CIVICA
Water Management Solutions

## Prepared For:
## The City of Richmond Hill

# Urban Master Environmental Servicing Plan Update Study
## Water and Wastewater Systems


**October 31, 2023**

330 Rodinea Road, Unit 3
Vaughan, Ontario, Canada L6A 4P5
(905) 417 9792
www.civi.ca

# STATEMENT OF QUALIFICATIONS AND LIMITATIONS

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

Please note that the information, data, analysis, recommendations, and conclusions contained in the Report was prepared for the specific purposes described in the Report and the Agreement and may be based upon information which has not been independently verified by the Consultant. The Consultant shall be entitled to rely upon the accuracy and completeness of information that was provided to the Consultant, and has no obligation to update such information. The material in this report reflects the Consultant's best professional judgement in the light of the information available to it at the time of preparation and publication.

The Consultant agrees that the Report represents its professional judgement as described above and that the Information has been prepared for the specific purpose and use described in the Report and the Agreement. The Consultant makes no other representations, any guarantees or warranties whatsoever, whether expressed or implied, with respect to the Report or any part thereof.

The Report is to be treated as confidential and may not be used or relied upon by third parties, except as agreed in writing by the Consultant and the Client. Neither possession of the Report, nor a copy of it, carries the right of publication. The Report shall not be disclosed, produced or reproduced, in whole or in part, neither published in any manner, without the written consent of the Consultant and the Client.

The Consultant expressly excludes liability to any party except the Client for either any use of or reliance upon the Report.

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

# EXECUTIVE SUMMARY

The City of Richmond Hill has completed updates to the water and wastewater components of the 2014 Urban Environmental Master Servicing Plan. These updates identify the infrastructure works needed to support the City structure framework defined by the City of Richmond Hill Official Plan. This UMESP, has followed Approach #2 under the Municipal Class Environmental Assessment process (MCEA, October 2000). This Study documents the completion of Phases 1 and 2 of the EA process. The UMESP recommends a series of projects intended to address the following Problem Statement:

*The Update to the Urban Environmental Servicing Plan is essential to align with the Official Plan. This UMESP will provide strategic guidance for essential upgrades in municipal water and wastewater infrastructure for the 2041, 2051 and Ultimate Build-Out growth scenarios, all of which are necessary to facilitate and sustain urban growth and intensification as outlined in the City's Official Plan.*

The study focuses on the Richmond Hill Centre, Key Development Areas, Regional Corridors, Local Centres, Local Development Areas, and Local Corridors, as defined by the Official Plan and roughly extending the length of the Yonge Street corridor through the City.

The City currently owns and operates approximately 9,292 sanitary sewers and 8,928 sanitary maintenance holes. The sewer diameters range from 125 mm to 2,700 mm. The City's wastewater collection system discharge to four Regional trunk sewers: the North Don Collector, the Central Collector, the Richmond Hill Collector (also referred to as the Yonge Street Collector) and the 19th Avenue Collector (which flows east to the YDSS).

Performance assessment of the existing wastewater collection system was completed as part of this study. To assess the system performance, a wastewater collection system hydraulic model was updated and utilized. The model was updated using the most recently available data and calibrated using flow and rainfall data collected at twenty-one (21) strategic flow monitoring sites and three (3) rain gauges. Collected data was reviewed and utilized to calibrate and validate the model in accordance with industry best practices. Collected data was also used to assess the extent of inflow and infiltration (I/I) into the wastewater collection system.

The existing wastewater system performance was assessed for dry weather flow conditions and wet weather flow conditions (25-year design storm event). For the 25-year design storm event, a significant number of local sewers were identified to surcharge due to bottlenecks and backwater, caused by bottlenecks. A level of surcharge (water level above the obvert of the pipe) greater than 0.3 m can be seen along Naughton Drive, East of Yonge Street. Also, at multiple locations between Elgin Mills Road and Major Mackenzie Drive; and along Harding Boulevard, just south of Major Mackenzie Drive. In consultation with the City, if surcharge is present during existing conditions, and is not caused by future growth within the Study Area, then remedial measures will not be evaluated as part of this study. As expected, the level of surcharge gradually increases for each future scenario (2041, 2051 and Ultimate Build-out growth scenarios).

The evaluation of alternatives concluded that enhancement and expansion of the existing collection system be undertaken. The analysis identified twenty (20) improvement projects to accommodate Ultimate Build-Out growth, with the majority of these being required by the 2051 growth projections within the study area. The total cost of the recommended wastewater system improvements was estimated to be $41.1M.

The City's water distribution system is a part of the York Region's system. The City provides water to its customers through four (4) Pressure Districts (PD6, PD7, PD8, and PD9, respectively). The existing conditions model reflects the system's condition to 2016. There were some changes in the system since 2016 that were only applied in the future conditions model. For example, the Flow Modulated Area (FMA) was removed in 2017. The valve setting in FMA was changed in 2017 which applied only to the future condition model.

The water model was run under 2016 Maximum Daily Demand and Peak Hour Demand. The modelling results are generally within 100 kPa of the hydrant test results. However, there areas some areas with modeled pressures more than 100 KPa difference with the hydrant test data. Results outside of 100 KPa range tend to be clustered, which could indicate operational issues that aren't modelled correctly (partially-closed valves or possibly nearby watermains temporarily closed for operational/maintenance purposes), or hydrant test data that was not undertaken during the daily peak demand hour.

A total of fifteen (15) improvement projects were identified for the City's water distribution system to accommodate the projected growth through 2041, 2051, and Ultimate Build-Out. All projects are triggered by fire flow insufficiencies based on the recommended fire flow demands and designated land use and built form of the future developments in the intensification areas. Main improvement areas include new watermains on Yonge Street corridor and watermain replacements on side streets west of Yonge Street to service future developments, as well as 1,410 m of watermain replacements on Church Street in the Downtown Local Centre. Other areas include watermain replacements in Local Development Areas south of Major Mackenzie Drive East as well as in Richmond Hill Centre. Thirteen (13) of the fifteen (15) projects are required to be implemented before 2041 either fully or partially with only two (2) projects required after 2041. The total cost of the proposed projects is $ 21,668,980 of which $ 16,030,537 required before 2041.

# TABLE OF CONTENTS





Civica Infrastructure Inc. • 330 Rodinea Road, Unit 3, Vaughan, Ontario, Canada, L6A 4P5 • 905-417-9792 | www.civi.ca | info@civi.ca

## List of Figures



## List of Tables

## Appendices

# 1.0 Introduction

## *1.1 Background Review*

In 2010, Richmond Hill Council adopted a new Official Plan (OP) that sets out the long-term vision for growth and development in Richmond Hill. Given that Richmond Hill's settlement area is nearly built out, most of the future growth and development in the City will occur through intensification. Directing new growth to the centres and corridors as set out in the Plan represents a city-building approach to developing a complete community. The hierarchy of centres and corridors is intended to achieve the City's intensification target and accommodate growth based on a comprehensive land use planning framework to direct and manage population and employment growth to 2051.

In 2014, the City completed an Urban Master Environmental Servicing Plan (UMESP). The UMESP was undertaken to identify the infrastructure work needed to support the planned growth and intensification within centers and corridors identified in the City's Official Plan.

## *1.2 Objectives*

In accordance with the Terms of Reference, this Urban Master Environmental Servicing Plan (UMESP) Update Study has been undertaken to update the water and wastewater components of the 2014 UMESP based on 2041, 2051 and Ultimate Build-Out growth forecasts based on the new Official Plan. This Study provide guidance to new Secondary Plans within the City's intensification centers and corridors with emphasis on the following areas of the City structure: Richmond Hill Centre, Key Development Areas, Regional Corridors, Local Centres, Local Development Areas, and Local Corridors.

This UMESP sets out environmental servicing requirements for future development applications. In addition, the UMESP is intended to identify necessary upgrades to the municipal water and wastewater infrastructure within the study area to accommodate growth, including costing to support development charge bylaws.

## *1.3 Class Environmental Assessment Process*

As required under the Ontario Environmental Assessment Act (R.S.O. 1990), this study followed the MCEA planning process. The Act is a provincially legislated document that governs all public undertakings that have the potential to affect the environment. In this sense, the term "environment" is broadly applied to include the natural, social, cultural, constructed and economic environments. The Environmental Assessment Act defines a planning and design process that proponents of projects must follow to ensure that all environmental impacts are considered, and any effects appropriately mitigated, before their project is implemented.

The Municipal Class Environmental Assessment (Class EA) process was developed by the Municipal Engineers Association as a means to categorize proposed typical municipal projects according to their anticipated environmental impact. The Ministry of the Environment has formally recognized the Municipal Class EA process as meeting the requirements of the Environmental Assessment Act, and the MEA has issued a comprehensive document to detail the process. Key principles of successful environmental assessment planning include:

- Consultation with stakeholders and affected parties upon study commencement, and throughout the process of the project.


Civica Infrastructure Inc. • 330 Rodinea Road, Unit 3, Vaughan, Ontario, Canada, L6A 4P5 • 905-417-9792 | www.civi.ca | info@civi.ca

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

## *1.4 Class EA Master Plans*

Master Plans typically differ from project-specific studies in several key respects. Long range infrastructure planning enables the proponent to comprehensively identify needs and establish broader infrastructure options. The combined impact of alternatives is also better understood which may lead to other and better solutions. In addition, the opportunity to integrate with land use planning enables the proponent to look at the full impact of decisions from a variety of perspectives. The following are distinguishing features of Master Plans:

a. The scope of Master Plans is broad and usually includes an analysis of the system in order to outline a framework for future works and developments. Master Plans are not typically undertaken to address a site-specific problem.

b. Master Plans typically recommend a set of works which are distributed geographically throughout the study area and which are to be implemented over an extended period of time. Master Plans provide the context for the implementation of the specific projects which make up the plan and satisfy, as a minimum, Phases 1 and 2 of the Class EA process. Notwithstanding that these works may be implemented as separate projects, collectively these works are part of a larger management system. Master Plan studies in essence conclude with a set of preferred alternatives and, therefore, by their nature, Master Plans will limit the scope of alternatives which can be considered at the implementation stage.

This Study is being undertaken in accordance with Approach #2, as described in Appendix 4 of the MCEA document. An overview of the Municipal Class Environmental Assessment process is provided in **Figure 1-1**. This approach involves the preparation of a Master Plan document upon the completion of Phase 1 and high-level analysis and public consultation completed as part of Phase 2 of the process. The Master Plan document is then made available for public comment prior to being approved by the municipality. Under Approach #2, the Master Plan is done at a high level of assessment.

## *1.5 Problem and Opportunity Statement*

The Problem Statement for this Class EA Master Plan has been articulated as follows:

*The Update to the Urban Environmental Servicing Plan is essential to align with the Official Plan. This UMESP will provide strategic guidance for essential upgrades in municipal water and wastewater infrastructure for the 2041, 2051 and Ultimate Build-Out growth scenarios, all of which are necessary to facilitate and sustain urban growth and intensification as outlined in the City's Official Plan.*


Civica Infrastructure Inc. • 330 Rodinea Road, Unit 3, Vaughan, Ontario, Canada, L6A 4P5 • 905-417-9792 | www.civi.ca | info@civi.ca

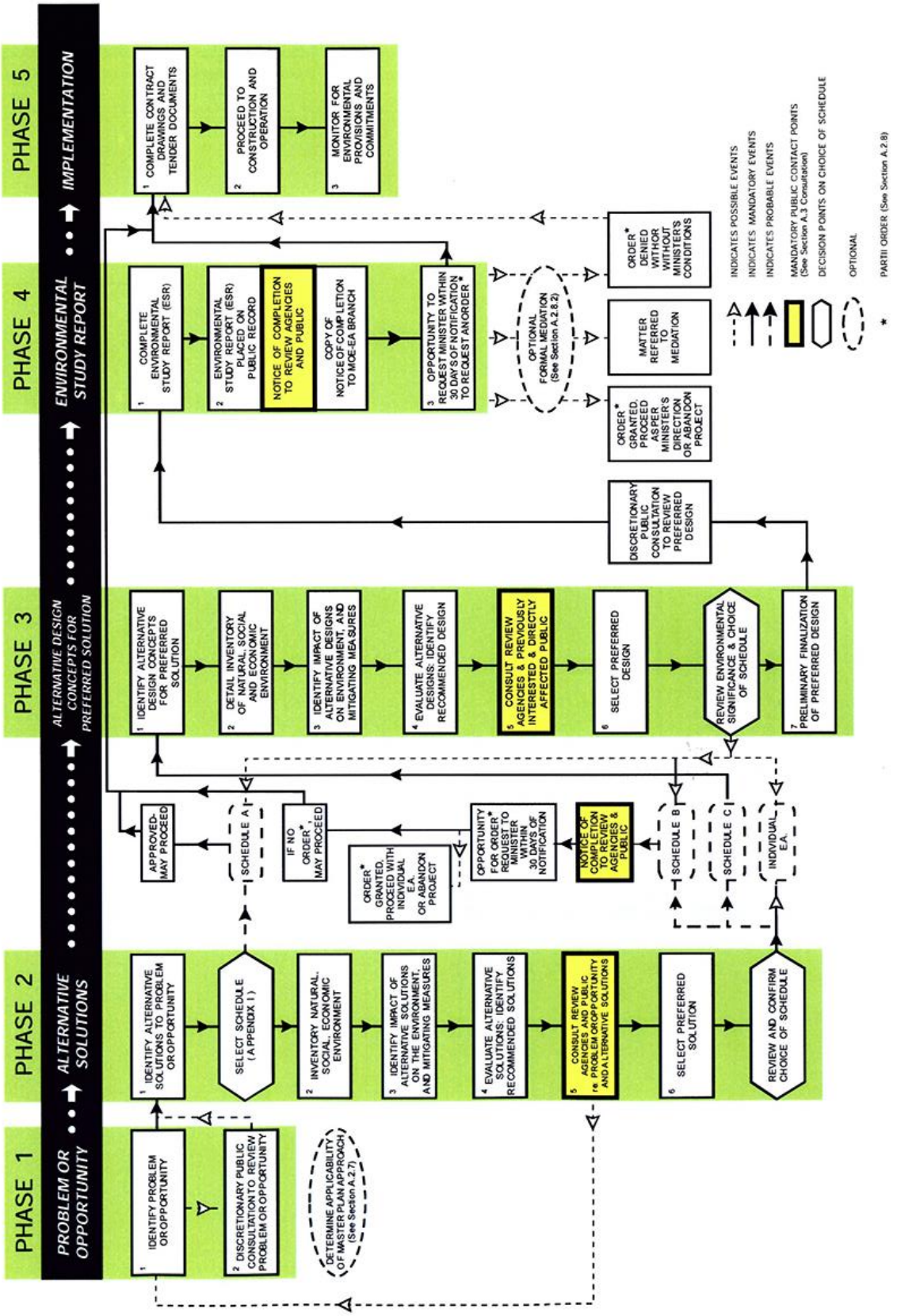



***Figure 1-1: Municipal Environmental Assessment Process***

## *1.6 Study Area*

The study area comprises the network of centres and corridors which include the secondary plan areas for local centres, key development areas, and the Richmond Hill Centre urban growth centre, as well as the other remaining intensification areas identified within the Richmond Hill Official Plan. This UMESP update study area extends beyond these City structure elements, where necessary, to ensure that the analyses and infrastructure recommendations account for any interdependencies with adjacent areas. **Figure 1-2** shows the study area of this project which consists of seven Official Plan (OP) land use intensification Areas in addition to three Emerging Growth Centres (EGC):

OP Intensification Areas:

1) Village Local Centre
2) Key Development Areas
3) Local Development Areas
4) Local Mixed Use Corridor
5) Oak Ridges Local Centre
6) Regional Mixed Use Corridors
7) Richmond Hill Centre

Emerging Growth Centres:

1) Newkirk GO Local Centre
2) Bathurst and Highway 7 Centre
3) East Beaver Creek and Highway 7 Centre.

The existing land use within the study area is comprised of a broad mix of commercial, institutional, and residential uses, interspersed by the City's Greenway system, other natural features, highways, and rail corridors. The study area primarily centres on the Yonge Street Regional corridor, which is a spine for development both within and beyond the City's boundaries.


Civica Infrastructure Inc. • 330 Rodinea Road, Unit 3, Vaughan, Ontario, Canada, L6A 4P5 • 905-417-9792 | www.civi.ca | info@civi.ca


Richmond Hill CIVICA

**RIC18-0004 -**
**Richmond Hill UMESP Update**

**Legend**

- Study Areas
- Emerging Growth Centres
- Municipal Boundary

**Figure 1-1:**
**Study Areas**

Drawn By: J.H. Date: Oct 28, 2023

0 500 1,000 2,000 Meters

# 2.0 Background Information

## *2.1 2014 Urban Master Environmental Servicing Plan*

In 2014, the City completed its Urban Master Environmental Servicing Plan (UMESP). The UMESP was undertaken to identify the infrastructure work needed to support the planned growth and intensification within centers and corridors identified in the City's Official Plan.

For water and wastewater services, the population and employment increases forecasted in the Official Plan will yield greater water demands and increased wastewater generation rates. Scenarios included the 2031 Official Plan planning horizon, along with 2051 and Ultimate scenarios. The Ultimate scenario represented full buildout of all parcels within the study area to the approved densities provided in the Official Plan.

Monitoring of the wastewater collection system was undertaken to compare observed flows in the sanitary sewer system to current design criteria at the time of the study commenced. The monitoring program demonstrated that observed flows are generally less than expected flows. This information did not impact the recommended improvements and may be used by the City to refine the timing of recommended improvements.

The modelling of the wastewater collection system revealed a number of deficiencies under future conditions. The evaluation of alternatives concluded that enhancement and expansion of the existing collection system be undertaken, along with consideration for long term water conservation strategies.

The analysis identified 18 improvement projects, with the majority of these being required beyond the 2031 growth projections within the study area. The total cost of the recommended wastewater system improvements was estimated to be $24,700,000.

The modelling of the water distribution network revealed sections that do not have sufficient capacity for the future conditions. The evaluation of alternatives concluded that a single improvement project should be undertaken. The recommended improvement involves a pressure zone conversion near Yonge Street and Major Mackenzie Drive. This improvement is partially located within the Downtown Local Centre Secondary Plan Area. Street network refinements within the Secondary Plan areas may trigger the need for service improvements. The total cost of the recommended water system improvement was estimated to be $600,000.

For this study, the 2014 UMESP was reviewed to provide strategic guidance for essential upgrades in municipal water and wastewater infrastructure for the 2041, 2051 and Ultimate Build-Out growth scenarios, all of which are necessary to facilitate and sustain urban growth and intensification as outlined in the City's Official Plan.

## *2.2 Richmond Hill Official Plan*

The Official Plan describes a City structure framework to direct growth to built-up urban areas with existing infrastructure and services in a network of centres and corridors and determine land use spatially throughout the City.

Given that Richmond Hill's settlement area is nearly built out, most development in the City will occur through *intensification*. Intensification is the development of a property, site or area at a higher density


Civica Infrastructure Inc. • 330 Rodinea Road, Unit 3, Vaughan, Ontario, Canada, L6A 4P5 • 905-417-9792 | www.civi.ca | info@civi.ca

than currently exists. The majority of intensification in the City shall occur in the *centres and corridors* shown on Schedule A1 (City Structure) and defined by the land use designations shown on Schedule A2 (Land Use) and the policies of the Plan. Intensification outside of the centres and corridors shall be limited in accordance with the policies of the Plan.

In the City's intensification hierarchy, Centres are recognized as focal points and destination areas where a mix of uses shall be required, whereas Corridors play a supporting role to these Centres. Corridors provide connections, continuity, and transition between Centres, forming a cohesive network of mixed-use lands that serve the broader community and Region as a whole. **Figure 2-1** shows the City structure elements defined in the City's OP. The City centres and corridors identified in the City's structure are:

**City Centres:**

- Richmond Hill Centre
- Yonge Street and 16th Avenue/Carrville Road Key Development Area
- Yonge Street and Bernard Avenue Key Development Area
- Village Local Centre
- Oak Ridges Local Centre
- Newkirk Local Centre
- Bathurst and Highway 7 Local Centre
- East Beaver Creek and Highway 7 Local Centre
- Trench Street Local Development Area
- Bayview Local Development Area

**City Corridors:**

- Yonge Street Regional Corridor
- Highway 7 Regional Corridor
- Major Mackenzie Local Corridor

**Richmond Hill Centre**: Richmond Hill Centre at Yonge Street and Highway 7 is identified as an urban growth centre in the Growth Plan for the Greater Golden Horseshoe and as a Regional Centre in the York Region Official Plan. The Richmond Hill Centre is part of the Richmond Hill/Langstaff Gateway Urban Growth Centre (UGC) shared with the City of Markham. It will become a vibrant, urban mixed-use centre that is transit-oriented and supports pedestrian and other forms of active transportation. This centre will contain the greatest height and densities in the City, focused around a major inter-modal Regional transit hub.

**Key Development Areas (KDAs):** KDAs are intensification areas located along the Regional Corridors where public rapid transit services intersect with major nodes of retail and commercial development, and where opportunities exist for redevelopment of large land parcels that can support new public streets. The Yonge and 16th Avenue KDA and the Yonge and Bernard Avenue KDA are envisioned as sub-centres or inter-modal nodes between the Local and Regional Centres.

**Regional Corridors:** Both Yonge Street and Highway 7 are Regional Corridors. Regional Corridors function as key connections between centres in York Region and centres across the Greater Toronto Area (GTA), accommodating rapid transit. While the Regional Corridors are anticipated to accommodate intensification, this Plan recognizes that the character of the areas along the corridors vary (i.e., historical


Civica Infrastructure Inc. • 330 Rodinea Road, Unit 3, Vaughan, Ontario, Canada, L6A 4P5 • 905-417-9792 | www.civi.ca | info@civi.ca

character, natural heritage, employment areas). Certain portions of the Regional Corridors will not develop or intensify in order to protect the Greenway System, to be maintained for employment uses only, and/or to maintain its predominant neighbourhood function.

**Local Centres:** Local Centres are intended to function as mixed use centres to serve adjacent neighbourhoods. They will be transit supportive, complete community areas, each with a unique character due to the existing built context, cultural heritage and/or natural heritage that exists within them. Five Local Centres (Village, Oak Ridges, Newkirk, Bathurst/Highway 7, and East Beaver Creek/Highway 7) are identified in the City's structure.

**Local Development Areas (LDAs):** LDAs are areas where a cluster of land uses and/or public transit services intersect with a Local Corridor providing a local destination point and opportunities for redevelopment. The Trench Street LDA and the Bayview LDA are envisioned as small-scale, sub-centres along the Local Corridor to serve adjacent neighbourhood and the community.

**Local Corridors:** Major Mackenzie Drive is identified as a Local Corridor. The Local Corridor functions as a key east-west connection between municipalities in southern York Region and is planned to accommodate a public rapid transit system. While the Local Corridor is anticipated to accommodate intensification, this Plan recognizes that the character of the corridor varies along its length in terms of building form, land use, and intensification of land uses.

Remaining areas, including Employment Lands, are not projected to undergo the level of intensification associated with the above noted elements of the City structure, and fall outside the study area scope of this MESP.

On the contrary, the Greenway System, which is defined as a key element of the City's City structure, is relevant to this MESP as development and associated infrastructure works must protect and enhance the Greenway System.

The Official Plan also sets out the densities associated with the various land use types. These densities were used to project beyond the 2041 forecast to identify whether additional municipal service constraints would ensue for the ultimate buildout, beyond 2051. These scenarios have been evaluated to provide the City with the ability to adapt to the potential variability of redevelopment patterns and timing.


Civica Infrastructure Inc. • 330 Rodinea Road, Unit 3, Vaughan, Ontario, Canada, L6A 4P5 • 905-417-9792 | www.civi.ca | info@civi.ca

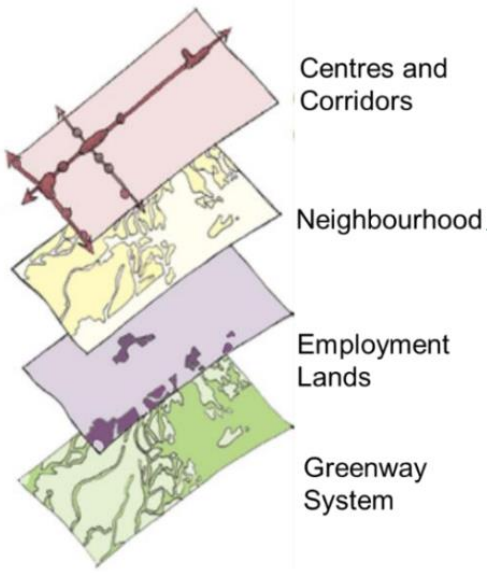



***Figure 2-1: City structure Elements. Source: Key Directions Report***

## *2.3 York Region Official Plan*

The York Region Official Plan was approved by the Province of Ontario with modifications in November 2022, and provides the basis for the delivery of infrastructure and facilities needed to support the established growth projections, which are consistent with those defined by Richmond Hill's Official Plan.

This UMESP addresses the City infrastructure and facilities needed to support projected growth, but coordination with the Region was undertaken to ensure that interdependencies were thoroughly considered in the identification of proposed works and improvements.

## *2.4 York Region Water and Wastewater Master Plan*

York Region's water and wastewater infrastructure systems support and supply the local City of Richmond Hill water and wastewater systems. The Region's Master Plan Update was endorsed by Regional Council in May 2022, and considered the improvements needed to service the growth projections outlined in both the City's and Region's Official Plans to the year 2051 and beyond.

The Region's Master Plan and corresponding infrastructure data were reviewed in relation to this UMESP to coordinate with the evaluation of the City's water and wastewater networks.

## *2.5 Study Components and Requirements*

In terms of support for planning processes, each component of this UMESP sets out to address the infrastructure improvements, requirements, and recommendations necessary at three different scales:

- At the **study area wide scale**, the recommendations are associated with the overall study area;
- At the **Secondary Plan scale**, the recommendations provide input and guidance with respect to the infrastructure needs for those areas within the UMESP study area requiring Secondary


Civica Infrastructure Inc. • 330 Rodinea Road, Unit 3, Vaughan, Ontario, Canada, L6A 4P5 • 905-417-9792 | www.civi.ca | info@civi.ca

Plans. As required in the Official Plan, Secondary Plans will be completed for the Richmond Hill Centre, the Downtown Local Centre, the Oak Ridges Local Centre, the Yonge Street and 16th Avenue KDA, and the Yonge Street and Bernard Avenue KDA.

- At the **Site Plan scale**, the recommendations provide requirements and guidelines for infrastructure works, criteria, and analyses that must accompany individual site-specific development applications.

A steering committee for this UMESP was established at the outset and included representatives of a number of City departments, York Region, and members of the study team.

# 3.0 Existing Environment

## *3.1 Natural Environment and the Greenway System*

As established by the Environmental Policy Review, the Greenway System is the overarching framework for the City's natural heritage policies and will not accommodate intensification and only those uses outlined under the Greenway System land use designations will be permitted. **Figure 3-1** illustrates the City of Richmond Hill Greenway System in the vicinity of the study areas as depicted on Schedule A1 from the Official Plan.


Civica Infrastructure Inc. • 330 Rodinea Road, Unit 3, Vaughan, Ontario, Canada, L6A 4P5 • 905-417-9792 | www.civi.ca | info@civi.ca

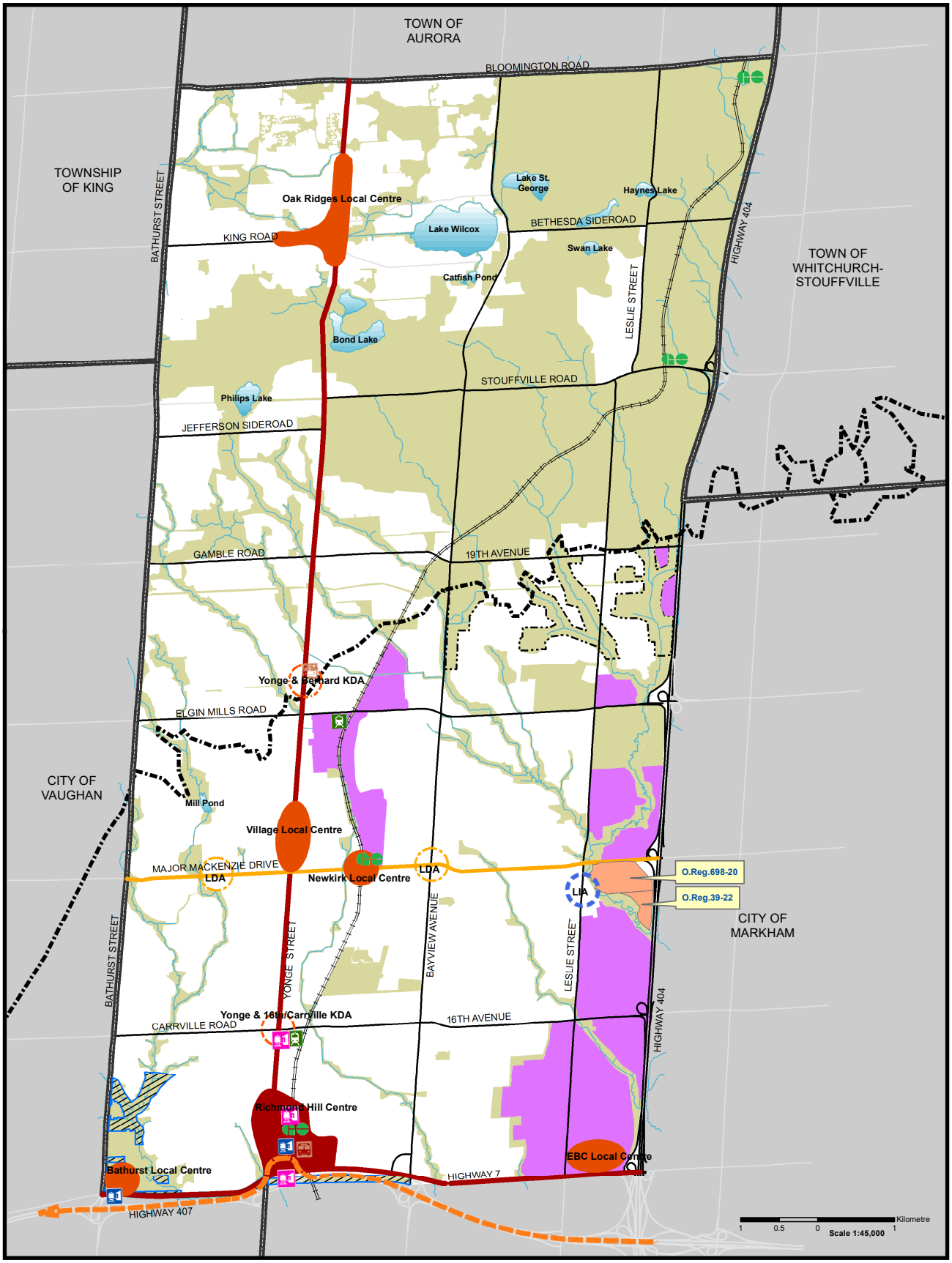



**FIGURE 3-1:**
RICHMOND HILL OFFICIAL PLAN
**City Structure**
SCHEDULE A1

## Legend

**Centres & Corridors**

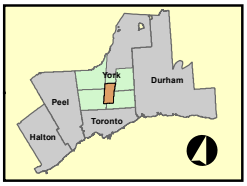
- Richmond Hill Centre
- Key Development Areas
- Local Centres
- Local Development Areas
- Leslie Street Institutional Area
- Regional Corridor
- Local Corridor

- Neighbourhood Areas
- Employment Lands
- Greenway Systems

**Transit Infrastructure**

- Existing GO Station
- Proposed GO Station
- Terminal
- Proposed TTC Subway

- 407 Transitway
- Proposed 407 Transitway Stations
- Oak Ridges Moraine Conservation Plan Area
- Greenbelt Plan Area
- Parkway Belt West Plan
- Areas Subject to Minister's Zoning Order
- Waterbodies
- Watercourses
- C.N.R.






PLANNING & INFRASTRUCTURE DEPARTMENT

\\richmondhill.local\Divisions\Policy Planning\Policy\Admin and Collab\Reference and Resources\1_Research Library\Mapping Library\OP Atlas Working Folder\Basemaps_Atlas\ArcGIS Maps\OP Update Maps\RHOP_SchA1_CityStructure_Final_v1.mxd 08-Mar-23

The Greenway System occurs in both the urban and rural areas of the City. It is generally comprised of rural, agricultural and environmental lands. Urban open spaces also form part of the interconnected Greenway System. The Greenway System provides tourism and economic opportunities as well as social/recreational and environmental opportunities. The natural areas of the Greenway System include features and functions of the natural environment including a portion of the Oak Ridges Moraine, the Greenbelt urban river valleys, the Don River, Rouge River, Humber River, and East Holland River system, and numerous wetlands, kettle lakes, forests, and woodlots in the City. This Official Plan protects and enhances the Greenway System over the long-term.

### *3.2 Socio-Economic Environment*

The City serves as both a destination and a major transit hub for commuters in the GTA. Socio-economic, natural and cultural landmarks such as the historic village core in the Downtown, the identifiable Beaver Creek Business Park, neighborhoods such as Mill Pond and Lake Wilcox, and the David Dunlap Observatory continue to provide unique and interesting places. Foremost, the City's central location in the middle of a thriving metropolitan region places Richmond Hill front and centre in the GTA. This location is partly what led to the City's past growth and development and will continue to influence it in the future.

In recognition of the City's urbanization and limited supply of employment lands, a comprehensive approach is set out to provide for an appropriate mix of employment uses within the City including industrial, commercial, retail and institutional uses to meet long term needs. The future economic vision for the City is for continued strong economic performance on its employment lands with an increased emphasis on developing its centres and corridors as the focal points of economic activity for office and population-related employment. To maintain and promote Richmond Hill's economic vitality, this Official Plan protects and seeks to maximize the appropriate use for the City's employment lands while diversifying Richmond Hill's economic base, where appropriate, throughout the City.

The City's local economy is well-served by its business parks along the Highway 404 corridor and within the Newkirk Business Park. The City has experienced pressure to convert its employment lands to retail, commercial, residential and other non-employment uses. Recognizing the City's limited employment land supply, this Plan maintains and protects the City's existing employment lands for employment uses as permitted by the policies of this Official Plan. The intent of these policies is to ensure that the long-term supply of employment lands is maintained to meet the future needs of the City and to ensure an appropriate balance of land uses across the City.

## 4.0 Water and Wastewater Services

### *4.1 General*

This portion of the UMESP document outlines the current status of the wastewater collection and water distribution systems in the UMESP study region. By constructing models for these systems using the InfoWorks ICM and InfoWater platforms, this assessment forms the foundation for identifying any limitations in servicing that might impact future development in the study area, and for choosing the suitable strategies to tackle these limitations.

The future condition projections applied to the study area are based on the values and principles described in **Section 5.0**.


Civica Infrastructure Inc. • 330 Rodinea Road, Unit 3, Vaughan, Ontario, Canada, L6A 4P5 • 905-417-9792 | www.civi.ca | info@civi.ca

At the onset of assignment, there was an underlying assumption that future growth would need improvements to the water and wastewater infrastructure. Thus, it becomes crucial to promptly recognize the opportunities and limitations that might influence the assessment of alternative solutions, ensuring the reliability of the resulting recommendations.

## *4.2 Wastewater*

The City of Richmond Hill currently owns and operates approximately 9,292 sanitary sewers and 8,928 sanitary maintenance holes. The sewer diameters range from 125 mm to 2,700 mm. The City's wastewater collection system discharge to four Regional trunk sewers which flow in a southerly direction, including:

- The North Don Collector;
- The Central Collector;
- The Richmond Hill Collector (also referred to as the Yonge Street Collector); and,
- The 19th Avenue Collector (which flows east to the YDSS).

For the purpose of this study, the study area was limited to the local sanitary sewers. **Figure 4-1** illustrates the local and the Regional trunk systems.

### *4.2.1 Wastewater Model Development*

The sewer network information was initially assembled using both the sewer network database provided by the City and the previous InfoSewer model; however, some assets had one or multiple gaps or issues. Therefore, appropriate assumptions were made to rectify/infill the data gaps. See **Appendix A** for details on the data gap rectification.

New subcatchments were discretized based on the lot fabric shapefile information, and population was assigned using the 2016 census data per Traffic Zone (TZ) and Water Consumption (WC) data. A total of 7,536 subcatchments were delineated. The 2016 annual water consumption data per individual address was used to distribute the population within each traffic zone.

For boundary conditions, the Regional trunk sewers were evaluated under the 25-year design storm (using the IDF curve pre-2021) and confirmed no surcharge conditions. Therefore, it can be concluded that there is no backflow affecting local sewers, and the downstream system can be modelled as free flow outfalls.

### *4.2.2 Sanitary Flow Monitoring*

Available historical rainfall and flow monitoring data was reviewed and analyzed to characterize dry weather flow (DWF) and wet weather flow (WWF) for use in the hydrodynamic model calibration. The flow monitoring data provides an indication of the performance of the wastewater network under various rain events.

Flow data from twenty-one (21) sanitary flow monitoring stations and three (3) rain gauges were selected for this study. **Figure 4-2** shows the location of these flow meter stations and rain gauges.

N

Bloomington Road

King Road

Bethesda Sideroad

Dufferin Road

Bathurst Street

Yonge Street

Stouffville Rd

Bayview Avenue

Leslie Street

Woodbine Avenue

19th Ave

Highway 404

Teston Road

Elgin Mills Rd E

Major Mackenzie Dr

Major Mackenzie Dr E

Rutherford Rd

16th Avenue

Highway 7

Richmond Hill

CIVICA

**RIC18-0004 -**
**Richmond Hill UMESP Update**

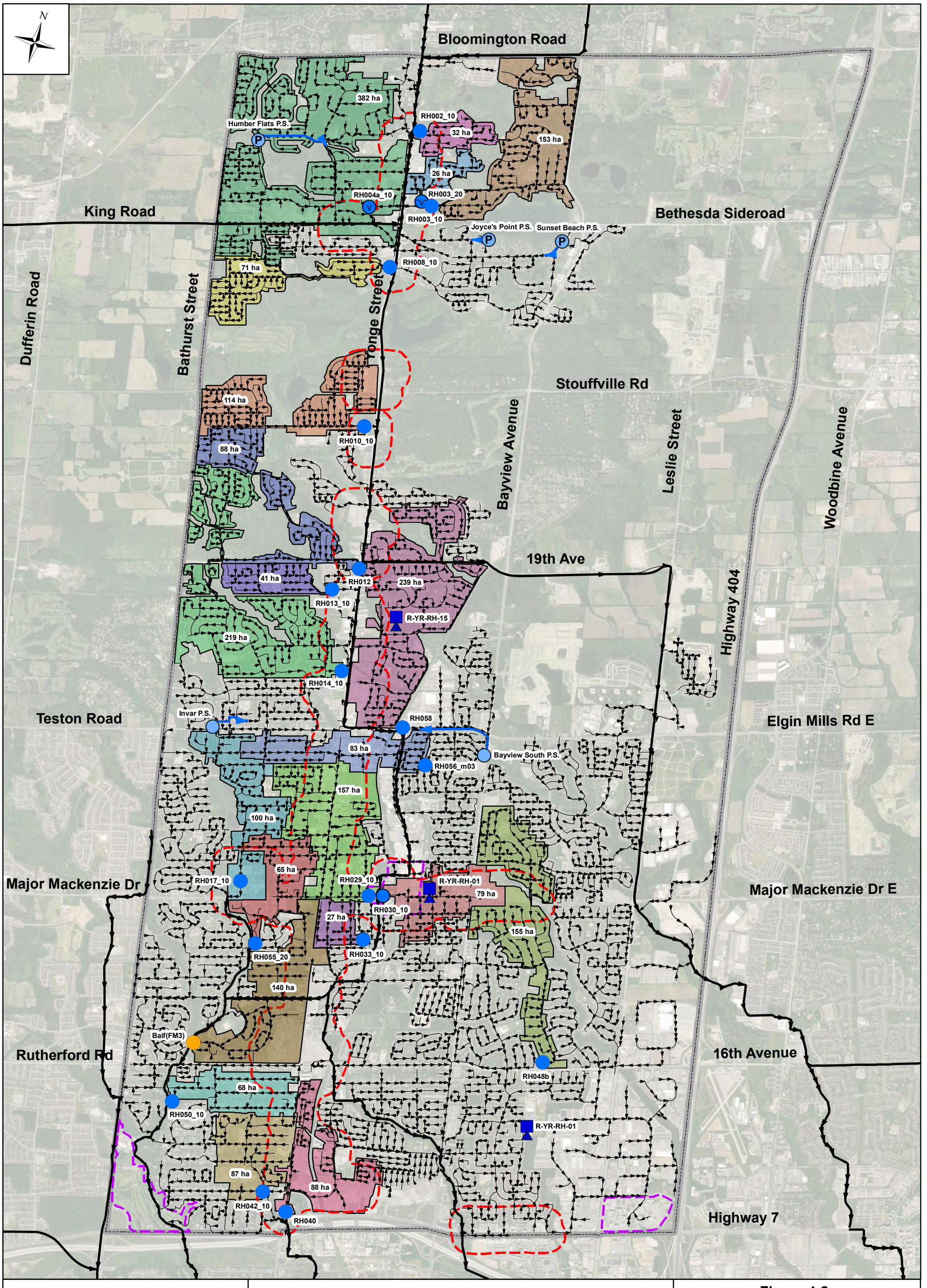
**Legend**

- Existing Sanitary Manholes
- Existing Sanitary Conduits
- Study Boundary
- Emerging Growth Centres
- Municipal Boundary

**Figure 4-1:**
**Wastewater Collection System**

Drawn By: J.H. Date: Oct 28, 2023

0 500 1,000 2,000 Meters




Richmond Hill CIVICA

**RIC18-0004 - Richmond Hill UMESP Update**

**Legend**

- 2016 Flow Monitoring Locations (20)
- 2017 Flow Monitoring Location (1)
- 2016 Rain Gauges (3)
- Existing Pumping Stations (5)
- Forcemains
- Sanitary Sewers
- York Region Sanitary Trunk Sewers
- Drainage Area
- Study Areas
- Emerging Growth Centres
- Municipal Boundary

**Figure 4-2: Drainage Areas and Flow Monitoring Locations (2016 & 2017)**

Drawn By: J.H. Date: Oct 28, 2023

0 500 1,000 2,000 Meters

#### 4.2.2.1 Dry Weather Flow

The measured flow parameters for each subcatchment are summarized in **Table 4-1**. These values were calculated using data from the 2016 flow monitoring period. The population is estimated based on the 2016 Census and Traffic Zone given by the City.

***Table 4-1: DWF Parameters used in the model***

| Flow Monitoring Station | Area (ha) | Land Use (1) | Residential Population | ICI Population | Total Population | Daily DWF Volume (L) | DWF Rate (L/c/d) | Measured Peaking Factor |
|---|---|---|---|---|---|---|---|---|
| RH002_10 | 31.6 | Res | 954 | 38 | 992 | 320,475 | 323 | 1.64 |
| RH003_10 | 134.3 | Res | 4,957 | 206 | 5,163 | 1,403,637 | 272 | 1.34 |
| RH003_20 | 26.2 | Res | 933 | 232 | 1,165 | 327,971 | 282 | 1.33 |
| RH004a_10 | 366.9 | Res | 11,920 | 1,620 | 13,540 | 3,737,550 | 276 | 1.31 |
| RH008_10 | 69.2 | Res | 3,979 | - | 3,979 | 990,285 | 249 | 1.49 |
| RH010_10 | 111.7 | Res | 6,148 | 391 | 6,539 | 1,025,462 | 157 | 1.83 |
| RH012 | 83.5 | Res | 3,921 | 427 | 4,348 | 996,909 | 229 | 1.59 |
| RH013_10 | 38.8 | Res | 2,198 | 302 | 2,500 | 679,759 | 272 | 1.61 |
| RH014_10 | 213.8 | Res | 11,109 | 519 | 11,628 | 3,106,695 | 267 | 1.7 |
| RH058 | 221.3 | Res | 11,739 | 1,569 | 13,308 | 2,310,197 | 174 | 1.42 |
| RH056_m03 | 82.2 | Res + ICI | 1,922 | 1,684 | 3,606 | 298,930 | 83 | 1.51 |
| RH017_10 | 99.7 | Res + ICI | 2,275 | 3,124 | 5,399 | 1,059,969 | 196 | 1.39 |
| RH055_20 | 65.0 | Res | 1,922 | 116 | 2,038 | 814,968 | 400 | 1.21 |
| RH029_10 | 157.4 | Res + ICI | 5,667 | 3,141 | 8,808 | 2,048,231 | 233 | 1.25 |
| RH030_10 | 78.7 | Res | 3,328 | 777 | 4,105 | 1,284,364 | 313 | 1.34 |
| RH033_10 | 27.1 | Res | 1,238 | 246 | 1,484 | 341,250 | 230 | 1.31 |
| RH050_10 | 67.8 | Res | 1,499 | 359 | 1,858 | 731,657 | 394 | 1.17 |
| RH040 | 88.3 | Res + ICI | 6,889 | 2,533 | 9,422 | 1,988,368 | 211 | 1.48 |
| RH042_10 | 70.5 | Res + ICI | 1,594 | 460 | 2,054 | 646,910 | 315 | 1.26 |
| RH048b | 151.5 | Res | 5,993 | 1,306 | 7,299 | 1,671,329 | 229 | 1.55 |
| Civica FM3 | 139.8 | Res + ICI | 5933 | 3744 | 9677 | 2,212,638 | 223 | 1.23 |

(1) Areas with 80% or more residential land use were assumed to be Residential (RES), areas with 80% or more ICI land use were assumed to be ICI, the rest were assumed to be mixed-used (Res + ICI)

#### 4.2.2.2 Wet Weather Flow

The number and magnitude of significant storms is important for assessing the suitability of the data for model calibration. The greater the number and larger the magnitude of storms, the more reliable and accurate the model should be when used to predict system response during critical (design) storms. **Table 4-2** summarizes the most intense storms captured during the 4-months period, from May 1, 2016 to August 31, 2016, selected to calibrate the model.

***Table 4-2: The 5 most intense storms captured during the 4-months monitoring period***

| Event | R YR RH 01 Peak Intensity 5 min (mm/hr) | R YR RH 10 Peak Intensity 5 min (mm/hr) | R YR RH 15 Peak Intensity 5 min (mm/hr) | Return Period |
|---|---|---|---|---|
| August 13, 2016 | 74.4 | 55.2 | 84.0 | < 2-year |
| July 25, 2016 | 64.8 | 62.4 | 62.4 | < 2-year |
| June 11, 2016 | 55.2 | 62.4 | 52.8 | < 2-year |
| July 27, 2016 | 50.4 | 0 | 43.2 | < 2-year |
| June 5, 2016 | 38.4 | 19.2 | 26.4 | < 2-year |

### *4.2.3 Wastewater Model Calibration*

The Groundwater Infiltration Module (GIM) method was used to calibrate the model for wet weather responses. The advantage of the InfoWorks GIM is to provide a large, highly attenuated response to rainfall which typically originates from groundwater infiltration, or large pervious areas of the catchment, as well as to allow continuous simulation.

There is a total of ten (10) parameters used in GIM. Of these, the Porosity of Soil, Porosity of Ground and the Soil Depth should be fixed as they have a physical basis. The remaining seven (7) parameters are calibration coefficients and these should be adjusted to match the observed flows. The continuous simulation accounts for antecedent moisture conditions (AMC) which may have an impact on the I/I response.

### *4.2.4 Calibration Results*

A 4-month period, from May 1, 2016 to August 31, 2016 was selected to calibrate the City's sanitary sewer. The results show good agreement between the measured and modelled values for all stations, except for station RH003_20, as shown in **Table 4-3**. For station RH003_20, the predicted peak flow for the August 14-19 event is 33% higher than the observed peak flow. The results shows that all the other simulated events were within the WaPUG criteria in terms of both peak flow and total volume. This confirms that the model is able to project the actual scenario within an acceptable deviation.

Further information about the wastewater model development, calibration and results can be found in **Appendix A**.


Civica Infrastructure Inc. • 330 Rodinea Road, Unit 3, Vaughan, Ontario, Canada, L6A 4P5 • 905-417-9792 | www.civi.ca | info@civi.ca

*Table 4-3: Model calibration results*

| Station | Event Date | Rainfall | | Peak Flow (m3/s) | | | Volume (m3) | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Volume | Peak Intensity (mm/hr) | Measured | Modelled | Difference (%) | Measured | Modelled | Difference (%) |
| RH002_10 | Aug 14-19 2016 | 21.0 | 14.4 | 0.010 | 0.009 | -10% | 1,739 | 1,681 | -3% |
| | July 24-30 2016 | 41.2 | 62.4 | 0.009 | 0.011 | 22% | 1,962 | 2,098 | 7% |
| | May 10-20 2016 | 26.4 | 24.0 | 0.009 | 0.008 | -11% | 3,217 | 3,324 | 3% |
| RH003_10 | Aug 14-19 2016 | 21.0 | 14.4 | 0.032 | 0.035 | 9% | 7,742 | 7,329 | -5% |
| | July 24-29 2016 | 30.8 | 62.4 | 0.024 | 0.029 | 21% | 6,312 | 7,242 | 15% |
| | June 03-13 2016 | 30.2 | 52.8 | 0.029 | 0.026 | -10% | 15,419 | 14,717 | -5% |
| RH003_20 | Aug 14-19 2016 | 21.0 | 14.4 | 0.006 | 0.008 | **33%*** | 1,625 | 1,700 | 5% |
| | July 24-27 2016 | 18.8 | 62.4 | 0.005 | 0.006 | 20% | 1,170 | 1,223 | 5% |
| | June 03-13 2016 | 30.2 | 52.8 | 0.007 | 0.006 | -14% | 3,518 | 3,418 | -3% |
| RH004a_10 | Aug 14-19 2016 | 21.0 | 14.4 | 0.080 | 0.100 | 25% | 19,347 | 19,312 | 0% |
| | July 13-15 2016 | 14.2 | 21.6 | 0.064 | 0.064 | 0% | 9,998 | 10,498 | 5% |
| | June 03-13 2016 | 30.2 | 52.8 | 0.079 | 0.073 | -8% | 41,593 | 38,059 | -8% |
| RH008_10 | June 03-13 2016 | 30.2 | 52.8 | 0.020 | 0.020 | 0% | 9,838 | 10,375 | 5% |
| | May 12-18 2016 | 26.4 | 24.0 | 0.020 | 0.020 | 0% | 7,023 | 7,227 | 3% |
| | July 01-26 2016 | 42.8 | 62.4 | 0.019 | 0.018 | -5% | 26,054 | 27,253 | 5% |
| RH010_10 | Aug 15-19 2016 | 21.0 | 14.4 | 0.029 | 0.028 | -3% | 4,704 | 4,409 | -6% |
| | June 03-13 2016 | 30.2 | 52.8 | 0.028 | 0.025 | -11% | 10,243 | 10,808 | 6% |
| | May 09-21 2016 | 26.4 | 24.0 | 0.027 | 0.026 | -4% | 12,664 | 12,639 | 0% |
| RH012 | Aug 14-19 2016 | 21.0 | 14.4 | 0.020 | 0.023 | 15% | 4,800 | 5,125 | 7% |
| | July 24-30 2016 | 41.2 | 62.4 | 0.023 | 0.026 | 13% | 6,056 | 6,349 | 5% |
| | June 03-13 2016 | 30.2 | 52.8 | 0.021 | 0.020 | -5% | 10,247 | 10,360 | 1% |
| RH013_10 | Aug 14-19 2016 | 21.0 | 14.4 | 0.018 | 0.016 | -11% | 3,573 | 3,454 | -3% |
| | July 24-30 2016 | 41.2 | 62.4 | 0.018 | 0.021 | 17% | 4,281 | 4,318 | 1% |
| | June 03-13 2016 | 30.2 | 52.8 | 0.014 | 0.014 | 0% | 7,234 | 6,970 | -4% |
| RH014_10 | Aug 14-19 2016 | 21.0 | 14.4 | 0.073 | 0.069 | -5% | 17,209 | 15,999 | -7% |
| | July 24-30 2016 | 41.2 | 62.4 | 0.081 | 0.082 | 1% | 19,133 | 19,931 | 4% |
| | June 30 - July 04 2016 | 9.6 | 19.2 | 0.066 | 0.059 | -11% | 12,477 | 12,422 | 0% |
| RH058 | May 11-21 2016 | 26.4 | 24.0 | 0.049 | 0.045 | -8% | 11,843 | 11,983 | 1% |
| | June 03-13 2016 | 30.2 | 52.8 | 0.044 | 0.045 | 2% | 20,975 | 24,154 | 15% |
| | July 23-27 2016 | 31.0 | 62.4 | 0.043 | 0.050 | 16% | 13,931 | 14,155 | 2% |
| RH056_m03 | Aug 15-21 2016 | 15.8 | 14.4 | 0.016 | 0.014 | -13% | 2,228 | 2,009 | -10% |
| | July 23-26 2016 | 23.0 | 64.8 | 0.016 | 0.015 | -6% | 1,424 | 1,446 | 2% |
| | July 27 - Aug 06 2016 | 19.0 | 50.4 | 0.014 | 0.013 | -7% | 3,864 | 3,923 | 2% |

| Station | Event Date | Rainfall | | Peak Flow (m3/s) | | | Volume (m3) | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Volume | Peak Intensity (mm/hr) | Measured | Modelled | Difference (%) | Measured | Modelled | Difference (%) |
| RH017_10 | Aug 12-19 2016 | 53.0 | 74.4 | 0.047 | 0.059 | 26% | 7,678 | 8,037 | 5% |
| | July 24-30 2016 | 37.2 | 64.8 | 0.029 | 0.028 | -3% | 7,434 | 6,838 | -8% |
| | June 09-13 2016 | 12.2 | 55.2 | 0.020 | 0.019 | -5% | 3,608 | 3,723 | 3% |
| RH055_20 | Aug 12-19 2016 | 53.0 | 74.4 | 0.039 | 0.046 | 18% | 6,088 | 6,406 | 5% |
| | June 03-13 2016 | 33.4 | 55.2 | 0.016 | 0.016 | 0% | 8,851 | 8,650 | -2% |
| | May 16-31 2016 | 15.2 | 31.2 | 0.017 | 0.017 | 0% | 16,343 | 14,960 | -8% |
| RH029_10 | Aug 12-19 2016 | 53.0 | 74.4 | 0.133 | 0.138 | 4% | 14,726 | 15,855 | 8% |
| | July 24-30 2016 | 37.2 | 64.8 | 0.094 | 0.094 | 0% | 13,134 | 13,481 | 3% |
| | June 03-13 2016 | 33.4 | 55.2 | 0.058 | 0.051 | -12% | 21,854 | 21,626 | -1% |
| RH030_10 | Aug 12-19 2016 | 53.0 | 74.4 | 0.061 | 0.057 | -7% | 9,331 | 9,499 | 2% |
| | July 22-31 2016 | 37.2 | 64.8 | 0.034 | 0.034 | 0% | 11,830 | 11,849 | 0% |
| | June 03-13 2016 | 33.4 | 55.2 | 0.024 | 0.024 | 0% | 13,499 | 13,294 | -2% |
| RH033_10 | Aug 12-19 2016 | 53.0 | 74.4 | 0.033 | 0.029 | -12% | 2,849 | 2,686 | -6% |
| | July 24-30 2016 | 37.2 | 64.8 | 0.021 | 0.021 | 0% | 2,088 | 2,271 | 9% |
| | June 03-13 2016 | 33.4 | 55.2 | 0.012 | 0.011 | -8% | 3,299 | 3,626 | 10% |
| RH050_10 | Aug 12-19 2016 | 53.0 | 74.4 | 0.061 | 0.056 | -8% | 6,434 | 5,925 | -8% |
| | July 10-20 2016 | 13.0 | 31.2 | 0.016 | 0.016 | 0% | 7,865 | 7,663 | -3% |
| | May 11-21 2016 | 22.8 | 31.2 | 0.016 | 0.018 | 13% | 8,239 | 7,643 | -7% |
| RH040 | Aug 14-19 2016 | 15.8 | 16.8 | 0.039 | 0.037 | -5% | 10,220 | 10,044 | -2% |
| | July 24-30 2016 | 24.8 | 62.4 | 0.040 | 0.035 | -13% | 12,317 | 12,403 | 1% |
| | June 03-13 2016 | 37.4 | 62.4 | 0.040 | 0.035 | -13% | 20,339 | 20,564 | 1% |
| RH042_10 | Aug 12-19 2016 | 52.2 | 55.2 | 0.053 | 0.060 | 13% | 5,107 | 5,057 | -1% |
| | June 02-16 2016 | 37.4 | 62.4 | 0.027 | 0.025 | -7% | 9,970 | 9,254 | -7% |
| | May 11-21 2016 | 23.0 | 40.8 | 0.017 | 0.016 | -6% | 7,953 | 6,336 | -20% |
| RH048b | Aug 14-19 2016 | 15.8 | 16.8 | 0.037 | 0.036 | -3% | 8,526 | 8,717 | 2% |
| | July 24-30 2016 | 24.8 | 62.4 | 0.041 | 0.046 | 12% | 10,458 | 11,037 | 6% |
| | June 03-13 2016 | 37.4 | 62.4 | 0.033 | 0.034 | 3% | 17,141 | 17,842 | 4% |
| Civica FM3 | July 12-17 2017 | 42.7 | 91.4 | 0.057 | 0.055 | -4% | 9,855 | 11,538 | 17% |
| | July 19-23 2017 | 23.9 | 67.1 | 0.054 | 0.067 | 24% | 8,126 | 8,677 | 7% |
| | Aug 17-24 2017 | 38.6 | 103.6 | 0.05 | 0.061 | 22% | 14,328 | 16,482 | 15% |

*Predicted peak flow is not within the WaPUG criteria

### 4.2.5 Model Assumptions and Limitations

Based on the quality of the data available at the time the model was developed, and the assumptions made in consultation with the City of Richmond Hill, the wastewater hydraulic model provides the most realistic representation of the existing sewer network performance conditions. Nevertheless, it should be noted that there are some limitations with the use and application of the calibrated model for the study area. The model limitations include:

- The best possible information available at the time was used to create, calibrate and validate the model; however, assumptions had to be made to fill the data gaps;
- Flow monitoring was used to calibrate the model. For non-monitoring areas, the City's design criteria was used DWF and I/I rates;
- The model was calibrated using rainfall events with a return period less than 2-year;
- Thiessen polygons were assumed for rainfall distribution; and,
- The model is designed to predict municipal sewer surcharge, and not to detect temporary or permanent potential operational failures such as sewer blockages.

### 4.2.6 Assessment of Existing Conditions

Under existing conditions, the existing sanitary sewer performance under the City's 25-year design storm is depicted in **Figure 4-3.** As shown, the sanitary sewer system is predicted to surcharge at multiple locations due to bottlenecks and backwater, caused by bottlenecks. A level of surcharge (water level above the obvert of the pipe) greater than 0.3 m can be seen along Naughton Drive, East of Yonge Street. Also, at multiple locations between Elgin Mills Road and Major Mackenzie Drive; and along Harding Boulevard, just south of Major Mackenzie Drive. All the surcharging locations can be seen in **Figure 4-3.**

In consultation with the City, if surcharge is present during Existing Conditions, and is not caused by future growth within the Study Area, then remedial measures will not be evaluated as part of this study. Further studies are needed to evaluate proposed solutions and eliminate surcharge conditions in locations outside of the study area, and surcharge caused by existing developments (2016 population).


Civica Infrastructure Inc. • 330 Rodinea Road, Unit 3, Vaughan, Ontario, Canada, L6A 4P5 • 905-417-9792 | www.civi.ca | info@civi.ca

N

Bloomington Road

King Road

Bethesda Sideroad

Dufferin Road

Bathurst Street

Yonge Street

Stouffville Rd

Bayview Avenue

Leslie Street

Woodbine Avenue

19th Ave

Highway 404

Teston Road

Elgin Mills Rd E

Major Mackenzie Dr

Major Mackenzie Dr E

Rutherford Rd

16th Avenue

Highway 7

Richmond Hill

CIVICA

**RIC18-0004 -**
**Richmond Hill UMESP Update**

**Legend**

**Manhole Water Depth (m)**
**(Water Level to Obvert)**

- No Surcharge
- 0 - 0.15
- 0.15 - 0.3
- 0.3 - 0.6
- > 0.6

- York Region Sanitary Trunk Sewers
- Study Area Boundary
- Emerging Growth Centres
- Municipal Boundary

**Figure 4-3:**
**Level of Surcharge Under Existing Conditions**

Drawn By: J.H. Date: Oct 28, 2023

0 500 1,000 2,000 Meters

## *4.3 Water*

The City's water distribution system is a part of the York Region's system. The City provides water to its customers through four (4) Pressure Districts (PD6, PD7, PD8, and PD9, respectively. The existing conditions model reflects the system's condition to 2016. There were some changes in the system since 2016 that were only applied in the future conditions model. For example, the Flow Modulated Area (FMA) was removed in 2017. The valve setting in FMA was changed in 2017 which applied only to the future condition model. The 2016 pressure districts, including Flow Modulated Area (FMA), are displayed in **Figure 4-4**. Richmond Hill FMA was removed in 2017, which is discussed later in the report.

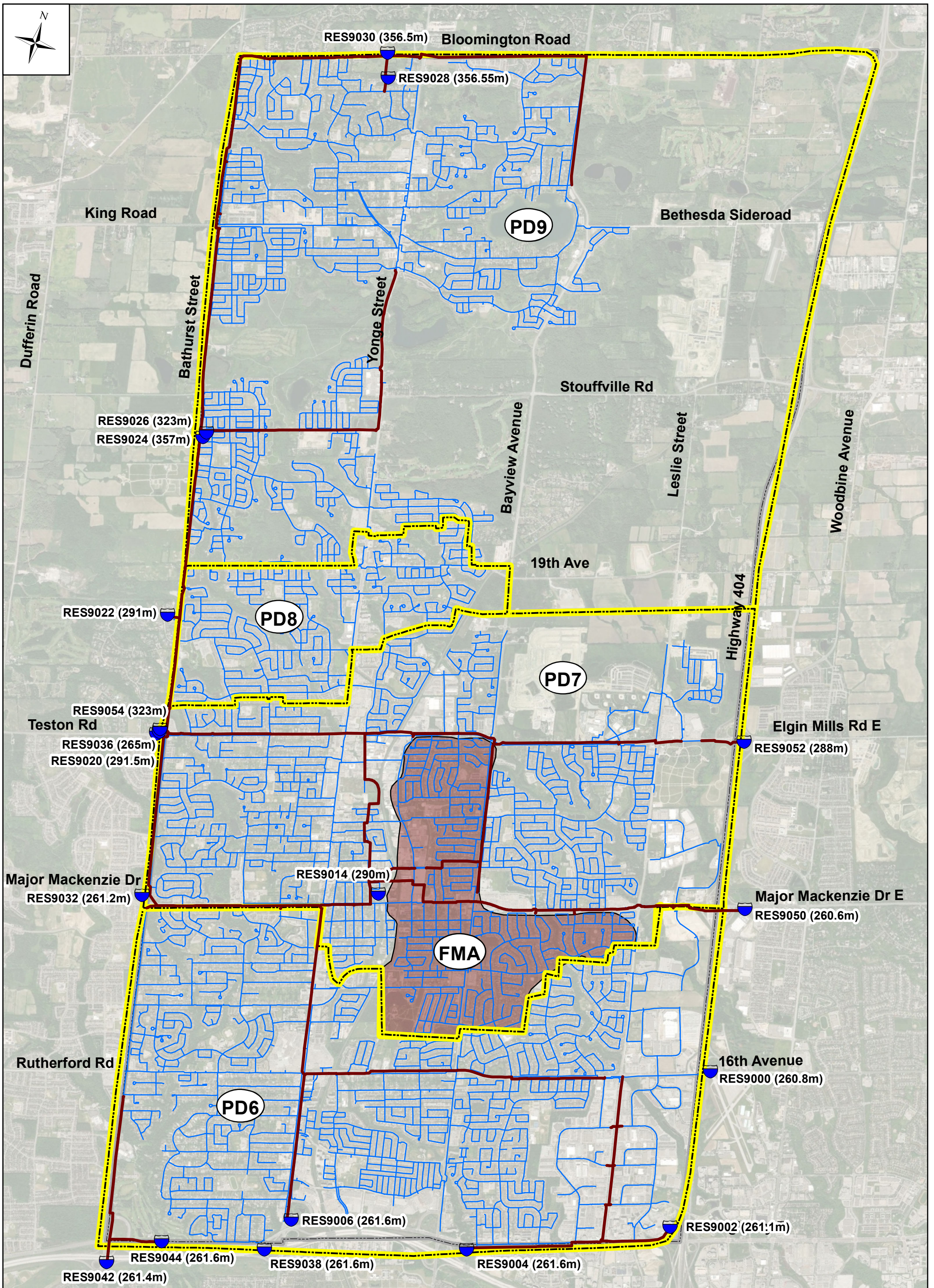
### *4.3.1 Water Model Development*

The previous 2014 City-wide model was developed to simulate the water distribution system under 2011 conditions and was used to analyze the system until the Ultimate Build-Out. As a part of this study, Civica Infrastructure (Civica) updated the 2011 model employing the updated data provided by the City and York Region. The model is also verified in terms of assumptions and infrastructures and the required changes were made. New model scenarios are defined to simulate the water distribution network under 2041, 2051, and Ultimate Build-Out conditions.

The 2011 InfoWater model was developed as a steady state model; therefore, every connection to the Regional feed points, pumping stations, reservoir, and elevated tanks were modeled as fixed-head reservoirs. The head levels of the fixed-head reservoirs were established based on information obtained from the Region at the time. Valve settings (check valves, pressure reducing valves [PRVs], and flow control valves) were obtained from the City and the 2010 pressure monitoring report by Genivar. In terms of Hazen-William C factors, City's design values were assigned.

Civica examined the 2011 model assumptions and updated the model for 2016 conditions. Changes were made as required, employing information obtained from the City and Region. This included assumptions for model configuration, supply points, boundary conditions, watermains, pressure district boundaries, and valve settings.


Civica Infrastructure Inc. • 330 Rodinea Road, Unit 3, Vaughan, Ontario, Canada, L6A 4P5 • 905-417-9792 | www.civi.ca | info@civi.ca




Richmond Hill CIVICA

**RIC18-0004 -**
**Richmond Hill UMESP Update**

**Legend**

- York Region Reservoir Locations (19) (Head (m))
- Local Watermains
- Regional Watermains
- PD9 — Pressure District Zones
- FMA Area
- Municipal Boundary

**Figure 4-4:**
**2016 Pressure Districts**

Drawn By: J.H. Date: Sep 27, 2023

0 500 1,000 2,000 Meters

#### 4.3.1.1 Demand Allocation

Similar to the sanitary model, water demands were allocated to the model using the population and according to the City's and York Region's standards summarized in **Table 4-4.** Total water consumption during 2016 at each meter as well as total 2016 population (residential and ICI) for Traffic Zones was obtained from the City and Region. The 2016 water consumption for meters close to each demand node were calculated, and the population was assigned to the node proportional to the average water consumption. The Average Day, Max Day, and Peak Hour demands were then calculated for each demand node using the assigned populations (ICI and Residential) and agreed upon York Region and City's design standards. For new developments, populations were assigned as described in **Appendix A**.

For the existing scenario (2016) population, the City's water demand rate of 365 lpcd was used for both residential and ICI demands as per the City design criteria. For future population demand calculations, forecasted water demand rates from York Region's 2016 Water and Wastewater Masterplan were adopted. Similarly, the regional Maximum day and peak hour demand factors were used for future demand calculations. Adopted water demand rates and peak factors are summarized in **Table 4-4.**

The City does not have a criterion for the minimum hour demand, therefore, the minimum rate factor of 0.8 was assumed as per MECP recommendation.

***Table 4-4: City of Richmond Hill Standard Design Demand Factors***

| Year | Residential Demand (L/c/d) | ICI Demand (L/c/d) | Maximum Day Demand Factor | Peak Hour Demand Factor |
|---|---|---|---|---|
| 2016 | 365 | 365 | 1.8 | 2.7 |
| 2041 | 189 | 144 | 1.8 | 2.7 |
| 2051 | 189 | 144 | 1.8 | 2.7 |
| Ultimate Build-Out | 189 | 144 | 1.8 | 2.7 |

City of Richmond Hill has no minimum rate recommendation. A minimum rate factor of 0.8 was used to calculate minimum hour demand in this project, as per MECP recommendation for communities with the population greater than 150,000

Boundary conditions of the system were verified and updated using Regional data. All points of supply to the distribution system were modeled as fixed-head reservoirs. The head levels of the fixed-head reservoirs were established based on information obtained from the Region.

### 4.3.2 Assessment of Existing Conditions

To verify the modeling results versus City static pressure test data, the model was run under 2016 Maximum Daily Demand and Peak Hour Demand. The difference between the model pressures and the 2016 observed pressures are shown in **Figure 4-5** and **Figure 4-6**. The modelling results are generally within 100 kPa of the hydrant test results. The areas with modeled pressures more than 100 KPa difference with the hydrant test data are:

**A.** South of Major Mackenzie Drive and east of Bayview: this area is the south part of the old FMA. As mentioned before, FMA no longer exists and the area is now a part of PD7;

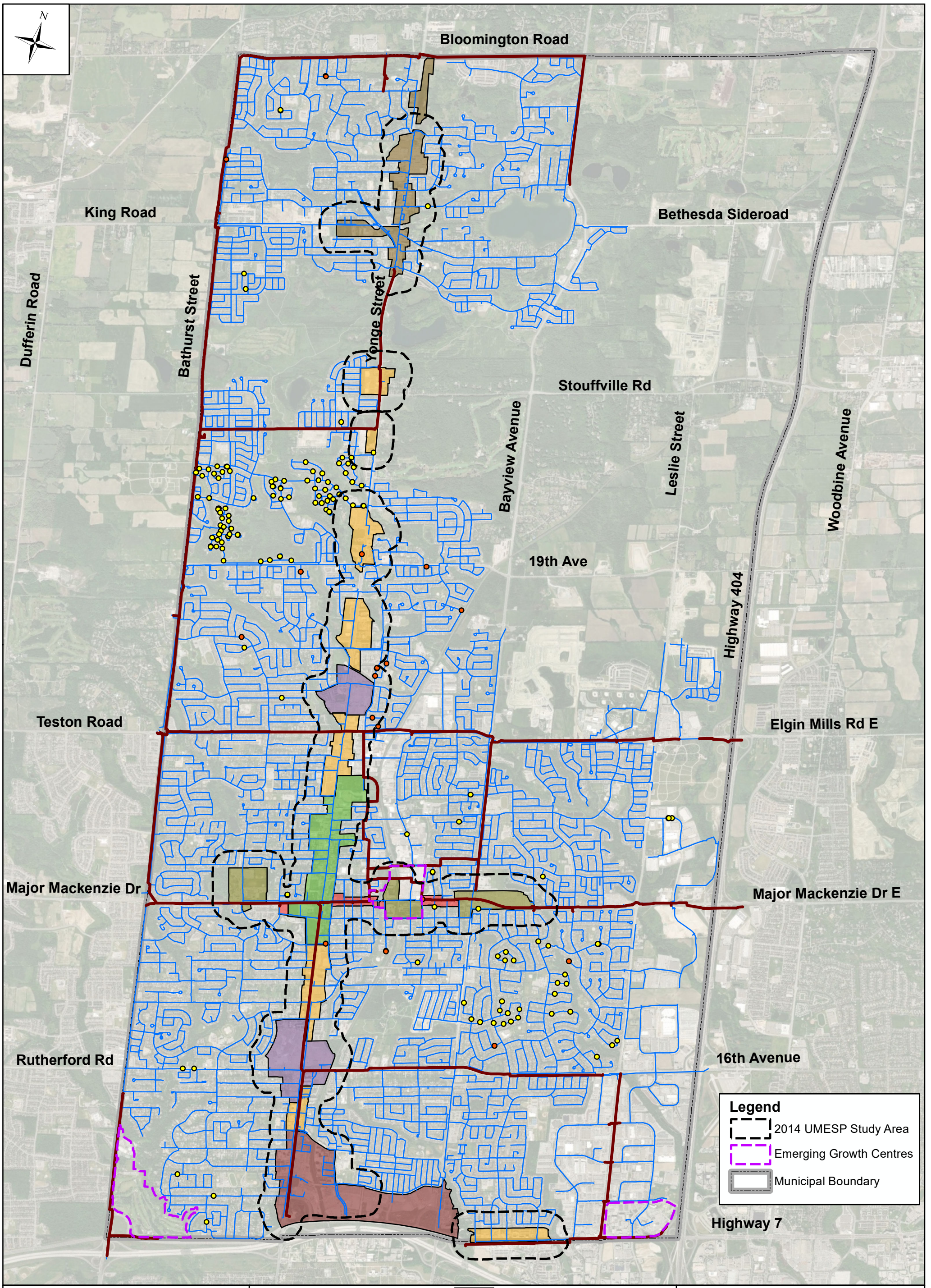
**B.** South of Major Mackenzie Drive and east of Yonge Street;

**C.** North of Gamble Street and west of Yonge Street. This area consists of sub-divisions in PD9 with five PRVs in the area. The PRV settings were not available at the time of this study, which affects

the modeling results. According to the City, the area has high-pressure fluctuations, which affects the hydrant test results.

Results outside of 100 KPa range tend to be clustered, which could indicate operational issues that aren't modelled correctly (partially-closed valves or possibly nearby watermains temporarily closed for operational/maintenance purposes), or hydrant test data that was not undertaken during the daily peak demand hour.

Further information about the water model development, calibration and results can be found in **Appendix B**.




Richmond Hill CIVICA

**RIC18-0004 -**
**Richmond Hill UMESP Update**

**Legend**

- Observed Pressure 100KPa Higher than Modeled
- Modeled Pressure 100KPa Higher than Observed
- Local Watermains
- Regional Watermains
- Village Local Centre
- Key Development Areas
- Local Development Areas
- Local Mixed Use Corridor
- Oak Ridges Local Centre
- Regional Mixed Use Corridors
- Richmond Hill Centre

**Figure 4-5:**
**2016 Modeled Maximum Day Demand Pressures v.s. Observed Pressures**

Drawn By: J.H. Date: Oct 28, 2023

0 500 1,000 2,000 Meters

N

Bloomington Road

King Road

Bethesda Sideroad

Dufferin Road

Bathurst Street

Yonge Street

Stouffville Rd

Bayview Avenue

Leslie Street

Woodbine Avenue

19th Ave

Highway 404

Teston Road

Elgin Mills Rd E

Major Mackenzie Dr

Major Mackenzie Dr E

Rutherford Rd

16th Avenue

Highway 7

**Legend**

- 2014 UMESP Study Area
- Emerging Growth Centres
- Municipal Boundary

Richmond Hill

CIVICA

**RIC18-0004 -**
**Richmond Hill UMESP Update**

**Legend**

- Observed Pressure 100KPa Higher than Modeled
- Modeled Pressure 100KPa Higher than Observed
- Local Watermains
- Regional Watermains
- Village Local Centre
- Key Development Areas
- Local Development Areas
- Local Mixed Use Corridor
- Oak Ridges Local Centre
- Regional Mixed Use Corridors
- Richmond Hill Centre

**Figure 4-6:**
**Modeled Peak Hour Demand Pressures v.s. 2016 Obversed Pressures**

Drawn By: J.H. Date: Oct 28, 2023

0 500 1,000 2,000 Meters

# 5.0 Future Conditions & Design Criteria

## *5.1 Future Development Scenarios*

This section summarizes the assessment of the water and wastewater sewer systems considering the following incremental growth scenarios: 2041, 2051 and Ultimate build-out conditions. Incremental development conditions assume that each successive scenario adds flows derived from population growth from the previous scenarios as per the expected development sequence.

The areas and populations added in each future scenario have been defined in consultation with the City and from the best available planning documents, e.g. Traffic Zone Projections and Development Applications. Initially, the future population was estimated and distributed using the Traffic Zone Projections. These estimations were further refined based on known development applications. This means that the estimated population from known development applications was subtracted from the projected Traffic Zone population. For example, if the projected 2041 population for a given TZ is 10,000 people, and in that TZ there are some development applications with an estimated population of 2,000 people, then, it is assumed that the final projected TZ population to be distributed within the study area is 8,000 people.

A breakdown of the estimated future population for each growth scenario is presented in **Table 5-1** below.

***Table 5-1: Population Breakdown Per Growth Scenario***

| **Description** | **Growth Scenario** | | |
|---|---|---|---|
| | **2016 2041** | **2041 2051** | **2051 Ultimate Build out** |
| Residential population[1] | 107,192 | 18,905 | 121,442 |
| Employment population[2] | 30,571 | 12,144 | 49,580 |
| Other residential and employment population[3] | | | 39,122 |
| **Total Population Added** | **137,763** | **31,049** | **210,144** |

NOTES:

1) Includes population from active development applications. Also, in TZ where population decreased, the 2016 population was kept.
2) In TZ where employment decreased, the 2016 employment numbers were kept.
3) Includes additional population growth from Richmond Hill Centre Secondary Plan, OPAs for Oak Ridges Local Centre and the Village Core, beyond original 2021 forecast.

## *5.2 Future Wastewater System Conditions*

The calibrated model was used to assess the sanitary system under extreme wet-weather conditions, specifically, during the City's 1 in 25-year design storm. The storm is a six-hour event with a time-to-peak ratio of 0.33 (Chicago-type storm), with a peak intensity of 172 mm/hr over 10-min intervals.

The per capita flow rate assigned for areas without flow monitoring data and for future population was 265 L/c/d, and the infiltration allowance was assumed to be 0.26 L/s/ha.


Civica Infrastructure Inc. • 330 Rodinea Road, Unit 3, Vaughan, Ontario, Canada, L6A 4P5 • 905-417-9792 | www.civi.ca | info@civi.ca

In terms of level of service, an agreement was reached with the City that sewer upgrades should be generally implemented when the surcharge level exceeds 0.3 meters above the obvert during the 25-year design storm. The evaluation of surcharge levels and acceptance was conducted on a case-by-case basis.

As mentioned above, if the system surcharges during Existing Conditions, i.e. the surcharge was not triggered by future growth within the Study Area, then remedial measures will not be evaluated as part of this study. Further studies are needed to evaluate proposed solutions and eliminate surcharge conditions in locations outside of the study area, and surcharge caused by existing developments (2016 population).

The sewer performance under each growth scenario is depicted in **Figure 5-1** to **Figure 5-3**. As expected, the level of surcharge increases from the 2041 to the Ultimate Build-out growth scenario.


Civica Infrastructure Inc. • 330 Rodinea Road, Unit 3, Vaughan, Ontario, Canada, L6A 4P5 • 905-417-9792 | www.civi.ca | info@civi.ca

N

Bloomington Road

King Road

Bethesda Sideroad

Dufferin Road

Bathurst Street

Yonge Street

Stouffville Rd

Bayview Avenue

Leslie Street

Woodbine Avenue

19th Ave

Highway 404

Teston Road

Elgin Mills Rd E

Major Mackenzie Dr

Major Mackenzie Dr E

Rutherford Rd

16th Avenue

Highway 7

Richmond Hill

CIVICA

**RIC18-0004 -**
**Richmond Hill UMESP Update**

**Legend**

**Manhole Water Depth (m)**
**(Water Level to Obvert)**

- No Surcharge
- 0 - 0.15
- 0.15 - 0.3
- 0.3 - 0.6
- > 0.6

- York Region Sanitary Trunk Sewers
- Study Area Boundary
- Emerging Growth Centres
- Municipal Boundary

**Figure 5-1:**
**Level of Surcharge Under 2041 Conditions**

Drawn By: J.H. Date: Oct 28, 2023

0 500 1,000 2,000 Meters

N

Bloomington Road

King Road

Bethesda Sideroad

Dufferin Road

Bathurst Street

Yonge Street

Stouffville Rd

Bayview Avenue

Leslie Street

Woodbine Avenue

19th Ave

Highway 404

Teston Road

Elgin Mills Rd E

Major Mackenzie Dr

Major Mackenzie Dr E

Rutherford Rd

16th Avenue

Highway 7

Richmond Hill

CIVICA

**RIC18-0004 -**
**Richmond Hill UMESP Update**

**Legend**

**Manhole Water Depth (m)**
**(Water Level to Obvert)**

- No Surcharge
- 0 - 0.15
- 0.15 - 0.3
- 0.3 - 0.6
- > 0.6

- York Region Sanitary Trunk Sewers
- Study Area Boundary
- Emerging Growth Centres
- Municipal Boundary

**Figure 5-2:**
**Level of Surcharge Under 2051 Conditions**

Drawn By: J.H. Date: Oct 28, 2023

0 500 1,000 2,000 Meters

N

Bloomington Road

King Road

Bethesda Sideroad

Dufferin Road

Bathurst Street

Yonge Street

Stouffville Rd

Bayview Avenue

Leslie Street

Woodbine Avenue

19th Ave

Highway 404

Teston Road

Elgin Mills Rd E

Major Mackenzie Dr

Major Mackenzie Dr E

Rutherford Rd

16th Avenue

Highway 7

Richmond Hill

CIVICA

**RIC18-0004 -**
**Richmond Hill UMESP Update**

**Legend**

**Manhole Water Depth (m)**
**(Water Level to Obvert)**

- No Surcharge
- 0 - 0.15
- 0.15 - 0.3
- 0.3 - 0.6
- > 0.6

- York Region Sanitary Trunk Sewers
- Study Area Boundary
- Emerging Growth Centres
- Municipal Boundary

**Figure 5-3:**
**Level of Surcharge Under Ultimate Build-Out**

Drawn By: J.H. Date: Oct 28, 2023

0 500 1,000 2,000 Meters

## *5.3 Future Water System Conditions*

To review the need for infrastructure upgrades within the study areas, the InfoWater model was run under the following scenarios:

- Ultimate Build-Out Peak Hour Demand: the model was run under this scenario to examine if the future demands can be supplied while maintaining the minimum pressure of 275 KPa;
- 2041 Minimum Hour Demand: the model was run under the 2041 minimum day demand to examine if the future demands can be supplied while maintaining the maximum pressure of 690 Kpa; and,
- Fire Flow Scenario: the model was run under Ultimate Build-Out Maximum Day Demand plus fire flow demands to investigate the available fire flow at each node while maintaining a minimum pressure of 140 KPa in demand nodes.

As discussed, the model was validated with 2016 observed data and valve setting; however, the valve setting in FMA that changed in 2017 was applied to the future condition model. Furthermore, the transmission main at Bathurst and Major Mackenzie will be recommissioned by the City before 2031 and feed the system in the future conditions. The future model also includes the new watermains on the BRT line located on Yonge Street, south of Major Mackenzie Drive. **Figure 5-4** displays the updated Pressure districts after removing the FMA.

As per the previous UMESP, the modeling results within the 100 KPa of the observed pressures were assumed acceptable. In terms of Static Pressure, the acceptable criteria was set as follows:

- Minimum pressure during the peak hourly demand, 275 Kpa.
- Maximum pressure during average day demand 690 Kpa.

For fire flow, the minimum pressure at all demand nodes should be more than 140 KPa when the system is tested for fire flow during maximum day demand conditions. It is worth noting that Richmond Hill design criteria indicate that the City's minimum pressure during fire flow plus maximum day demand should be 275 KPa. After communications with the City, the minimum pressure of 140 KPa was used. The later value (140 KPa) was also used in the previous UMESP.

For the purposes of this UMESP, fire flow demands of 317 l/s are recommended for high rises. Required fire flow demand was recommended for each land use designation by reviewing the City’s land use policy explained in Richmond Hill Official Plan, and after consultation with the City. **Table 5-2** summarizes the recommended fire flow demands used in this study.

Note that the purpose of this study was to investigate water network conditions within the study area. It is proposed that the City conducts studies to investigate the effect of the new developments on conditions outside of the study area. For example, the area south of Lake Wilcox and some areas north of Teston Road would not meet the City’s criteria under future conditions.

***Table 5-2: Recommended Fire Flow Demand for Land Use Designations (APPENDIX B: Final Urban MESP Update Study Water Servicing and Results)***

| Structure Type | FF Demand (L/s) |
|---|---|
| Single Family | 67 |
| Townhouses and Apartments up to 3 stories | 100 |
| Institutional, Industrial, Commercial | 190 |
| Apartments up to 8 stories | 190 |
| Medium to High-Rise buildings | 317 |
| Big box Retail | 317 |

### *5.3.1 Minimum Pressure During the Peak Hourly Demand*

The minimum pressure was investigated under Ultimate Build-Out, Peak Hour Demand. Results are shown in **Figure 5-5**. All nodes within the study area satisfy the minimum pressure requirement (275 KPa), except for a small area in Downtown Local Center.

### *5.3.2 Maximum Pressure During the Minimum Hourly Demand*

The maximum pressure was investigated under 2041 Minimum Hour Demand. As shown in **Figure 5-6**, there are two areas with pressures higher than 690 KPa inside or close to the study area:

- Yonge Street north of Elgin Mills, and Canyon Hill Avenue west of Yonge and Elgin Mills Key Development Area
- Church Street, south of Major Mackenzie Dr and east of Yonge Street

As high pressures exceeding 690 kPa are not triggered by population growth, solutions for these areas will not be recommended in this study.

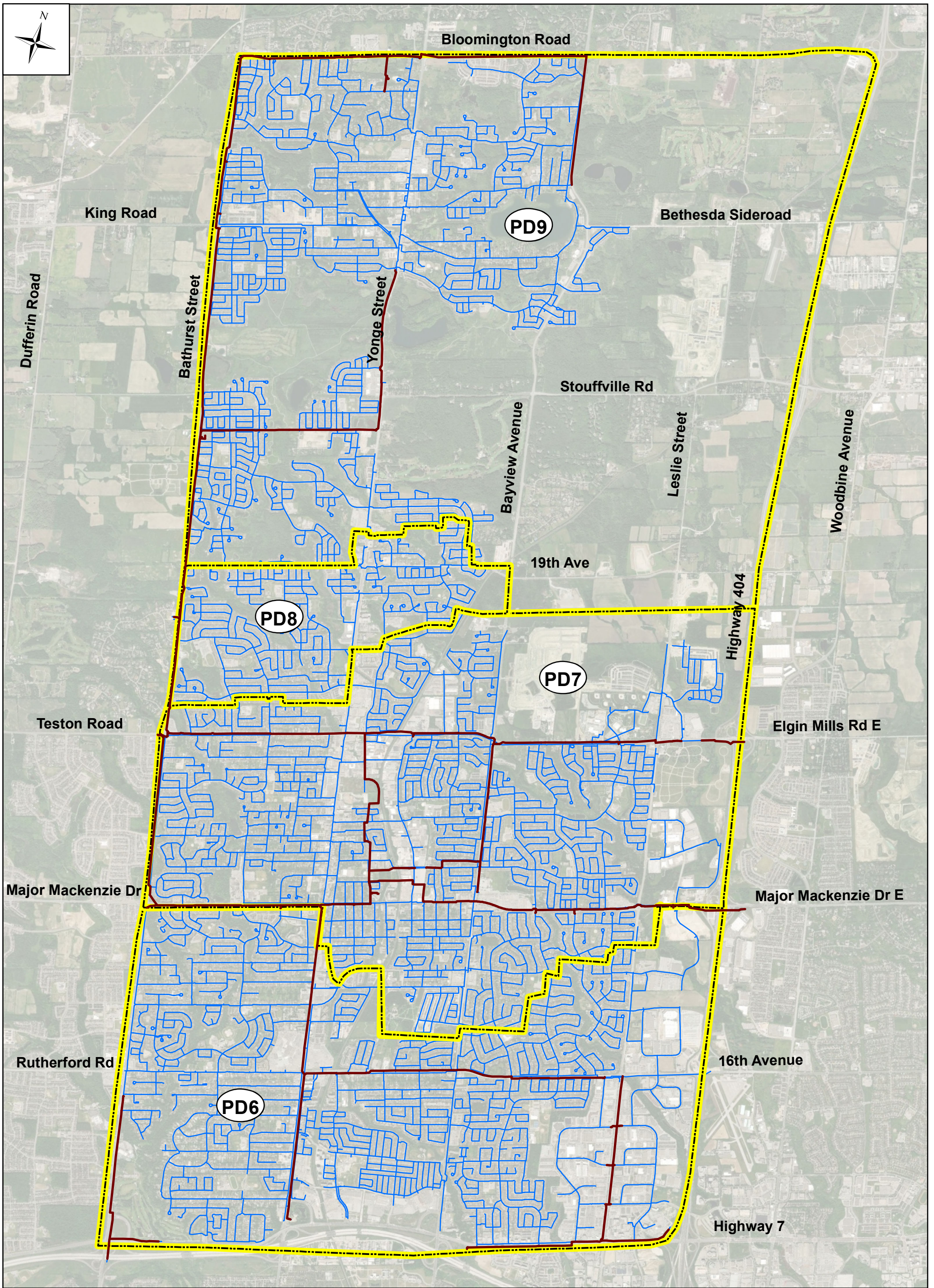
### *5.3.3 Fire Flow Demand*

Available fire flow required for each land use and development application was investigated by considering the fire flow demands discussed in previous sections under the Ultimate Build-Out maximum day demand. **Appendix B** shows the required and available fire flows (for a minimum pressure of 140 kPa) for every OP subdivision, Emerging Growth Centre and Development application in the study area. Major flow deficiencies were observed in the following areas:

- Oak Ridges Local Center at Yonge Street and Elm Grove Avenue. The existing watermains cannot support the institutional and commercial growth in the area.
- Yonge Street at Stoufville Road and Murihead Crescent. There are no existing municipal watermains to service growth east of Yonge Street.
- Yonge Street North of Gamble Road. There are not existing municipal watermains to service growth west of Yonge Street.
- Yonge Street East Side, North of Silverwood Ave. There are not any existing municipal watermains to service growth east of Yonge Street.
- Yonge Street & Oxford Street. The existing watermains cannot support the growth west of Yonge Street.

- Church Street. Existing 150mm watermain cannot support the growth west of Church Street between Lorne Avenue and Dunbarton Court.
- Yonge Street between Major Mackenzie Drive East and Elmwood Avenue. The existing 150mm watermain cannot support the growth east of Yonge Street.
- 150 mm watermains on Cedar Avenue, Norfolk Avenue and Old Markham Road cannot support growth in these areas.
- Yonge Street at Yonghurst Drive and Clarissa Drive. Existing watermains cannot support growth or not available to service future intensification areas east side of Yonge Street.
- Spruce Avenue, Oak Avenue, Edgar Avenue, Scott Drive, Mackay Drive and Garden Avenue at intersections with Yonge Street. Existing 150 mm watermains cannot support growth in these areas.
- Richmond Hill Centre: High Tech Road between Yonge St and Red Maple Rd. Existing 150 mm watermains cannot support growth in the area.


Civica Infrastructure Inc. • 330 Rodinea Road, Unit 3, Vaughan, Ontario, Canada, L6A 4P5 • 905-417-9792 | www.civi.ca | info@civi.ca




Richmond Hill CIVICA

**RIC18-0004 -**
**Richmond Hill UMESP Update**

**Legend**

- PD9 — Pressure District Zones
- Municipal Boundary
- Local Watermains
- Regional Watermains

**Figure 5-4:**
**Updated Pressure Districts After Removing FMA (2017)**

Drawn By: J.H. Date: Sep 27, 2023

0 500 1,000 2,000 Meters

N

Bloomington Road

King Road

Bethesda Sideroad

Dufferin Road

Bathurst Street

Yonge Street

Stouffville Rd

Bayview Avenue

Leslie Street

Woodbine Avenue

19th Ave

Highway 404

Teston Road

Elgin Mills Rd E

Major Mackenzie Dr

Major Mackenzie Dr E

Rutherford Rd

16th Avenue

Highway 7

**Legend**

- 2014 UMESP Study Area
- Emerging Growth Centres
- Municipal Boundary

Richmond Hill

CIVICA

**RIC18-0004 -**
**Richmond Hill UMESP Update**

**Peak Hour Demand Pressure (KPa)**

- < 275
- > 690

Note: Nodes with normal pressure ( 275 - 690 KPa) are not shown

- Local Watermains
- Regional Watermains

- Village Local Centre
- Key Development Areas
- Local Development Areas
- Local Mixed Use Corridor
- Oak Ridges Local Centre
- Regional Mixed Use Corridors
- Richmond Hill Centre

**Figure 5-5:**
**Peak Hour Demand Pressures under Ultimate Built-Out Condition**

Drawn By: J.H. Date: Oct 28, 2023

0 500 1,000 2,000 Meters

N

Bloomington Road

King Road

Bethesda Sideroad

Dufferin Road

Bathurst Street

Yonge Street

Stouffville Rd

Bayview Avenue

Leslie Street

Woodbine Avenue

19th Ave

Highway 404

Teston Road

Elgin Mills Rd E

Major Mackenzie Dr

Major Mackenzie Dr E

Rutherford Rd

16th Avenue

Highway 7

**Legend**

- 2014 UMESP Study Area
- Emerging Growth Centres
- Municipal Boundary

Richmond Hill

CIVICA

**RIC18-0004 -**
**Richmond Hill UMESP Update**

**Minimum Hour Demand Pressure (KPa)**

- < 275
- > 690

Note: Nodes with normal pressure ( 275 - 690 KPa) are not shown

- Local Watermains
- Regional Watermains

- Village Local Centre
- Key Development Areas
- Local Development Areas
- Local Mixed Use Corridor
- Oak Ridges Local Centre
- Regional Mixed Use Corridors
- Richmond Hill Centre

**Figure 5-6:**
**Minimum Hour Demand Pressures Under 2041 Conditions (Inside the Study Area)**

Drawn By: J.H. Date: Oct 28, 2023

0 500 1,000 2,000 Meters

# 6.0 Development & Evaluation of Alternatives

To minimize the risk of the risk of inadequate level of service triggered by the ultimate Build-out population, four (4) alternative solutions were evaluated. These alternative solutions are described in **Table 6-1** below.

***Table 6-1: Evaluation of Wastewater Alternatives***

| Alternative | Description | Results of Evaluation |
|---|---|---|
| **1. Do Nothing** | A do-nothing scenario would allow Build-out of the City structure in accordance with the Official Plan, without making improvements to the sanitary collection system. | This approach would result in a substandard level of service through some parts of the City, with the potential for sanitary sewer surcharging as build-out occurs. This could then trigger basement flooding, and possibly even surface flooding. This alternative does not satisfy the objectives associated with the problem statement for this project but provides an important baseline for comparison to other viable solutions. |
| **2. Limit Community Growth** | This alternative would require updating the Official Plan in order to limit the extent of intensification to only what could be accommodated within the existing sanitary sewers. In order to accommodate the provincially-mandated growth, the City would have to designate additional areas within the City for intensification, where sufficient reserve sanitary servicing capacity exists. | This alternative solution would ultimately negate some of the planning processes that have been undertaken to date, and therefore be unsatisfactory with respect to the objectives associated with the problem statement for this project. |
| **3. Implement Water Conservation Procedures** | This alternative solution would effectively increase the population that could be serviced through the existing collection system by decreasing the average per-capita flow rates across the City. | While many municipalities have successfully reduced the overall flow generation rate through implementing education and incentive-based water conservation procedures, the success of these programs in general – and within the specific areas where a flow reduction would be required in order to service the planned growth – is not guaranteed. |
| **4. Enhance / Expand the Existing Collection System** | This alternative would have the City plan for strategic enhancements to and/or expansion of the existing collection system in order to accommodate the planned populations at the prescribed level of service in accordance with the City's design criteria. | The future condition model was used to identify the extent of system upgrades needed to compensate for any observed shortfalls. |

Alternatives 1 and 2 are not recommended within the context of the problem statement for this project. Alternative 3 is not recommended because the flow reduction that would be required to service the planned future growth is not guaranteed. Therefore, Alternative 4 is the preferred solution for this Study.

## *6.1 Wastewater Solutions*

Based on the evaluation of the four (4) alternatives, Alternative 4 was selected as the preferred solution. The mitigation measures proposed as part of Alternative 4 are listed and described in **Table 6-2**. The overall preferred remedial measures for the Study Area can be seen in **Figure 6-1** and the detailed maps for every proposed project are provided in **Appendix A**.

As mentioned above, sanitary sewers that are surcharging but were not triggered by future growth within the study area will not be evaluated for remedial measures during this study. Further studies are recommended to address existing capacity constraints throughout the City. These locations are highlighted in blue in **Figure 6-1**.

For the purposes of this report, all recommended pipe replacements refer to replacing an existing pipe with a larger sized pipe (i.e. upsizing/upgrading). Although, it has been assumed that most of the proposed solution will be located within the City's right-of-way, some of the crossings, new pipes, and new connections and will be affecting the Regional infrastructure.


Civica Infrastructure Inc. • 330 Rodinea Road, Unit 3, Vaughan, Ontario, Canada, L6A 4P5 • 905-417-9792 | www.civi.ca | info@civi.ca

***Table 6-2: Recommended Wastewater Projects***

| Project | 2014 UMESP Project ID | Description | Location | From | To | Existing Diameter (mm) | Recommended Diameter (mm) | Length (m) |
|---|---|---|---|---|---|---|---|---|
| WW-1 | n/a | Sewer Upgrade | King Road and Schomberg Road | on King Street | on Schomberg Road | 250 | 300 and 375 | 470.2 |
| WW-2 | WW-17 | New Pipe | Yonge Street | Muirhead Crescent | Jefferson Sideroad | NA | 450 | 558.6 |
| WW-3 | WW-16 | New Pipe & Sewer Upgrade | Yonge Street, Grange Drive and Townwood Drive | on Yonge Street | on Townwood Drive | 250 | 250, 300 and 375 | 513.7 |
| WW-4 | n/a | New Pipe | Easement along Yonge Street | NA | NA | NA | 250 | 121 |
| WW-5 | n/a | New Pipe | Yonge Street | NA | NA | NA | 250 | 48.6 |
| WW-6 | WW-15 | New Pipe | Yonge Street and easement | NA | NA | NA | 300 | 114.8 |
| WW-7 | WW-13, WW-14 | Sewer Upgrade | Industrial Road, Newkirk Road and Beechy Drive | Yonge Street / Industrial Road | Beechy Drive / Newkirk Road | 300, 250 and 200 | 375 | 791.2 |
| WW-8 | WW-11 | Sewer Upgrade | Yonge Street | Levendale Road | Dunlop Street | 300 and 375 | 375, 450 and 525 | 593.5 |
| WW-9 | WW-12 | Sewer Upgrade | Wright Street | Hall Street | Yonge Street | 250 | 375 | 266.3 |
| WW-10 | WW-11 | Sewer Upgrade | Dunlop Street and Church Street | Yonge Street | Centre Street East | 375 and 450 | 525 and 600 | 344.2 |
| WW-11 | WW-11 | Sewer Upgrade | Centre Street East and Pugsley Avenue | Church Street | Major Mackenzie Drive East | 300, 375 and 450 | 525, 600 and 675 | 847.3 |


Civica Infrastructure Inc. • 330 Rodinea Road, Unit 3, Vaughan, Ontario, Canada, L6A 4P5 • 905-417-9792 | www.civi.ca | info@civi.ca

| Project | 2014 UMESP Project ID | Description | Location | From | To | Existing Diameter (mm) | Recommended Diameter (mm) | Length (m) |
|---|---|---|---|---|---|---|---|---|
| WW-12 | n/a | Sewer Upgrade | Major Mackenzie Drive East and Easement | Bayview Avenue | Essex Avenue | 250, 300 and 375 | 300, 375, 450 and 525 | 840.5 |
| WW-13 | WW-10 | Sewer Upgrade | Addison Street and Easement, May Avenue Easements, Weldrick Road West and Springhead Gardens | Addison Street | Kitsilano Crescent | 250, 300, 350, 375 and 525 | 375, 450, 525 and 600 | 1707.6 |
| WW-14 | WW-9 | Sewer Upgrade, and New Pipe | Addison Street, Yonge Street Easement, City Park, Church Street South | Addison Street | Harding Boulevard | 200 | 375 | 461.9 |
| WW-15 | n/a | Sewer Upgrade | Cedar Avenue | Elmwood Avenue | South of Palmer Avenue | 200 | 300 | 287.6 |
| WW-16 | n/a | Sewer Upgrade | Baif Boulevard | Yonge Street | Springhead Gardens | 250 and 300 | 375 | 342.5 |
| WW-17 | n/a | Sewer Upgrade | Carrville Road | Yonge Street | Duncombe Lane | 300 | 375 | 976.4 |
| WW-18 | WW-04 | Sewer Upgrade, and New Pipe | Dalemount Gate | Yonge Street | Ellesmere Street | 250 | 300 | 78.5 |
| WW-19 | n/a | New Pipe | Yonge Street, High Tech Road, RHC Street, Easements and Red Maple Road | Yonge Street | Red Maple Road | NA | 250, 300, 450, 525 and 675 | 1405.8 |
| WW-20 | n/a | Sewer Upgrade | York Boulevard, East Beaver Creek Road | York Boulevard | Norman Bethune Avenue | 250 and 300 | 300 and 450 | 364.7 |

Notes:
1. Sewer Upgrades refer to replacing an existing pipe with a larger sized pipe.
2. All proposed works are assumed to be within the City's right-of-way.


Civica Infrastructure Inc. • 330 Rodinea Road, Unit 3, Vaughan, Ontario, Canada, L6A 4P5 • 905-417-9792 | www.civi.ca | info@civi.ca

WW-01:
Pipe Replacement of
205.8 m of 250 mm with 300 mm
264.4 m of 250 mm with 375 mm

WW-02:
New Pipe
558.6 m of 450 mm

WW-03:
New Pipe
144.7 m of 250 mm

WW-03:
Pipe Replacement of
167.7 m of 250 mm with 300 mm

WW-03:
Pipe Replacement of
63.8 m of 250 mm with 300 mm
137.5 m of 250 mm with 375 mm

WW-04:
New Pipe
121.0 m of 250 mm

WW-05:
New Pipe
48.6 m of 250 mm

WW-06:
New Pipe
114.8 m of 300 mm

WW-07:
Pipe Replacement of
10 m of 200 mm with 375 mm
514.3 m of 250 mm with 375 mm
208.7 m of 250 mm with 375 mm
58.2 m of 300 mm with 375 mm

WW-08:
Pipe Replacement of
108.8 m of 300 mm with 375 mm
255 m of 300 mm with 450 mm
214.5 m of 300 mm with 525 mm
15.2 m of 375 mm with 525 mm

WW-09:
Pipe Replacement of
266.3 m of 250 mm with 375 mm

WW-10:
Pipe Replacement of
5.5 m of 375 mm with 525 mm
114 m of 375 mm with 600 mm
224.7 m of 450 mm with 600 mm

WW-11:
Pipe Replacement of
86.3 m of 375 mm with 675 mm
271.3 m of 300 mm with 525 mm
5.3 m of 450 mm with 675 mm
131.4 m of 450 mm with 525 mm
335.6 m of 450 mm with 600 mm
17.4 m of 375 mm with 600 mm

WW-12:
Pipe Replacement of
233.2 m of 250 mm with 300 mm
83.8 m of 250 mm with 375 mm
96.9 m of 300 mm with 450 mm
300.4 of 375 mm with 525 mm
126.2 m of 375 mm with 450 mm

WW-13:
Pipe Replacement of
171.9 m of 250 mm with 375 mm

WW-13:
Pipe Replacement of
142.7 m of 300 mm with 450 mm
309 m of 350 mm with 450 mm
176.1 m of 375 mm with 525 mm

WW-13:
Pipe Replacement of
455.7 m of 525 mm with 600 mm

WW-13:
Pipe Replacement of
452.2 m of 525 mm with 600 mm

WW-14:
New Pipe 362.9 m of 375 mm
Pipe Replacement of
99 m of 200 mm with 375 mm

WW-15:
Pipe Replacement of
287.6 m of 200 mm with 300 mm

WW-16:
Pipe Replacement of
273.3 m of 250 mm with 375 mm
69.2 m of 300 mm with 375 mm

WW-17:
Pipe Replacement of
552.0 m of 300 mm with 375 mm

WW-17:
Pipe Replacement of
110.8 m of 300 mm with 375 mm

WW-17:
Pipe Replacement of
313.6 m of 300 mm with 375 mm

WW-18:
New Pipe
32.5 m of 300 mm

WW-18:
Pipe Replacement of
46.0 m of 250 mm with 300 mm

WW-19:
New Pipe
173.4 m of 250 mm

WW-19:
New Pipe
151.3 m of 300 mm

WW-19:
New Pipe
41.1 m of 300 mm

WW-19:
New Pipe
334.7 m of 450 mm
199.1 m of 525 mm
506.2 m of 675 mm

WW-20:
Pipe Replacement of
113.6 m of 250 mm with 300 mm
251.1 m of 300 mm with 450 mm

## Legend

**Recommended Solutions:**

- Pipe Replacement
- New Pipe
- Sewer Installed through Viva Next BRT

**Manhole Water Depth (m) (Water Level to Obvert)**

- No Surcharge
- 0 - 0.15
- 0.15 - 0.3
- 0.3 - 0.6
- > 0.6

- Sewer Surcharging During Existing Conditions
- York Region Sanitary Trunk Sewers
- Study Areas
- Emerging Growth Centres
- Municipal Boundary

RIC18-0004 -
Richmond Hill UMESP Update

**Figure 6-1:**
**Recommended Wastewater Projects**

Drawn By: J.H. Date: Oct 28, 2023

0 500 1,000 2,000 Meters

## *6.2 Water Solutions*

To identify the required solutions, Civica initially investigated the deficiencies in the study area and reported the possible deficiencies to the City. The recognized areas were reviewed by the City and the final solutions were proposed for the locations where upgrades deemed necessary by the City. **Figure 6-2** illustrates a schematic of the required changes in the water network and **Table 6-3** summarizes the proposed projects. Figures showing the details of each project are presented in **Appendix B.**

***Table 6-3. Proposed Projects - Water Distribution System***

| Project ID | Description | OP Area | Location | Year |
|---|---|---|---|---|
| W1 | New 150 mm Watermain | Oak Ridges Local Centre | Yonge Street South of Elm Grove Avenue | 2041 |
| W2.1 | Watermain Replacement (150mm to 300mm) | Regional Mixed Use Corridor | Yonge Street & Murihead Crescent | 2041 |
| W2.2 | New 300 Watermain | Regional Mixed Use Corridor | Yonge Street beteen Murihead Crescent and Stoufville Road | 2041 |
| W2.3 | New 200 mm Watermain | Regional Mixed Use Corridor | Yonge Street North of Murihead Crescent | 2041 |
| W3.1 | New 250 mm Watermain | Regional Mixed Use Corridor | Yonge Street & Harris Avenue | 2041 |
| W3.2 | New 300 Watermain | Regional Mixed Use Corridor | Yong Street between Harris Avenue and Jefferson Sideroad | 2041 |
| W3.3 | New 300 Watermain | Regional Mixed Use Corridor | Yonge Street West Side, North of Gamble Road | 2041 |
| W4 | New 250 mm Watermain | Regional Mixed Use Corridor | Yonge Street East Side, North of Silverwood Ave | 2041 |
| W5 | New 300 mm Watermain | Key Development Area | South of Yonge St and Canyon Hill Ave | 2041 |
| W6.1 | Watermain Replacement (150mm to 300mm) | Regional Mixed Use Corridor | Yonge St. North of Oxford St. | 2051 |
| W6.2 | Watermain Replacement (150mm to 250mm) | Regional Mixed Use Corridor | Yong St. & Oxford St. | 2051 |
| W7.1 | Watermain Replacement (150mm to 250mm) | Downtown Local Centre | Lorne Ave & Church St. North of Major Mackenzie | 2041 |
| W7.2 | Watermain Replacement (150mm to 300mm) | Downtown Local Centre / Regional Mixed Use Corridor | Church St. South of Major Mackenzie | 2051 |
| W8.1 | Watermain Replacement (150mm to 300mm) | Downtown Local Centre | Yonge St East Side between Major Mackenzie Dr. and Elmwood Ave. | 2041 |


Civica Infrastructure Inc. • 330 Rodinea Road, Unit 3, Vaughan, Ontario, Canada, L6A 4P5 • 905-417-9792 | www.civi.ca | info@civi.ca

| Project ID | Description | OP Area | Location | Year |
|---|---|---|---|---|
| W8.2 | New 300 Watermain | Downtown Local Centre | Yonge St East Side between Major Mackenzie Dr. and Elmwood Ave. | 2041 |
| W8.3 | New 150 mm Watermain | Downtown Local Centre | Yonge St & Palmer Ave. | 2041 |
| W9.1 | Watermain Replacement (150mm to 250mm) | Loval Development Area | Cedar Ave. South of Major Mackenzie Dr. | Ultimate |
| W9.2 | Watermain Replacement (150mm to 250mm) | Loval Development Area | Norfolk Ave. South of Major Mackenzie Dr. | 2051 |
| W10 | Watermain Replacement (150mm to 300mm) | Loval Development Area | Old Markham Rd. & Bayview Ave. | 2041 |
| W11.1 | Watermain Replacement (150mm to 250mm) | Regional Mixed Use Corridor | Yonghurst Drive at Yonge Street Intersection | 2041 |
| W11.2 | New 300 Watermain | Regional Mixed Use Corridor | Yonge Street East Side North of Clarissa Dr. | 2041 |
| W11.3 | Watermain Replacement (150mm to 300mm) | Regional Mixed Use Corridor | Yonge Street East Side North of Clarissa Dr. | 2041 |
| W12.1 | Watermain Replacement (150mm to 250mm) | Regional Mixed Use Corridor | Spruce Avenue At Yonge St. Intersection | 2041 |
| W12.2 | Watermain Replacement (150mm to 250mm) | Regional Mixed Use Corridor | Oak Avenue at Yonge St. Intersection | 2041 |
| W12.3 | Watermain Replacement (150mm to 250mm) | Regional Mixed Use Corridor | Edgar Avenue at Yonge St. Intersection | 2041 |
| W13.1 | Watermain Replacement (150mm to 250mm) | Regional Mixed Use Corridor / Richmond Hill Centre | Scott Drive at Yonge St. Intersection | 2041 |
| W13.2 | Watermain Replacement (150mm to 250mm) | Richmond Hill Centre | Mackay Drive at Yonge St. Intersection | Ultimate |
| W14.1 | Watermain Replacement (150mm to 300mm) | Richmond Hill Centre | High Tech Road between Yonge St and Red Maple Rd. | 2041 |
| W14.2 | New 300 Watermain | Richmond Hill Centre | High Tech Road between Yonge St and Red Maple Rd. | 2041 |
| W14.3 | Watermain Replacement (150mm to 300mm) | Richmond Hill Centre | High Tech Road between Yonge St and Red Maple Rd. | 2041 |
| W15 | Watermain Replacement (150mm to 250mm) | Richmond Hill Centre | Garden Avenue At Yonge St. Intersection | 2041 |

N

Bloomington Road

King Road

Bethesda Sideroad

PD9

Bathurst Street

Yonge Street

W1:
New 200mm Watermain

W2.1:
Watermain Replacement
(150mm to 300mm)

W2.2:
New 200mm Watermain

W2.3:
New 300mm Watermain

Stouffville Rd

W3.2:
New 300mm Watermain

W3.1:
New 250mm Watermain

Bayview Avenue

Leslie Street

Woodbine Avenue

W3.3:
New 300mm Watermain

W4:
New 250mm Watermain

19th Ave

PD8

PD7

Highway 404

W5:
New 300mm Watermain

W6.1:
Watermain Replacement
(150mm to 300mm)

W6.2:
Watermain Replacement
(150mm to 250mm)

Teston Road

Elgin Mills Rd E

W9.1:
Watermain Replacement
(150mm to 250mm)

W9.2:
Watermain Replacement
(150mm to 250mm)

W7.1:
Watermain Replacement
(150mm to 250mm)

W8.1:
Watermain Replacement
(150mm to 300mm)

Major Mackenzie Dr E

W8.2:
New 300mm Watermain

W8.1:
Watermain Replacement
(150mm to 300mm)

W10:
Watermain Replacement
(150mm to 300mm)

W7.2:
Watermain Replacement
(150mm to 300mm)

W8.3:
New 150mm Watermain

W11.1:
Watermain Replacement
(150mm to 250mm)

W11.2:
New 300mm Watermain

W11.3:
Watermain Replacement
(150mm to 300mm)

Rutherford Rd

16th Avenue

W12.1:
Watermain Replacement
(150mm to 250mm)

W12.2:
Watermain Replacement
(150mm to 250mm)

W12.3:
Watermain Replacement
(150mm to 250mm)

W13.1:
Watermain Replacement
(150mm to 250mm)

W13.2:
Watermain Replacement
(150mm to 250mm)

W14.1:
Watermain Replacement
(150mm to 300mm)

W14.2:
New 300mm Watermain

W14.3:
Watermain Replacement
(150mm to 300mm)

PD6

W15:
Watermain Replacement
(150mm to 250mm)

Highway 7

Richmond Hill

CIVICA

**RIC18-0004 -**
**Richmond Hill UMESP Update**

## Legend

- 2014 UMESP Study Area
- Emerging Growth Centres
- Regional Watermain
- Local Watermains

**Proposed Solution**

- Proposed Watermain Replacement
- Proposed New Watermain
- Proposed District Boundary
- City Boundary

**Figure 6-2**
**Ultimate Water Solutions**

Drawn By: W.A. Date: Aug 22, 2023

0 500 1,000 2,000 Meters

# 7.0 Implementation

## *7.1 Wastewater*

The assessment of the interim scenarios (2041 and 2051), between the existing conditions and the Ultimate Build-out scenario, was used to establish the timing of recommended wastewater projects based on anticipated or estimated locations for development within the study area for each growth period. However, the actual triggers for individual projects would be development-driven, so the recommended timing of projects would need to be reviewed and adjusted periodically to account for the actual pace of growth. This is especially relevant to the preparation of applicable development charge bylaws. **Table 7-1** list the anticipated timing of the recommended wastewater projects.

***Table 7-1: Anticipated Timing of Proposed Wastewater Solutions***

| Project ID | Implementation Phase | | |
|---|---|---|---|
| | 2041 | 2051 | Ultimate Build out |
| WW-1 | Partially | Partially | Fully |
| WW-2 | Fully | Fully | Fully |
| WW-3 | Partially | Partially | Fully |
| WW-4 | Fully | Fully | Fully |
| WW-5 | Fully | Fully | Fully |
| WW-6 | Fully | Fully | Fully |
| WW-7 | Fully | Fully | Fully |
| WW-8 | Partially | Partially | Fully |
| WW-9 | - | Partially | Fully |
| WW-10 | Fully | Fully | Fully |
| WW-11 | Partially | Partially | Fully |
| WW-12 | Partially | Partially | Fully |
| WW-13 | Partially | Partially | Fully |
| WW-14 | Fully | Fully | Fully |
| WW-15 | - | - | Fully |
| WW-16 | - | - | Fully |
| WW-17 | - | - | Fully |
| WW-18 | Partially | Partially | Fully |
| WW-19 | Fully | Fully | Fully |
| WW-20 | - | - | Fully |

### *7.1.1 Cost Estimates*

AACE type Class 4 cost estimate has been employed to determine the preliminary cost estimates of the identified projects in the study area. Civica's 2020 unit price database was used as a baseline for the cost estimate analysis. The unit prices were adjusted to 2023 prices using Infrastructure Cost Indexes from Statistics Canada. A trend analysis using data from 2010 to 2019 was used to extrapolate the index values to 2023. Moreover, a 25% multiplier for project delivery allowance and 25% for Class 4 Contingency have been applied to the cost estimates.

The project delivery allowance is a multiplier for preliminary design, tendering, construction services, insurance, mobilization & demobilization, traffic control, utility impacts/relocations, etc. The unit rates and costing estimates do not include any land costs.

The estimated cost of the recommended wastewater projects for the ultimate Build-out scenario is $41.1M and includes HST.

**Table 7-2** lists the total cost per recommended project, a detailed breakdown of the cost estimates is presented in **Appendix A**.

***Table 7-2: Estimated Cost of Recommended Wastewater Projects***

| Project ID | 2041 Scenario Total Cost | Additional Cost to Service 2051 Population | 2051 Scenario Total Cost | Additional Cost to Service Ultimate Build out Population | Ultimate Build out Total Cost |
|---|---|---|---|---|---|
| WW-1 | $855,092 | $0 | $855,092 | $810,031 | **$1,665,123** |
| WW-2 | $2,444,174 | $0 | $2,444,174 | $0 | **$2,444,174** |
| WW-3 | $581,355 | $0 | $581,355 | $1,145,080 | **$1,726,435** |
| WW-4 | $381,896 | $0 | $381,896 | $0 | **$381,896** |
| WW-5 | $205,766 | $0 | $205,766 | $0 | **$205,766** |
| WW-6 | $401,508 | $0 | $401,508 | $0 | **$401,508** |
| WW-7 | $3,005,095 | $0 | $3,005,095 | $0 | **$3,005,095** |
| WW-8 | $1,458,088 | $0 | $1,458,088 | $554,944 | **$2,013,032** |
| WW-9 | $0 | $595,442 | $595,442 | $310,133 | **$905,575** |
| WW-10 | $1,276,321 | $0 | $1,276,321 | $0 | **$1,276,321** |
| WW-11 | $1,357,603 | $238,247 | $1,595,850 | $1,393,934 | **$2,989,784** |
| WW-12 | $1,083,446 | $0 | $1,083,446 | $1,679,548 | **$2,762,994** |
| WW-13 | $2,506,646 | $288,988 | $2,795,634 | $3,742,290 | **$6,537,924** |
| WW-14 | $1,800,114 | $0 | $1,800,114 | $0 | **$1,800,114** |
| WW-15 | $0 | $0 | $0 | $841,679 | **$841,679** |
| WW-16 | $0 | $0 | $0 | $1,164,700 | **$1,164,700** |
| WW-17 | $0 | $0 | $0 | $3,320,329 | **$3,320,329** |
| WW-18 | $148,879 | $0 | $148,879 | $158,796 | **$307,675** |
| WW-19 | $0 | $0 | $0 | $5,997,674 | **$5,997,674** |
| WW-20 | $0 | $0 | $0 | $1,315,721 | **$1,315,721** |
| **Total** | **$17,505,983** | **$1,122,677** | **$18,628,660** | **$22,434,859** | **$41,063,519** |

## *7.2 Water*

The deficient fire flows and high pressures occur when the indicated population growth happens, which is under 2041 conditions for most OP intensification areas and all development applications. Therefore, all but two (2) of the recommended improvement projects will be required prior to 2041, either fully or partially.

Indeed, only projects W-6 and W-9 are recommended for construction by 2051 when the population growth is forecasted to start. **Table 7-3** summarizes the implementation phases for each project.

***Table 7-3. Anticipated Timing of Proposed Water Projects***

| Project ID | Implementation Phase | | |
|---|---|---|---|
| | **2041** | **2051** | **Ultimate Build out** |
| W-1 | Fully | - | - |
| W-2 | Fully (W2.1, W2.2 & W2.3) | - | - |
| W-3 | Fully (W3.1, W3.2 & W3.3) | - | - |
| W-4 | Fully | - | - |
| W-5 | Fully (W5.1 & W5.2) | - | - |
| W-6 | - | Fully (W6.1 & W6.2) | - |
| W-7 | Partially (W7.1) | Partially (W7.2) | - |
| W-8 | Fully (W8.1, W8.2 & W8.3) | - | - |
| W-9 | - | Partially (W9.2) | Partially (W9.1) |
| W-10 | Fully | - | - |
| W-11 | Fully (W11.1, W11.2 & W11.3) | - | - |
| W-12 | Fully (W12.1, W12.2 & W12.3) | - | - |
| W-13 | Partially (W13.1) | - | Partially (W13.2) |
| W-14 | Fully (W14.1, W14.2 & W14.3) | - | - |
| W-15 | Fully | - | - |

### *7.2.1 Cost Estimate*

AACE type Class 4 cost estimate has been employed to determine the preliminary cost estimates of the identified projects in the study area. Civica's 2020 unit price database was used as a baseline for the cost estimate analysis. The unit prices were adjusted to 2023 prices using Infrastructure Cost Indexes from Statistics Canada. A trend analysis using data from 2010 to 2019 was used to extrapolate the index values

to 2023. Moreover, a 25% multiplier for project delivery allowance and 25% for Class 4 Contingency have been applied to the cost estimates. The project delivery allowance is a multiplier for preliminary design, tendering, construction services, insurance, mobilization & demobilization, traffic control, utility impacts/relocations, etc.

The total cost of the proposed projects is **$ 21,668,980** and includes HST. More than 70% of the cost is proposed by 2041. **Table 7-4** summarizes the estimated cost per project and per implementation phase. Details are presented in **Appendix B**.

***Table 7-4. Proposed Water System Projects – Cost Estimate***

| Project | 2041($) | 2051($) | Build Out($) | Total Cost (2023)($) |
|---|---|---|---|---|
| **W1** | **400,209** | **-** | **-** | **400,209** |
| W2.1 | 293,996 | - | - | 293,996 |
| W2.2 | 949,595 | - | - | 949,595 |
| W2.3 | 179,444 | - | - | 179,444 |
| **W2 Subtotal** | **1,423,035** | **-** | **-** | **1,423,035** |
| W3.1 | 226,330 | - | - | 226,330 |
| W3.2 | 960,621 | - | - | 960,621 |
| W3.3 | 547,119 | - | - | 547,119 |
| **W3 Subtotal** | **1,734,071** | **-** | **-** | **1,734,071** |
| **W4** | **1,666,022** | **-** | **-** | **1,666,022** |
| **W5** | **1,417,573** | **-** | **-** | **1,417,573** |
| W6.1 | - | 163,898 | - | 163,898 |
| W6.2 | - | 218,101 | - | 218,101 |
| **W6 Subtotal** | **-** | **381,999** | **-** | **381,999** |
| W7.1 | 1,855,100 | - | - | 1,855,100 |
| W7.2 | - | 3,606,203 | - | 3,606,203 |
| **W7 Subtotal** | **1,855,100** | **3,606,203** | **-** | **5,461,303** |
| W8.1 | 848,983 | - | - | 848,983 |
| W8.2 | 457,982 | - | - | 457,982 |
| W8.3 | 147,101 | - | - | 147,101 |
| **W8 Subtotal** | **1,454,067** | **-** | **-** | **1,454,067** |
| W9.1 | - | - | 550,041 | 550,041 |
| W9.2 | - | 522,027 | - | 522,027 |
| **W9 Subtotal** | **-** | **522,027** | **550,041** | **1,072,068** |
| **W10** | **937,539** | **-** | **-** | **937,539** |
| W11.1 | 81,305 | - | - | 81,305 |
| W11.2 | 546,810 | - | - | 546,810 |
| W11.3 | 346,433 | - | - | 346,433 |
| **W11 Subtotal** | **974,547** | **-** | **-** | **974,547** |
| W12.1 | 498,929 | - | - | 498,929 |
| W12.2 | 439,537 | - | - | 439,537 |
| W12.3 | 403,367 | - | - | 403,367 |
| **W12 Subtotal** | **1,341,833** | **-** | **-** | **1,341,833** |
| W13.1 | 485,805 | - | - | 485,805 |

| Project | 2041 | 2051 | Build Out | Total Cost (2023) |
|---|---|---|---|---|
| W13.2 | $ - | $ - | $ 578,173 | $ 578,173 |
| **W13 Subtotal** | **$ 485,805** | **$ -** | **$ 578,173** | **$ 1,063,979** |
| W14.1 | $ 366,785 | $ - | $ - | $ 366,785 |
| W14.2 | $ 847,386 | $ - | $ - | $ 847,386 |
| W14.3 | $ 627,636 | $ - | $ - | $ 627,636 |
| **W14 Subtotal** | **$ 1,841,807** | **$ -** | **$ -** | **$ 1,841,807** |
| **W15** | **$ 498,929** | **$ -** | **$ -** | **$ 498,929** |
| **Total** | **$ 16,030,537** | **$ 4,510,228** | **$ 1,128,214** | **$ 21,668,980** |

# 8.0 Public Consultation

As described in **Section 1.0**, this UMESP has been undertaken to address the requirements of a Class Environmental Assessment Master Plan, requiring Phase 1 and Phase 2. One requirement of Phase 2 is the need to consult with review agencies and the public once alternative solutions have been identified. Typically, consultation involves presenting the problem or opportunity that will be addressed, the environmental considerations and potential impacts of each alternative, and the approach used for evaluating the alternatives. The comments and the input from the public and other stakeholders are taken into consideration in the identification of the preferred alternative.

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

## *8.1 Public Consultation*

In accordance with the Class EA Master Plan framework, public consultation undertaken in association with this project included the following:

- Issuance of Notice of Commencement — August 30, 2018
- Public Information Centre — July 20, 2023

Public consultation materials, including the above notices, attendance information, and display boards presented at the public information centres, are provided in **Appendix C**.

# 9.0 References and Resources

1. City of Richmond Hill. May 2014. "*Urban Master Environmental Servicing Plan*".
2. Municipal Engineers Association. October 2000 (as amended in 2007 and 2011). *"Municipal Class Environmental Assessment"*.
3. York Region. June 2023. "*Official Plan. Office Consolidation*".
4. City of Richmond Hill. January 2023. "*City of Richmond Hill Official Plan Consolidation".*
5. City of Richmond Hill. June 2011. "*City of Richmond Hill Standards and Specifications Manual".* Revision 35.
6. City of Richmond Hill. November 2021. *"Key Directions Report – For the Richmond Hill Official Plan Update"*.
7. Town of Newmarket. September 2018. *"Design Standards, Town of Newmarket"*.
8. City of Toronto. January 2021. *"Design Criteria for Sewers and Watermains".*
9. City of Waterloo. March 2015. "*Water Distribution Master Plan".*
10. City of Burnaby. November 2019. *"Design Criteria Manual, Engineering Department".*
11. City of Winnipeg. November 2019. *"Water Demand Estimation and Design Guidelines".*
12. Town of Whitchurch-Stouffville. November 2017. *"Water and Wastewater Master Plan Study"*.
13. City of Edmonton. April 2021. *"Design and Construction Standards, Volume 4".*
14. Fire Underwriters Survey. 2020 "*Water Supply for Public Fire Protection*".