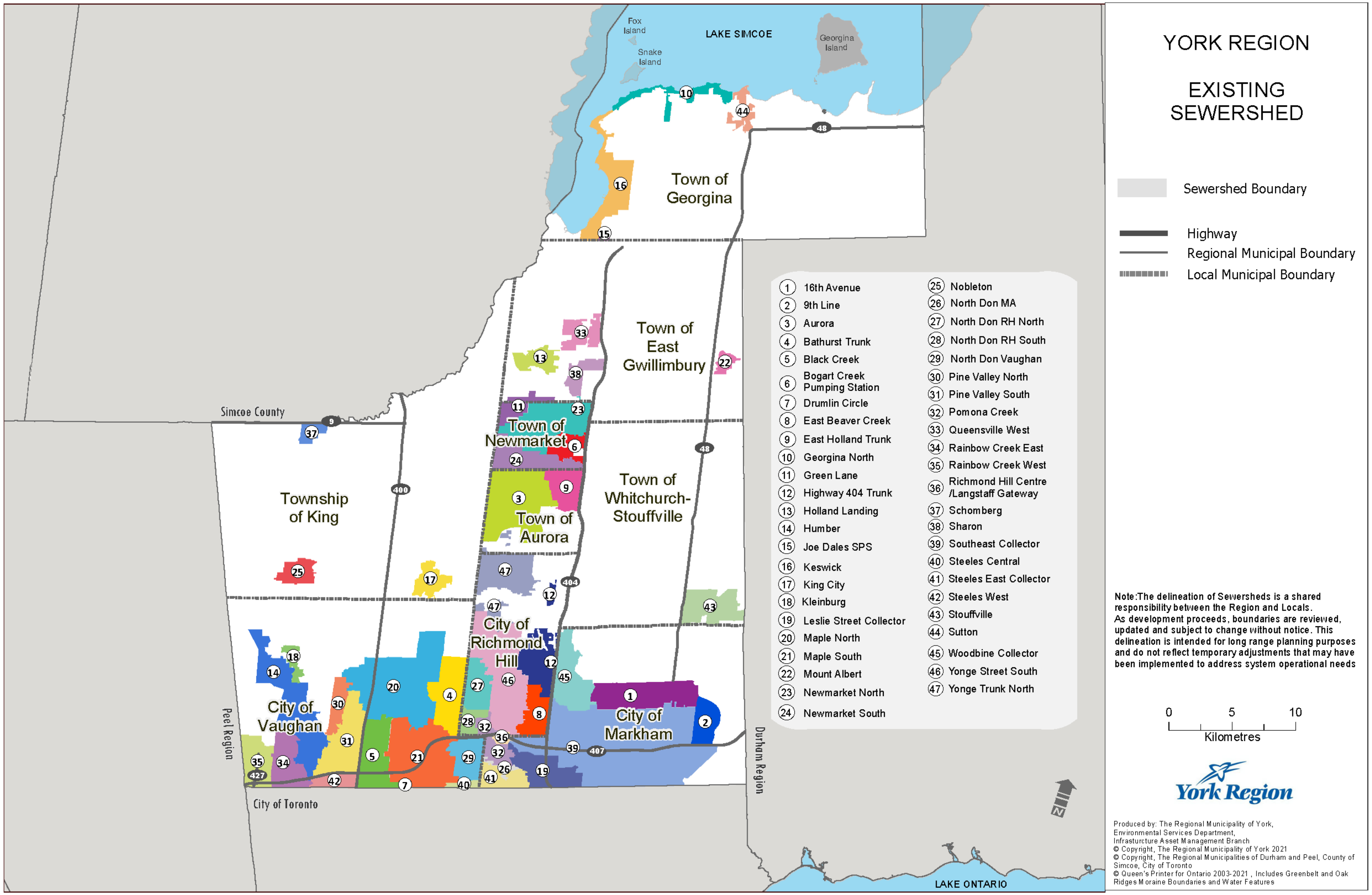


Figure 21 - Sewersheds in York Region



YORK DURHAM SEWAGE SYSTEM INCLUDING PEEL DIVERSION

The York Durham Sewage System (YDSS) currently services eight of the nine local municipalities through infrastructure organized into 37 sewersheds (including sub-sewersheds) directing most of wastewater flows to Duffin Creek WPCP with a small portion diverted to the Peel Region Wastewater System. While the Duffin Creek WPCP was expanded to 630 ML/d in 2010, its operational capacity is limited to 520 MLD until outfall capacity constraints are addressed through the ongoing Outfall Strategy Project. The treatment capacity at Peel is expected to gradually increase to 53.2 ML/d by 2031.

A brief overview of YDSS key service areas and associated regional infrastructure is provided below.

YDSS North

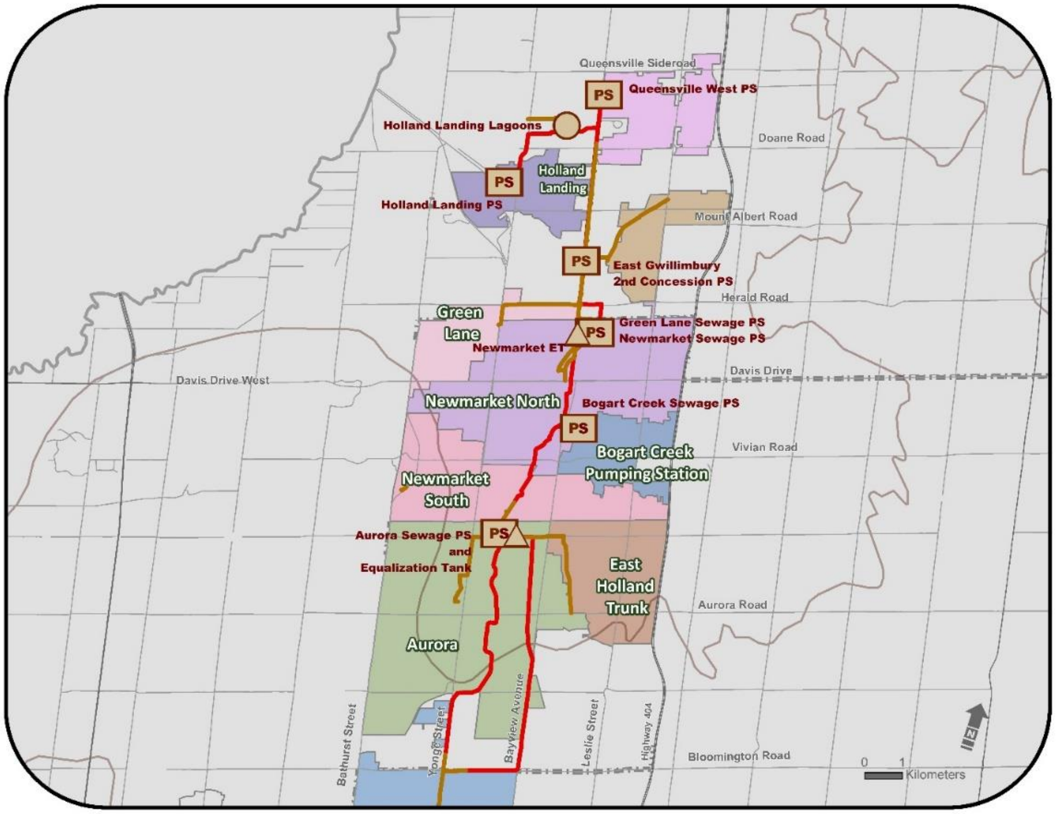
The north terminus of the YDSS consists of an infrastructure network that conveys flows from Holland Landing, Queensville, Sharon, Newmarket and Aurora to the YDSS Central. In the most northern reaches of the YDSS, the Holland Landing, Queensville West and Green Lane pumping station convey flows to the Second Concession sewage pumping station to service Queensville, Sharon and a portion of Holland Landing. These flows are then directed to the Newmarket Sewage Pumping Station and equalization tank, which work together to convey Newmarket and Aurora flows to the Aurora Pumping Station via the recently twinned Newmarket forcemains.

The Aurora Sewage Pumping Station receives wastewater flows from the Newmarket and Hamilton (formerly Bogart Creek) sewage pumping stations, along with gravity flows from most of the lands in the Town of Aurora and the southern portion of Newmarket. Wastewater is then pumped southward to the Yonge Street Trunk Sewer at Bloomington Road through parallel forcemains. An equalization tank at this station allows for attenuation of wet weather flows and operational flexibility. Since 2016, a new forcemain has been introduced to the Newmarket Sewage Pumping Station and interim servicing solutions are currently being implemented to bridge the capacity gap caused by the delay in the Class Environmental Assessment approval of the proposed Water Reclamation Centre.

A portion of the Holland Landing community is also serviced by a four-cell lagoon system that treats wastewater before discharging twice per year into the east branch of the Holland Landing River. The Holland Landing Lagoons are expected to be decommissioned upon commissioning of the proposed Water Reclamation Centre pending approval.

The YDSS North service area is shown in **Figure 22**.

Figure 22 - YDSS North



YDSS Central

The Yonge Street Trunk Sewer North receives flows from the Aurora and King City sewage pumping stations along with flows from local connections within its sewershed. Flows conveyed by the Yonge Street Trunk Sewer are intercepted by the 19th Avenue Interceptor and then routed through the Woodbine Collector and Highway 404 Trunk (North) Sewer before it is intercepted by 16th Avenue Collector. The 16th Avenue Collector merges with the Ninth Line Sewer which also services the community of Stouffville and a portion of Markham before connecting to the Southeast Collector. A class environmental assessment study is expected to commence in 2022 to identify a long-term solution to address capacity bottlenecks at the Yonge Street Sewer North and facilitate the rehabilitation of the aging pipe.

With flow from the north being intercepted at 19th Avenue, the Yonge Street Trunk Sewer South and Highway 404 Trunk (South) Sewer convey local flow along their routes to the Southeast Collector.

YDSS South

Leslie Street Sewage Pumping Station pumps wastewater from parts of the Cities of Vaughan, Markham and Richmond Hill to the Duffin Creek WPCP. The key tributary sewer systems to Leslie Street Sewage Pumping Station are:

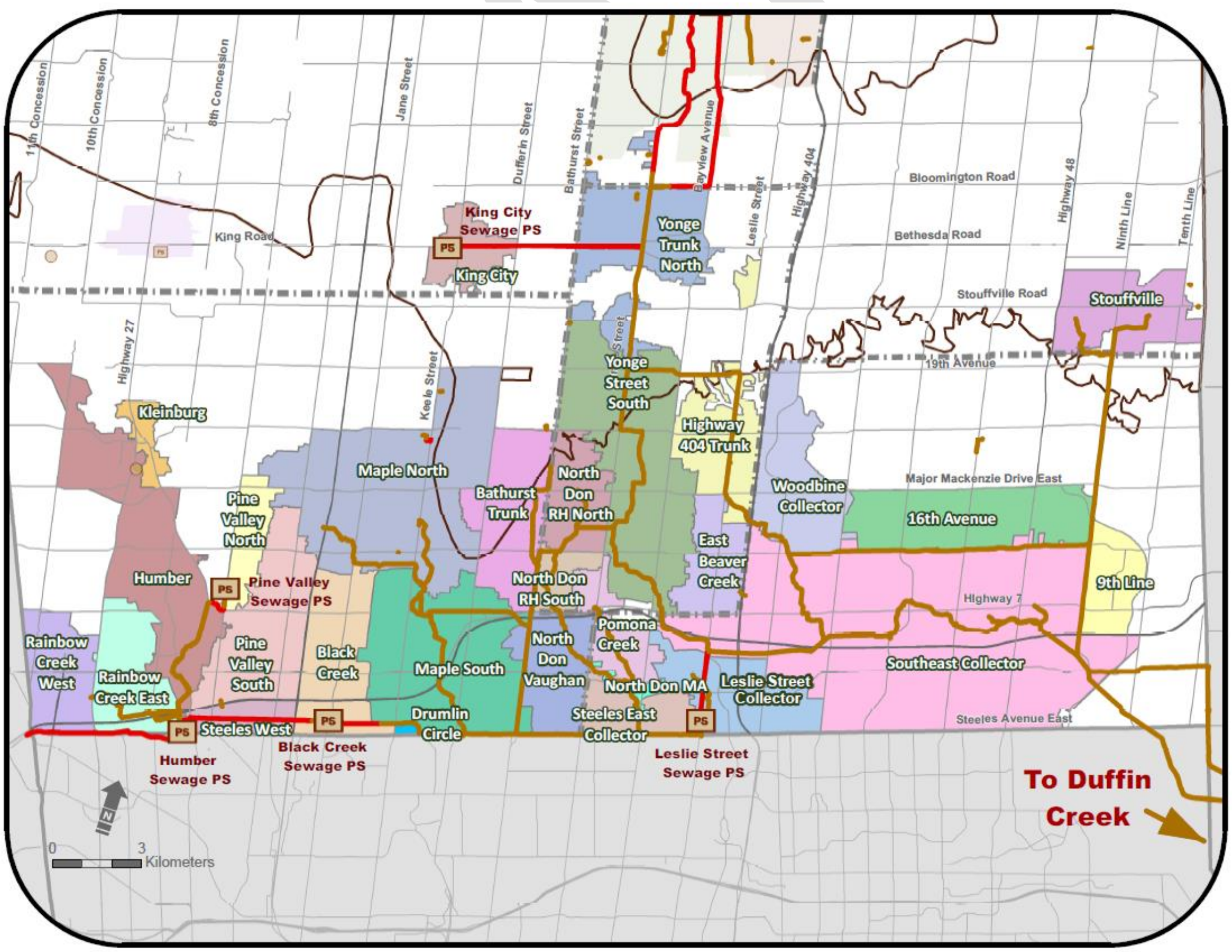
- The Humber Pumping Station, which conveys the majority of flow westerly to the Region of Peel with the balance directed to Black Creek and Leslie Street sewage pumping stations for treatment at the Duffin Creek WPCP

- The Black Creek Sewage Pumping Station, which services the industrial and commercial lands between Highway 400 and Creditstone Road, the Vaughan Metropolitan Centre and receives flows from the Humber Sewage Pumping Station for conveyance to the Steeles Collector and Leslie Street Sewage Pumping Station
- The Jane-Rutherford and Maple Collector (North) sewersheds, which convey flows from the Jane-Rutherford Road Sewer and Maple Collector North mostly to the Langstaff Road Sewer, which in turn connects to the Bathurst Trunk Sewer
- The Maple Collector (South), North Don Collector and Pomona sewersheds, which convey local flows along their routes to the Steeles Collector for conveyance to the Leslie Street Sewage Pumping Station
- The Bathurst Trunk and Langstaff Sewer sewersheds. Langstaff Trunk Sewer collects flow from the Jane-Rutherford and Maple Collector before it connects to the Bathurst Trunk Sewer, where flow is conveyed south to the Steeles Collector

Since 2016, work continues to implement infrastructure upgrades recommended by the West Vaughan, Northeast Vaughan and Richmond Hill Langstaff Regional Urban Centre Class Environmental Assessments.

The YDSS Central and South areas are shown on **Figure 23**.

Figure 23 - YDSS Central and South



YDSS Primary System

Flows from the YDSS are conveyed to the Southeast Collector and Primary Trunk for treatment at Duffin Creek WPCP in the Region of Durham. The twinned Southeast Collector receives wastewater from Ninth Line Sewer and Markham Collector and directs it to the Primary Trunk Sewer, which in turn conveys it for final treatment at the Duffin Creek WPCP. Since 2016, the Duffin Creek Outfall Environmental Assessment has been approved and work is progressing to implement upgrades necessary to bring the plant to its design capacity of 630 ML/d.

GEORGINA WASTEWATER SYSTEM

The Georgina Wastewater System services the Keswick, Willow Beach and Sutton communities in the Town of Georgina through two independent wastewater systems: Keswick and Sutton. Both systems return flows to the Lake Huron watershed after treatment at the Keswick and Sutton water resource recovery facilities.

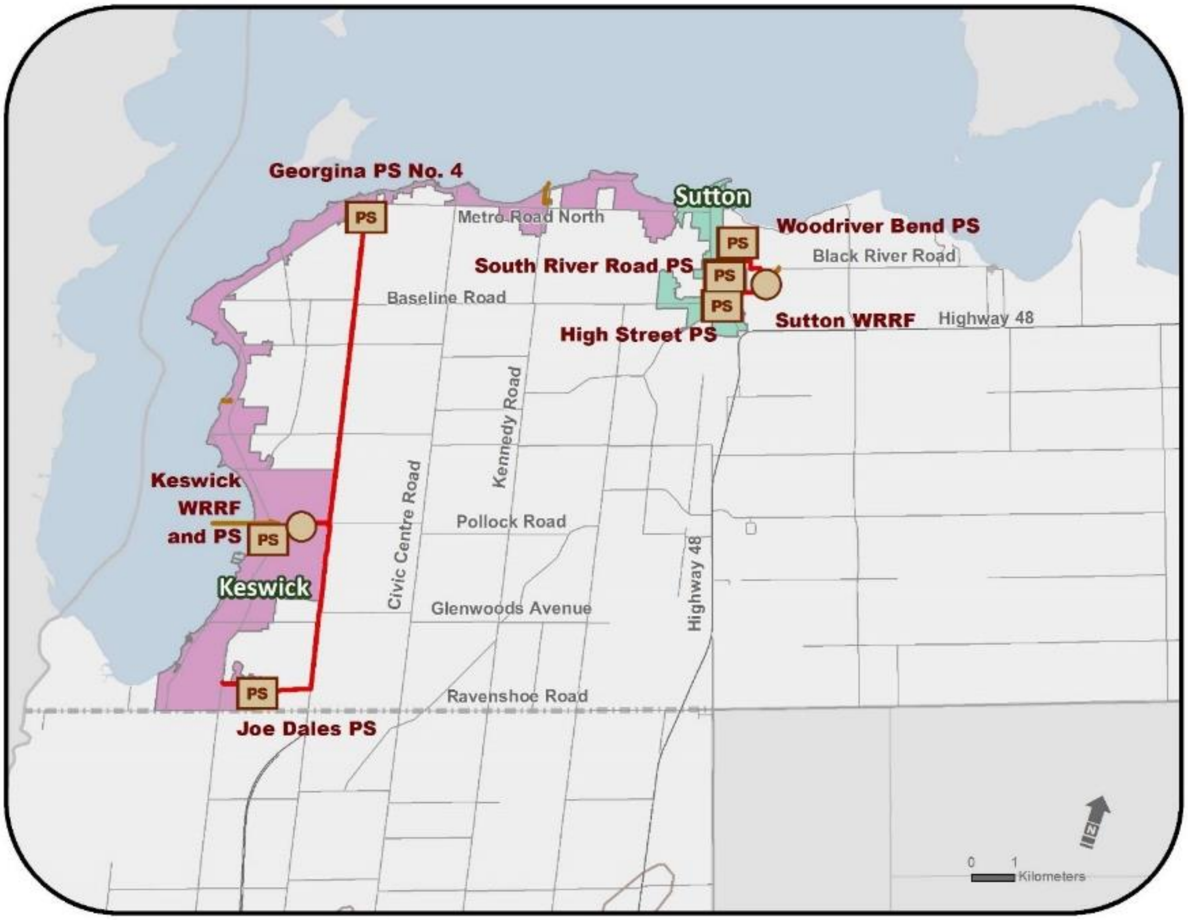
The Keswick wastewater system services the Keswick, Willow Beach and Lake Simcoe lakeshore communities. Flows from the local system are collected at the Keswick, Georgina No. 4 and Joe Dales Sewage Pumping Stations, and then treated at the Keswick Water Resource Recovery Facility (WRRF) before returning to Cook’s Bay in Lake Simcoe. The Keswick (WRRF) has a rated capacity of 18 ML/d and subject to implementation of capacity upgrades identified in a completed Class Environmental Assessment, it can be expanded to 24 ML/d.

The Sutton wastewater system services the Sutton and Jacksons Point communities. Flows from the local system are collected at South River Road, Woodriver Bend and High Street Sewage Pumping Stations, and then treated at the Sutton WRRF before returning to Lake Simcoe via the Black River. The Sutton WRRF has a rated capacity of approximately 3.4 ML/d and can be expanded to 6.2 ML/d contingent on implementation of works recommended in the Class Environmental Assessment completed in 2010.

Since 2016, a project is in progress to rehabilitate the Keswick Pumping Station which includes capacity expansion of the forcemain to support growth in the service area.

The Georgina Wastewater System is shown in **Figure 24**.

Figure 24 - Georgina Wastewater System



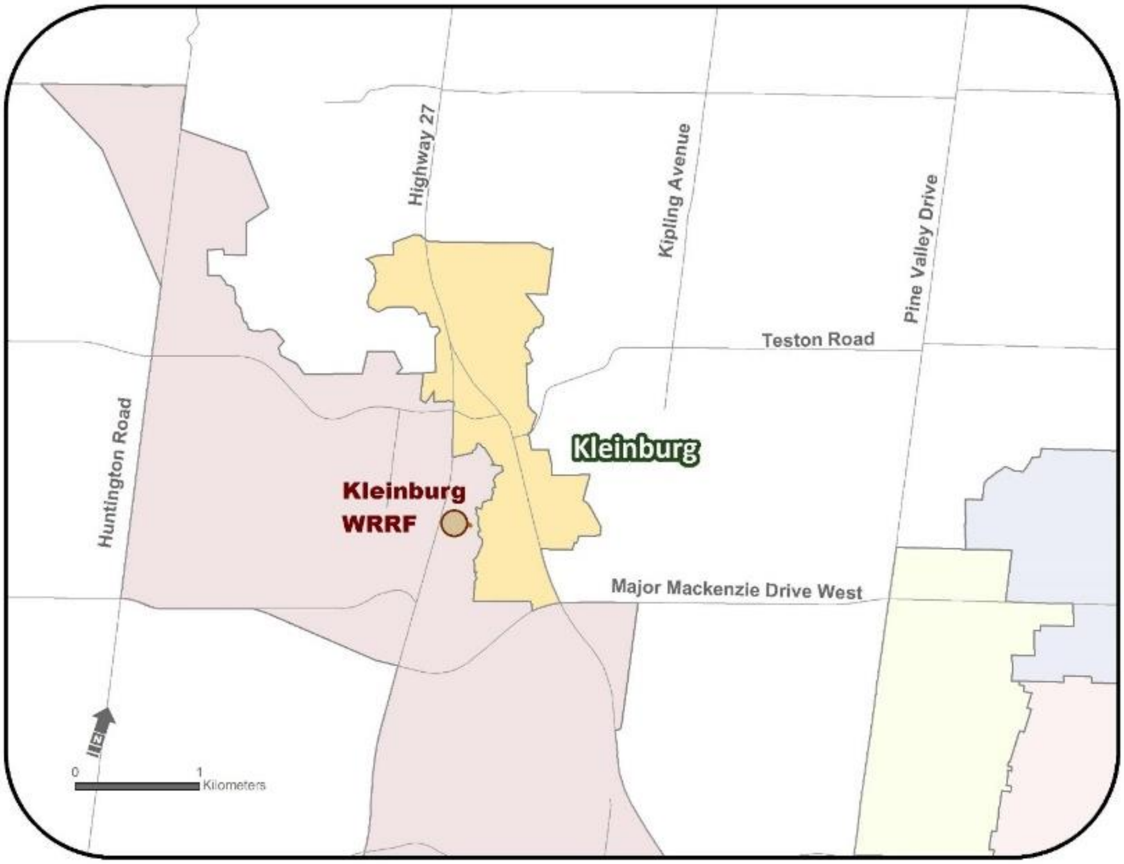
STAND-ALONE WASTEWATER SYSTEMS

The communities of Kleinburg (City of Vaughan), Mount Albert (Town of East Gwillimbury), Nobleton and Schomberg (both Township of King) are supported by individual water resource recovery facilities returning flows to local water bodies. The Mount Albert and Schomberg systems are located within the Lake Huron watershed, and the Nobleton and Kleinburg systems are in the Lake Ontario watershed.

Kleinburg Wastewater System

The Kleinburg Wastewater System services the area generally bounded by Kirby Road to the north, Major Mackenzie Drive to the south, Huntington Road to the west, and Kipling Avenue to the east in the City of Vaughan (**Figure 25**). Wastewater flows are collected by local sewers and conveyed through a combination of gravity and pumping for treatment at Kleinburg before return to the Humber River. Kleinburg WRRF has a capacity of 2.87 ML/d and is expected to be decommissioned following completion of a new sewer along Highway 27 that will connect Kleinburg to the new Humber Sewage Pumping Station as recommended by the West Vaughan Wastewater Servicing Class Environmental Assessment.

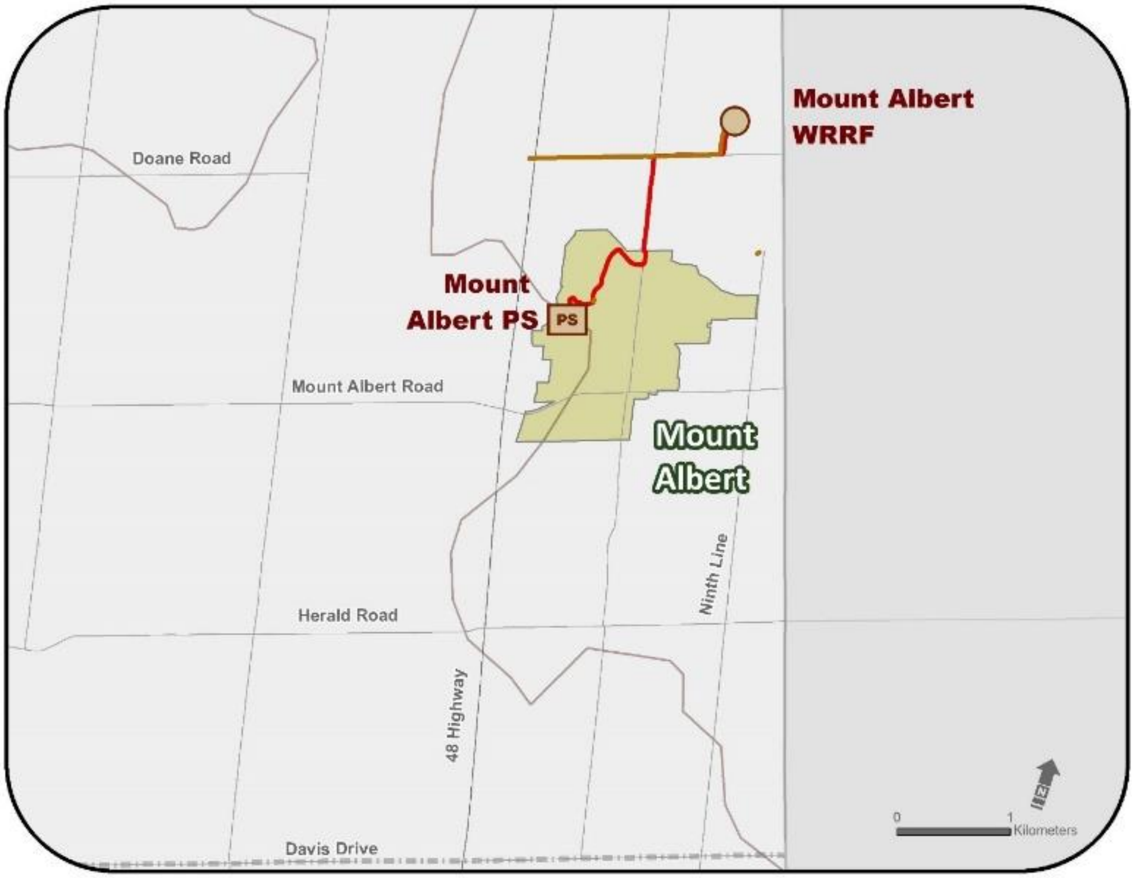
Figure 25 - Kleinburg Wastewater System



Mount Albert Wastewater System

The Mount Albert Wastewater System services the area generally bounded by Doane Road to the north, Mount Albert Road to the south, Highway 48 to the west, and Ninth Line to the east in the Town of East Gwillimbury (**Figure 26**). The Mount Albert Sewage Pumping Station receives flow collected by the local sewer and directs it for treatment at Mount Albert WRRF before return to Mount Albert and Vivian creeks. Mount Albert WRRF has a capacity of 2.04 ML/d and subject to implementation of upgrades identified in a recent capacity optimization study the serviceable population could be increased, within the existing Environmental Compliance Approval.

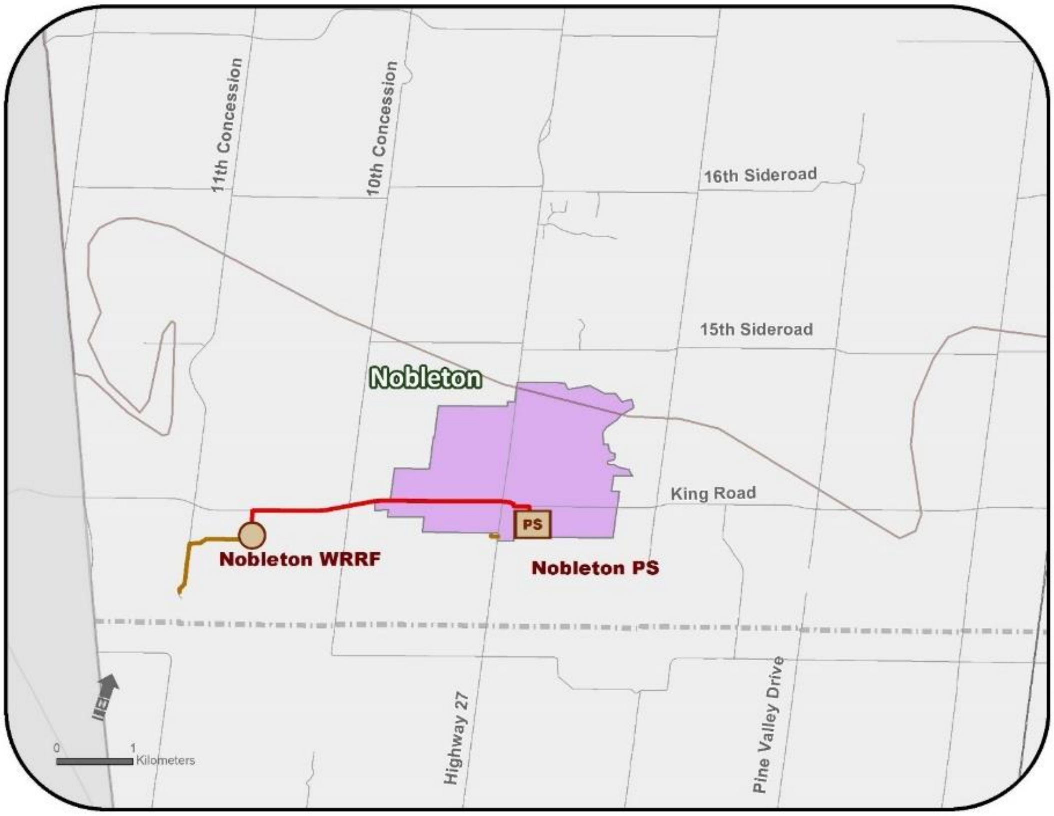
Figure 26 - Mount Albert Wastewater System



Nobleton Wastewater System

The Nobleton Wastewater System services the area around the intersection of Highway 27 and King Road in the Township of King (**Figure 27**). The Nobleton Sewage Pumping Station receives flows collected by local sewers and directs it for treatment at Nobleton WRRF before return to the Humber River. Nobleton WRRF has a capacity of 2.9 ML/d which is expected to be expanded contingent upon implementation of recommended upgrades in the Class Environmental Assessment study completed in 2021.

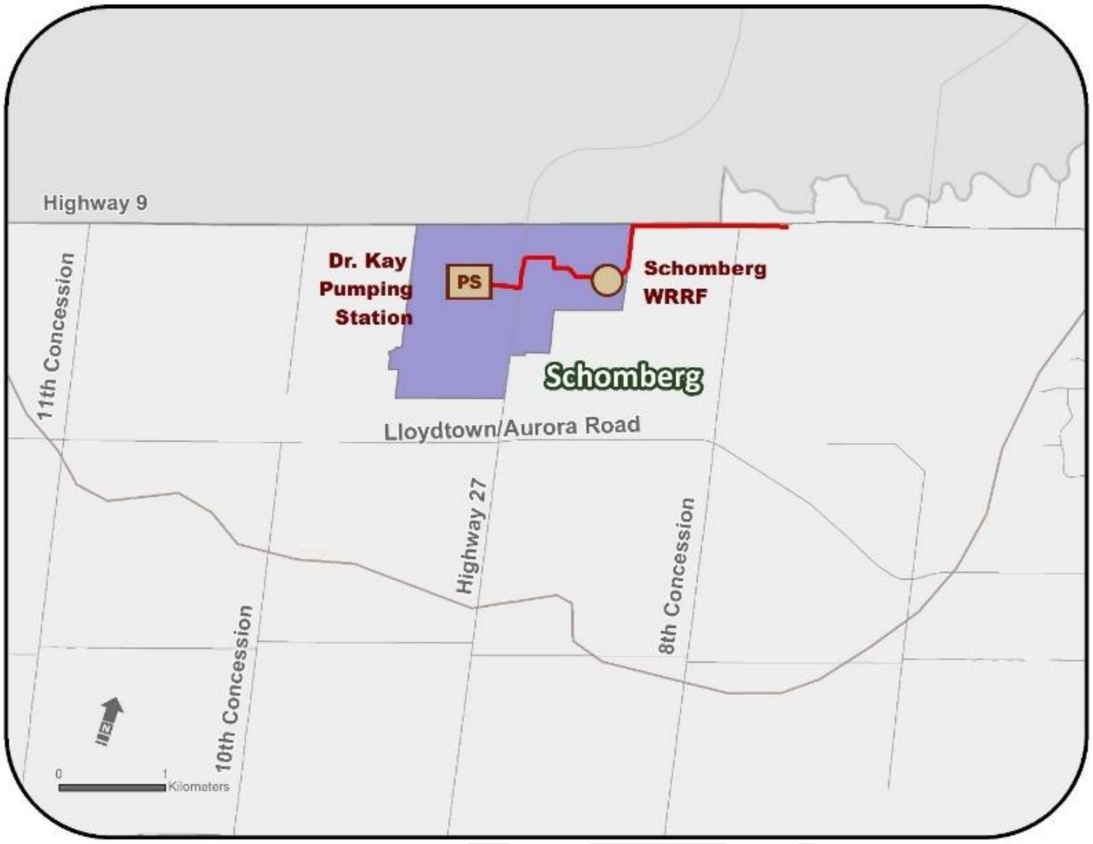
Figure 27 - Nobleton Wastewater System



Schomberg Wastewater System

The Schomberg Wastewater System services the area near the intersection of Highway 27 and Highway 9 in the Township of King (**Figure 28**). Dr. Kay Sewage Pumping Station receives flow collected by the local system from most of the residential area. Flow from the Schomberg industrial sector is collected at the Proctor Sewage Pumping Station owned and operated by the Township of King. Both stations direct flows for treatment at Schomberg WRRF before return to the Schomberg River. Schomberg WRRF has a capacity of 2.05 ML/d and no capacity upgrades has been implemented in this facility since 2016.

Figure 28 - Schomberg Wastewater System



APPENDIX A.3 DESIGN CRITERIA

Summary

Design criteria used to analyze the regional water and wastewater systems were mostly derived from the analysis of historical flow data and continue to be in alignment with assumptions made in the 2016 Water and Wastewater Master Plan update. These criteria are intended for Regional long-term infrastructure planning purposes and are expected to be reviewed and updated through specific planning studies and future master plans.

Disclaimer

January 4, 2022

York Region

Statement of Qualifications and Limitations

The attached Design Criteria appendix (the "Report") has been prepared by The Regional Municipality of York ("Region") for its own use and benefit.

The information, data, recommendations and conclusions contained in the Report (collectively, the "Information"):

- is subject to constraints and limitations due to the mandate of the Environmental Services Department and the resources allocated to the compiling of the Report at the time the Report was written, and the qualifications contained in the Report (the "Limitations")
- is general background in nature representing no judgment on the part of the Region, in light of these constraints and limitations, and the industry standards for the preparation of similar reports
- may be based on information provided to the Region which has not been independently verified
- may not have been updated after the date of issuance of the Report and its accuracy is limited to the time-period and circumstances in which it was collected, processed, made or issued
- must be read as a whole and sections thereof should not be read out of such context
- was prepared for the specific purposes described in the Report
- may be based on limited testing and on the assumption that such conditions are uniform and not variable either geographically or over time

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This Statement of Qualifications and Limitations is attached to and forms part of the Report and any use of the Report is subject to the terms hereof.

Purpose

This document summarizes design criteria for the assessment of hydraulic capacity of Regional water and wastewater systems in support of long-term infrastructure planning requirements.

Background

The Water and Wastewater Master Plan reviews and updates design criteria to ensure they continue to be informed by evolving servicing conditions and regulatory requirements. This update builds upon industry practices, 2016 Water and Wastewater Master Plan update (2016 Plan) assumptions and considers flow data for the period 2016 to 2020. Design criteria discussed in this memo informed the identification of the recommended infrastructure plan identified in the 2021 Water and Wastewater Master Plan update (2021 Master Plan) and is intended to complement York Region's design guidelines and standards which set detailed direction on the design of specific Regional infrastructure.

Water Design Criteria

SYSTEM PRESSURES

Regional water systems are generally planned to accommodate the pressures summarized in Table 1 in alignment with engineering guidelines by the Ministry of the Environment, Conservation and Parks.

Table 1 - System Pressure Targets

Category	Pressure in kPa (psi)	Demand Condition
Minimum pressure	275 (40)	Maximum hour demand
Maximum pressure	700 (100)	Minimum hour demand
Not less than	140 (20)	Maximum day demand plus fire flow condition

WATER UNIT RATES

Projected average day demands for the York Water System and Georgina Water System were estimated based on estimated unit rates presented in Table 2. These unit rates (in litres per capita per day, or "Lpcd") are based on the flow forecast derived from the calibrated Regional water demand forecast model developed for the Water and Wastewater Financial Sustainability Plan. The model considers historical flow data and the elasticity of water demand to various demand factors.

Projected unit rates are applied universally to existing and future developments in the York and Georgina water systems except for the Kleinburg-Nashville community. In recognition of the unique water consumption patterns in this community, average day demands for existing developments are based on historical flow data and unit rates in Table 2 are only used to estimate the water demands for future developments.

Table 2 - Unit Rates for York Water System and Georgina Water System

Year	Residential Unit Rate (Lpcd)	Employment Unit Rate (Lpcd)
2021	221	161
2026	214	159
2031	207	158
2036	200	155
2041	195	151
2051	195	151

For stand-alone water systems, unit rates are presented in Table 3. They are in accordance with recent class environmental assessments and/or the analysis of the last five years of historical flow data. Given the geographical isolation of these communities and their unique water consumption patterns, any future analysis for these communities should consider a review and update of unit rates based on latest flow data available.

Table 3 - Unit Rates for Stand-alone Water Systems

Stand-alone Water System	Residential Unit Rate (Lpcd)	Employment Unit Rate (Lpcd)	Combined Unit Rate (Lpcd)
Ballantrae-Musselman's Lake[1]	-	-	300
Mount Albert[2]	(See Table 2)	(See Table 2)	-
Nobleton[3]	299	248	-
Schomberg[4]	296	210	-

[1] Design rates based on recently completed class environmental assessment studies.
[2] Since unit rates using historical flows in Mount Albert are similar to estimated 2021 unit rates for York and Georgina water systems, the later was used for the 2021 Master Plan.
[3] Design rates based on recently completed class environmental assessment studies.
[4] Design rates based on the analysis of historical flow data for the period 2016 to 2020. With no planned growth in the Ansnorveldt community, this water system is not included in the analysis.

PEAKING FACTORS

Peaking factors presented in Table 4 were used to estimate projected maximum day demands. Peaking factors were derived from mass balance analysis using flow data for the period of 2016 to 2020.

Table 4 - Peaking Factors

Water System	Peaking Factor
York Water System	1.7
King City Water System	2.2
Kleinburg-Nashville Water System	2.5
Georgina Water System	1.8
Ballantrae –Musselman's Lake Water System	3.05
Mount Albert Water System	2.1
Nobleton Water System	2.1
Schomberg Water System	2.2

FIRE FLOW REQUIREMENTS

Historically, Regional water systems have been planned to meet fire flow requirements in accordance with the Fire Underwriter Survey 1999 and land use designation as shown in Table 5**.** These flows continued to be used in the water analysis carried out as part of the 2021 Master Plan.

Table 5 - Fire Flow Requirements[5]

Land Use	Flow Rate (L/min)[6]	Duration (Hours)	Fire Storage Volume (ML)
Residential	10,000	2	1.2
Commercial	10,000	2	1.2
Industrial	17,000	3.5	3.6

[5] Regional water system components are planned and designed to meet maximum day plus fire demands while maintaining a residual pressure of at least 20 psi.
[6] Fire flow requirements remain consistent with 2009 and 2016 Water and Wastewater Master Plan updates.

Wastewater Design Criteria

WASTEWATER GENERATION RATES (TREATMENT)

Unit rates used to estimate average wastewater flows from expected growth over the planning period are presented in Table 6. They were established by completed class environmental assessments and where relevant, adjusted based on analysis of historical flow data.

Table 6 - Generation Rates (Treatment)

Treatment Facility	Generation Rate (Lpcd)
Duffin Creek Water Pollution Control Plant	350
Keswick Water Resource Recovery Facility	365
Sutton Water Resource Recovery Facility	455
Mount Albert Water Resource Recovery Facility	341
Schomberg Water Resource Recovery Facility	365
Nobleton Water Resource Recovery Facility	370
Kleinburg Water Resource Recovery Facility	383
Proposed Water Reclamation Centre - Newmarket (Residential/Employment)	303/274
Proposed Water Reclamation Centre - Holland Landing, Queensville and Sharon (Residential/Employment)	319/288

WASTEWATER UNIT RATES (CONVEYANCE)

Average dry weather flows for the York Durham Sewage System are estimated as follows:

- Existing service area: as per calibrated hydraulic model based on historical flow data
- Future service area: based on population projections and water design rates presented in Table 2 plus a groundwater base infiltration allowance of 90 Lpcd

For the Georgina Wastewater System and stand-alone systems, existing and future average dry weather flows are based on historical flow data. Otherwise, they are derived from population projections and water design rates plus a groundwater base infiltration allowance of 90 Lpcd.

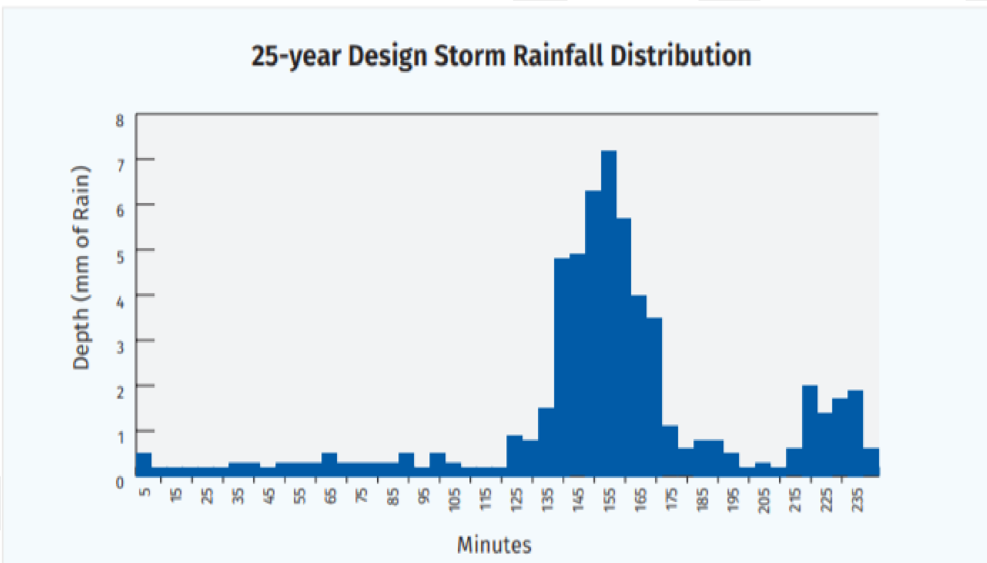
Diurnal patterns derived from historical flow data were used to estimate existing and future peak dry weather flows for the York Durham Sewage System. For Georgina and stand-alone systems, peak dry weather flows were estimated using the Harmon Formula.

REGIONAL DESIGN STORM AND EXTRANEOUS FLOW ALLOWANCE

Wet weather flows for the York Durham Sewage System are estimated as follows:

- Existing service area: wet weather flows come from inflow and infiltration rates determined by the calibrated hydraulic model based on measured flow data normalized to the Region's 25-year design storm (see Figure 1). This storm was developed and adopted for the 2016 Plan analysis and was derived from the analysis of rainfall events observed within York Region as recorded by several rain gauge stations. In 2020, a review of the Regional design storm concluded that it continues to be relevant for long-term infrastructure planning purposes and therefore was used in the 2021 Master Plan analysis
- Future service area: For the anticipated growth, wet weather flows are based on inflow and infiltration flow rates for future service areas using the Region's inflow and infiltration flow hydrograph, which is the theoretical flow pattern estimating the future inflow and infiltration flow, with a peak flow of 0.26 L/s/ha

Figure 1 - York Region Design Storm



For Georgina and stand-alone wastewater systems, existing and future wet weather flows are based on the analysis of historical flow data, recently completed class environmental assessment studies, or an inflow and infiltration allowance of 0.26 L/s/ha.

APPENDIX A.4 WATER AND WASTEWATER FLOWS FORECASTS

Summary

This appendix provides several figures that compare forecasted flows to existing and planned capacity for key Regional water and wastewater systems and facilities.

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March 15, 2022

York Region

Background and Purpose

As the Region continues to grow, demands for drinking water and wastewater servicing will increase. Projections of water and wastewater flows are a key input to long term infrastructure planning as they are used to update hydraulic models and assess future capacity requirements to support growth to 2051. Projected flows were estimated using population projections and design criteria described in Appendix A.3 Design Criteria and Assumptions.

The following sections complement Section 4.2 of the 2022 Water and Wastewater Master Plan Update by providing forecasted flows and existing/planned capacity for key regional water and wastewater systems and facilities.

1. Water Demand and Supply to 2051

Capacity was evaluated and infrastructure improvements identified for the Region's water systems to accommodate growth to 2051. Figures showing forecasted demands and capacity for major water systems are presented below.

Figure 1.1 shows the overall York Region water system maximum day demand (forecasted flow) and the planned system-wide supply capacity in 2051 in million litres per day (ML/d). The estimated proportion of each source of supply (Lake Ontario, groundwater, and Lake Simcoe) is also presented. This comparison demonstrates that planned supply capacity across the Regional system as a whole is sufficient to meet water demands to 2051 and beyond.

Figure 1.1 - York Region 2051 Maximum Day Water Demand vs. 2051 Supply by Source

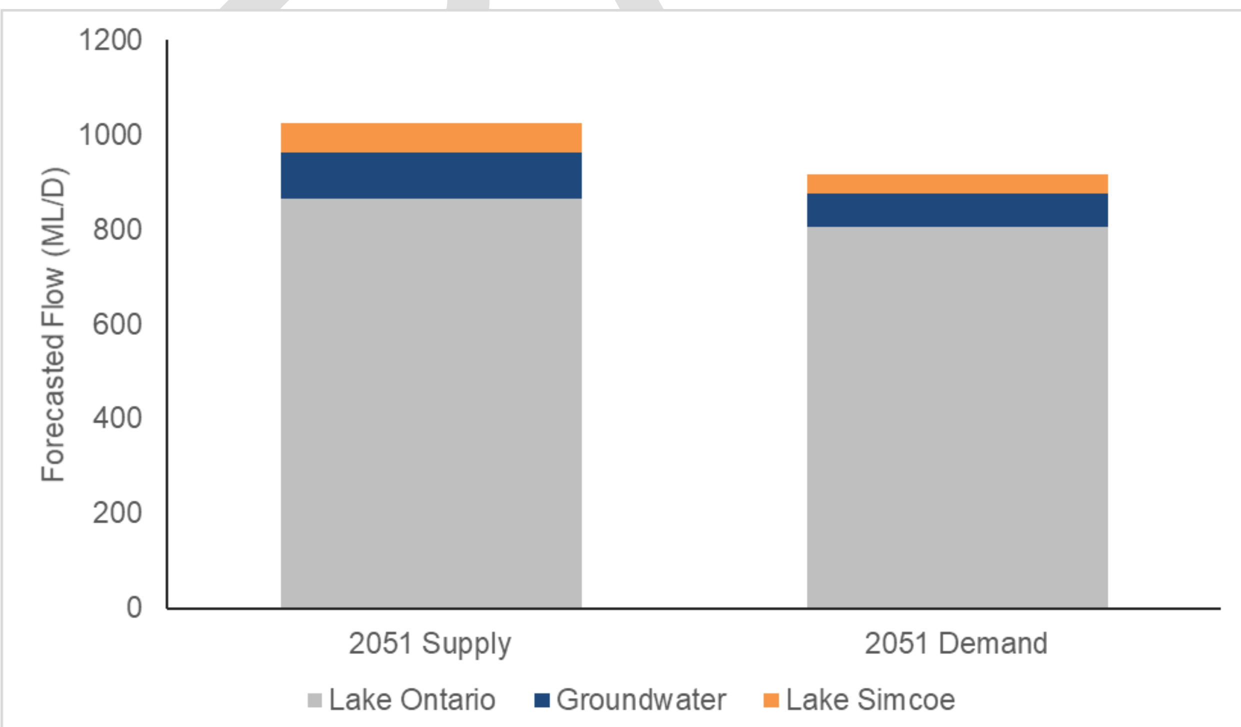


Figure 1.2 compares the projected increase of maximum day water demands by local municipality. This figure provides an indication of the future water supply requirements to accommodate anticipated growth in each local municipality up to 2051.

Figure 1.2 - Forecasted Maximum Day Water Demand by Local Municipality

Figure 1.3 compares the forecasted maximum day water demands to the planned supply capacity in the York Water System servicing the municipalities of Aurora, Newmarket, Markham, Richmond Hill, Vaughan and the communities of King City, Holland Landing, Queensville, Sharon and Stouffville. It is estimated that about 90% of the York Water System supply will be used to satisfy the 2051 maximum day water demand.

Figure 1.3 - Forecasted York Water System Maximum Day Demand vs. Supply Capacity

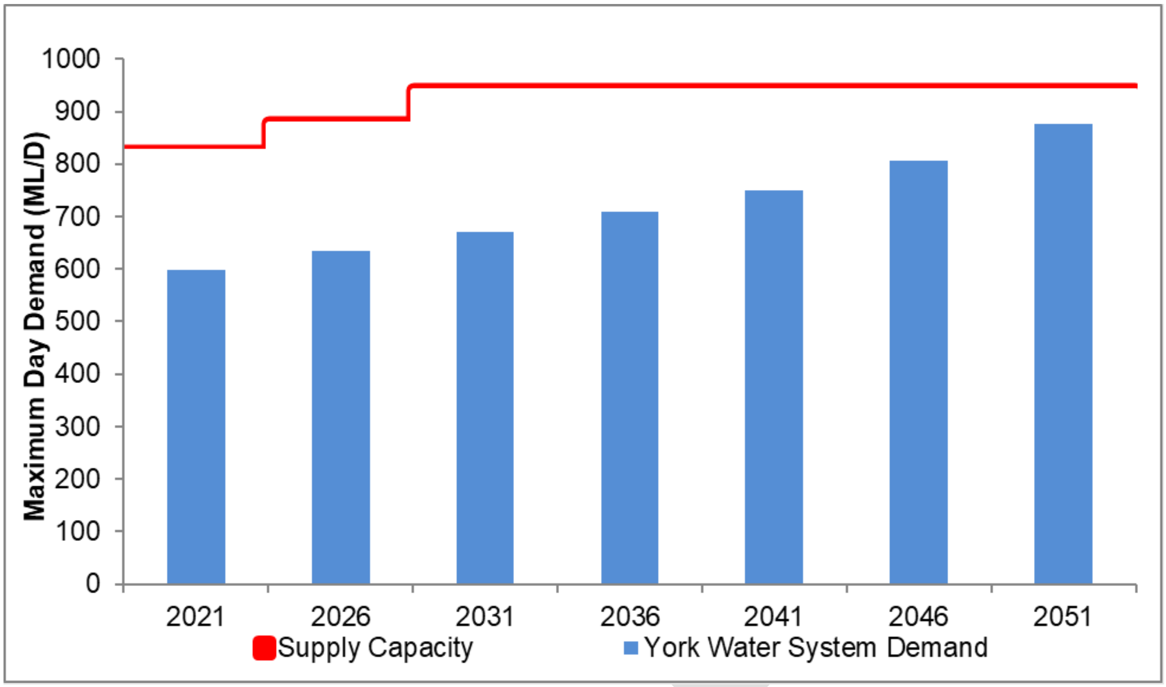


Figure 1.4 compares the forecasted maximum day water demands to the planned supply capacity in the Georgina Water System. This figure includes the planned water transfer to support the introduction of Lake Simcoe supply into East Gwillimbury and Newmarket through the proposed Northern Connection expected to be completed in 2041. It is estimated that approximately 70% of the Georgina planned supply will be used to meet the 2051 maximum day water demand.

Figure 1.4 - Forecasted Georgina Water System Maximum Day Demand vs. Supply Capacity

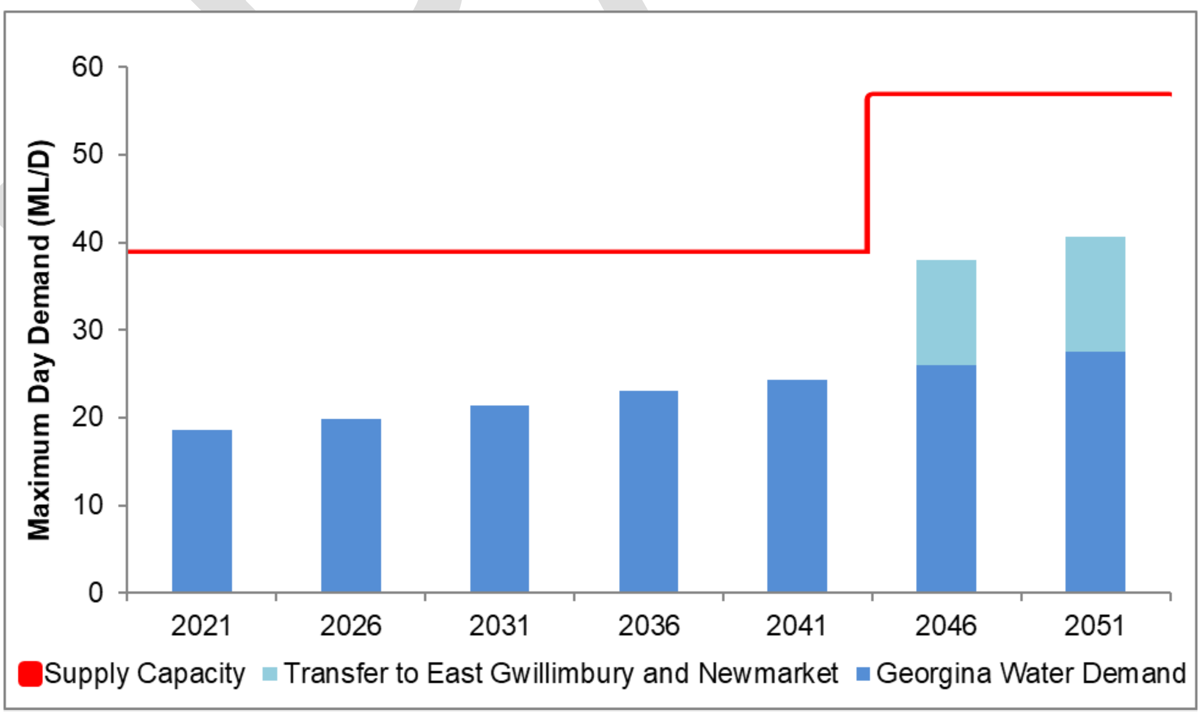
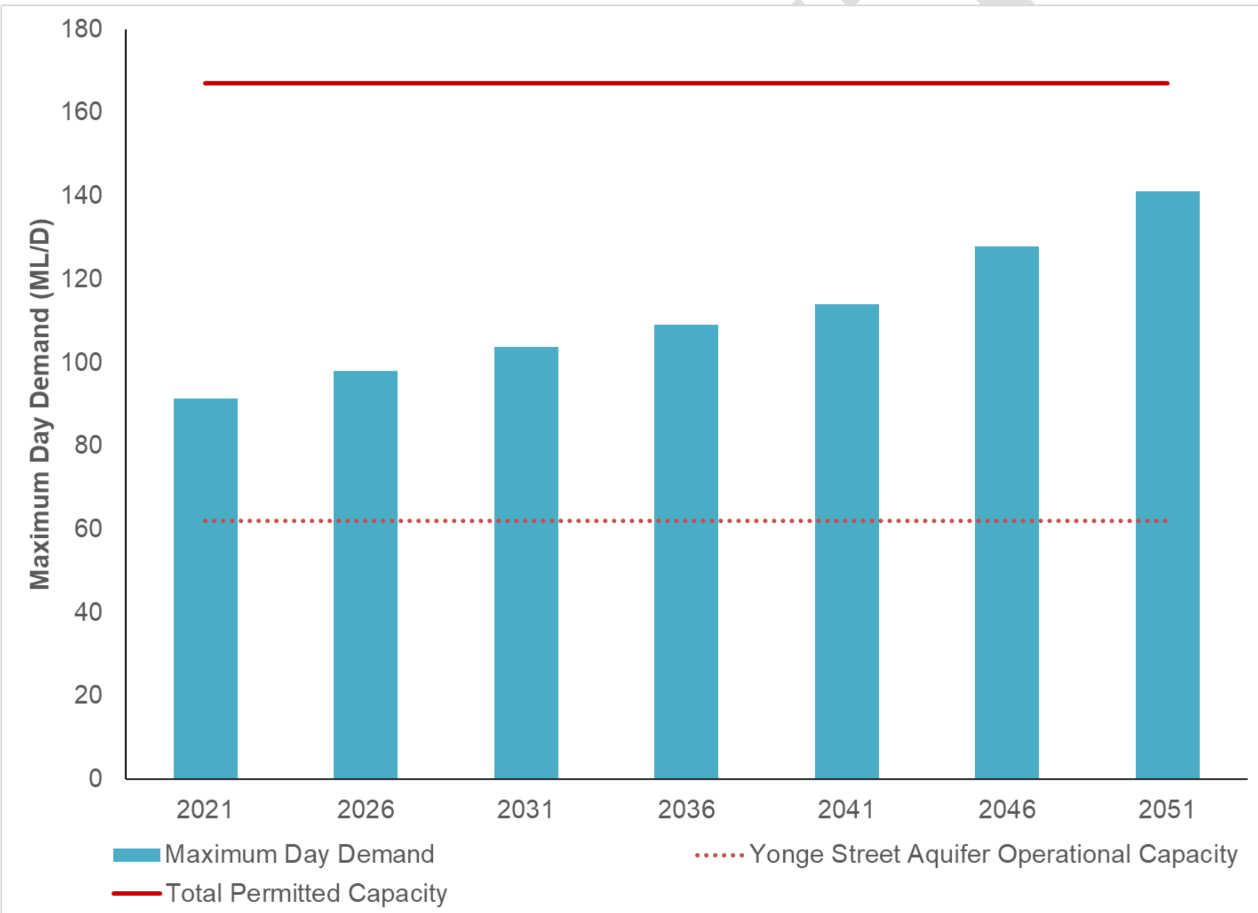


Figure 1.5 compares the total maximum day water demand to 2051 for Aurora, Newmarket and East Gwillimbury, and the water supply capacity from groundwater sources plus Lake Ontario permitted transfer of 105 ML/d. The individual contribution of groundwater supply is also presented. While each individual supply would not be adequate to meet forecasted demands, when combined, groundwater and Lake Ontario (shown as total permitted capacity), provide robust water supply and operational flexibility to meet the increasing drinking water requirements over time. Not shown in the figure for simplicity is the planned introduction of Lake Simcoe-based supply, which would offer further flexibility to manage flows in these communities and help to maintain water balance as Lake Huron based wastewater servicing comes online upon completion of the proposed Upper York Water Reclamation Centre.

Figure 1.5 - Forecasted Maximum Day Demand and Supply Capacity in Aurora, East Gwillimbury and Newmarket



1.1. STAND-ALONE WATER SYSTEMS

Stand-alone systems are isolated from the larger Regional infrastructure system and have unique characteristics that must be considered when planning for growth and servicing. Long term servicing needs for stand-alone systems have been assessed either through the Master Plan or through other ongoing and completed studies. Results are summarized in **Table 1.1**.

Table 1.1 Stand-alone Systems Long Term Water Servicing

Stand-alone Water Systems	Assessment of Future Growth and Servicing Needs
Ansnorveldt	No growth expected. No additional servicing needs identified.
Ballantrae-Musselman's Lake	Growth envisioned through Municipal Comprehensive Review is within planned servicing capacity identified through detailed 2019 Environmental Assessment. Additional servicing details are provided in Appendix A.7.
Mount Albert	Opportunities to optimize servicing capacity of the Mount Albert infrastructure system are being assessed through a separate study in close coordination with the Town of East Gwillimbury. Additional servicing details are provided in Appendix A.7.
Nobleton	Servicing needs assessed through completed 2021 Class Environmental Assessment. Additional servicing details are provided in Appendix A.7.
Schomberg	Future growth is within existing servicing capacity assessed through detailed 2007 Environmental Assessment.

2. Wastewater Flows and Treatment to 2051

Capacity was evaluated and infrastructure improvements identified for the Region's wastewater systems to accommodate planned growth to 2051. Figures showing forecasted flows and capacity of major treatment facilities are presented below.

Figure 2.1 shows forecasted average day wastewater flows for the Duffin Creek Water Pollution Control Plant (WPCP) servicing the majority of York Region as well as a portion of Durham Region. Duffin Creek WPCP's current rated capacity of 630 ML/d is forecast to be reached by 2040 – 2045 with planned capacity expected to be determined through a future Environmental Assessment study that will also explore opportunities to optimize the existing treatment plant. Several upgrades have been identified for Duffin Creek WPCP in the 2022 Water and Wastewater Master Plan update to accommodate growth to 2051.

Figure 2.1 - Forecasted Average Day Flow at Duffin Creek WPCP (York and Durham Regions)

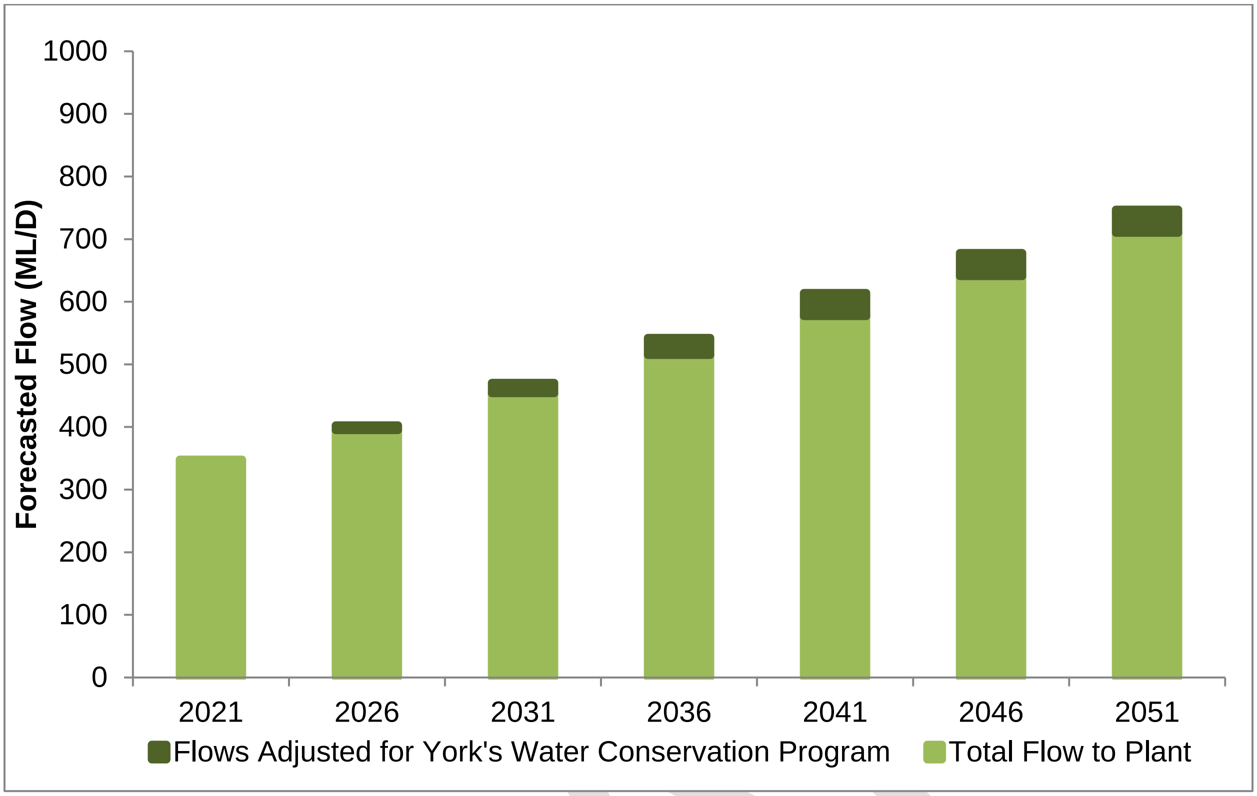


Figure 2.2 shows the forecasted average day flows to the proposed Water Reclamation Centre compared to the planned phased capacity. The proposed Upper York Water Reclamation Centre (WRC) capacity has been planned to meet estimated increases in future wastewater flows in the service area to 2051 and beyond. This capacity is contingent on approval of the Individual Environment Assessment completed in 2014 and future Environmental Assessment(s) for planned expansion.

Figure 2.2 - Forecasted Average Day Flow at the Proposed Upper York Water Reclamation Centre

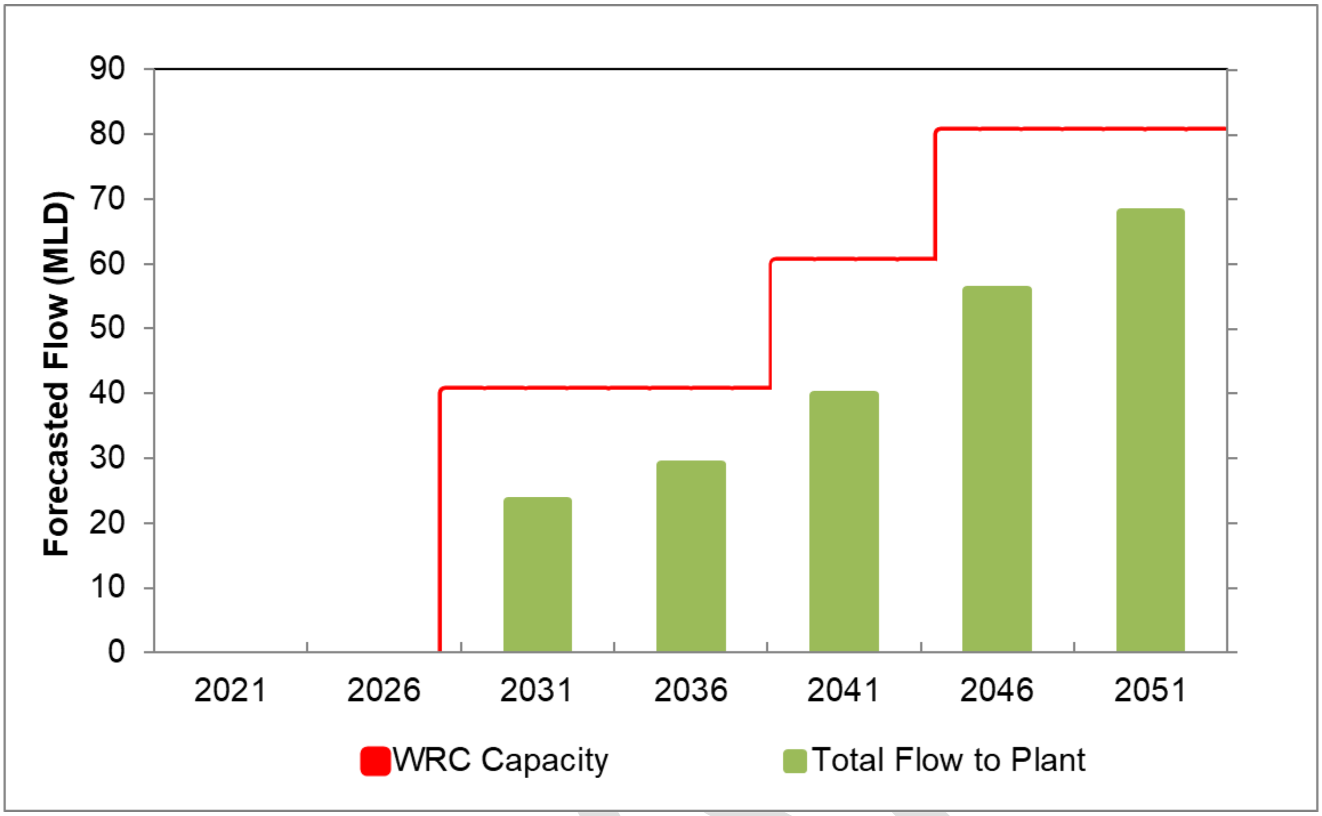


Figure 2.3 compares the forecasted average day flow to the existing and planned capacity of Keswick Water Resource Recovery Facility (WRRF). Keswick WRRF capacity is expected to be adequate support wastewater treatment needs of the growing population in compliance requirements of the Lake Simcoe Protection Plan.

Figure 2.3 - Forecasted Average Day Flow at Keswick Water Resource Recovery Facility

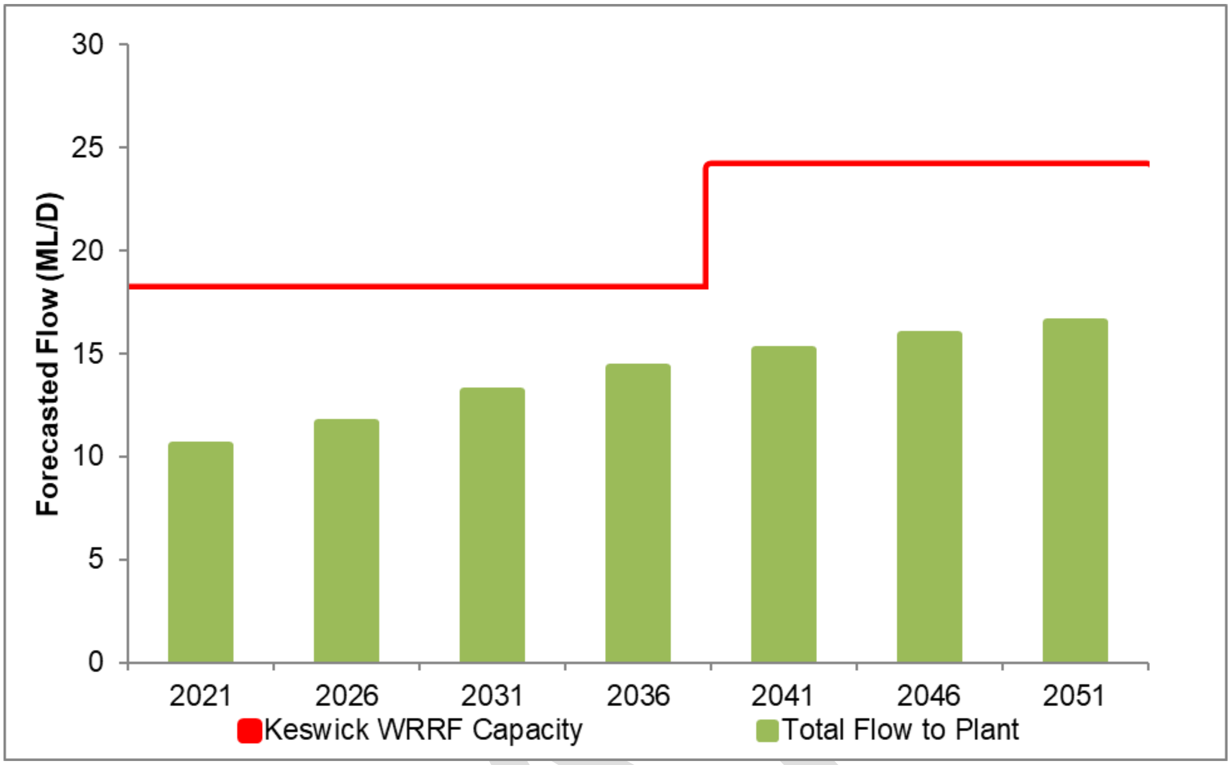
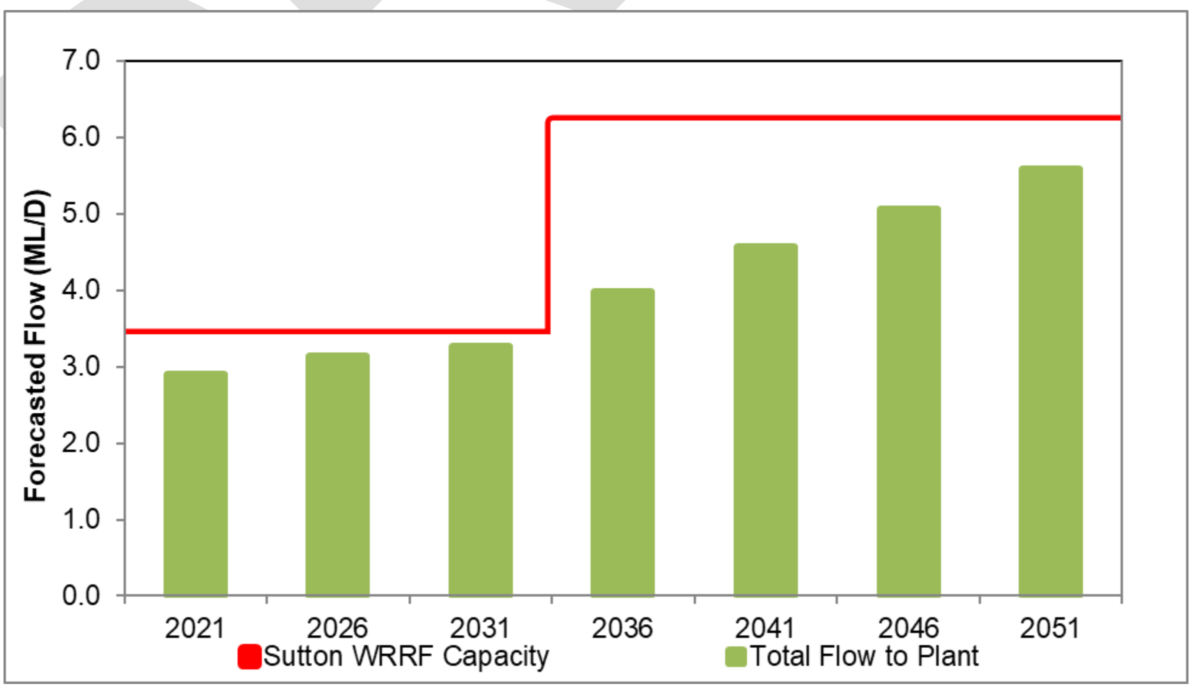


Figure 2.4 compares the forecasted average day flow to the existing and planned capacity of Sutton Water Resource Recovery Facility (WRRF). The expected increase in wastewater flows in the Sutton Service area by 2051 can be accommodated by the planned expansion of the Sutton WRRF while complying with the requirements of the Lake Simcoe Protection Plan.

Figure 2.4 - Forecasted Average Day Flow at Sutton Water Resource Recovery Facility



2.1. STAND-ALONE WASTEWATER SYSTEMS

Standalone systems are isolated from the larger Regional infrastructure system and have unique characteristics that must be considered when planning for growth and servicing. Long term servicing needs for stand-alone systems have been assessed either through the Master Plan or through other ongoing and completed studies. Results are summarized in **Table 2.1.**

Table 2.1 Stand-alone Systems Long Term Wastewater Servicing

Stand-alone Wastewater Systems	**Assessment of Future Growth and Servicing Needs**
Kleinburg	Per West Vaughan Servicing Class Environmental Assessment completed in 2013, this system is to be connected to the larger York Durham Sewage System and thus, servicing needs are considered in York Durham Sewage System (Duffin Creek WPCP) analysis.
Mount Albert	Opportunities to optimize treatment facility capacity are being assessed through a separate study in close coordination with the Town of East Gwillimbury. Additional details are provided in Appendix A.7.
Nobleton	Servicing needs assessed through recently completed Class Environmental Assessment (2021).
Schomberg	Future growth is within existing servicing capacity assessed through detailed Class Environmental Assessment in 2007.

APPENDIX A.5 DETAILED ALTERNATIVE SERVICING STRATEGIES EVALUATION

Summary

This appendix contains a table summarizing the detailed evaluation and rationale for scoring the two alternative water servicing strategies ("York Water System with Northern Connection" and "York Water System without Northern Connection").

Disclaimer

September 30, 2021

York Region

Background

The alternative strategies described in Section 5.4 of the Master Plan support future growth through demand management measures in combination with expansion and optimization of the infrastructure system. Due to the maturity of the servicing system, the alternative strategies are similar and in both, the strategic addition of new or expanded infrastructure components would bring increased operational flexibility and continued refinement of the infrastructure system.

To identify the preferred strategy, this evaluation focuses on the key differences between the two alternative strategies for water servicing - namely, the inclusion of a connection between Lake Simcoe-based water supply and the north end of the York Water System in one of the two strategies. This "Northern Connection" would require an additional pumping station and watermain to facilitate the connection. The Northern Connection would bring water supply to support a portion of the growth expected in the north end of the York Water System that would otherwise be supplied through increasing supply from the current arrangement which is sourced from a combination of groundwater and Lake Ontario-based supply. The Northern Connection is intended to provide bi-directional flow and thus, would also provide a secondary source of supply from the north end of the York Water System to the Georgina Water System should a disruption of Lake Simcoe-based water supply occur due to an emergency or scheduled maintenance.

Detailed Evaluation Criteria Scoring

METHODOLOGY

The evaluation for water servicing used the 2016 Master Plan assessment as a basis, including applying the same criteria, weighting and scoring. For each criterion, if one strategy was superior to the other, it received a score of 1 and the other got a score of 0. If both performed the same against the criterion, they both scored 1. A weighted score was then determined for each category of criteria, which included technical, environmental, financial, social and regulatory/jurisdictional considerations. The sum of the weighted criteria category scores yielded the total score for each alternative strategy.

The criteria category weighting is as follows:

- Technical – 27%
- Environmental – 27%
- Financial – 21%
- Jurisdictional/Regulatory – 15%
- Social/Cultural – 10%

EVALUATION

Evaluation Criteria	York Water System with Northern Connection	York Water System without Northern Connection
Technical Category		
Constructability Construction challenges considering the need to maintain service, infrastructure crossings, depth of excavation, geotechnical conditions, contaminated soils and other factors. Volume and complexity of construction associated with strategy.	**Score: 0** • Compared to the alternative strategy, this strategy includes an additional pumping station and watermain, which facilitate the connection of Lake Simcoe water supply to the northern portion of the York Water System • A slightly greater amount of construction is associated with this strategy	**Score: 1** A slightly lesser of amount of construction is associated with this strategy.
Security of Supply/Service Improvement in security of water supply and service.	**Score: 1** • This strategy leverages the robustness of the existing infrastructure system • Compared to the alternative, this strategy provides increased operational flexibility in the north end of the York Water System due to additional source of supply • Additionally, this strategy increases security of supply to the Georgina Water System from added ability to back feed water from the York Water System in emergency scenarios	**Score: 0** This strategy leverages the robustness of the existing infrastructure system but does not provide additional benefits to the security of supply/service over the alternative strategy.
Resilience to Climate Change The ability of the strategy to reliably provide desired level of service under a changing climate.Is the strategy robust?	**Score: 1** Continued development of the Region's infrastructure system is expected to provide increased operational flexibility to respond to climate change.	**Score: 1** Continued development of the Region's infrastructure system is expected to provide increased operational flexibility to respond to climate change.

Evaluation Criteria	York Water System with Northern Connection	York Water System without Northern Connection
Water Age Impact on water age in the distribution system.	**Score: 1** The proposed integration of York and Georgina water systems reduces water age in the north end due to the shorter travel time.	**Score: 0** This strategy continues the current approach to supplying water to north end of the York Water System.
Operations and Maintenance Requirement for additional and or new operating and maintenance resources. The complexity and maintainability of new assets.	**Score: 1** While this strategy includes one additional pumping station and watermain compared to alternative strategy, these facilities are operated remotely and thus, both strategies are expected to have similar new resource requirements.	**Score: 1** Both strategies are expected to have similar new resource requirements, so no advantage overall.
Energy Efficiency Energy intensity associated with the alternative in ekWh/ML and potential greenhouse gas emissions from ongoing operations.	**Score: 1** • Energy intensity is estimated to be 1,600 ekWh/ML • GHGs associated with lower energy intensity expected to result in approximate reduction of 118 tonnes of CO_2eq per year compared to alternative strategy	**Score: 0** Energy intensity is estimated to be 2000 ekWh/ML.
Technical Sub-Score	**5/6**	**3/6**
Technical Weighted Score	**23/27**	**14/27**
Environmental Category		
Aquatic Vegetation and Wildlife Includes impacts during construction and from ongoing operations. Considerations include impacts on local aquatic species and habitats,	**Score: 0** • Long term impact to aquatic vegetation and wildlife anticipated to be similar and limited for both strategies. Short term construction impacts expected to be largely mitigated and will be examined in detail as part of project-specific environmental assessment process • Additional watermain associated with this strategy includes several water crossings.	**Score: 1** Long term impact to aquatic vegetation and wildlife anticipated to be similar and limited for both strategies. Short term construction impacts expected to be largely mitigated and will be examined in detail as part of project-specific environmental assessment process.

Evaluation Criteria	York Water System with Northern Connection	York Water System without Northern Connection
aquatic species at risk and locally significant aquatic species.	Construction impacts expected to be largely mitigated through non-damaging construction techniques. In the long term, small risk of impact resulting from pipe breaks expected to be largely mitigated through asset management activities	
Terrestrial Vegetation and Wildlife Includes impacts during construction and from ongoing operations. Considerations include impacts on local terrestrial species and habitats, designated areas, species at risk and locally significant species.	**Score: 1** Long term impact to terrestrial vegetation and wildlife anticipated to be similar and limited for both strategies. Short term construction impacts expected to be largely mitigated and will be examined in detail as part of project-specific environmental assessment process.	**Score: 1** Long term impact to terrestrial vegetation and wildlife anticipated to be similar and limited for both strategies. Short term construction impacts expected to be largely mitigated and will be examined in detail as part of project-specific environmental assessment process.
Regional Water Balance Intra-Basin water balance of water transferred between Lake Ontario to Lake Huron basins. Based on average annual daily transfer in ML/d	**Score: 1** • Average daily intra-basin water transfers are within permitted limits under both strategies • Additionally, this strategy provides enhanced water balance over alternative strategy as water returned to Lake Huron watershed via the proposed Upper York Water Reclamation Centre will be sourced from the same watershed through connection of Lake Simcoe to York Water System	**Score: 0** Average daily intra-basin water transfers are within permitted limits under both strategies.
Construction Impacts on Groundwater Resources Potential impact on groundwater quantity or quality during construction.	**Score: 1** • Dewatering likely to be required for a number of infrastructure components common to both strategies as well as for the additional components associated with this strategy • Short term impact on groundwater expected to be similar for both strategies	**Score: 1** • Dewatering likely to be required for a number of infrastructure components common to both strategies • Short term impact on groundwater expected to be similar for both strategies

Evaluation Criteria	York Water System with Northern Connection	York Water System without Northern Connection
Environmental Sub-Score	**3/4**	**3/4**
Environmental Weighted Score	**20/27**	**20/27**
Financial Category		
Capital Cost Initial capital and commissioning costs to implement the strategy.	**Score: 1** • Capital costs of the two strategies are comparable • The additional pumping station and watermain associated with this strategy contribute to capital costs that are approximately 1% higher for this strategy compared to the alternative strategy	**Score: 1** Capital costs of the two strategies are comparable.
Lifecycle Cost Lifecycle costs expected over a 100-year period.	**Score: 1** • Life cycle costs of the two strategies are expected to be comparable • Total costs associated with the additional pumping station and watermain result in approximately 1% higher life cycle costs over a 100-year period compared to the alternative strategy	**Score: 1** Life cycle costs of the two strategies are expected to be comparable.
Financial Sub-score	**2/2**	**2/2**
Financial Weighted Score	**21/21**	**21/21**
Jurisdictional/Regulatory Category		
Land Requirements Area of non-Regional land orlength of easements required	**Score: 1** Land needs are very similar for both strategies, except for an additional 0.75 acres needed for the additional pumping station associated with this strategy.	**Score: 1** Land needs are very similar for both strategies.

Evaluation Criteria	York Water System with Northern Connection	York Water System without Northern Connection
Direct Access to Water Supply Improved direct access to water supply	**Score: 1** • Continued use of Lake-Ontario based supplies in other areas of the system with improvements to delivery system in some service areas • In addition, improved direct access to water supply and greater flexibility in the management of water supply in the north end of the York Water System through connection of Lake Simcoe-based supply	**Score: 0** Continued use of Lake-Ontario based supplies in other areas of the system with improvements to delivery system in some service areas.
Adaptability to Changing Regulation Ability of strategy to adapt to anticipated changes in drinking water quality and wastewater effluent requirements	**Score: 1** Continued development of the infrastructure system builds greater flexibility in operation and management of the system which improves the Region's ability to respond to future changes.	**Score: 1** Continued development of the infrastructure system builds greater flexibility in operation and management of the system which improves the Region's ability to respond to future changes.
Jurisdictional/Regulatory Sub-score	**3/3**	**2/3**
Jurisdictional/Regulatory Weighted Score	**15/15**	**10/15**
Social/Cultural Category		
Archaeological Sites Potential impact on registered/known archaeological features during construction or ongoing operations	**Score: 1** Future infrastructure projects identified are mostly conceptual at the master plan stage. They will be examined in detail as part of project-specific environmental assessment process which will determine infrastructure location at which time more detailed archaeological studies will be undertaken as appropriate.	**Score: 1** Future infrastructure projects identified are mostly conceptual at the master plan stage. They will be examined in detail as part of project-specific environmental assessment process which will determine infrastructure location at which time more detailed archaeological studies will be undertaken as appropriate.

Evaluation Criteria	York Water System with Northern Connection	York Water System without Northern Connection
Cultural Heritage Features Potential impacton known cultural landscapes and built heritage features during construction or ongoing operations	**Score: 1** Future infrastructure projects identified are mostly conceptual at the master plan stage. They will be examined in detail as part of project-specific environmental assessment process which will determine infrastructure location at which time more detailed cultural heritage studies will be undertaken as appropriate.	**Score: 1** Future infrastructure projects identified are mostly conceptual at the master plan stage. They will be examined in detail as part of project-specific environmental assessment process which will determine infrastructure location at which time more detailed cultural heritage studies will be undertaken as appropriate.
Impacts during Construction Potential construction impacts due to noise, dust, odour or traffic	**Score: 1** Impact of construction expected to be similar for both strategies.	**Score: 1** Impact of construction expected to be similar for both strategies.
Long Term Community Impact Long term impact on local community and businesses including land-use compatibility	**Score: 1** Potential community impacts such as noise from ongoing operation of facilities or financial impact on water user rates, are expected to be similar for both strategies.	**Score: 1** Potential community impacts such as noise from ongoing operation of facilities or financial impact on water user rates, are expected to be similar for both strategies.
Social/Cultural Sub-score	**4/4**	**4/4**
Social/Cultural Weighted Score	**10/10**	**10/10**
Total Score	**89/100**	**75/100**

APPENDIX A.6 INFRASTRUCTURE COSTING METHODOLOGY

Summary

Development of cost estimates for water and wastewater infrastructure is a critical step towards planning and securing funding for new projects. This appendix provides information on York Region's cost models used to generate cost estimates for projects identified in the 2021 Water and Wastewater Master Plan.

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September 30, 2021

York Region

Prepared By:

York Region

Technical Memorandum #C1 – Master Plan Costing Methodology

GMBP File: 720014

September, 2021

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Table of Contents

List of Tables

List of Figures

List of Acronyms and Key Terms

Master Plan (MP)	**Elevated Tank (ET)**
Replacement Cost Models (Models)	**Sewage Pumping Station (SPS)**
Master Plan (MP) Cost Equations	**Water Resource Recovery Facility (WRRF)**
Water Pumping Station (WPS)	**Water Treatment Plant (WTP)**

1. Introduction and Background

Development of accurate, defendable and reproducible cost estimates for water and wastewater infrastructure is a critical step towards securing stable revenues for funding new projects (through development charges) and planning for proper maintenance once assets are in operation. In order to achieve this goal, York Region (Region) created and continues to maintain water and wastewater infrastructure Replacement Cost Models (Models), which leverage tender data from past and recent Regional infrastructure projects to produce unit rates for components that make up the Region's linear and facility assets.

In 2020, GM BluePlan (BluePlan) was retained by the Region to update the Models by incorporating recent projects and to further refine them to improve their accuracy. As part of this assignment, BluePlan also supported the Water and Wastewater Master Plan 2021 Update by leveraging the updated Models to develop reliable cost estimates for planned growth infrastructure. This will provide Region staff a consistent approach and a higher degree of confidence in the cost estimates produced for both long term capital renewal projects and long term growth projects identified through the Water and Wastewater Master Plan (MP).

The costing approach for the 2021 MP is also consistent with the method developed as part of the 2016 York Region Water and Wastewater Master Plan by Yaku Consulting, and is summarized in Section 2.

This report, **Technical Memorandum (TM) #C1,** documents the revised/updated Water and Wastewater Master Plan Project Costing Methodology.

2. Overview of 2021 Master Plan Cost Estimates Development

The methodology for estimating costs in the 2021 MP is an update of the costing methodology from the 2016 MP. As part of GM BluePlan's assignment, a review of the 2016 cost estimate methodology was completed, which concluded that it was a reasonable approach to adopt in this MP update as it utilized the Region's best available cost estimate information and appropriate percentage-based provisions for project costs related to design, contract administration, contingency, etc. At the master plan stage of planning, limited detail is available on future projects for costing. The unit rates and the overall methodology aligns with the conceptual nature of projects in the master plan.

As installation costs inform the Region's Development Charges Bylaw, the primary mechanism by which the Region collects revenues to fund growth-related infrastructure, the development of these costs were documented in the greatest detail and are the focus of BluePlan's assignment.

Similar to the 2016 MP, installation cost estimates consisted of the following components:

- Base construction cost
- Soft costs (engineering, planning and permit fees)
- Contingency
- Land/property costs

In this 2021 MP update, a number of additional costing factors were also considered to capture costs anticipated to result from project-specific requirements where applicable.

Similar to the 2016 MP, base construction costs were developed using the Models to generate a general cost vs. capacity curve replacement costs for each asset type, or in the case of linear infrastructure, cost vs. meter length of different diameter pipes. From the curves, the relationship between cost and capacity/size was expressed as equations which were then used to calculate base construction costs. Specific soft cost percentages, contingency and additional factors were then applied to the base construction cost (based on specific project details) and all costs (construction, soft costs and contingency) were summed with land/property costs to determine the total installation/capital cost for each project identified in the MP. This methodology is documented in greater detail in Section 3 of this document.

Where existing detailed cost estimates for projects were available from EAs, detailed design, etc., these costs were used for the installation cost on a particular project in place of the Models.

The life cycle costs of growth infrastructure proposed through the 2021 MP were developed by the York Region Environmental Services Department staff and are discussed in greater detail in the main Master Plan report.

As mentioned above, as a critical output of the MP costing, informing future development charges, installation costs are the primary focus of this costing methodology document.

3. Methodology for Estimating Installation Cost

Following a similar approach as the 2016 MP, installation costs will be the sum of the component costs for land, construction, engineering, program management and contingency. These costs will be derived from one of the following three methods:

1) For most projects, cost estimates will be developed by leveraging the Region's infrastructure replacement cost models.
2) For projects that are currently in progress, detailed cost estimates from budgets, EAs, design or other studies will be used, as these represent best available, project-specific information.
3) For highly unique and specialized projects that have not yet started and are unsuitable to be costed using the Models, specialized expertise will inform the estimates on a per project basis.

The focus of this document will be first method of cost estimation, as this method will be used for the majority of projects identified in the Master Plan. A summary of the calculation steps for cost estimation method one, using the Region's replacement cost models is shown in Table 1.

Table 1 – MP Project Cost Calculation Methodology

	Components	Calculation
A	Base Construction Cost-Discrete Base Construction Cost-Linear	Capacity x Unit Rate Length x Unit Rate + Shaft Costs
B	Soft Cost-Engineering-Planning	% x (A)
C	Soft Cost-Engineering- Design	% x (A)
D	Soft Cost-Engineering-Construction Service	% x (A)
E	Program Management	% x (A)
F	Contingency	% x (A)
G	Additional Costing Factors	% x (A)
H	Land	Area x Unit Cost
I	***Total Project Cost***	***A+B+C+D+E+F+G+H***

It is important to note that the Models were initially developed to estimate costs of renewing and replacing existing assets. Thus, cost estimates from the Models consist of dozens of components and/or parameters that are summed to create a total replacement cost, e.g. replacement cost of an *existing* sewage pumping station includes 75 separate line items such as: superstructure, pumps, wet well, diesel generator, building finishes, piping, HVAC, etc. However, at the Master Plan stage of infrastructure planning, projects are still conceptual in nature, often with little detail known beyond the required capacity in the case of facilities and length/diameter/general location in the case of linear works. In order to leverage the Models and the large database of historical tender data that they are built from, simplified cost equations have been created from the Models for costing the Master Plan projects. These simplified cost equations are described in the following sections.

Note that all unit rates, costs and figures are provided in Q2 2020 dollars.

3.1 Base Construction Cost

3.1.1 Discrete/Facility Construction Costs

The Discrete Models underwent a review and update as part of this project, with cost equations for facility components being updated to incorporate recent tender data where available. For each facility type, MP Cost Equations were developed by plotting Model-generated replacement costs for all existing Regional facilities against capacity. This produced a summary-level graph for each facility type with a trendline that linked facility capacity to total construction costs. To validate the model output, available cost data from recent tenders and projects currently in progress were overlaid on the cost curves to ensure that the curves were representative of actual construction costs and/or best available information.

The MP Cost Equations used to calculate the Facility **Base Construction Cost** for a given project are summarized in Table 2 and the cost curves from which they are developed are presented in Figures 1 through 4.

Table 2 – Master Plan Unit Rates Summary – Discrete

Discrete Facility	Construction Cost Equation	Input Variables
Water Pumping Station*	(Capacity <= 55) Cost = 174,815.16xC + $3,448,198 (Capacity > 55) Cost = 71,919.72xC + $17,317,831	Capacity in MLD
Water Storage Reservoir	Cost = -0.0015xC^2 + 690.72xC + $815,575	Capacity in m^3
Water Elevated Tank	Cost = 2,695,223.17x$e^{0.00016xC}$	Capacity in m^3
Wastewater Pumping Station*	(Capacity <= 775) Cost = -27.63xC^2 + 35,693.34xC + 1,500,655 (Capacity > 775) Cost = -1.84xC^2 + 24,840.69.34xC - 5,281,705	Capacity in L/s

* Note that in some instances, it was found that the correlation between facility capacity and cost changed at a particular capacity threshold and was better represented through two separate curves.

Figure 1 – Water Pumping Station Master Plan Unit Rate Curve

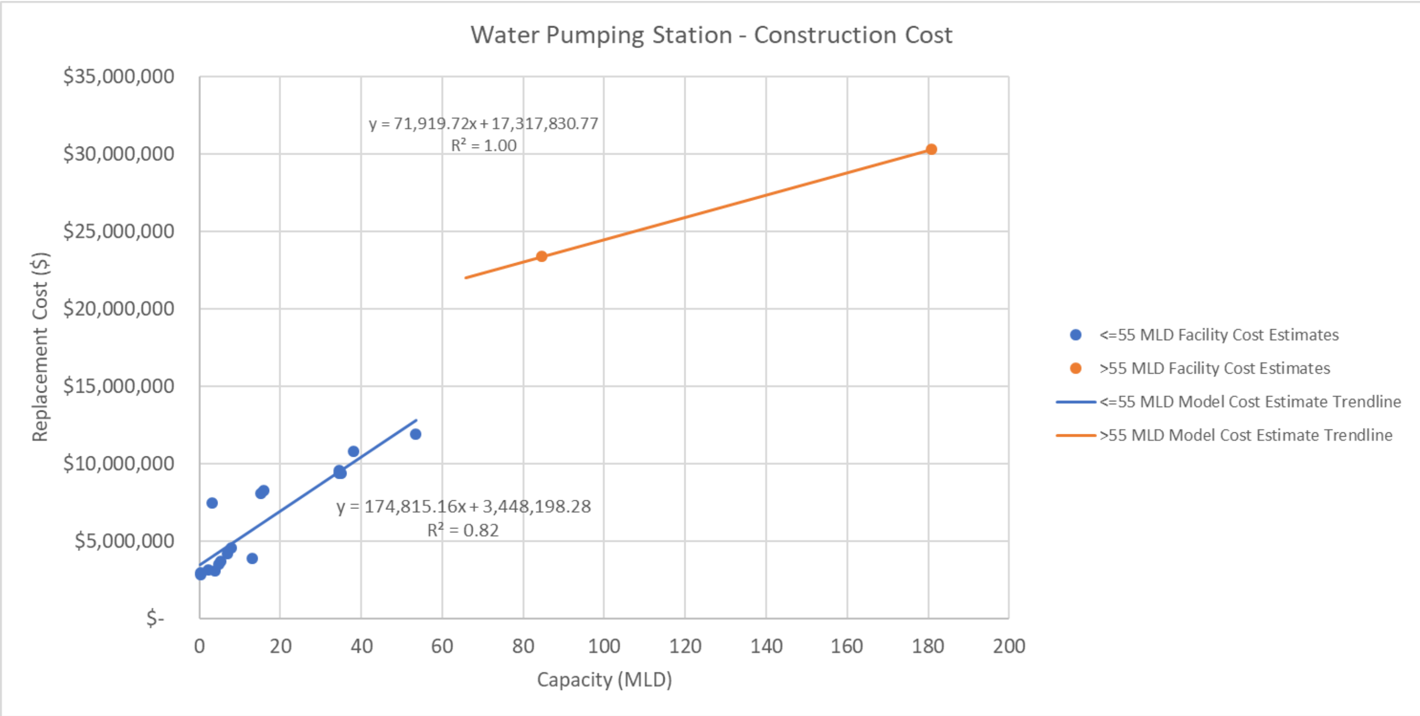


Figure 2 – Water Storage in Ground Reservoir

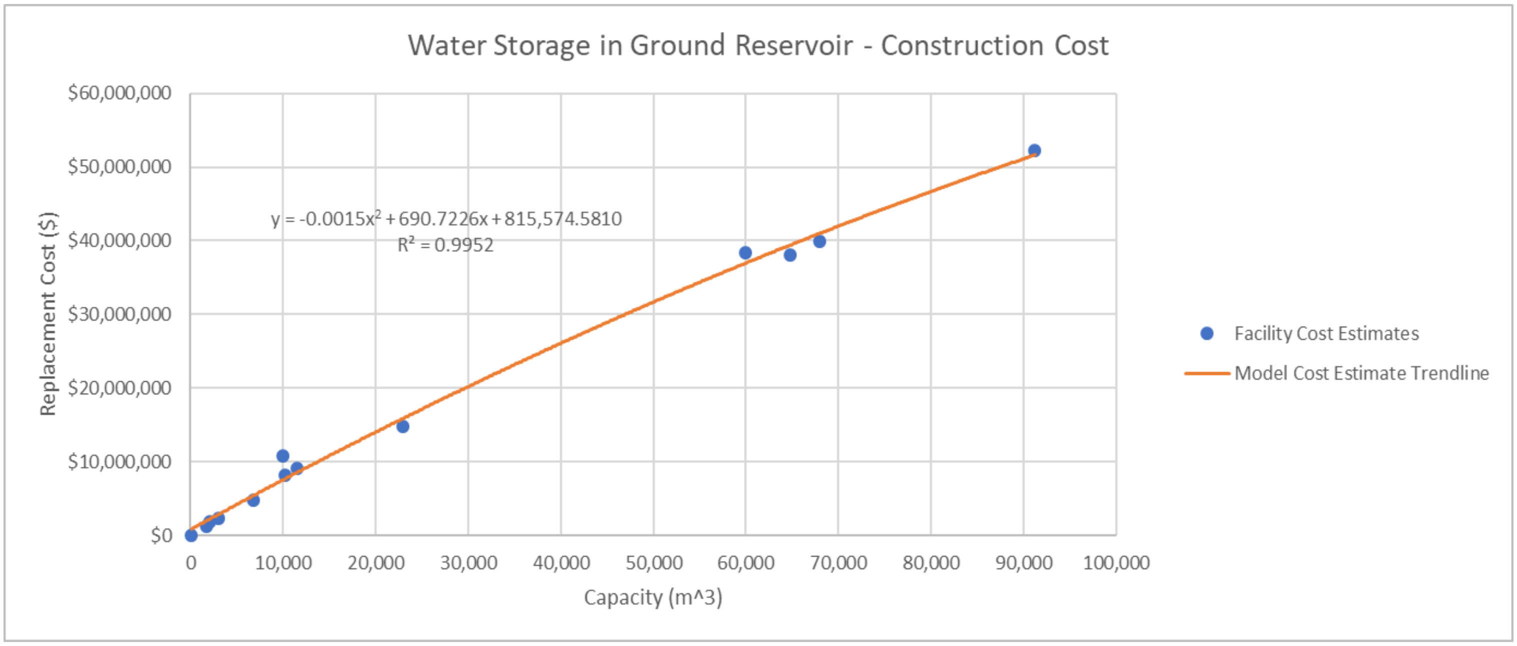


Figure 3 – Water Elevated Tank

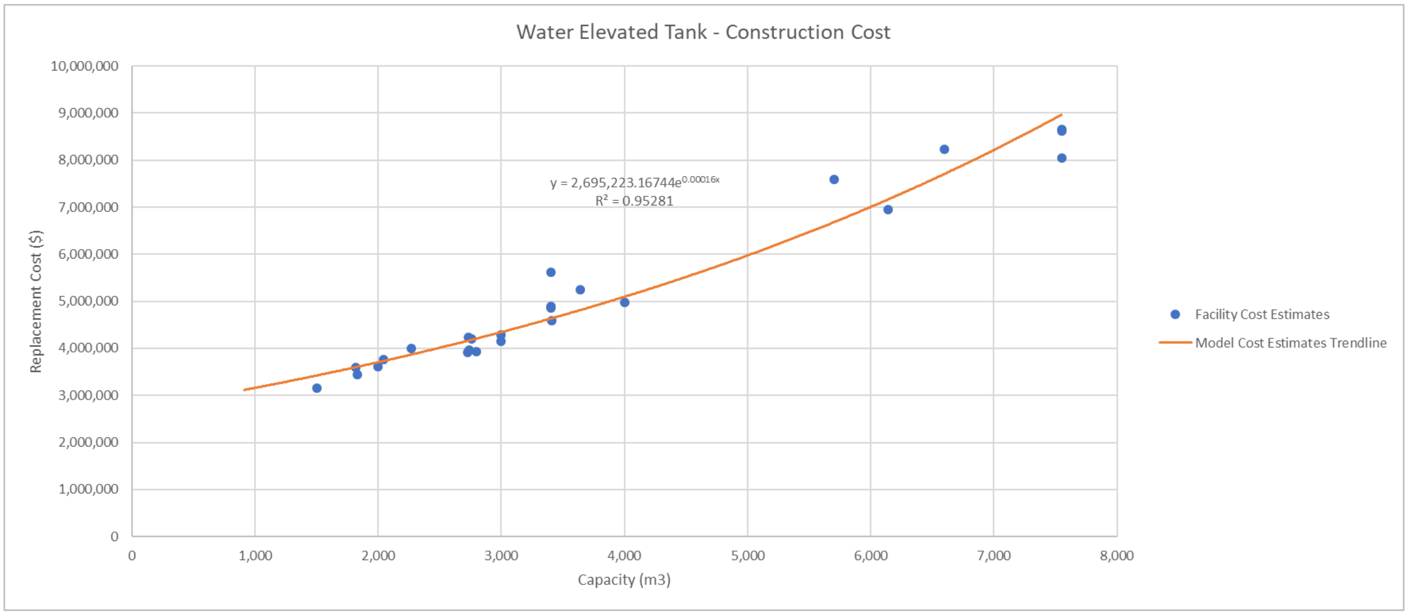
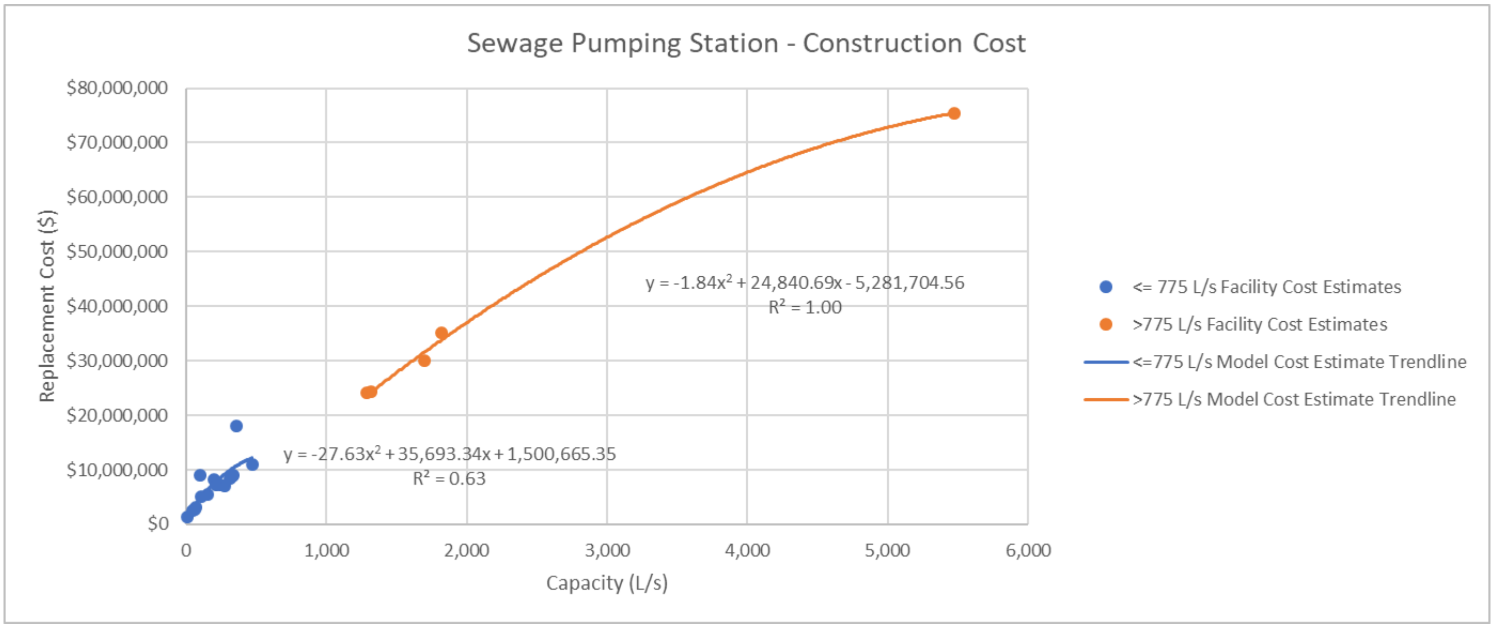


Figure 4 – Wastewater Pumping Station



3.1.2 Linear Construction Costs

The Linear Replacement Cost Models were also reviewed and updated as part of this project. The Linear Models provide unit rate costs (based on historical tender data) for pipes of different size and type (pressure pipe or gravity sewer) that are constructed via open cut and trenchless methodologies. These unit rates will be leveraged to produce cost estimates for projects identified in the 2021 MP based on available project details (pipe length, diameter, open cut vs tunnel construction, etc.).

The Linear Replacement Cost Models comprise unit cost tables categorized by diameter for each linear asset type and construction methodology. As the infrastructure projects identified at the master plan stage of infrastructure planning are conceptual in nature, a general assumption was made for the purpose of cost estimation that pipes at depths greater than 8m would be constructed by trenchless methods. In almost all other cases, open-cut construction was assumed, unless special considerations were applicable such as water crossings, utility crossings, severe traffic impacts, etc. This section documents unit rates used for the various linear asset types and construction methodologies as follows:

1. Trenchless Construction
    a) Gravity Sewer – $/m length
    b) Pressure Pipe (Watermain and Sanitary Forcemain) – $/m length
    c) Tunnel Shafts – to be added to tunnel costs ($/m depth)
2. Open Cut Construction
    a) Gravity Sewer (includes Manhole cost) – $/m length
    b) Pressure Pipe (Watermain and Sanitary Forcemain including valve chamber costs) – $/m length
    c) Meter and Pressure Reducing Valve Chambers – $/area

Similar to the approach used to generate facility cost equations outlined in section 3.1.1, graphs were used to correlate cost estimates from the Linear Models to pipe diameter or chamber area. A line of best fit was used to smooth out/average the data points and generate unit rates for estimating **Base Construction Cost** of MP watermain and sewer projects**.**

The linear 2021 Master Plan unit rate tables and cost curves are shown in the following figures and summarized in Table 3 through Table 14.

3.1.2.1 Trenchless Construction of Linear Assets:

Trenchless Gravity Sewer

The Linear gravity sewer tunneling cost curve was created using a blended unit rate of applicable trenchless tunneling construction methods based on pipe diameter. The unit rate includes the costs for advancing the tunnel horizontally from the launch pit to the receiving pit only. The costs for excavating vertically down to the new tunnel invert are specifically excluded and accounted for separately through the unit rate for tunneling shafts.

Figure 5 – Gravity Sewer Tunneling Cost Curve

Table 3 – Master Plan Unit Rates – Gravity Sewer Tunneling

Diameter (mm)	Gravity Sewer Tunneling Rate ($/m)
300	$5,492
375	$5,841
450	$6,164
525	$6,462
600	$6,737
675	$6,993
750	$7,232
825	$7,455
900	$7,666

Diameter (mm)	Gravity Sewer Tunneling Rate ($/m)
975	$7,867
1050	$8,061
1200	$8,435
1350	$8,809
1500	$9,201
1650	$9,632
1800	$10,120
1950	$10,686
2100	$11,348
2250	$12,127
2400	$13,043

Trenchless Pressure Pipe

Similar to gravity sewers, the unit rates for pressure pipe constructed via trenchless tunneling methods were created using a blended rate of applicable technologies based on pipe diameter. However, for pressure pipe separate cost curves were developed for pipe diameters less than and equal to 750mm and greater than 750mm because horizontal directional drilling (HDD) is generally only applicable for pipe diameters up to 750mm. The unit rate for HDD significantly lowered the blended tunneling rate, therefore, to maintain more realistic and lower cost tunneling rates for smaller diameter pipes, two costs curves were developed.

Figure 6 – Pressure Pipe Tunneling Cost Curves

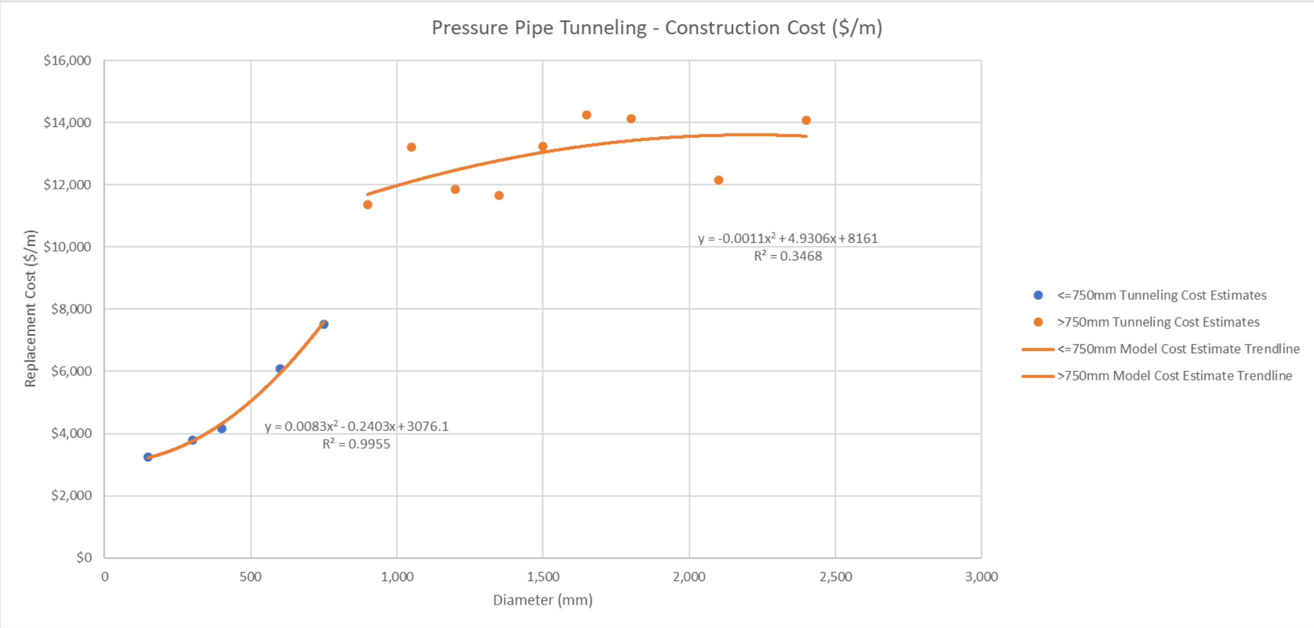


Table 4 – Master Plan Unit Rates - Pressure Pipe

Diameter (mm)	Pressure Pipe Tunneling Rate ($/m)
300	$3,751
400	$4,308
600	$5,920
750	$7,565
900	$11,708
1050	$12,125
1200	$12,494

Trenchless Shafts

The construction costs for excavation of shafts for installation of trenchless tunneling technologies are largely dependent on the volume of material to be excavated which in turn is dependent on the plan area and depth of the shaft.

Using knowledge and experience of applicable trenchless technologies for gravity sewer and pressure pipe tunneling construction, BluePlan's subject matter experts derived the following guidelines for shaft size based on the final installed pipe diameter. For MP costing purposes it was assumed that there is no difference in size between the launching and receiving shafts.

Table 5 – Shaft Properties

Gravity Sewer Shafts		Pressure Pipe Shafts	
Pipe Diameter (mm)	Inside Shaft Diameter (m)	Pipe Diameter (mm)	Inside Shaft Diameter (m)
250 – 1500mm	7	100 – 900mm	7
1650 – 1950mm	8	1050 – 1350mm	8
2100 – 2550mm	9	1500 – 1650mm	9
2700 – 3000mm	10	1800 – 2250mm	10

The unit costs for excavation, taken from the linear cost models for open cut construction, were applied to calculate shaft construction costs using the formula below:

Cost = $11,774 x Inside Shaft Dia. (m) x Depth (m)

To estimate shaft spacing GM BluePlan's subject matter experts used their knowledge and experience of trenchless technologies, taking into account experience from previous projects completed across Ontario as well as the average shaft spacing for past York Region projects to develop the following guideline for estimating the spacing and number of shafts for a particular project.

Table 6 – Shaft Construction Criteria

Depth (m)		Frequency (m)
From	To	
0	20	600
20		1000

The number of shafts are calculated using the formula below:

Number of Shafts = length of tunneling / Frequency +1 (rounded up)

This equation captures the starting shaft (plus one component) and rounds up to the final value to maintain a conservative approach .

3.1.2.2 Open Cut Construction of Linear Assets

The linear open cut unit rates were delivered from analysing past tender data and different construction components (excavation. backfill, etc.) were considered to produce a generalized unit rate per linear meter.

Open Cut Gravity Sewer

Open cut unit rates for gravity sewers within the updated linear cost models were derived from past tenders by calculating costs for the following cost components;

- Excavation
- Backfill
- Restoration
- Dewatering
- Material and installation

The costs for these individual components were summed to provide a unit rate for open cut gravity construction by diameter and depth which was averaged across the entire inventory by pipe diameter to provide a combined unit rate per meter length of pipe.

In the original 2016 MP, open cut construction for gravity sewers and manholes were separate cost curves. In 2021 these have been combined to help simplify the costing process. The manhole construction cost was converted into a dollar per meter price and added to the open cut construction cost. The assumptions used for converting the costs for manhole construction into a dollar per meter rate can be seen in Table 7 below. To account for the first manhole, when costing open cut construction projects, the cost of one manhole will be added to the total linear construction cost.

Table 7 – Manhole Construction Criteria

Pipe Diameter (mm)		Manhole Diameter (mm)	Frequency (m)
From **Diameter (mm)**	To **Diameter (mm)**		
0	600	1200	100
600	825	1500	100
825	1050	1800	100

Pipe Diameter (mm)		Manhole Diameter (mm)	Frequency (m)
From Diameter (mm)	To Diameter (mm)		
1050	1500	2400	150
1500		3000	150

Cost have also been differentiated between rural, urban and dense urban environments to account for the difference in restoration costs for the different settings.

Table 8 – Master Plan Unit Rates – Gravity Pipe – Rural Open Cut

Depth (m)	Diameter (mm)											
	300	375	450	525	600	675	750	825	900	975	1050	1200
3	$626	$724	$721	$772	$876	$1,155	$1,286	$1,401	$1,574	$1,697	$1,824	$2,237
4	$953	$1,058	$1,058	$1,117	$1,228	$1,520	$1,659	$1,781	$1,962	$2,092	$2,227	$2,683
5	$1,466	$1,579	$1,583	$1,672	$1,795	$2,117	$2,278	$2,474	$2,618	$2,762	$2,922	$3,405
6	$1,079	$1,199	$1,207	$1,304	$1,434	$1,776	$1,944	$2,147	$2,299	$2,450	$2,618	$3,106
7	$1,490	$1,617	$1,662	$1,763	$1,909	$2,289	$2,480	$2,645	$2,879	$3,056	$3,242	$3,775
8	$1,517	$1,650	$1,699	$1,808	$1,960	$2,359	$2,558	$2,730	$2,971	$3,155	$3,349	$3,891

Table 9 – Master Plan Unit Rates – Gravity Pipe – Urban Open Cut

Depth (m)	Diameter (mm)											
	300	375	450	525	600	675	750	825	900	975	1050	1200
3	$754	$856	$855	$911	$1,019	$1,309	$1,444	$1,564	$1,741	$1,868	$2,000	$2,421
4	$1,176	$1,285	$1,288	$1,350	$1,466	$1,770	$1,912	$2,039	$2,225	$2,359	$2,498	$2,961
5	$1,784	$1,901	$1,908	$2,001	$2,128	$2,461	$2,626	$2,827	$2,975	$3,123	$3,288	$3,779
6	$1,492	$1,616	$1,627	$1,728	$1,862	$2,215	$2,387	$2,595	$2,751	$2,907	$3,078	$3,575
7	$1,941	$2,072	$2,119	$2,225	$2,375	$2,766	$2,962	$3,131	$3,369	$3,550	$3,741	$4,282
8	$2,063	$2,200	$2,252	$2,364	$2,521	$2,932	$3,135	$3,311	$3,556	$3,744	$3,942	$4,493

Table 10 – Master Plan Unit Rates – Gravity Pipe – Dense Urban Open Cut

Depth (m)	Diameter (mm)											
	300	375	450	525	600	675	750	825	900	975	1050	1200
3	$898	$1,005	$1,006	$1,067	$1,180	$1,483	$1,623	$1,747	$1,929	$2,061	$2,197	$2,628
4	$1,426	$1,540	$1,546	$1,613	$1,733	$2,050	$2,197	$2,329	$2,519	$2,658	$2,802	$3,275
5	$2,142	$2,263	$2,272	$2,371	$2,503	$2,849	$3,018	$3,223	$3,376	$3,530	$3,699	$4,199
6	$1,957	$2,085	$2,098	$2,204	$2,343	$2,709	$2,886	$3,098	$3,259	$3,420	$3,596	$4,102
7	$2,448	$2,584	$2,634	$2,744	$2,898	$3,303	$3,503	$3,677	$3,920	$4,106	$4,301	$4,851
8	$2,676	$2,819	$2,873	$2,990	$3,152	$3,575	$3,783	$3,964	$4,214	$4,407	$4,609	$5,169

Open Cut Pressure Pipe

To simplify costing at the Master Plan stage, a single unit rate for open cut pressure pipe is used which includes costs associated with both the pipe and valve/valve chambers. Using the updated linear cost models, the Region's complete inventory of pressure pipes (including Pressure Pipe, Valve Chambers, Valves) was analyzed to determine the average costs of valve chambers and valves for each pipe diameter. These costs were combined with the average unit rates per meter of pressure pipe to yield a combined MP unit rate for each pipe diameter for open cut pressure pipe (assuming 300m spacing between valve chambers).

Note that location-based restoration costs were not considered in the case of pressure pipes because an average across the pressure pipe inventory was used instead. Additionally, depth of pressure pipes was generally assumed to be 5m to reasonably account for adequate cover.

Figure 7 – Pressure Pipe Open Cut Cost Curve

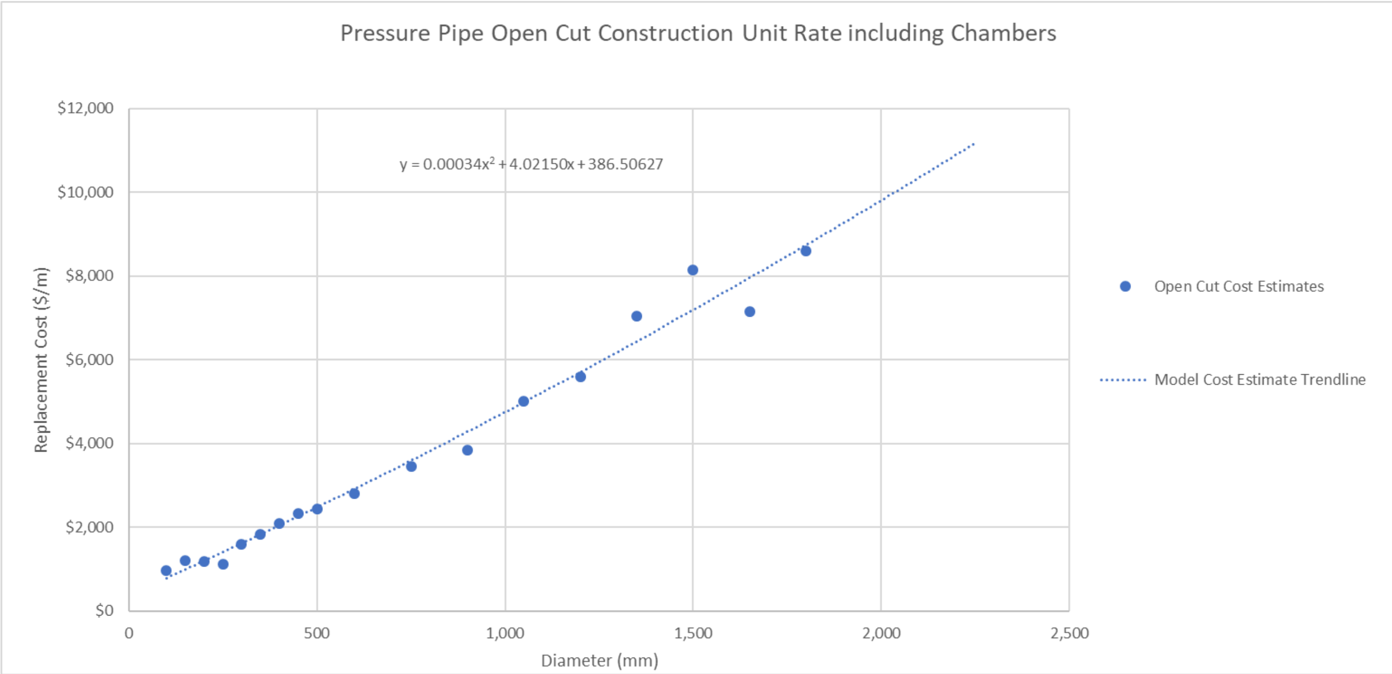


Table 11 – Master Plan Unit Rates - Pressure Pipe – Open Cut

Diameter (mm)	Cost ($/m)
300	$1,624
350	$1,836
400	$2,050
450	$2,265
500	$2,482
600	$2,922
750	$3,594
900	$4,281
1050	$4,984
1200	$5,702

Meter and Pressure Reducing Valve Chambers

Meter chambers were classified as their own infrastructure type because they have several additional components and cost more compared with typical valve chambers. The meter chamber cost curve is based on the plan area of a chamber and can be seen in Figure 8. The meter chamber cost curve was also used to approximate the cost of pressure reducing valve chambers, which are similarly, more complex and costly compared to typical valve chambers. The chamber plan area for all MP meter and pressure reducing valve projects was estimated based on experience with existing Regional chambers with comparable characteristics.

Figure 8 – Meter and Pressure Reducing Valve Chamber

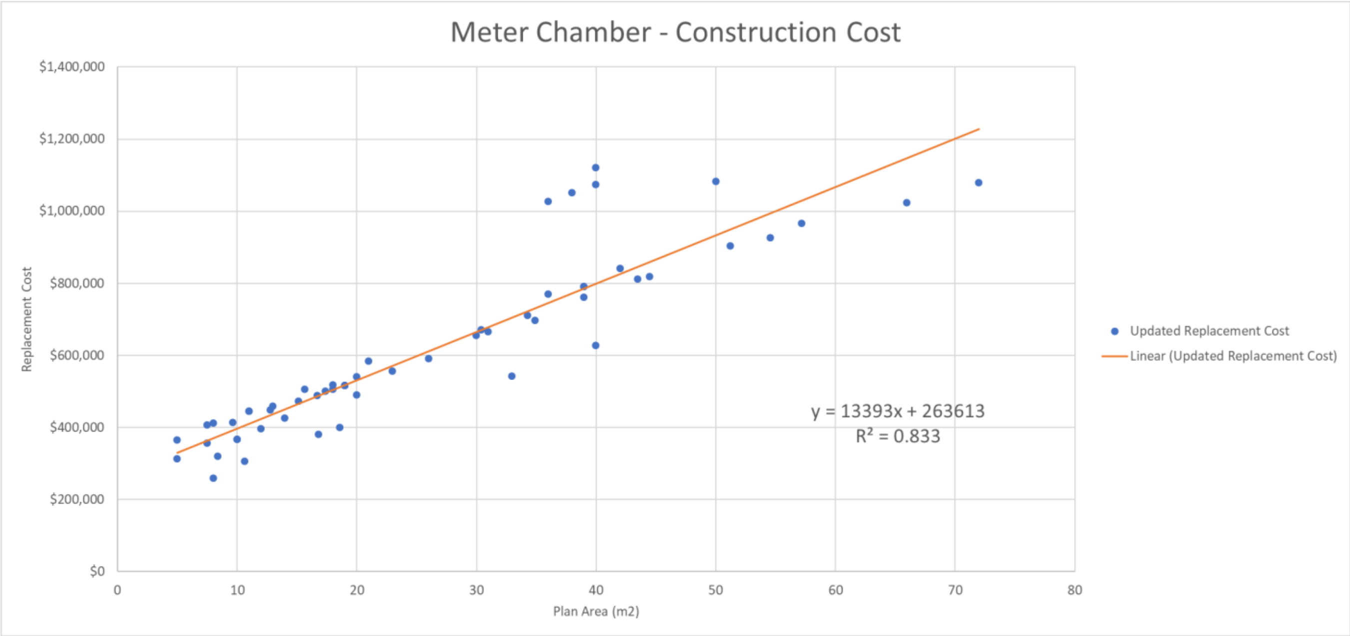


Table 12 – Master Plan Unit Rates – Meter and Pressure Reducing Valve Chamber

Area (m^2)	Construction Cost ($/$m^2$)
5	$330,578
10	$397,543
20	$531,473
30	$665,403
40	$799,333
50	$933,263
60	$1,067,193
70	$1,201,123

Valve Chambers

The following exercise was completed to determine the Master Plan valve chamber unit rate. The replacement cost for all valve chambers in the Region's asset inventory was calculated using the linear model, then the average valve chamber cost was determined for each pipe size. This exercise also showed the frequency of valve chambers in York Region is 300m. This value was incorporated in calculating the open cut pressure pipe unit rate, which includes the cost of valve chambers.

Figure 9 – Valve Chamber

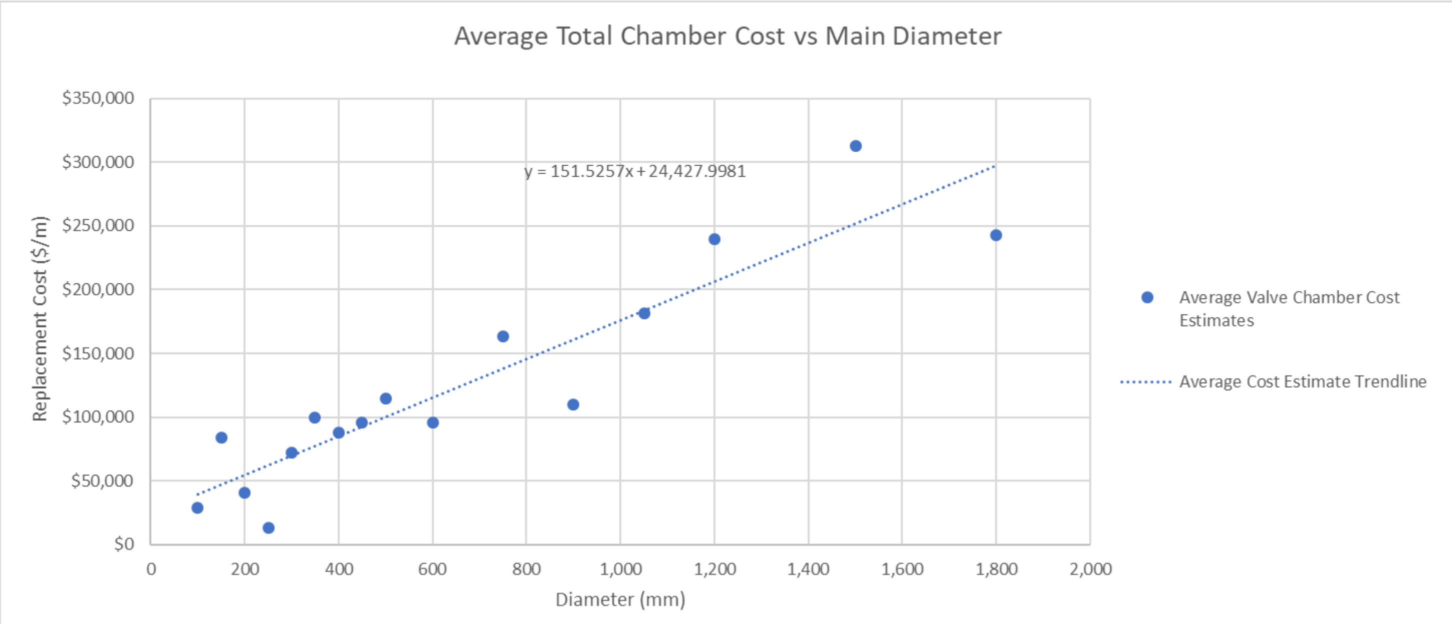


Table 13 – Master Plan Unit Rates – Valve Chamber

Diameter (mm)	Cost ($/m)
250	$62,309
300	$69,886
350	$77,462
400	$85,038
450	$92,615
500	$100,191
600	$115,343
750	$138,072
900	$160,801

Diameter (mm)	Cost ($/m)
1050	$183,530
1200	$206,259
1350	$228,988
1500	$251,717
1650	$274,445
1800	$297,174
1950	$319,903
2100	$342,632
2250	$365,361

Table 14 – Master Plan Unit Rates Summary – Linear

Discrete Facility	Construction Cost Equation	Input Variables
Gravity Sewer Tunneling	Cost = (-9.658E-07xD^3 – 0.00350xD^2 + 6.689D + $3,774) x L	Diameter in mm Length in m
Pressure Pipe Tunneling	((Dia. <=750mm) Cost = (0.0083xD^2 + 0.2403xD + $3,076) x L (Dia. >750mm) Cost = (-0.0011xD^2 + 4.931xD + $8,161) x L	Diameter in mm Length in m
Gravity Pipe Open Cut	See Costing Charts Above	
Pressure Pipe Open Cut	Cost = (0.00034xD^2 + 4.0215xD + $387) x L	Diameter in mm Length in m
Shafts	Cost = $11,774 x Inside Shaft Dia. (m) x Depth (m)	Diameter in mm Depth in m
Meter Chamber	Cost = 13,393xA + $263,613	Area in m^2
Valve Chamber	Cost = 151.526xD + $24,428	Diameter in mm

3.1.3 Facility Upgrades Costs

Separate cost curves or unit rates were used to estimate the costs for upgrading existing infrastructure. The proposed unit rates were generated from the updated Models and were used to produce the construction cost for facility upgrades to meet future capacity needs. These unit rates are summarized in Table 15. The majority of unit rates remain unchanged from the 2016 MP, all unit rates were indexed to Q2 2020 dollars.

Table 15 – Component Construction Unit Rates for Infrastructure Upgrade

Discrete Facility	Construction Cost Equation	Unit	Facility Types
Chlorination System	$175,849	-	All water storage, treatment, WPS
Ammonia System	$135,519	-	All water storage, treatment, WPS
Gas Scrubber	$148,130	-	All water storage, treatment, WPS
Reservoir Foundation	$8,466	Per m^2	Ground storage Reservoir
ET Mixers	$139,554	-	ET
Piping & Valving (all)	<92MLD, Y = 27866*X + 54,511 >92MLD, Y = 68*X^2 + 22,847*X – 63,657	Capacity in MLD	WPS
Pumps	Y = 4530*X + 106,719	Capacity in MLD	WPS, WTP
Power Supply	<55MLD, Y = 10,738*X + 39,151 >55MLD, Y = 213,580*LN(X) – 212,824	Capacity in MLD	WPS
Distribution	<55MLD, Y = 14,374*X + 52,408 >55MLD, Y = 285,903*LN(X) – 284,890	Capacity in MLD	WPS,WTP
Motor Control	<55MLD, Y = 9,578*X + 34,921 >55MLD, Y = 190,506*LN(X) – 189,831	Capacity in MLD	WPS,WTP
Generator	Y = -0.04053*X^2 + 732.89*X	Capacity in KW	All

Discrete Facility	Construction Cost Equation	Unit	Facility Types
Instrumentation	Y = 2334*X + 60,893	Capacity in MLD	WPS,WTP
Controls	Y = 5,056 *X + 131,918	Capacity in MLD	WPS,WTP
Piping & Valving	<500L/s, Y = 2,116*X + 34,921 >500L/s, Y = 1,244,690*LN(X) – 6,775,210	Capacity in L/s	SPS
Pumps	Y = -0.11698*X^2 + 1,537*X	Capacity in L/s	SPS
Process Electrical	Y = -0.00168*X^2 + 1,492*X	Capacity in L/s	SPS
Process Electrical Distribution Zenon	Y = 32,954*X	Capacity in MLD Weighted unit cost (each). Use this: Chemical System=0.6, UV=0.4, Generator=1	WTP
Process Electrical Distribution Chemical and UV	Y = 55,965*X		WTP
Process Electrical Motor Control Zenon	Y = 4,079*X	Capacity in MLD Weighted unit cost (each). Use this: Chemical System=0.6, UV=0.4, Generator=1	WTP
Process Electrical Motor Control Chemical and UV	Y = 10,207*X		WTP
Instrumentation Zenon	Y = 10,666*X	Capacity in MLD Weighted unit cost (each). Use this: Chemical System=0.6, UV=0.4, Generator=1	WTP
Instrumentation Chemical and UV	Y = 6,281*X		WTP

Discrete Facility	Construction Cost Equation	Unit	Facility Types
Controls Zenon	Y = 23,107*X	Capacity in MLD Weighted unit cost (each). Use this: Chemical System=0.6, UV=0.4, Generator=1	WTP
Controls Chemical and UV	Y = 22,483*X		WTP

The following unit rates were update with recent tender data; Chlorination System, Ammonia System, Gas Scrubber and Generator

3.2 Soft Costs

Soft costs account for engineering fees, studies and project administration/management costs that are not captured in the base construction cost. The soft costs were calculated based on a percentage of the Base Construction Costs and consist of the following components; planning, design, construction services and project management. The soft cost percentages used in the 2016 MP are generally in line with typical industry practice for Master Plan level values and, as such, were carried forward for application within the 2021 Master Plan. Table 16 shows the break down of the soft costs that will be applied based on project type and construction cost.

Table 16 – Engineering and Program Management Percentages

Engineering & Contingency	Construction Cost	Linear W & WW	Discrete Water	Discrete Wastewater
Engineering-Planning	< 1,000,000	4.0%	6.0%	6.0%
	1,000,000-10,000,000	3.8%	5.5%	5.5%
	10,000,000-50,000,000	3.5%	5.0%	5.0%
	50,000,000-75,000,000	3.2%	4.0%	4.0%
	≥ 75,000,000	3.0%	3.0%	3.0%
Engineering - Design	< 1,000,000	11.3%	11.3%	11.3%
	1,000,000-10,000,000	6.6%	6.6%	6.6%
	10,000,000-50,000,000	5.6%	5.6%	5.6%
	50,000,000-75,000,000	4.6%	4.6%	4.6%

Engineering & Contingency	Construction Cost	Linear W & WW	Discrete Water	Discrete Wastewater
	≥ 75,000,000	4.0%	4.0%	4.0%
Engineering – Construction Service	< 1,000,000	10.0%	10.0%	10.0%
	1,000,000-10,000,000	10.0%	10.0%	10.0%
	10,000,000-50,000,000	10.0%	10.0%	10.0%
	50,000,000-75,000,000	10.0%	10.0%	10.0%
	≥ 75,000,000	10.0%	10.0%	10.0%
Program Management	All	2.0%	2.0%	2.0%
Total	< 1,000,000	27.3%	29.3%	29.3%
	1,000,000-10,000,000	22.4%	24.1%	24.1%
	10,000,000-50,000,000	21.1%	22.6%	22.6%
	50,000,000-75,000,000	19.8%	20.6%	20.6%
	≥ 75,000,000	19.0%	19.0%	19.0%

3.3 Contingency

Capital cost estimating for infrastructure projects typically include provision for contingency to cover unforeseen events or circumstances. This is usually applied as a percentage of the Base Construction cost to cover costs for items that are not yet known or defined at the Master Plan stage.

The contingency that will be used in the 2021 MP are generally in line with industry standard values. Table 17 below shows the contingency percentage that will be applied for each project type.

Table 17 – Contingency Percentages

Engineering & Contingency	Construction Cost	Linear W & WW	Discrete Water	Discrete Wastewater
Contingency	All	30.0%	30.0%	30.0%

At this level of planning, only high-level project information is typically known (size, capacity, length, etc.). Thus, a standard contingency percentage is used to account for the general uncertainty inherent to this early stage in planning, with additional, project-specific requirements considered through additional costing factors, where further project information is known.

3.4 Additional Costing Factors

The additional project cost percentages seen in Table 18 were created by GM BluePlan's technical leads to help further refine the cost of certain Master Plan projects. These additional costing factors were used to capture the impacts of items expected to occur but were not yet fully understood or scoped at the master plan stage. Application of the additional costing factors was determined largely through the Region's knowledge of the existing system/understanding of how integration of new components could be achieved, or additional project-specific information.

Table 18 – Additional Costing Factors

Costing Factor	Rationale	Percentage
Staging	- To account for added cost and complexity of maintaining operation of facilities or linear works during construction of upgrade/modification - Applicable to facility or linear upgrades where integration with the existing system is expected to be complex	10%
Environmental Impact	- To account for additional consultation, studies, investigations, mitigation measures for construction near environmental features or with potential impact to environmental features - Applicable to infrastructure in close proximity to known environmentally significant features	5%
Depth	- To account for additional sewage pumping station construction costs associated with deep stations - Applicable for stations with inlet sewer depth > 10m	15%
Urban/Dense Urban	- To account for less tangible additional costs and complexity for construction within urban areas; greater number and complexity of utility relocation, slower pace of work, traffic, limited site/construction easements, more extensive mitigation of construction impacts - Applicable to facility or linear works in urban areas and dense urban areas, estimated at an additional 5 or 10% of base construction cost, respectively	5-10%

3.5 Land Costs

Updated land costs were developed by Regional Property Services staff based on analysis of reported land sales in York Region from 2019 to the end of 2020. These values are presented in Table 19. Averages for agricultural or long-term development land constituted Rural land values, while commercial, industrial and low-density residential land sales were utilized for urban values. Dense Urban sales are based on medium and high-density land sales in each municipality, where applicable.

Table 19 – Updated Land Cost Unit Rate

Location	Area Type	Updated MP Land Cost ($/Acre)
East Gwillimbury	Rural	$200,000
East Gwillimbury	Urban	$800,000
East Gwillimbury	Dense Urban	$4,000,000
Georgina	Rural	$30,000
Georgina	Urban	$300,000
Georgina	Dense Urban	$1,400,000
King	Rural	$200,000
King	Urban	$1,200,000
King	Dense Urban	$4,000,000
Newmarket/Aurora	Rural	$500,000*
Newmarket/Aurora	Urban	$2,000,000
Newmarket/Aurora	Dense Urban	$4,000,000
Richmond Hill/Markham	Rural	$500,000*
Richmond Hill/Markham	Urban	$3,000,000
Richmond Hill/Markham	Dense Urban	$6,000,000
Vaughan	Rural	$500,000*
Vaughan	Urban	$3,000,000
Vaughan	Dense Urban	$6,000,000

Location	Area Type	Updated MP Land Cost ($/Acre)
Whitchurch-Stouffville	Rural	$200,000
Whitchurch-Stouffville	Urban	$1,200,000
Whitchurch-Stouffville	Dense Urban	$4,000,000

*Values based on Regional average

To determine the area of land required for future facilities, the following land curves were created from existing York Region facilities to correlate property size and facility capacity for water storage infrastructure. For water and wastewater pumping stations, property/space requirements are not closely correlated to capacity, and thus, a base assumption of 0.75 acres for new water pumping station and a lot size of 1 acre for new wastewater pumping stations was recommended by Regional subject matter experts.

Figure 10 – Water Storage in Ground Reservoir Propertey Size Curve

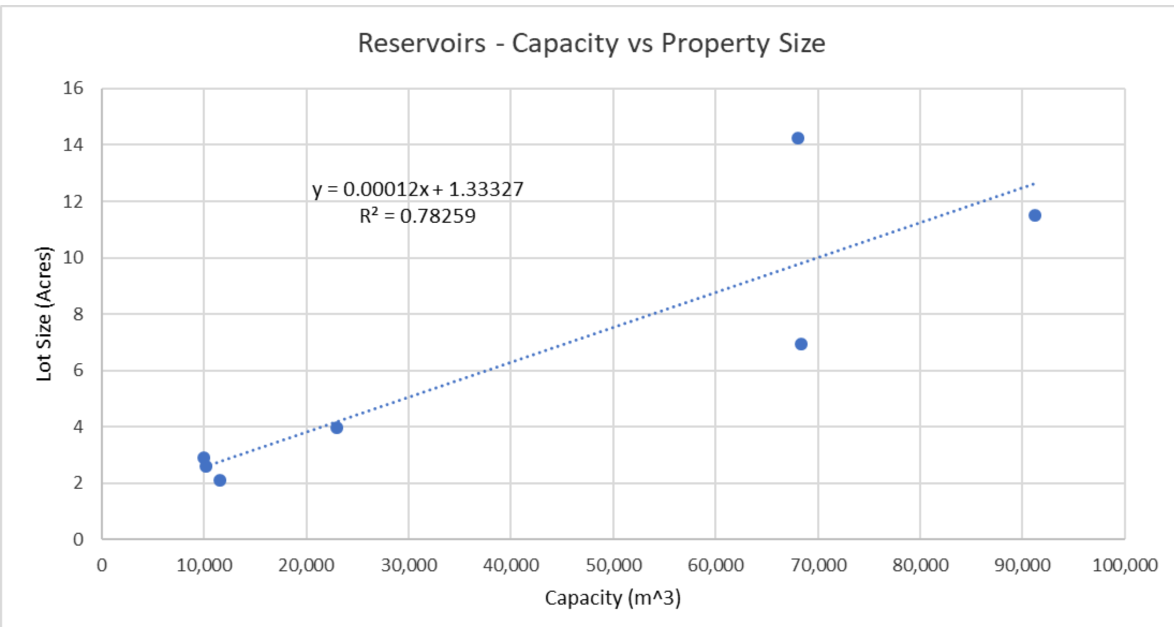
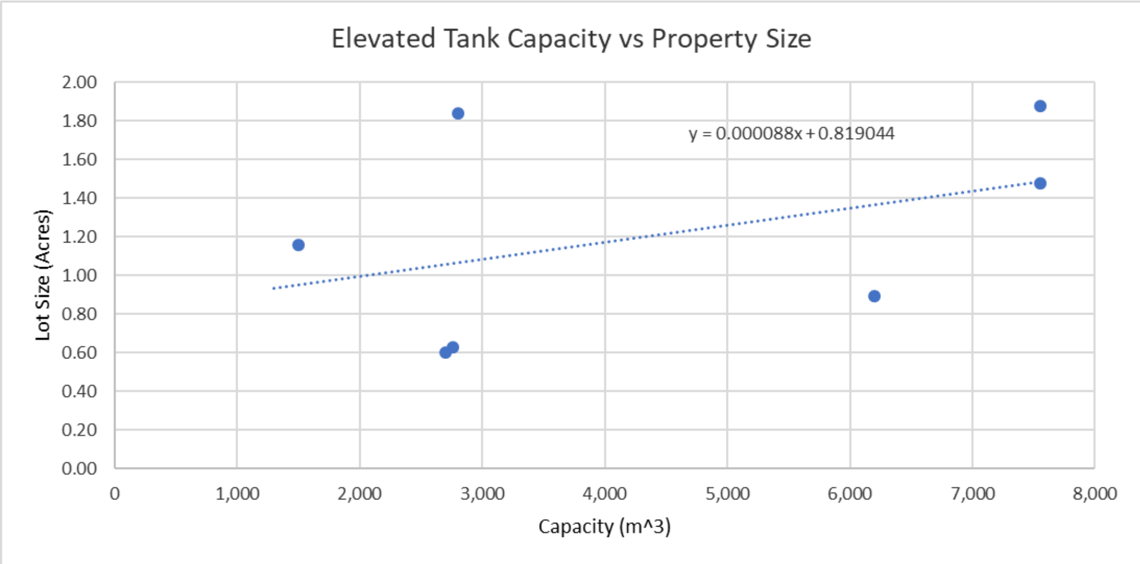


Figure 11 – Elevated Tank Property Size Curve



4. Other Life Cycle Cost Components

Beyond the upfront capital costs associated with installation of growth infrastructure, the ongoing costs of operating, repairing and eventually, replacing the additional infrastructure components are also considered. These costs are not included in the Development Charges calculations, as they are funded through the water user rate. Estimation of these other life cycle cost components is consistent with the methodologies applied to the Region's Water Rate Study (Water and Wastewater Financial Sustainability Plan update) and Asset Management Plan.

Further information related to these additional costs associated with infrastructure are documented in the main body of the Master Plan report.

5. Summary and Conclusion

As described in the preceding sections, the methodology for developing Master Plan cost estimates leveraged the Region's detailed Replacement Cost Models to develop a series of general unit rates ($/m, $/L/s, $/ML, $/MLD, etc.). At a Master Plan level, projects are conceptual in nature and thus, the unit rates and overall methodology aligned with the level of project detail typically available.

In general, refinements rather than major changes were made to the 2016 MP methodology as follows:

- Updated Cost Models were used to develop updated and in some cases, new MP unit rates and Capital Cost Equations
- Updated land unit rates were used based on 2020 market value
- Addition of costing factors to improve accuracy of cost estimates for complex projects where impacts are anticipated but not yet fully defined.

The updated methodology resulted in overall improvements to the accuracy, transparency and reproducibility of cost estimates developed as part of the 2021 Master Plan Update.

APPENDIX A.7 ADDITIONAL SERVICING CONSIDERATIONS

Summary

This appendix describes servicing considerations for the communities of Ballantrae, Gormley and Vandorf-Preston Lake in the Town of Whitchurch-Stouffville, Nobleton in the Township of King and Mount Albert in East Gwillimbury. Provision of municipal servicing is currently restricted by provincial policy (Greenbelt Plan, Oak Ridges Moraine Conservation Plan and Lake Simcoe Protection Plan) for these communities. The purpose of this appendix is to detail servicing considerations for these communities. This information could be used as a basis to consider municipal servicing implications if provincial policy restrictions are removed in the future. This appendix also includes considerations regarding private communal servicing in York Region.

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March 31, 2022

York Region

Purpose

Through the Municipal Comprehensive Review, interest was expressed in the provision of water and wastewater services to select communities currently restricted through provincial policies. Due to these policy restrictions, these communities were not considered for significant growth nor for provision of municipal servicing through the Municipal Comprehensive Review. This document outlines considerations for servicing these communities currently restricted through provincial policy if those restrictions are lifted in the future. It also includes considerations regarding private communal servicing in York Region.

Background

With 69% of the land base in York Region protected by provincial policy, there remain areas in the Region where development interest continues despite the servicing limitations imposed by the current regulatory regime.

Provincial policy prohibits extension of Great Lake sourced water and wastewater servicing to rural communities located within the Protected Countryside Area designation of the Greenbelt Plan and/or the Countryside Area designation of the Oak Ridges Moraine Conservation Plan. Similarly, the Lake Simcoe Protection Plan restricts an increase in the existing rated capacity of a sewage treatment plant and requires an environmental assessment to be approved prior to planning approvals.

Development interest also continues where municipal services are not available or feasible. Provincial policy enables planning authorities to consider the use of private communal servicing options in areas where municipal water and wastewater services are not available or feasible. As the Master Plan addresses municipal servicing where it is feasible, requests to introduce private communal services to communities are outside of the scope of the Region's master planning process. Considerations for private communal servicing have been included in this document.

Preliminary servicing options for these areas have been outlined in this Appendix should provincial policy change and provide a high-level understanding of implications to address servicing for ongoing development interests.

Provincial Policy Limitations on Municipal Services

Provincial policy provides direction for municipalities to assess options for water and wastewater servicing. In general, the provision of full municipal services to settlement areas is encouraged where available or planned, however, restrictions are in place for communities located within the Protected Countryside Area designation of the Greenbelt Plan and/or the Countryside Area designation of the Oak Ridges Moraine Conservation Plan. These restrictions are intended to promote preservation and enhancement of the natural environment and protect the agricultural land base.

Generally speaking, the Growth Plan for the Greater Golden Horseshoe prohibits the extension of water and wastewater servicing from a Great Lake source to settlement areas serviced by rivers, in-land lakes or groundwater unless:

- The extension of services is required for public health and safety
- The proposed extension had all the necessary approvals as of July 1, 2017
- The area is identified as an urban growth centre outside of the Greenbelt Area

Moreover, the Oak Ridges Moraine Conservation Plan prohibits construction or expansion of partial municipal services and like the Growth Plan, the expansion of partial services is only permitted if required to address a serious health or environmental concern or if the construction/expansion of partial services was approved under the Environmental Assessment Act before November 17, 2001.

In addition, the Lake Simcoe Protection Plan limits the discharges from municipal sewage treatment plants, along with other sources of phosphorus with the goal to improve the water quality in Lake Simcoe. Expansion of services requires an approved environmental assessment before planning approvals can be considered. Through regulation (O.Reg 60/08), the Province has limited discharges to control phosphorus entering Lake Simcoe from specific municipal and industrial sources; including all York Region Lake Simcoe Water Resource Recovery Facilities.

With growth in the Regional Official Plan only contemplated where permitted by Provincial Plans and in locations with existing or planned water/wastewater capacity, introduction of municipal servicing to the communities of Ballantrae, Gormley and Vandorf-Preston Lake in the Town of Whitchurch-Stouffville, as well as the expansion of Nobleton systems in the Township of King beyond the 2021 Class Environmental Assessment planned capacity, and expansion of Mount Albert Water Resource Recovery Facility, is not considered in the 2022 Master Plan. Options and costs for servicing these communities are presented in this Appendix as a basis for consideration should circumstances change in the future.

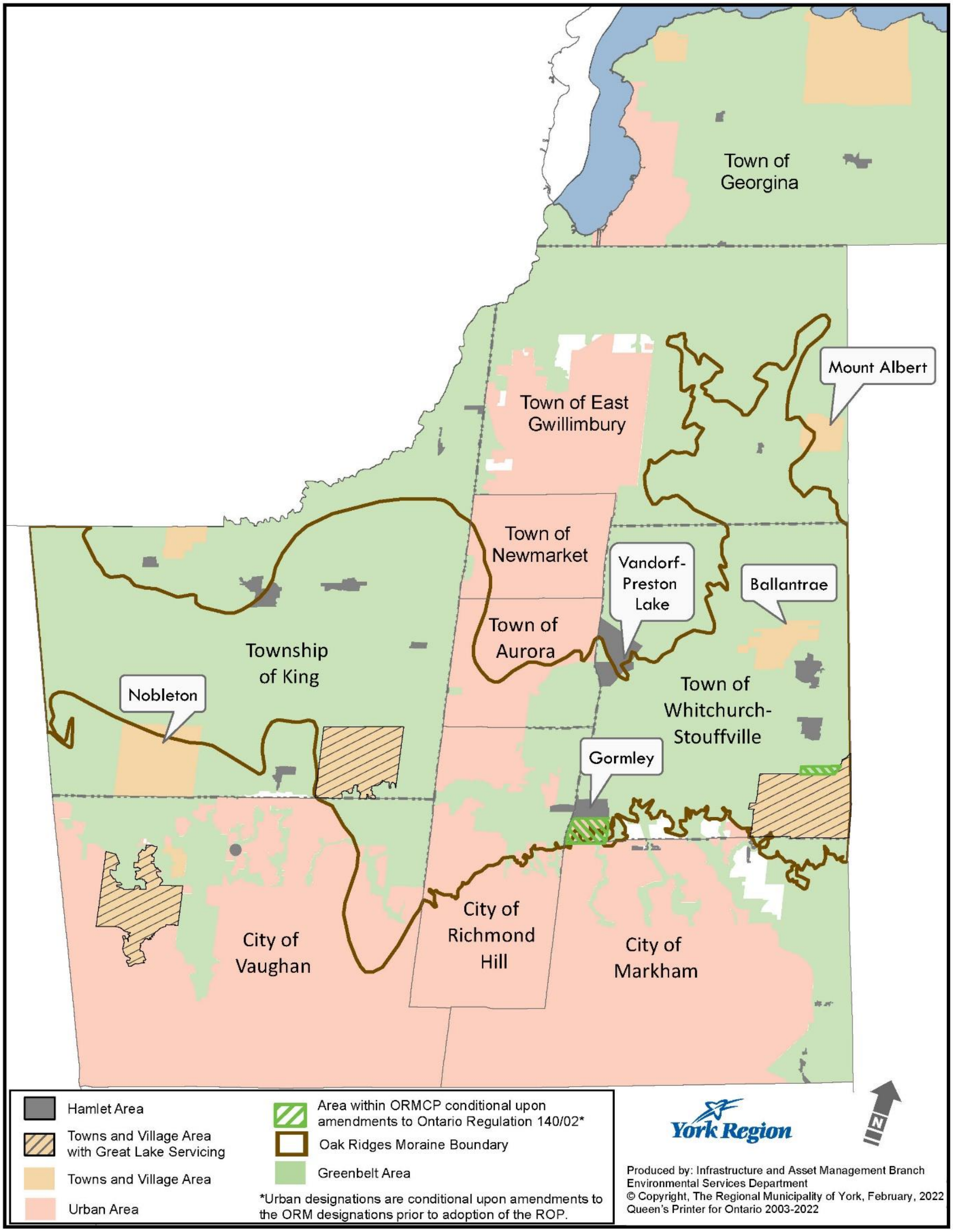
Designated lands and communities currently restricted are illustrated in **Figure 1.**

Preliminary Servicing Options and Considerations

While the Region has advocated for a process to allow access of Great Lake-based servicing to some communities currently restricted through provincial policies, the Province remains committed to servicing options allowed within the current regulatory regime. Implementation of any of the servicing options discussed herein is contingent on compliance with Provincial planning and policy requirements along with confirmation of their technical, environmental, and financial feasibility through the appropriate Class Environmental Assessment process.

Cost estimates for municipal servicing options presented in this appendix are preliminary (conceptual engineering level cost estimates) and are based on limited information. These estimates are subject to change as more detailed analyses are undertaken. Cost estimates are for Regional infrastructure only and do not include required upgrades to local water and wastewater systems. Local Improvement Charges may be applied to any solution that transfers existing residents from current municipal servicing to the new solution required to service additional growth.

Figure 1 - Location Map



BALLANTRAE SERVICING – TOWN OF WHITCHURCH-STOUFFVILLE

The community of Ballantrae-Musselman Lake is located north and south of Aurora Road between McCowan Road and York/Durham Line. The community is located within the Oak Ridges Moraine and Greenbelt designated areas. The community is shown in **Figure 2**.

The original secondary plan for Ballantrae-Musselman Lake was approved in 1997, as OPA 90, establishing the settlement boundary, designations, and partial servicing through municipal wells. Partial services were deemed necessary to address ongoing health concerns due to private septic system impacts on groundwater drinking water quality. Wastewater services were provided through a private communal system by the Ballantrae Golf and Country Club and private septic systems. In 1999, the Region entered into a Municipal Responsibility Agreement with Ballantrae Golf and Country Club owners to ensure sufficient financial and operational measures were in place to protect the health and safety of the residents and community.

In 2007, the Town adopted OPA 112 to bring the plan into conformance with the Oak Ridges Moraine Conversation Plan. In 2014, the Town updated the secondary plan to increase the service population from 5,900 to 6,230 persons and directed growth to the Highway 48 core, maintaining all existing residential designations and densities. In 2018, four residential developers appealed for non-decision to address their additional servicing needs of 954 persons. At that time, a mediation process was established through the Ontario Land Tribunal with the appellants and other parties, the Town and Region engaging to address servicing needs. In the meantime, the Region as part of the 2016 Master Plan, undertook an Environmental Assessment to meet water servicing needs of the 6,230 persons identified in OPA 136. The Environmental Assessment for water servicing was approved on September 4, 2019.

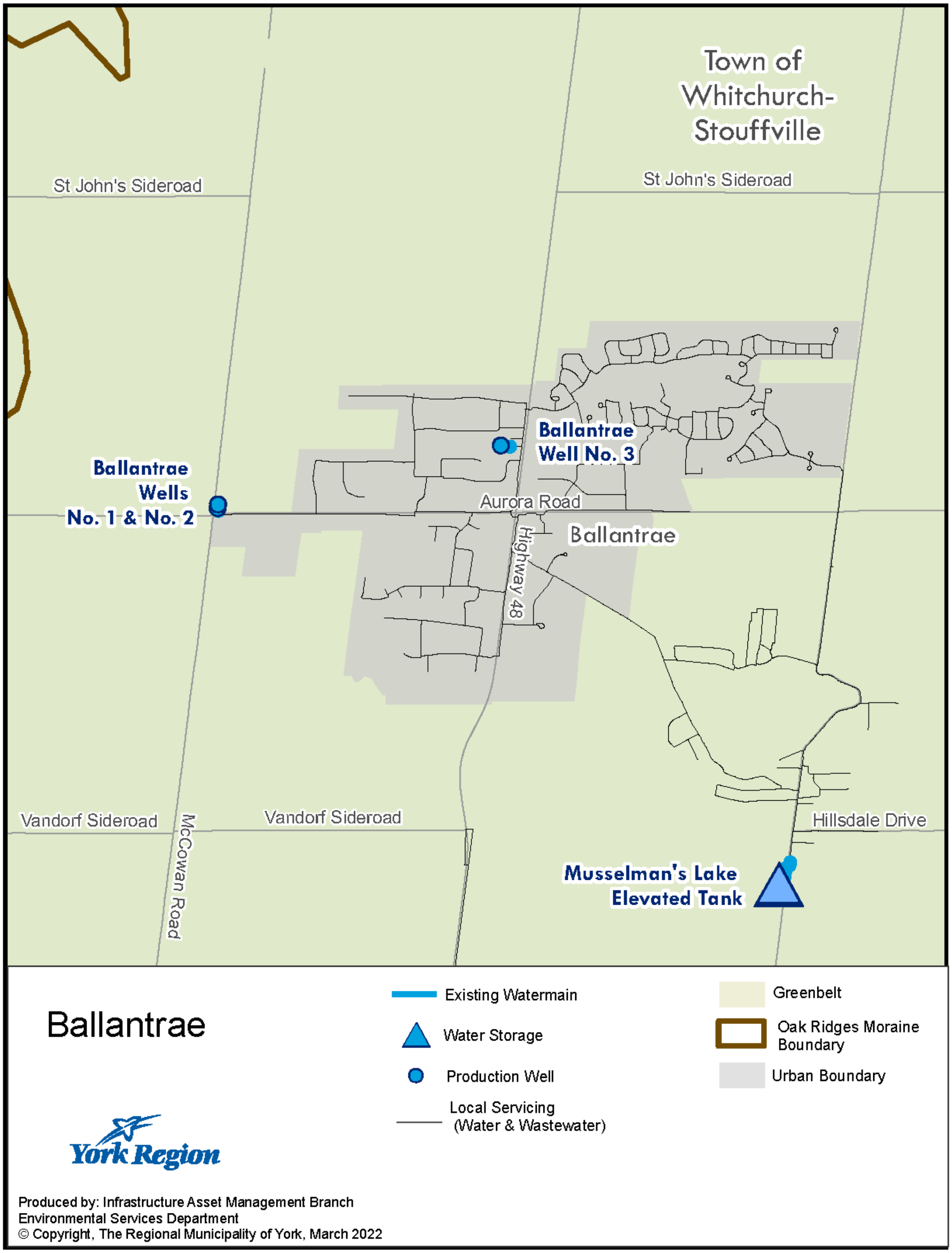
The Region is reviewing the feasibility of undertaking work to re-rate the water system with equipment upgrades and storage optimization to address landowner water servicing needs and to enable existing private well owners to convert to municipal drinking water. Wastewater will continue to be provided by private services, pending studies to demonstrate financial, environmental, and technical feasibility of any private communal systems, and completion of Municipal Responsibility Agreements for any such systems. These requirements are outlined in the Regional Official Plan and are supported by future guidelines for private communal systems, currently being prepared.

To address the Town's desire for longer term feasibility of servicing options that include existing residents within the Highway 48 corridor, a servicing feasibility study would need to be undertaken to assess options given the following regulatory constraints:

- *Lake Simcoe Protection Act, 2008* requirements related to wastewater discharges
- *Oak Ridges Moraine Conservation Act, 2001* and associated Plan land use restrictions and regulated environmental features in the study area
- *Clean Water Act, 2006* requirements related to regional aquifer capacity potential and wellhead protection area implications
- *Ontario Water Resources Act* related to concerns expressed by the Ministry of Environment, Conservation and Parks regarding shallow groundwater mounding from aquifer discharge of treated wastewater
- *Greenbelt Act, 2005* regarding the potential introduction of Lake Ontario water

- Great Lakes Charter relating to federal jurisdiction and control regarding Great Lake Transfers and Diversion relating to potential York Durham Sewage System servicing and the transfer of waters across Bloomington Road (the watershed divide between Lake Ontario and Lake Huron)

Figure 2 – Ballantrae



A summary of servicing options in Ballantrae are shown in Table 1.

Table 1 - Summary of Ballantrae Servicing Options

Water Option	Estimated Costs
• **Phase 1** – Feasibility study, conceptual design, planning, design and construction to stretch existing infrastructure to support 954 persons • **Phase 2 –** Feasibility water and wastewater study, conceptual design and planning for full services	• **Phase 1** – To be determined • **Phase 2 -** $200,000
Wastewater Option	**Estimated Costs**
• **Phase 1** – Private services (no municipal wastewater servicing) • **Phase 2 –** Feasibility water and wastewater study, conceptual design and planning for full services	• **Phase 1 -** $0 Million • **Phase 2 -** $200,000

GORMLEY SERVICING – CITY OF RICHMOND HILL AND TOWN OF WHITCHURCH-STOUFFVILLE

Gormley is a Hamlet divided by Highway 404 in the City of Richmond Hill to the west (Gormley-Richmond Hill) and the Town of Whitchurch-Stouffville to the east (Gormley-Stouffville). Gormley is located within the Oak Ridges Moraine and Greenbelt designated areas. More recently, the Town of Whitchurch-Stouffville has expressed interest in the expansion of Gormley employment area along the Highway 404 corridor between Gormley Industrial Secondary Plan area and the City of Markham; this proposal, however, would require a settlement area boundary expansion within the Countryside Area of the Oak Ridges Moraine Conservation Plan and would require provincial approval. This proposal was approved by Regional Council at it's October 21, 2021 meeting and staff are awaiting provincial approval to proceed.

Gormley is currently serviced by private individual wells and septic systems. Gormley-Stouffville is also supported by a non-potable fire suppression system owned and operated by the Town. In response to multiple requests for connection of these communities to full municipal servicing, the Region has identified the preliminary options illustrated in **Figure 3** and summarized in **Table 2.**

Figure 3 - Preliminary Servicing Options in Gormley

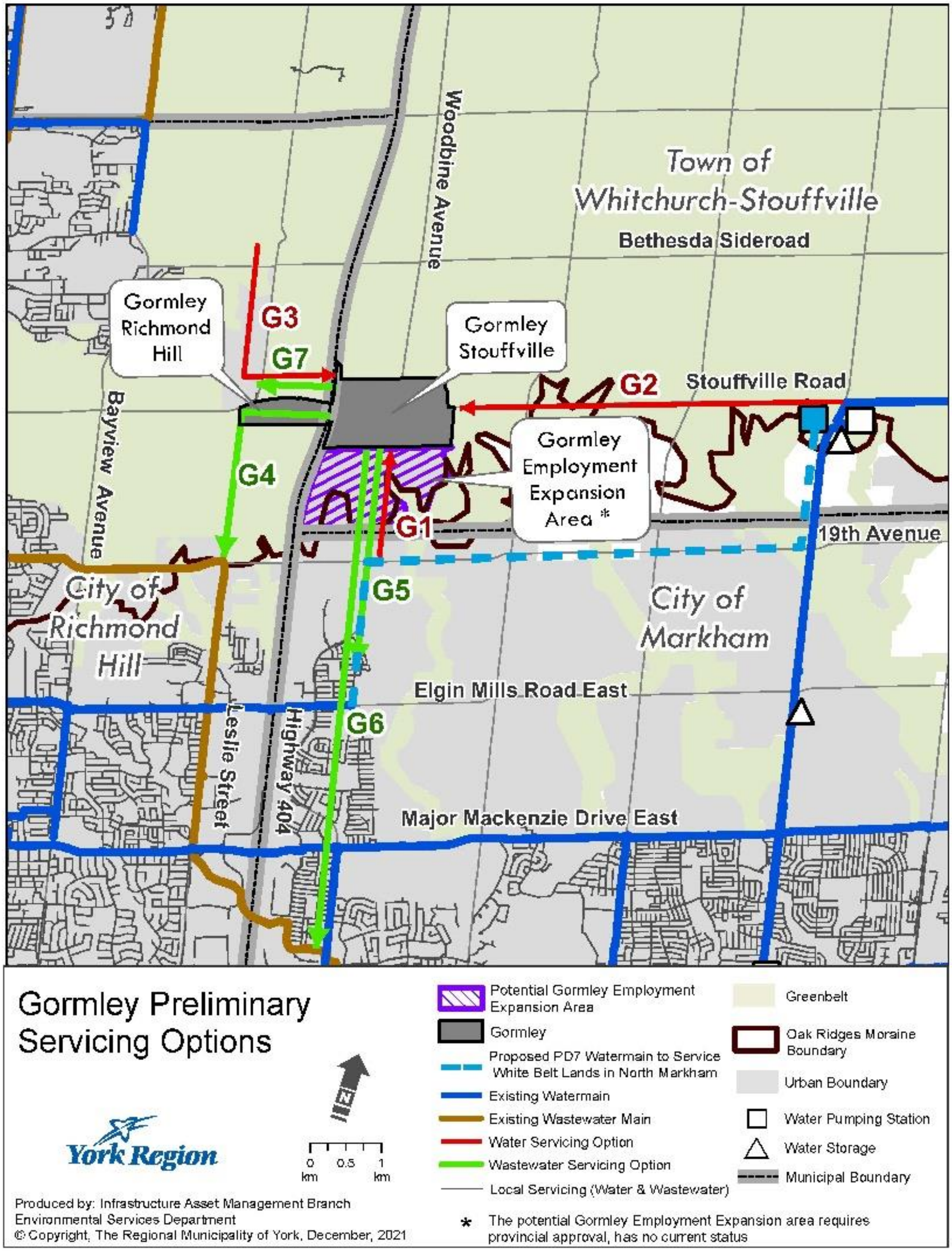


Table 2 - Summary of Gormley Servicing Options

Water Options	**Estimated Costs**
• **G1 -** Connection to proposed Pressure District (PD) 7 watermain expected to service Markham urban expansion as recommended in the 2021 Master Plan under Project W11 - North Markham Water Servicing. Feasibility of this connection is contingent on the outcome of the future North Markham Servicing Class Environmental Assessment.	Range from $5 Million to $10 Million plus an additional $5 Million for connection of Gormley Expansion area
• **G2 -** Connection to the existing Stouffville Zone 2 watermain at McCowan Road and Stouffville Road and it is therefore contingent on availability of supply and storage capacity in the Stouffville Water System.	Range from $10 Million to $20 Million plus an additional $5 Million for connection of Gormley Expansion area (estimate does not include any upgrades to Stouffville Zone 2 water system in addition to those identified in the 2021 Master Plan)
• **G3 -** Connection to the PD9 Richmond Hill local system dependent on availability of water capacity and consent from the City of Richmond Hill.	Range from $15 Million to $20 Million excluding any need to upgrade Richmond Hill water system
Wastewater Options	**Estimated Costs**
• **G4 -** Connection to the Region's 19th Avenue Trunk sewer at Leslie Street.	Range from $25 Million to $30 Million
• **G5 -** Connection to the City of Markham's Woodbine Avenue sewer just north of Elgin Mills Road. Feasibility of this connection is therefore dependent on availability of capacity and consent from the City of Markham.	Range from $25 Million to $40 Million
• **G6 -** Connection to the Region's 404 Trunk Sewer south of Major Mackenzie Drive.	Range from $35 Million to $60 Million
• **G7 -** Connection to the City of Richmond Hill sanitary sewer at Leslie Street and Stouffville Road. Feasibility of this connection is therefore dependent on availability of capacity and consent from the City of Richmond Hill.	Range from $15 Million to $25 Million

VANDORF-PRESTON LAKE SERVICING – TOWN OF WHITCHURCH-STOUFFVILLE

Vandorf-Preston Lake is located between Highway 404 and Warden Avenue and extends from Bloomington Road to North of Vandorf Sideroad in the Town of Whitchurch-Stouffville. All the lands within the Preston Lake community and approximately half of Vandorf are located within the Oak Ridges Moraine designated area.

Servicing is currently provided by private wells, septic systems and a privately serviced industrial business park. Preliminary options to connect these communities to full municipal servicing are illustrated in **Figure 4** and summarized **Table 3.**

Figure 4 - Preliminary Servicing Options in Vandorf-Preston Lake

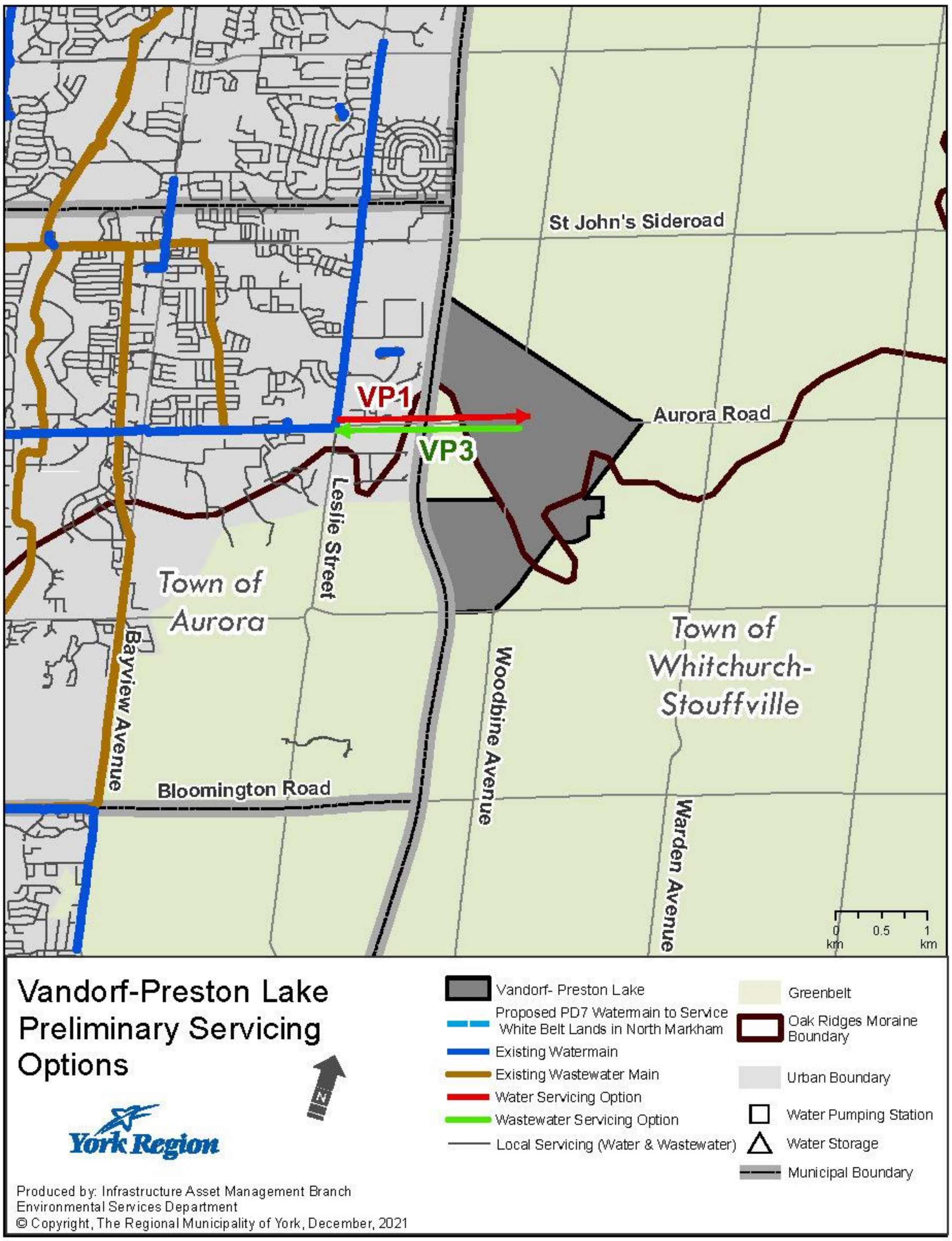


Table 3 - Summary of Vandorf-Preston Lake Servicing Options

Water Option	Estimated Cost
• **VP1 -** Connection to the Region's Leslie Street watermain at Wellington Street East.	Range from $5 Million to $10 Million
Wastewater Option	**Estimated Cost**
• **VP2 -** Connection to Town of Aurora's Wellington trunk sewer at Wellington Street East. Feasibility of this connection is dependent on consent from the Town of Aurora and availability of capacity in the Town's sewer and the Region's Aurora Sewage Pumping Station.	Range from $10 Million to $15 Million

NOBLETON SERVICING – TOWNSHIP OF KING

The Nobleton community in the Township of King is bounded by 15th Sideroad in the north, the boundary of Township of King and City of Vaughan in the south, 8th Concession Road to the east and 10th Concession Road to the west. The community is fully located within the Greenbelt Plan designated area. This community currently receives municipal water and wastewater servicing, and existing systems are planned to be upgraded to accommodate approximately 10,800 residents.

Growth in Nobleton beyond this planned capacity is restricted by current provincial policy. Also given the technology required meet environmental requirements the capital costs for plant expansion beyond the planned 10,800 residents are not currently financially viable.

Nevertheless, preliminary options to service growth beyond the 10,800 residents being contemplated in the 2021 Class Environmental Assessment have been developed in case future provincial policy and Regional circumstances change. These options are illustrated in **Figure 5** and summarized in **Table 4.**

Figure 5 - Preliminary Servicing Options Beyond 10,800 Population in Nobleton

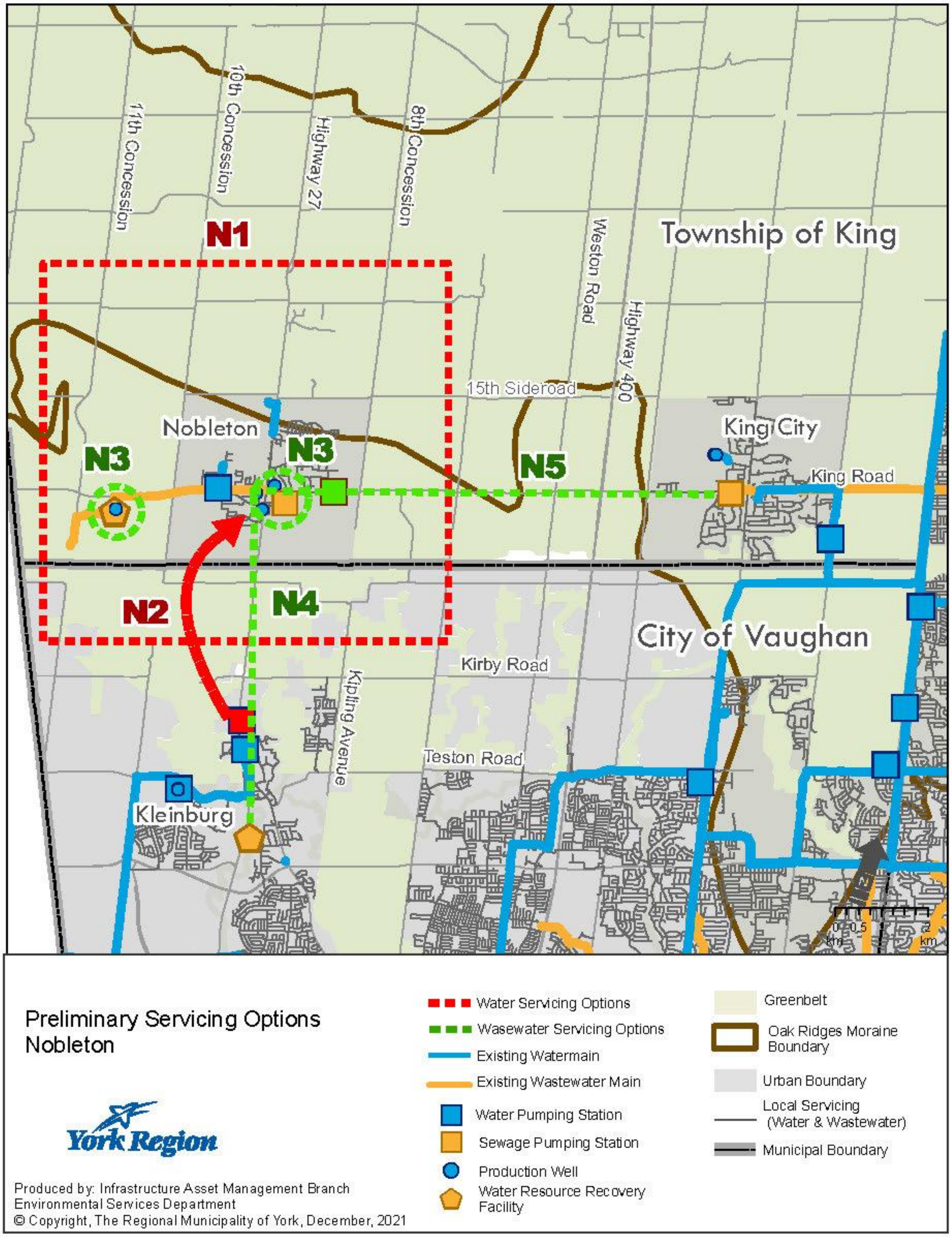


Table 4 - Summary of Nobleton Servicing Options Beyond 10,800 Population

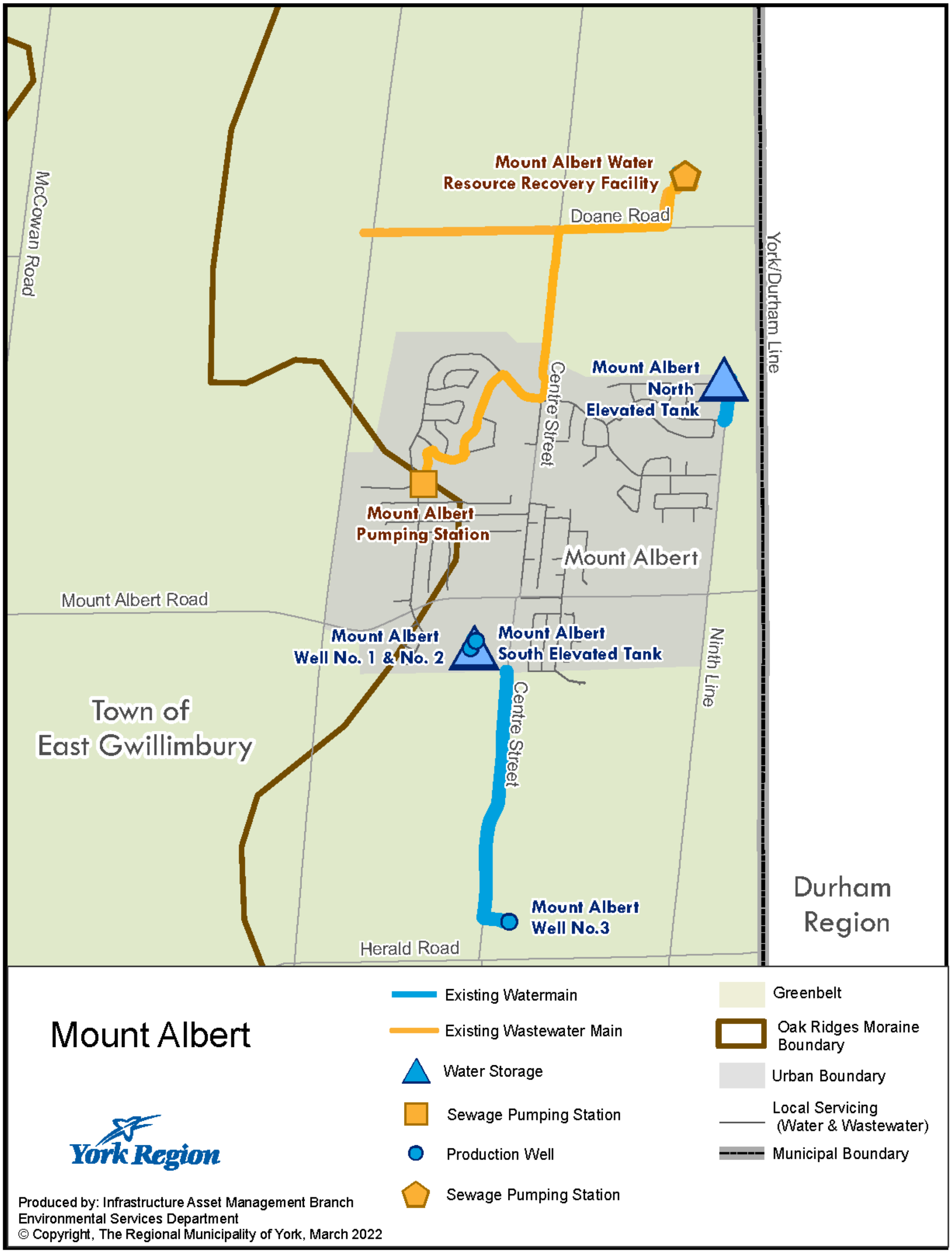
Water Options	Estimated Costs
• **N1 -** Expansion of the existing well and transmission system. Based on understanding of water resources in the area, it is likely that exploration work will need to consider areas outside of the community to avoid well interference and adequate resources management thus increasing complexity and cost.	Range from $20 Million to $30 Million
• **N2 -** Connection to the Kleinburg lake-based water system. Subject to further analysis, this option likely requires upgrades to Kleinburg water system (e.g., upsizing storage facility along with a new pumping station and connecting watermain). This option will also need a blending study to assess water quality implications.	Range from $20 Million to $30 Million
Wastewater Options	**Estimated Costs**
• **N3 -** Expansion of existing Water Resource Recovery Facility with introduction of microfiltration and new outfall along with conveyance upgrades which may include a new pumping station and associated forcemain.	Range from $115 Million to $150 Million
• **N4 -** Connection to the proposed West Vaughan sewer – Kleinburg connection. Feasibility of this option is dependent on availability of capacity at Humber Sewage Pumping Station as flows from Nobleton were not considered in the design of this facility.	Range from $80 Million to $150 Million
• **N5 -** Connection to the King City wastewater system. Subject to further analysis, this option requires addressing conveyance capacity limitations in King City.	Range from $110 Million to $150 Million

MOUNT ALBERT SERVICING – TOWN OF EAST GWILLIMBURY

The village of Mount Albert is bounded by Doane Road to the north, Mount Albert Road to the south, Highway 48 to the west and Ninth Line to the east in the Town of East Gwillimbury. Water supply is provided by three groundwater wells and two elevated tanks. The Mount Albert Water Resource Recovery Facility (WRRF) provides wastewater treatment to the village. A Regional sewage pumping station and sewer direct flow from the community to the WRRF. Mount Albert is shown in **Figure 6**.

The Mount Albert Water Resource Recovery Facility was originally designed in 2004 to provide wastewater servicing to 6,000 persons. With increased community density, there remains some lands vacant and available for further development. In 2020, East Gwillimbury Council approved an increase of the Mount Albert population from 6,000 to 8,000 persons to complete the community.

Figure 6 - Mount Albert



Since 2014, the Region has undertaken several studies to evaluate capacity at the Mount Albert Water Resource Recovery Facility. To increase the servicing population to 8,000 persons, the studies identified an additional $20 million in wastewater infrastructure was needed to increase capacity and meet strict phosphorus effluent limits in the Lake Simcoe Protection Plan.

Due to the high cost of wastewater works identified, expansion of the facility beyond the rated capacity was considered cost prohibitive and a project was not included in the previous Master Plan or Capital Plan. More recently, the Region undertook an optimization feasibility study to determine if up to 8,000 persons could be accommodated within the existing Environmental Compliance Approval for the Plant through minor upgrades. This study was funded by the interested Mount Albert landowners and concluded that up to 1,890 additional persons could be accommodated through $6 million in wastewater upgrades to optimize the wastewater system. This would bring the serviceable population of Mount Albert up to a total of 7,890 persons. Town staff confirmed that this would be sufficient to support growth.

In a separate study, water works were assessed to increase treatment to address the highly mineralized groundwater system. Using this water study as a basis, an additional $3 million was assessed to increase the waterworks to meet the additional 1,890 persons. A summary of proposed wastewater and water system upgrades and estimated costs are presented in **Table 5**.

Table 5 - Summary of Mount Albert Wastewater and Water Upgrades and Costs

Wastewater System Upgrades	**Estimated Costs**
• **MA1 –** Like-for-like pump replacement of pumps at the Mount Albert Sewage Pumping Station to restore rated pumping capacity.	$1 Million
• **MA2 –** Addition of 4th blower to secondary treatment process to provide required aeration for the additional service population.	$0.2 Million
• **MA3** – Retrofit existing tertiary sand filters with EcoWash® upgrade to reduce backwash volumes and hydraulic loadings through the facility.	$1 Million
• **MA4** – A system for alkalinity adjustment is recommended to address nitrification challenges and effluent ammonia excursions related to insufficient alkalinity. Estimated cost depends on type of system implemented.	Range from $0.1 Million to $1 Million
• **MA5 –** Improved sludge management is recommended to address increased sludge handling requirements as a result of the additional connected population. Estimated cost depends on type of system implemented.	Range from $0.7 Million to $1.3 Million
• **MA6 –** Upgrades to the effluent piping and/or outfall are required to address a hydraulic bottleneck and restore the hydraulic capacity of the effluent discharge system. Further investigation is required to confirm the location and extent of the bottleneck.	$1.5 Million

Water System Upgrades	Estimated Costs
• **MA7 –** To accommodate additional population not contemplated through the Mount Albert Water Supply Upgrades Class Environmental Assessment, additional upgrades to the water supply system are required. These include additional emergency storage, treatment redundancy and security of supply. The scope of upgrades and cost are to be confirmed through detailed design.	$3 Million

At the time of writing this Master Plan, the optimization study and discussions with the landowners were underway and no formal development agreement had been finalized. Through this optimization study, staff identified upgrades to stretch the existing infrastructure to complete the community. This work would be completed at the cost of the benefiting landowners. A formal agreement with the participating landowners is expected in Q3 2022.

ADDITIONAL CONSIDERATIONS

In addition to provincial changes required to lift current policy restrictions, introduction of municipal services to these communities will require planning, design and construction of infrastructure works suitable for the expected land use that are financially viable over their life cycle while protecting public health and safety and the natural environment. In advancing any of these options please note the following considerations:

- Given the geographical location and existing environmental or physical constraints (e.g., crossings of highways, environmental features, etc.) in providing municipal servicing to these communities, the capital infrastructure investment is expected to be significant relative to the small scale of developable land; this may impact the financial viability of servicing solutions
- Operational challenges should be identified and considered in the comprehensive analysis of servicing options; for instance, since water quality is usually difficult to maintain when water infrastructure is designed to accommodate large fire flows required by employment areas while daily demands are low, consideration should be given to servicing options that prevent/minimize water quality degradation linked to water age
- Advancing infrastructure to address localized servicing needs for specific landowners adds complexity to the capacity assignment process with local municipalities and may limit the local municipalities' ability to allocate capacity to other community areas not part of the landowner fundings group

Requirements for Private Communal Systems

A private communal water or wastewater system is a system not owned by a municipality that serves multiple lots or private residences or for non-residential uses. The Provincial Policy Statement defines:

- A private communal water service as a "non-municipal drinking water system within the meaning of section 2 of the *Safe Drinking Water Act, 2002* that serves six or more lots or private residences"

- A private communal wastewater service as "sewage works within the meaning of section 1 of the *Ontario Water Resources Act* that serves six or more lots or private residences and is not owned by a municipality"

Where municipal water and wastewater servicing is not planned, available, or feasible in settlement areas, the Provincial Policy Statement identifies private communal water and wastewater services as a servicing solution. This solution may be appropriate for rural communities in Ontario where there may be no prospect of building municipal services, but this may not be feasible within a York Region context given prohibitions on servicing in provincially protected areas. The Greenbelt Plan and Oak Ridges Moraine Conservation Plan have more restrictive requirements related to servicing that supersede the Provincial Policy Statement.

The Regional Official Plan (2022) reinforces that development shall be prioritized in locations with existing regional infrastructure capacity. When full municipal water and wastewater services cannot be provided and where the protection of public health is an issue (as determined by a Medical Officer of Health), private communal water supply and wastewater treatment systems maybe be considered for existing residential development. Private communal systems may be permitted for employment uses on an interim basis where full municipal services are planned, subject to further criteria.

MUNICIPAL RESPONSIBILITY AGREEMENTS

Municipal Responsibility Agreements are required for private communal water and wastewater services for residential developments, which are entered into at the discretion of the municipality (in this case, "municipality" refers to York Region). A private communal system for either water or wastewater servicing of multi-lot residential units requires a Municipal Responsibility Agreement to minimize the risk to public health and the environment in the event the communal water or wastewater system malfunctions or fails.

A Municipal Responsibility Agreement, along with adequate funds, is a condition of provincial and planning approval only where the municipality agrees to take on this responsibility. By entering into an agreement, the municipality works to manage its financial and performance risks in the event of default by the system owner and operator. These arrangements help alleviate risk to the environment and public health.

The province provides specific guidance to ensure these agreements outline operational monitoring and maintenance of these systems. More importantly, provisions in the agreement must specify assumption of the communal service by the municipality in the event of default as well as identify financial securities to be established and used in the event of system failure.

The Ministry of Environment, Conservation and Parks also has an approval and regulatory role for private communal systems, with a number of requirements for the design and management of these systems, including, but not limited to:

- Section 22 of the Ministry of Environment, Conservation and Parks design guidelines for sewage works *Design Guidelines for Sewage Works* and section 3.2 of the design guidelines for drinking water systems *Design Guidelines for Drinking Water Systems*
- O. Reg. 205/18 for systems in source protection areas *B-7 Guidelines*
- *Safe Drinking Water Act, 2002* and *Clean Water Act, 2006*

REQUIREMENTS FOR PRIVATE COMMUNAL SYSTEMS IN YORK REGION

York Region is developing a guideline that will provide minimum standards and implementation guidance, as well as requirements for Municipal Responsibility Agreements for private communal servicing for residential or mixed-use developments, to ensure protection of public health and the environment. The Region has a legislated responsibility under the *Safe Drinking Water Act, 2002* and through its source protection plans to ensure the health and safety of all Region residents.

The guideline for communal systems will articulate the administrative, engineering, environmental, and financial standards referred to under the Regional Official Plan that must be met to have a development serviced by a private communal system in York Region.

APPENDIX A.8 PRIMARY SYSTEM MASTER PLAN REQUIREMENTS

Summary

This appendix identifies the future work required to develop a Primary System Master Plan based on the Official Plans of both Durham Region and York Region.

Disclaimer

Content in this appendix is subject to change. York Region accepts no responsibility or liability for the correctness of this report. Accessible formats or communication supports are available upon request. Please contact accessyork@york.ca or call 1-877-464-9675.

February 28, 2022

York Region

Purpose and Background

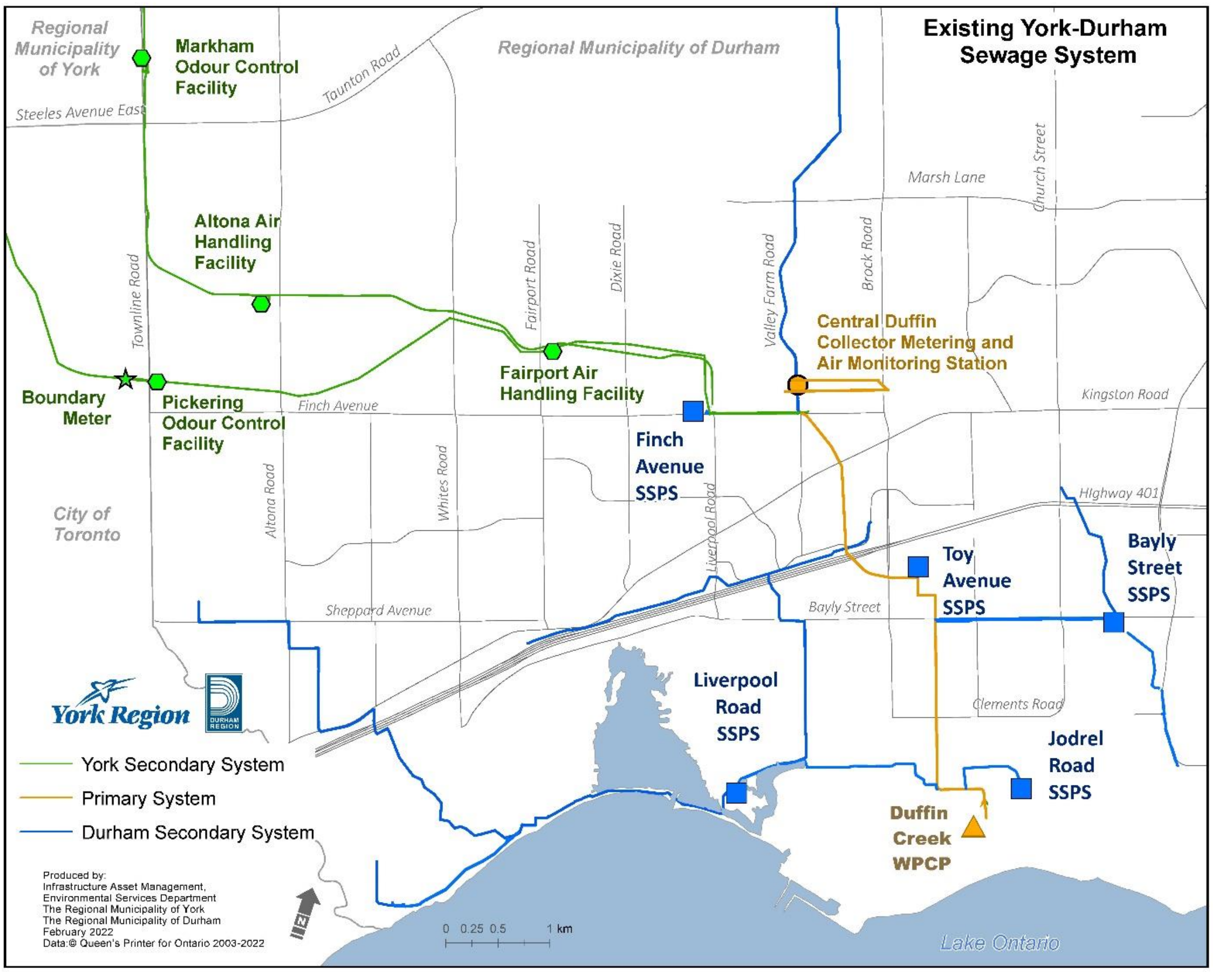
This appendix identifies the future work required to develop a Primary System Master Plan based on the Official Plans of both Durham and York Regions and is expected to be updated every five years.

In 2021, York Region conducted a preliminary planning study on future expansion requirements of Primary System using the best available population forecasts available for the Duffin Creek sewershed.

Primary System

The Primary System is the most downstream section of the York Durham Sewage System that includes the Duffin Creek Water Pollution Control Plant (WPCP), outfall and ancillary sections of the conveyance system that are jointly owned by York and Durham Regions. The location plan of the Primary System is provided below in **Figure 1**.

Figure 1 - Location Plan of Primary System



Primary System Master Plan Requirements

The operations are administered and managed through a long-term operating agreement, which specifies that together the Regions will develop a plan that forecasts future capital expansion requirements for the next 30 years of the Primary System.

This Primary System Master Plan will be developed based on the Official Plans of both Regions and is expected to be updated every five years. The staging of capital projects identified in this plan will be based on ten-year population and flow forecasts produced the Regions which is updated and approved annually through the Duffin Creek WPCP Management Committee.

In 2021, as part of the Water and Wastewater Master Plan Update, York Region conducted a preliminary planning study on future expansion requirements of Primary System using the best available population forecasts available for the Duffin Creek sewershed from York and Durham Regions. At the time of study, both municipalities were working on their municipal comprehensive reviews, with preliminary 2051 population forecasts based on the Provincial Growth Plan.

Further work to develop a Primary System Master Plan will be undertaken when the population forecasts are finalized. As an interim measure, the recommendations from the preliminary study informed York Region's Master Plan Update. Draft population projections for the Duffin Creek WPCP sewershed areas was provided by York and Durham Regions:

- York Region catchment areas reach population of 1,654,000 in 2051
- Durham Region catchment areas reach equivalent population of 643,845 in 2041 (includes an allowance for Federally owned lands)

A high-level summary of the estimated works and expenditures is provided in **Table 1** below.

Table 1 - Estimated Works and Expenditures in the 2022 Master Plan to be Considered in the Primary System Master Plan

Project Description	**Estimated Expenditures (2022-2051 (000's)**	**Planned Implementation Timeframe**
Duffin Creek Water Pollution Control Plant Growth Expansions Implement several upgrades to optimize and/or expand Duffin Creek WPCP beyond the current capacity including a new outfall to accommodate growth in the York Durham System service area. Upgrades to be implemented in phases and are expected to be confirmed by future planning and Environmental Assessment studies.	$757,900	2032-2051