



BURNSIDE

**Functional Servicing and  
Stormwater Management Report  
Sobeys - Yonge Street and  
Mapleview Drive East**

**Crombie REIT  
5935 Airport Road, Suite 810  
Mississauga ON L4V 1W5**



**BURNSIDE**

**Functional Servicing and Stormwater  
Management Report  
Sobeys - Yonge Street and Mapleview  
Drive East**

**Crombie REIT  
5935 Airport Road, Suite 810  
Mississauga ON, L4V 1W5**

**R.J. Burnside & Associates Limited  
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**April 2022  
300035146.0000**

## Distribution List

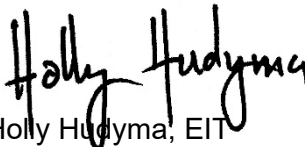
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|----------|---------------|--------------------------------------|
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## R.J. Burnside & Associates Limited

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S1 – Servicing Plan  
G1 – Grading Plan

Functional Servicing and Stormwater Management Report  
April 2022

ESC1 – Erosion and Sediment Control Plan  
D1 – Details Plan

## **Appendices**

Appendix A Hewitt's Secondary Plan Area Subwatershed Impact Study Figures and  
Addendums

Appendix B Water Supply and Distribution Calculations

Appendix C Sanitary Servicing Calculations

Appendix D Stormwater Management Calculations

Appendix E Low Impact Development and Infiltration Calculations

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## **1.0 Introduction**

### **1.1 General Information**

R.J. Burnside & Associates Limited (Burnside) has been retained by Crombie REIT (Crombie) to prepare a Functional Servicing and Stormwater Management Report in support of a Zoning By-Law Amendment Submission for the proposed Phase 1 Development of the Sobeys property located on the southwest corner of the intersection of Yonge Street and Mapleview Drive East, within the City of Barrie.

The proposed development lands are located within the Hewitt's Secondary Plan Area and are a part of the Hewitt's Creek Landowners Group. The Sobeys Land is approximately 8.22 ha in size; Phase 1 of the site is located on the north side of the property and is approximately 3.61 ha in size and will be the focus of this report. Refer to Figure 1 for the site location. The proposed redevelopment of the site will consist of six (6) slab on grade retail buildings, associated parking lots and landscaped areas.

This Functional Servicing and Stormwater Management Report (FSR) will support the Re-zoning and future Site Plan Applications for the site. The attached engineering designs and drawings related to site servicing and grading will incorporate the functional concepts outlined in this report.

### **1.2 Objectives**

The objectives of this FSR are:

- To ensure compliance with the approved Hewitt's Secondary Plan Area Subwatershed Impact Study, Lover's, Hewitt's and Sandy Cove Creeks prepared by R.J. Burnside & Associates Limited (September 2016).
- To ensure compliance with the approved Hewitt's Secondary Plan Area Subwatershed Impact Study, Addendum No. 2 prepared by R.J. Burnside & Associates Limited (December 9, 2021).
- To evaluate and confirm adequate supply and on-site distribution of municipal water to meet domestic and fire flow requirements.
- To evaluate and confirm capacity for sanitary servicing.
- To evaluate stormwater management opportunities and constraints including:
  - Review existing quality and quantity control facilities for the site.
  - Determine suitable methods for the attenuation and treatment of stormwater runoff.
  - Demonstrate compliance of the proposed stormwater control measures with the LSRCA Technical Guidelines for Stormwater Management Submissions.
  - Confirm that sufficient capacity is provided in the minor system to safely convey the design flows from the site.

- Review the existing hydrogeological conditions of the site to determine the potential of low-impact development options.

The above will be in accordance with accepted engineering practices and governing criteria from the approval agencies in support of the development applications.

Site lighting, traffic, and parking considerations are not part of the scope of this report and will be addressed by others.



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Project Name

**MAPLEVIEW ROAD AND YONGE  
STREET  
BARRIE, ON**

Drawing Title

**SITE LOCATION PLAN**

Drawn

Checked

Date

Drawing No.

CL

JS

21/12/16

Scale

Project No.

N.T.S.

300035146

**FIG1**

## **2.0 Background**

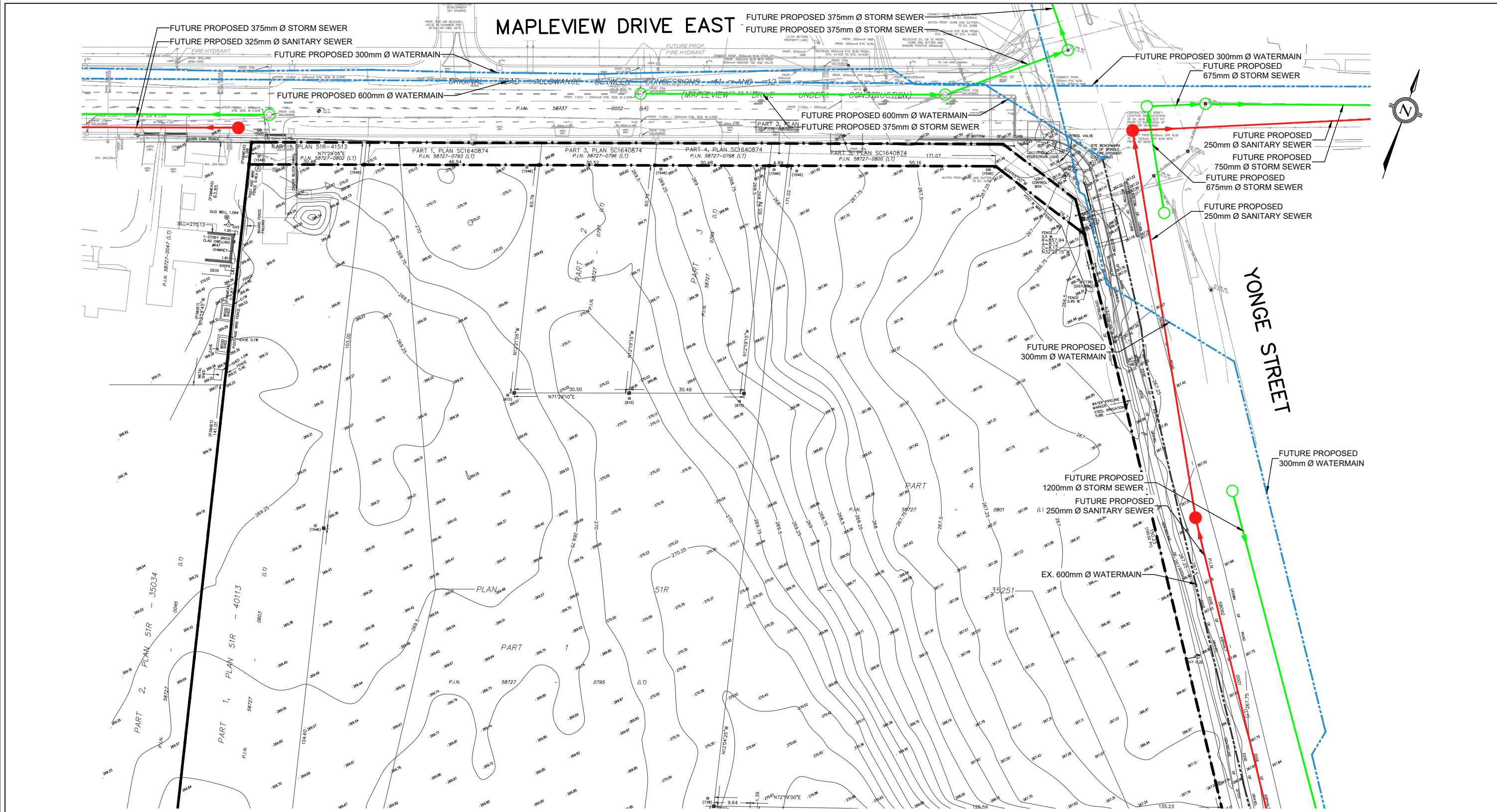
### **2.1 Existing Conditions**

The subject site is approximately 3.61 ha in size and is part of the Sobeys Land in the Hewitt's Secondary Plan Area; approximately 8.22 ha in size, located at the southwest corner of the intersection of Yonge Street and Mapleview Drive East. The subject site consists of an existing wooded area and is bound by Mapleview Drive East to the north, Yonge Street to the east, existing agricultural and woodland to the south, and existing residential and agricultural land to the west.

The City of Barrie is currently in the process of completing the Mapleview Drive East Improvements from Country Lane to Yonge Street, which is proposed to extend the urbanized street cross section to replace the existing rural road. An existing easement is located along the northern edge of the property, in anticipation of the proposed Mapleview Drive East Road Widening. As this easement area will ultimately be conveyed to the City of Barrie, it will not be included within the site area or considered for the stormwater management calculations for the proposed development.

The City of Barrie is also currently in the process of completing the Yonge Street Transportation Improvements from Mapleview Drive East to Lockhart Road, which is proposed to reconstruct and widen Yonge Street to include a 3.0 m cycle-track and a 2.0 m sidewalk. The Yonge Street Transportation Improvements will include the installation of new storm sewers, sanitary sewers and watermain which will be used to service the proposed development. The property line on the east side of the subject site is proposed to shift 3.5 m to the west to allow for road widening. As this easement area will ultimately be conveyed to the City of Barrie, it will not be included within the site area or considered for the stormwater management calculations for the proposed development.

The subject site is currently vacant and there are no existing municipal service connections.



Notes

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- The contractor shall verify all dimensions, levels, and datums on site and report any discrepancies or omissions to this office prior to construction.
- This drawing is to be read and understood in conjunction with all other plans and documents applicable to this project.

LEGEND

|     |                                |
|-----|--------------------------------|
| --- | PROPERTY LINE                  |
| --- | EXISTING WATERMAIN             |
| --- | FUTURE PROPOSED STORM SEWER    |
| --- | FUTURE PROPOSED SANITARY SEWER |
| --- | FUTURE PROPOSED WATERMAIN      |

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Project Name

**MAPLEVIEW ROAD AND YONGE STREET  
BARRIE, ON**

Drawing Title

**EXISTING SITE CONDITIONS**

|         |             |          |             |
|---------|-------------|----------|-------------|
| Drawn   | Checked     | Date     | Drawing No. |
| CL      | JS          | 21/12/16 |             |
| Scale   | Project No. |          | <b>FIG2</b> |
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## 2.2 Proposed Conditions

Phase 1 of the proposed development is 3.61 ha and will include the construction of a public road, six (6) retail buildings, associated parking lots, private roadways and landscaped areas.

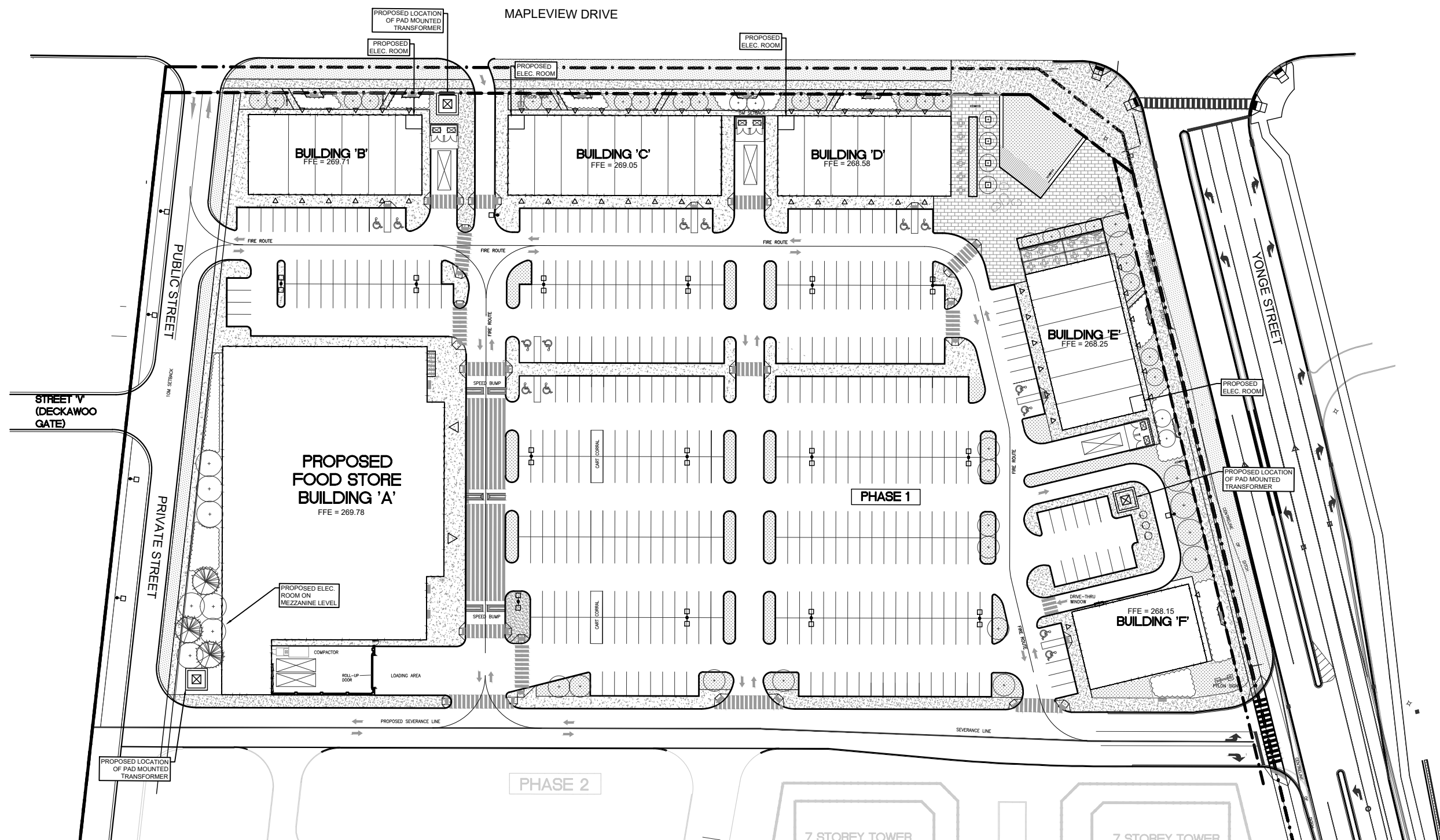
A site breakdown of the proposed development is outlined in Table 1.

**Table 1: Proposed Development Site Breakdown**

| Site Description           | Area (ha)    |
|----------------------------|--------------|
| Public Road                | 0.14         |
| Building A Retail Rooftop  | 0.34         |
| Building B Retail Rooftop  | 0.07         |
| Building C Retail Rooftop  | 0.09         |
| Building D Retail Rooftop  | 0.07         |
| Building E Retail Rooftop  | 0.07         |
| Building F Retail Rooftop  | 0.05         |
| Asphalt/Concrete Hardscape | 2.44         |
| Landscape                  | 0.34         |
| <b>Total Area</b>          | <b>3.61*</b> |

\* Please note the site area to be considered in this brief does not include the existing easement at the north end of the property or the proposed 3.5 m widening to the east side of the site.

Refer to Figure 3 for the proposed site layout.



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**LEGEND**

----- PROPERTY LINE



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L4V 1W5

Project Name  
**MAPLEVIEW ROAD AND YONGE STREET  
BARRIE, ON**

Drawing Title  
**PROPOSED SITE PLAN**

| Drawn   | Checked | Date        | Drawing No. |
|---------|---------|-------------|-------------|
| CL      | JS      | 21/12/16    | <b>FIG3</b> |
| Scale   |         | Project No. |             |
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## **2.3 Hewitt's Secondary Plan Area Future Municipal Servicing**

On behalf of the Hewitt's Creek Landowner's Group, R.J. Burnside & Associates Limited (Burnside) prepared the Hewitt's Secondary Plan Area Subwatershed Impact Study Lover's, Hewitt's, and Sandy Cove Creek Report, dated September 2016 (SIS Report).

The SIS Report identifies environmental, hydrogeological, stormwater management, servicing, and grading concepts for the Secondary Plan Area. The Sobeys Land is included within the SIS Report and is noted as Block 7a, located within the Hewitt Creek Subwatershed. The Hewitt Creek Subwatershed is located within the City of Barrie, County of Simcoe and is under the jurisdiction of the Lake Simcoe Region Conservation Authority (LSRCA).

Based on the Hewitt's Secondary Plan Area Subwatershed Impact Study Addendum Number 2, prepared by Burnside, dated December 9, 2021, a portion of the western edge of the site, including the proposed public road and a portion of the private road, is a part of the Lover's Creek Subwatershed. The Lover's Creek Subwatershed is located within the City of Barrie, County of Simcoe and is under the jurisdiction of the Lake Simcoe Region Conservation Authority (LSRCA). Refer to Appendix A for further details.

### **2.3.1 Hewitt's Secondary Plan Area – Storm Sewer Network**

The proposed condition for the Hewitt's Secondary Plan Area as identified within the SIS Report is to divide the area into subcatchments which ultimately drain to the Lover's Creek, Hewitt's Creek, and Sandy Cove Creek Watersheds. Stormwater Management Facilities (SWMF) were proposed within the SIS Report to provide the necessary stormwater management quality and quantity control.

As per the SIS Report, the Sobeys Land is located within Catchment 7a and is proposed to be regraded to direct a portion of the overland stormwater flow to the Hewitt Creek subwatershed. The remaining portion on the western edge of the site is located within Catchment 4 which directs the overland stormwater flow to the Lovers Creek subwatershed. This area includes the proposed public road and a portion of the private road. Refer to Figure DD of the SIS Report Addendum Number 2 in Appendix A for further details on the proposed drainage divide.

Stormwater Management Facility #7, as noted within the SIS Report, is proposed to capture the stormwater flows from Catchment 7a, including the Sobeys Land. Stormwater Management Facility #7 is proposed to be located south of Maplevue Drive East, east of the existing GO Transit Rail, as per SIS Report Addendum Number 2, Figure 10 in Appendix A. SWMF#7 has been designed to provide end-of-pipe quality and quantity control. At the time of writing this report, SWMF#7 has been constructed.

The SIS report indicates that the Sobeys Land will be serviced with 100-year capture pipes which will convey the stormwater runoff from the site in an easterly direction to SWMF#7. The proposed 100-year capture pipes are to be constructed prior to occupancy of the buildings on site. Refer to SIS Report Addendum Number 2, Figure 10 in Appendix A for the proposed layout and extent of the 100-year capture pipes.

Stormwater Management Facility #4, as noted within the SIS Report Addendum Number 2 is proposed to capture the stormwater flows from Catchment 4, which includes the western portion of the Sobeys Land. SWMF#4 is proposed to be located south of Maplevue Drive, adjacent to Lover's Creek within a future residential subdivision development. At the time of writing this report SWMF#4 appears to be under construction.

### **2.3.2 Hewitt's Secondary Plan Area – Internal Water Distribution**

The proposed condition for the Hewitt's Secondary Plan Area as identified within the SIS Report is to provide an internal network of 200 mm and 300 mm diameter watermains that connect to existing and proposed external trunk watermains. The SIS Report has updated the watermain network as proposed in the Secondary Plan to reflect the conceptual plan developed by the Hewitt's Creek Landowner's Group as shown in SIS Report Figure 12, located in Appendix A.

The Sobeys Land will be serviced via local 300 mm diameter trunk watermain which is proposed to be installed within Yonge Street as part of the Yonge Street Transportation Improvements as shown on Figure 4 and Drawing S1 – Servicing Plan. The proposed 300 mm diameter watermain to service the proposed development is to be constructed prior to occupancy of the buildings on site.

### **2.3.3 Hewitt's Secondary Plan Area – Sanitary Servicing**

The SIS Report notes a number of sanitary projects listed in Section 8.2 of the City of Barrie Wastewater Collection Master Plan to be constructed to service the proposed developments within the Hewitt's Creek Secondary Plan Area.

As per the SIS Report, the Sobeys Land is located within a 30.8 ha sanitary drainage catchment area which ultimately outlets to the existing sewer at Maplevue Drive East and St. Paul's Crescent (Connection point referred to as E4-A).

The Sobeys Land will be serviced via proposed local 250 mm diameter sanitary sewer that flows north in Yonge Street and is proposed to be installed as part of the Yonge Street Transportation Improvements as shown on Figure 5 and Drawing S1 - Servicing Plan. The proposed 250 mm diameter sanitary sewer to service the proposed development is to be constructed prior to occupancy of the buildings on site.

The SIS Report has updated sanitary tributary areas and associated flows from the Wastewater Collection Master Plan to reflect current conceptual land uses per the Hewitt's Creek Landowner's Group. The SIS Report indicates a peak sewage flow at this connection point at Maplevue Drive East and St. Paul's Crescent to be 34.5 L/s, which is less than the pipe capacity of 40.3 L/s. The SIS Report notes that downstream pipe capacity may limit the full development of the Sobeys Land and detailed analysis is required to confirm pipe sizing and unit distribution within the development area. The proposed Phase 1 Development is well below the sanitary discharge rate allotted for the Sobeys Land, as such a detailed analysis is not required for this phase. Pending the ultimate proposed development plan, a downstream analysis may be required for the future phases to confirm that adequate capacity is available for the proposed density.

### **3.0 Water Supply and Distribution**

#### **3.1 Existing Water Infrastructure**

As the subject site is currently a greenfield, there are no existing service connections to a municipal watermain. There are three (3) existing watermains adjacent to the subject site:

- 300 mm diameter watermain located on the north side of Maplevue Drive East.
- 600 mm diameter watermain located on the west side of Yonge Street.

A 300 mm diameter PVC watermain is proposed within Yonge Street as part of the Yonge Street Transportation Improvements from Maplevue Drive East to Lockhart Road. This will include a 300 mm diameter stub to the proposed development for connection.

A 600 mm diameter CPP watermain and a 300 mm diameter PVC watermain is proposed along Maplevue Drive East as part of the Maplevue Drive East Improvements from Country Lane to Yonge Street. The proposed 600 mm diameter watermain will connect to the existing 600 mm diameter PVC watermain within Yonge Street at the intersection of Maplevue Drive East. The proposed 300 mm diameter watermain will connect to the existing 300 mm diameter watermain within Maplevue Drive East.

The proposed watermain within Yonge Street is to be constructed prior to occupancy of the buildings on site. Refer to Figure 2 and Figure 4 for the existing and proposed water infrastructure within the Municipal ROWs.



### 3.2 Proposed Water Infrastructure

The Phase 1 development of the Sobeys Lands is proposed to be serviced via 300 mm diameter connection to the future 300 mm diameter watermain within Yonge Street, once installed. This watermain will be installed as part of the Yonge Street Transportation Improvements and is required prior to occupancy of the buildings on site.

The internal onsite water supply and distribution system will be designed and specified to comply with the current standards and specifications of the County of Simcoe, City of Barrie, the Ontario Building Code and NFPA 13.

The following assumptions were made for the fire flow calculations:

- The development will be ordinary construction with a coefficient of 1.0.
- A reduction of 25% has been considered for Building A to include a NFPA Sprinkler System.
- It has been assumed that Buildings B, C, D, E, and F will not be equipped with a NFPA Sprinkler System, as such no reduction has been considered.

The commercial and fire flow requirements for the proposed commercial buildings were calculated using the Fire Underwriters Survey and completed as per the "Water Supply for Public Fire Protection, a Guide to Recommended Practice." The total demand for proposed commercial Buildings A through F are 3,330 GPM (210 L/s), 2060 GPM (130 L/s), 2403 GPM (152 L/s), 2060 GPM (130 L/s), 1902 GPM (120 L/s), and 1519 GPM (96 L/s), respectively. Refer to Appendix B for the fire flow calculations.

Fire protection for the proposed development will be provided through the use of future public and private hydrants. There is one hydrant proposed by the Mapleview Drive East Improvements from Country Lane to Yonge Street on the north side of the Mapleview Drive East ROW adjacent to the site. There is one hydrant proposed by the Yonge Street Transportation Improvements from Mapleview Drive East to Lockhart Road within the Yonge Street ROW adjacent to the site. Hydrant flow testing of the proposed hydrants adjacent to the site will be completed following completed construction of the proposed ROW works.

Four (4) private hydrants have been proposed within the site to provide additional fire protection. Refer to Drawing S1 (Servicing Plan) and Figure 4 Proposed Watermain Plan for the proposed watermain layout.

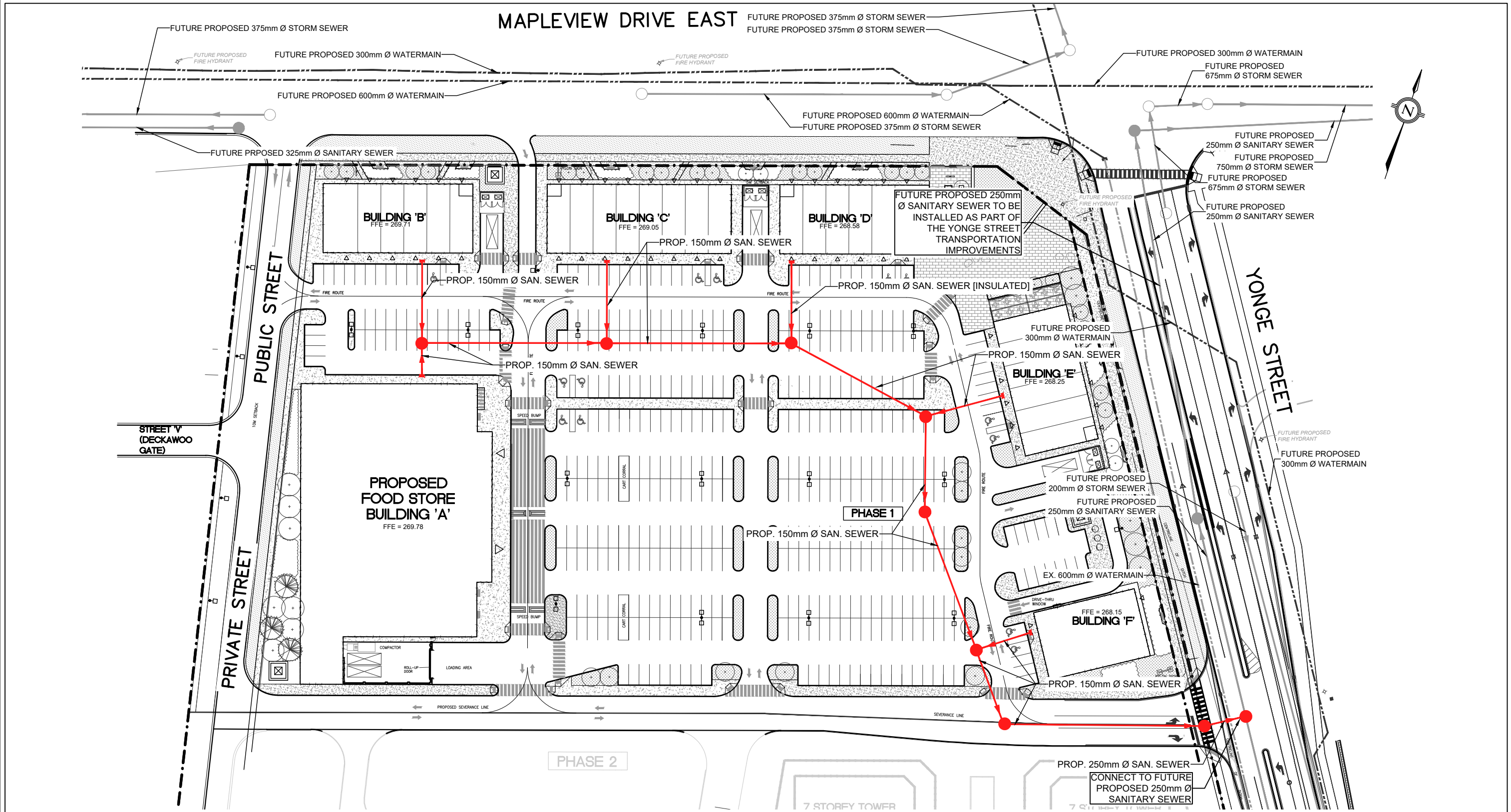
## **4.0 Sanitary Servicing**

### **4.1 Existing Sanitary Servicing**

As the subject site is currently a greenfield, there are no existing service connections to municipal sanitary sewers. There are no existing sanitary sewers in proximity to the subject site.

A 250 mm diameter sanitary sewer is proposed within Yonge Street as part of the Yonge Street Transportation Improvements from Maplevue Drive East to Lockhart Road and will extend the full length of the subject property. This sewer will flow north to Maplevue Drive West where it ultimately outlets to the existing sewer at Maplevue Drive East and St. Paul's Crescent

The proposed 250 mm diameter sanitary sewer within Yonge Street is to be constructed prior to occupancy of the buildings on site. Refer to Figure 5 for the proposed sanitary sewer infrastructure within the Municipal ROWs.



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**LEGEND**

|  |                                |
|--|--------------------------------|
|  | PROPERTY LINE                  |
|  | EXISTING WATERMAIN             |
|  | FUTURE PROPOSED STORM SEWER    |
|  | FUTURE PROPOSED SANITARY SEWER |
|  | FUTURE PROPOSED WATERMAIN      |
|  | PROPOSED SANITARY SEWER        |

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Project Name

**MAPLEVIEW ROAD AND YONGE STREET  
BARRIE, ON**

Drawing Title

**PROPOSED SANITARY SEWER PLAN**

|         |             |          |             |
|---------|-------------|----------|-------------|
| Drawn   | Checked     | Date     | Drawing No. |
| CL      | JS          | 21/12/16 |             |
| Scale   | Project No. |          | <b>FIG5</b> |
| 1:1,000 | 300035146   |          |             |

## 4.2 Proposed Sanitary Servicing

The Phase 1 development of the Sobeys Lands is proposed to be serviced via 250 mm diameter connection to the future 250 mm diameter sanitary sewer within Yonge Street, once installed. This sanitary sewer will be installed as part of the Yonge Street Transportation Improvements and is required prior to occupancy of the buildings on site.

The sanitary flows for the proposed development were calculated using the following City of Barrie Sanitary Sewage Collection System Policies and Design Guidelines:

- Average design flow rate of 28,000 L/ha/day for commercial uses.
- Infiltration rate of 0.26 L/s/ha.
- Peaking factor of two (2) has been applied to the total sanitary flows.

The proposed sanitary contribution for Phase 1 to the sanitary sewer within the Yonge Street ROW is 1.35 L/s including 0.86 L/s of infiltration. The proposed sanitary flow of 1.35 L/s is less than the 18.5 L/s sanitary flow allocated to the Sobeys Land per the SIS Report. As the proposed sewer within the Yonge Street ROW has been sized for future development, we can assume sufficient downstream capacity exists.

Refer to Appendix C for the sanitary design calculations. Refer to Drawing S1 (Servicing Plan) and Figure 5 Proposed Sanitary Sewer Plan for the proposed sanitary servicing infrastructure.

## 5.0 Existing Stormwater Conditions

### 5.1 Existing Stormwater Infrastructure

As the subject site is currently a greenfield, there are no existing storm sewer connections to the municipal system. The following storm sewers are located adjacent to the subject site:

- 600-675 mm diameter storm sewer at the intersection of Yonge Street and Mapleview Drive East which appears to capture drainage from the existing right-of-way that drains northeast to Mapleview Drive East.
- 375 mm diameter storm sewer located in Mapleview Drive East which appears to capture drainage from the existing right-of-way and drains in a northerly direction.

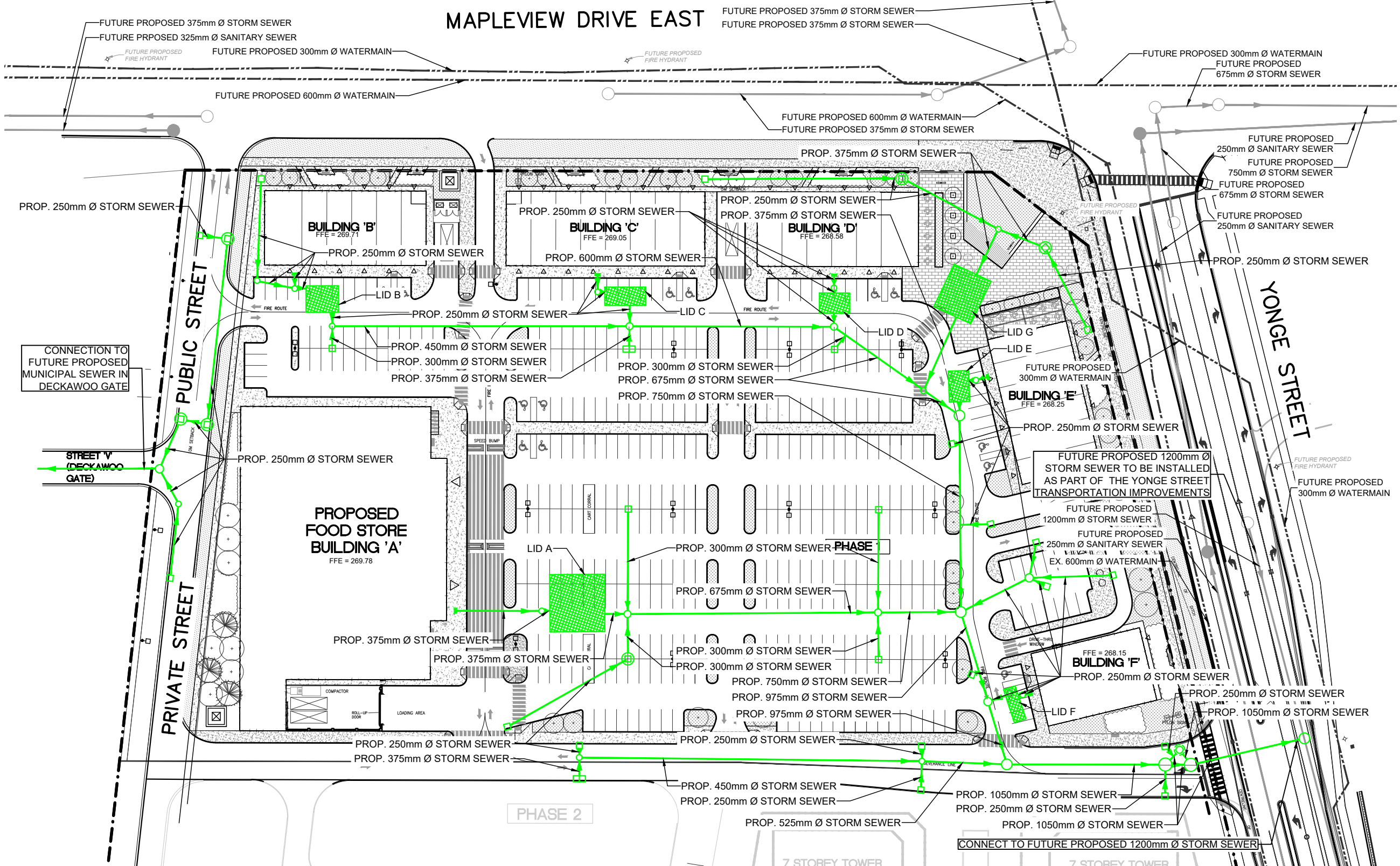
Two additional storm sewers are proposed within Yonge Street as part of the Yonge Street Transportation Improvements from Mapleview Drive East to Lockhart Road.

- A 675 mm diameter storm sewer is proposed south of the intersection of Yonge Street and Mapleview Drive East and will drain northeast to connect to the existing 750 mm diameter storm sewer in Mapleview Drive East.
- A 1200 mm diameter storm sewer is proposed adjacent to the site south of Mapleview Drive East within Yonge Street and will flow south. This storm sewer is the 100-year storm capture sewer proposed under the Hewitt's Secondary Plan Area referenced in Section 2.3.1 of this report. The proposed sewer will capture the 100-year flows from the proposed development and convey them to SWMF#7.

A second 375 mm diameter storm sewer is proposed along Mapleview Drive East, located west of the subject property as part of the Mapleview Drive East Improvements from Country Lane to Yonge Street. The proposed sewer will capture the flows from the Municipal ROW and drain northeast towards Yonge Street.

The proposed storm sewer within Yonge Street is to be constructed prior to occupancy of the buildings on site. Refer to Figure 6 for the proposed storm sewer infrastructure within the Municipal ROWs.

# MAPLEVIEW DRIVE EAST



- Notes**
1. This drawing is the exclusive property of R. J. Burnside & Associates Limited. The reproduction of any part without prior written consent of this office is strictly prohibited.
  2. The contractor shall verify all dimensions, levels, and datums on site and report any discrepancies or omissions to this office prior to construction.
  3. This drawing is to be read and understood in conjunction with all other plans and documents applicable to this project.

## LEGEND

|  |                                |  |                                 |
|--|--------------------------------|--|---------------------------------|
|  | PROPERTY LINE                  |  | PROPOSED CATCHBASIN MANHOLD     |
|  | EXISTING WATERMAIN             |  | PROPOSED QUALITY CONTROL DEVICE |
|  | FUTURE PROPOSED STORM SEWER    |  | PROPOSED CATCH BASIN            |
|  | FUTURE PROPOSED SANITARY SEWER |  | PROPOSED LID FACILITY           |
|  | FUTURE PROPOSED WATERMAIN      |  |                                 |
|  | PROPOSED STORM SEWER           |  |                                 |



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Client

## CROMBIE REIT

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Project Name

**MAPLEVIEW ROAD AND YONGE STREET  
BARRIE, ON**

Drawing Title

**PROPOSED STORM SEWER PLAN**

Drawn

CL

Checked

JS

Date

21/12/16

Scale

1:1,000

Project No.

300035146

Drawing No.

**FIG6**

## 5.2 Existing Stormwater Characteristics

Under existing conditions, the site has a drainage divide which directs 1.76 ha of the existing overland flow east to the Hewitt Creek subwatershed and the remaining 1.47 ha to the west to the Lover's Creek subwatershed. Refer to Figure 7 - Pre-Development Storm Drainage Plan, illustrating the drainage divide. There is approximately a 5 m difference in elevation across the site, with elevations ranging between 266 m to 271 m.

Based on the Hewitt's Secondary Plan Area Subwatershed Impact Study Lover's, Hewitt's, and Sandy Cove Creek Report, prepared by Burnside, dated September 2016, (SIS Report) the site falls within a significant groundwater recharge area (SGRA) and Ecologically Significant Groundwater Recharge Area (ESGRA). Refer to Figure 16 from the SIS Report, enclosed in Appendix A for further details.

As per the Draft Geotechnical Investigation – Proposed Commercial Development, prepared by Pinchin Ltd, dated December 16, 2021, the groundwater levels across the site were measured. The boreholes investigated on site were opened to a depth ranging from 6.4 mbgs to 6.6 mbgs and it was found that the boreholes were dry, indicating that the groundwater level on site is below 6.4 mbgs.

An existing easement is located along the northern edge of the property, in anticipation of the proposed Maplevue Drive East Road Widening. There is an additional 3.5 m road widening along the east side of the site for the proposed Yonge Street Transportation Improvements. As these easement areas will ultimately be conveyed to the City of Barrie, they will not be included within the site area for the stormwater management calculations for the proposed development. As such, the site area for the stormwater management calculations will be 3.61 ha.



## 6.0 Stormwater Management Analysis

### 6.1 Design Criteria

The site is located within the City of Barrie, County of Simcoe, under the jurisdiction of the Lake Simcoe Region Conservation Authority (LSRCA). The proposed development must comply with the City of Barrie, County of Simcoe and LSRCA criteria for stormwater management and design.

As the site is located within the Hewitt's Secondary Plan Area, the proposed drainage patterns and release rates must comply with the approved stormwater management strategy identified within the SIS Report and the respective Addendum updates.

The stormwater management criteria indicated within the LSRCA Technical Guidelines for Stormwater Management Submissions (2016) identifies stormwater requirements for developments based on the type of development as defined within the Lake Simcoe Protection Plan. As per the Lake Simcoe Protection Plan (2009), the development type that corresponds with the proposed development of the Sobeys Land is a Major Development. Major Developments are defined as a development consisting of the creation of four or more lots, the construction of a building or buildings which a ground floor area of 500 m<sup>2</sup> or more, or the establishment of a major recreational use. As the Phase 1 Sobeys Development consists of 6 retail units with a ground floor area exceeding 500 m<sup>2</sup>, it is subject to the requirements of Major Developments.

The following criteria will be applied:

- The post-development peak flow rates will be controlled to the proposed catchment area discharge rates indicated in the SIS Report for the 2, 5, 10-, 25-, 50-, and 100-year design storm events.
- Where new developments create more than 0.5 ha of new impervious sites, stormwater runoff volumes will be controlled, and the post-construction runoff volume shall be captured and retained/treated on site from a 25 m rainfall event.
- Stormwater must be treated to provide the MOECC Enhanced Protection Level which corresponds to a TSS removal of 80%.
- The removal of 80% of the annual Total Phosphorous (TP) load will be required.
- The stormwater management plan must make every effort to match the post-development infiltration volumes to pre-development levels on an annual basis. A water balance assessment has been completed in the Draft Hydrogeology Assessment – Proposed Commercial Development, prepared by Pinchin Ltd., dated December 21, 2021, which identifies the requirements for meeting pre-development water recharge.
- Ensure that there is no increase in erosion and sediment entering the receiving waters.

The drainage of abutting properties shall not be adversely affected, and all drainage shall be collected and discharged at an approved location as identified within the SIS Report.

The Modified Rational Method was used to calculate runoff rates from all drainage catchments, to quantify the detention storage for all control measures, and to demonstrate the site's overall SWM compliance. Intensity-Duration-Frequency (IDF) curves from the City of Barrie were used to simulate rainfall data. Refer to Appendix D for the proposed stormwater management calculations.

## **6.2 Allowable Release Rate**

As per the LSRCA Technical Guidelines for Stormwater Management Submissions (2016), the post-development peak flow rates will be controlled to pre-development levels for the 2, 5, 10, 25, 50, and 100-year design storm events. Onsite quantity controls shall be provided for the proposed development to ensure that the peak flow is reduced from the site to allowable levels.

As per the SIS Report, the Sobeys Land is located within Catchment 7a. The site is proposed to be regraded to direct a portion of the overland stormwater flow to the Hewitt Creek subwatershed. The remaining portion on the western edge of the site is located within Catchment 4 which directs the overland stormwater flow to the Lovers Creek subwatershed. This area includes the proposed public road and a portion of the private road. Refer to Figure DD of the SIS Report Addendum Number 2 in Appendix A for further details on the proposed drainage divide.

The Phase 1 Sobeys Development has been divided into three separate drainage areas for the purposes of stormwater management.

- Drainage Area 1 will consist of the public road which is proposed to drain to the Lover's Creek Sewershed.
- Drainage Area 2 will consist of the private road on the west side of the site which is proposed to drain to the Lover's Creek Sewershed.
- Drainage Area 3 will consist of the remaining site area and private road on the southern edge of the Phase 1 lands and is proposed to drain to the Hewitt's Creek Sewershed.

Refer to Figure 8 – Post – Development Storm Drainage Plan for further details on the proposed Drainage Areas.



### 6.2.1 Drainage Area 1 – Public ROW to Lover’s Creek

Drainage Area 1 consists of the proposed public road located on the west side of the subject site. The public road is 014 ha in size and consists of the proposed road, streetscaping and public sidewalk.

As per the SIS Report and the SIS Report Addendum Number 2, this section of the Sobeys Land is in Catchment 4 and is proposed to drain in a westerly direction to the future proposed storm sewer within the Municipal Deckawoo Gate ROW which ultimately outlets to SWMF#4.

The allowable release rate to SWMF#4 has been calculated for the proposed development based on the uncontrolled flows to SWMF#4 for Catchment 4 shown in Table 11: Lover’s Creek, Proposed Condition Modelling Results in the SIS Report. The total proposed discharge has been discretized for the proposed development drainage area and the allowable release rate is as shown in Table 2.

**Table 2: Public ROW – Lover’s Creek - Allowable Release Rates**

| Storm Event | Allowable Release Rate (L/s) |
|-------------|------------------------------|
| 2- Year     | 11.50                        |
| 5 – Year    | 17.45                        |
| 10 – Year   | 21.65                        |
| 25 – Year   | 27.18                        |
| 50 – Year   | 31.43                        |
| 100 – Year  | 35.72                        |

Quantity controls will be provided to ensure that the post-development release rate for each storm event is controlled back to the allowable release rate levels to SWMF#4. This will be achieved through the use of orifice controls provided upstream of the outlet from the site to control the release of stormwater to the future proposed municipal sewer.

### 6.2.2 Drainage Area 2 – Private Road to Lover’s Creek

Drainage Area 2 consists of the private road located on the west side of the subject site. The public road is 0.17 ha in size and consists of the proposed road, streetscaping, sidewalk and the landscape area behind Building A.

As per the SIS Report and the SIS Report Addendum Number 2, this section of the Sobeys Land is in Catchment 4 and is proposed to drain in a westerly direction to the future proposed storm sewer within the Municipal Deckawoo Gate ROW which ultimately outlets to SWMF#4.

The allowable release rate to SWMF#4 has been calculated for the proposed development based on the uncontrolled flows to SWMF#4 for Catchment 4 shown in Table 11: Lover’s Creek, Proposed Condition Modelling Results in the SIS Report. The

total proposed discharge has been discretized for the proposed development drainage area and the allowable release rate is as shown in Table 3.

**Table 3: Private Road – Lover’s Creek - Allowable Release Rates**

| Storm Event | Allowable Release Rate (L/s) |
|-------------|------------------------------|
| 2- Year     | 14.43                        |
| 5 – Year    | 21.89                        |
| 10 – Year   | 27.16                        |
| 25 – Year   | 34.11                        |
| 50 – Year   | 39.44                        |
| 100 – Year  | 44.89                        |

Quantity controls will be provided to ensure that the post-development release rate for each storm event is controlled back to the allowable release rate levels to SWMF#4. This will be achieved through the use of orifice controls provided upstream of the outlet from the site to control the release of stormwater to the future proposed municipal sewer.

### 6.2.3 Drainage Area 3 – Site Area to Hewitt’s Creek

Drainage Area 3 is 3.29 ha in size and will include the construction of a public road, six (6) retail buildings, associated parking lots, private roadways, and landscaped areas.

As per the SIS Report, the Sobeys Land will be serviced with 100-year capture pipes which will convey the stormwater runoff from the site in an easterly direction to SWMF#7. The allowable release rate to SWMF#7 has been calculated for the proposed development based on the uncontrolled flows to SWMF#7 for Catchment 7a shown in Table 12: Hewitt’s Creek, Proposed Condition Modelling Results in the SIS Report.

The total proposed discharge has been discretized for the proposed development and the allowable release rate is as shown in Table 4.

**Table 4: Allowable Release Rates**

| Storm Event | Allowable Release Rate (L/s) |
|-------------|------------------------------|
| 2- Year     | 393.05                       |
| 5 – Year    | 561.49                       |
| 10 – Year   | 707.48                       |
| 25 – Year   | 877.80                       |
| 50 – Year   | 1003.20                      |
| 100 – Year  | 1137.96                      |

As Drainage Area 3 is being regraded to redirect the existing drainage pattern from Lover’s Creek to Hewitt’s Creek, there is external drainage from the Phase 2 Sobeys Lands south of the site being captured by the proposed internal storm sewer system. This external drainage area flow is to be conveyed through the internal storm sewer system in all storm events to ensure that there are no negative impacts to the proposed

storm sewer design with the additional flow from the external area. As such, the allowable release rate to SWMF#7 has been adjusted to account for these flows being conveyed through the site. Refer to Table 5 below for further details.

**Table 5: Allowable Release Rate Including External Drainage**

| <b>Storm Event</b> | <b>Allowable Release Rate (L/s)</b> | <b>External Area Flow (L/s)</b> | <b>Adjusted Allowable Release Rate (L/s)</b> |
|--------------------|-------------------------------------|---------------------------------|----------------------------------------------|
| 2- Year            | 393.05                              | 28.01                           | 421.06                                       |
| 5 – Year           | 561.49                              | 39.54                           | 601.03                                       |
| 10 – Year          | 707.48                              | 42.60                           | 750.08                                       |
| 25 – Year          | 877.80                              | 49.98                           | 927.78                                       |
| 50 – Year          | 1003.20                             | 55.33                           | 1058.53                                      |
| 100 – Year         | 1137.96                             | 60.83                           | 1198.79                                      |

On-site quantity controls will be provided to ensure that the post-development release rate for each storm event is controlled back to the allowable release rate levels. This will be achieved through the use of orifice controls provided upstream of the outlet from the site to control the release of stormwater to the proposed municipal sewer.

## 7.0 Proposed Stormwater Management

### 7.1 Drainage Area 1 – Public ROW to Lover’s Creek

#### 7.1.1 Stormwater Quantity Control

##### 7.1.1.1 Peak Flow Control

Drainage Area 1 is 0.14 ha in size and consists of the proposed public road, streetscaping and public sidewalk. The proposed public road will be designed to outlet to the 5-year storm capture sewer within the Municipal Deckawoo Gate ROW which will ultimately outlet to Stormwater Management Facility #4 (SWMF#4). The stormwater release from the site is designed to control the post-development flows for the 2, 5, 10, 25, 50, and 100-year storm events to the allowable release rate based on the SWMF#4 design within the SIS Report.

Table 6 summarizes the stormwater quantity control requirements to meet the required release rate for the proposed public road.

**Table 6: Drainage Area 1 - Stormwater Quantity Control Requirements**

| Storm Event | Allowable Release Rate (L/s) | Quantity Control Volume Required (m <sup>3</sup> ) | Storage Provided* (m <sup>3</sup> ) |
|-------------|------------------------------|----------------------------------------------------|-------------------------------------|
| 2- Year     | 11.50                        | 9                                                  | 14.9                                |
| 5 – Year    | 17.45                        | 11                                                 |                                     |
| 10 – Year   | 21.65                        | 11                                                 |                                     |
| 25 – Year   | 27.18                        | 11                                                 |                                     |
| 50 – Year   | 31.43                        | 11                                                 |                                     |
| 100 – Year  | 35.72                        | 11                                                 |                                     |

\*Note: 14.9 m<sup>3</sup> includes 2.8 m<sup>3</sup> of surface ponding storage plus 12.09 m<sup>3</sup> of structure storage

The runoff generated by the public road will be collected by the proposed storm sewer system and 14.9 m<sup>3</sup> of storage will be provided using surface storage as well as structure storage. Orifice controls will be provided downstream of ROW.CBMH3 to control the release of the stormwater to the proposed municipal sewer. Orifice sizing details will be provided with a future submission.

Refer to Figure 8 - Post-Development Storm Drainage Plan and Appendix D for the stormwater management calculations.

##### 7.1.1.2 Volume Control

Based on the LSRCA Technical Guidelines for Stormwater Management Submissions (2016), where new developments create more than 0.5 ha of new impervious sites,

stormwater runoff volumes will be controlled, and the post-construction runoff volume shall be captured and retained/treated on site from a 25 mm rainfall event.

As the proposed public road will generate 0.14 ha in new impervious areas, volume control will not be required.

#### **7.1.1.3 Water Balance and Groundwater Recharge**

As per the LSRCA Technical Guidelines for Stormwater Management Submissions (2016), the proposed stormwater management plan must make every effort to match the post-development infiltration volumes to pre-development levels on an annual basis for Major Developments.

Water balance and groundwater recharge efforts will be provided for the proposed development site. As the proposed public road is a small drainage area that is not a Major Development, water balance will not be required.

#### **7.1.1.4 Stormwater Quality Control**

As per the stormwater management criteria indicated within the LSRCA Technical Guidelines for Stormwater Management Submissions (2016), stormwater must be treated to provide the MOECC Enhanced Protection Level which corresponds to a TSS removal of 80%.

The stormwater generated by the proposed public road will ultimately discharge to SWMF#4 which has been designed to provide quality control for the contributing areas. As such, stormwater quality control is not required within the proposed public road.

### **7.2 Drainage Area 2 – Private Road to Lover's Creek**

#### **7.2.1 Stormwater Quantity Control**

##### **7.2.1.1 Peak Flow Control**

Drainage Area 2 is 0.17 ha in size consists of the proposed road, streetscaping, sidewalk and the landscape area behind Building A. The proposed private road will be designed to outlet to the 5-year storm capture sewer within Deckawoo Gate which will ultimately outlet to Stormwater Management Facility #4 (SWMF#4). The stormwater release from the site is designed to control the post-development flows for the 2, 5, 10, 25, 50, and 100-year storm events to the allowable release rate based on the SWMF#4 design within the SIS Report.

Table 7 summarizes the stormwater quantity control requirements to meet the required release rate for the proposed public road.

**Table 7: Drainage Area 2 - Stormwater Quantity Control Requirements**

| Storm Event | Allowable Release Rate (L/s) | Quantity Control Volume Required (m <sup>3</sup> ) | Storage Provided* (m <sup>3</sup> ) |
|-------------|------------------------------|----------------------------------------------------|-------------------------------------|
| 2- Year     | 14.43                        | 6                                                  | 25.92                               |
| 5 – Year    | 21.89                        | 6                                                  |                                     |
| 10 – Year   | 27.16                        | 5                                                  |                                     |
| 25 – Year   | 34.11                        | 5                                                  |                                     |
| 50 – Year   | 39.44                        | 4                                                  |                                     |
| 100 – Year  | 44.89                        | 4                                                  |                                     |

Note: 25.92 m<sup>3</sup> storage volume is provided by surface ponding storage

The runoff generated by the private road will be collected by the proposed private storm sewer system and 25.92 m<sup>3</sup> of storage will be provided using surface ponding storage. Orifice controls will be provided upstream of Control MH2 to control the release of the stormwater to the proposed municipal sewer. Orifice sizing details will be provided with a future submission.

Refer to Figure 8 - Post-Development Storm Drainage Plan and Appendix D for the stormwater management calculations.

#### **7.2.1.2 Volume Control**

Based on the LSRCA Technical Guidelines for Stormwater Management Submissions (2016), where new developments create more than 0.5 ha of new impervious sites, stormwater runoff volumes will be controlled, and the post-construction runoff volume shall be captured and retained/treated on site from a 25 mm rainfall event.

As the proposed private road will generate 0.17 ha in new impervious areas, volume control will not be required.

#### **7.2.1.3 Water Balance and Groundwater Recharge**

As per the LSRCA Technical Guidelines for Stormwater Management Submissions (2016), the proposed stormwater management plan must make every effort to match the post-development infiltration volumes to pre-development levels on an annual basis for Major Developments.

Water balance and groundwater recharge efforts will be provided for the proposed development site. As the proposed private road is a small drainage area that is not a Major Development, water balance will not be required.

#### **7.2.1.4 Stormwater Quality Control**

As per the stormwater management criteria indicated within the LSRCA Technical Guidelines for Stormwater Management Submissions (2016), stormwater must be

treated to provide the MOECC Enhanced Protection Level which corresponds to a TSS removal of 80%.

The stormwater generated by the proposed private road will ultimately discharge to SWMF#4 which has been designed to provide quality control for the contributing areas. As such, stormwater quality control is not required within the proposed private road.

### 7.3 Drainage Area 3 – Development Site to Hewitt’s Creek

#### 7.3.1 Stormwater Quantity Control

##### 7.3.1.1 Peak Flow Control

Drainage Area 3 is 3.29 ha in size and will include the construction of six (6) retail buildings, associated parking lots, private roadways, and landscaped areas.

Phase 1 of the development will be designed to outlet to the future 100-year storm capture sewer within Yonge Street which will ultimately outlet to Stormwater Management Facility #7 (SWMF#7). The stormwater release from the site is designed to control the post-development flows for the 2, 5, 10, 25, 50, and 100-year storm events to the allowable release rate based on the SWMF#7 design within the SIS Report.

There is a 0.40 ha external drainage area flow that is to be conveyed through the internal storm sewer system in all storm events. As such, the allowable release rate to SWMF#7 has been adjusted to account for these flows being conveyed through the site.

Table 8 summarizes the stormwater quantity control requirements to meet the required release rate for the subject site.

**Table 8: Drainage Area 3 - Stormwater Quantity Control Requirements**

| Storm Event | Allowable Release Rate (L/s) | Uncontrolled Flow (L/s) | Controlled Release Rate (L/s) | Quantity Control Volume Required (m <sup>3</sup> ) | Quantity Storage Volume Provided (m <sup>3</sup> ) |
|-------------|------------------------------|-------------------------|-------------------------------|----------------------------------------------------|----------------------------------------------------|
| 2- Year     | 421.06                       | 3.1                     | 417.98                        | 201                                                | 247                                                |
| 5 – Year    | 601.03                       | 4.4                     | 596.68                        | 236                                                |                                                    |
| 10 – Year   | 750.08                       | 4.7                     | 745.39                        | 217                                                |                                                    |
| 25 – Year   | 927.78                       | 5.5                     | 922.28                        | 213                                                |                                                    |
| 50 – Year   | 1058.53                      | 6.1                     | 1052.44                       | 212                                                |                                                    |
| 100 – Year  | 1198.79                      | 6.7                     | 1192.09                       | 206                                                |                                                    |

The runoff generated on site will be collected by an internal storm sewer system and stored using parking lot ponding and low-impact development techniques across the site.

A cumulative surface ponding storage volume of 247 m<sup>3</sup> has been provided within the proposed parking lot, swales and in the private road south of the subject site. Orifice controls will be provided at the catchbasins throughout the site as needed to ensure surface ponding is utilized and to control the release of the stormwater to the proposed municipal sewer.

Refer to Figure 6, Figure 8, and Drawing S1 Servicing Plan for the storm sewer design and Drawing G1 – Grading Plan for details on the surface ponding storage.

### **7.3.2 Volume Control**

Based on the LSRCA Technical Guidelines for Stormwater Management Submissions (2016), where new developments create more than 0.5 ha of new impervious sites, stormwater runoff volumes will be controlled, and the post-construction runoff volume shall be captured and retained/treated on site from a 25 mm rainfall event. As the proposed development will generate 3.05 ha in impervious surfaces, volume control requirements are to be met.

The proposed site area of 32,941 m<sup>2</sup> will result in a 25 mm rainfall event retention volume of 823.53 m<sup>3</sup>. Volume control for the proposed development will be achieved using low-impact development techniques in addition to the volume control provided at SWMF#7.

As per the recommendation SIS Report, should it not be possible to infiltrate the full volume of 823.53 m<sup>3</sup> through low-impact development techniques, the remaining target can be achieved through filtration and attenuation measures.

### **7.3.3 Water Balance and Groundwater Recharge**

As per the LSRCA Technical Guidelines for Stormwater Management Submissions (2016), the proposed stormwater management plan must make every effort to match the post-development infiltration volumes to pre-development levels on an annual basis.

A water balance assessment was completed for the proposed development and included within the Draft Hydrogeology Assessment – Proposed Commercial Development, prepared by Pinchin Ltd, dated December 21, 2021. The sitewide assessment identified an average annual infiltration volume of 11,336 m<sup>3</sup>/year in the pre-development condition.

To meet the water balance requirements in the post-development condition, 11,336 m<sup>3</sup>/year is required to be infiltrated on-site using low impact development techniques.

To achieve the water recharge requirements, infiltration facilities are proposed for the site. Based on our conversations at the Design Charette Meeting on January 10, 2022,

with the Lake Simcoe Region Conservation Authority (LSRCA), it was requested that the parking lot areas on site not be used as contributing areas to the proposed infiltration facilities.

Based on this request, the infiltration facilities outlined in Section 7.3.4 have been designed to only accept flows from the proposed building rooftops and landscaped areas. As such, the annual recharge volume provided is 8,253 m<sup>3</sup>/year which is less than the required 11,336 m<sup>3</sup>/year water balance requirements.

To achieve the full 11,336 m<sup>3</sup>/year water balance requirements, the use of infiltration facilities within the parking lot areas would be required.

Refer to Appendix E for the low impact development and infiltration calculations.

### 7.3.4 On-Site Infiltration Rates

The stormwater quantity and water balance requirements for the proposed development can be achieved using lot level conveyance controls and low impact development techniques such as green roofs, bioretention, infiltration practices, permeable pavements, and rainwater harvesting.

Based on the Draft Hydrogeology Assessment – Proposed Commercial Development, prepared by Pinchin Ltd, dated December 21, 2021, hydraulic conductivity tests were unable to be completed in the boreholes and monitoring wells as they were found to be dry. The hydraulic conductivity of the soils was estimated based on the grain size analysis of soil samples to determine estimated infiltration rates across the site. As per the STEPS LID SWM Planning and Design Guideline, a safety correction of 3 shall be used in design calculations when a grain size analysis is used to determine the calculated infiltration rates. The design infiltration rates noted in Table 9 below, consider a safety correction factor of 3.

**Table 9: Site Infiltration Rates**

| <b>Borehole</b> | <b>Measured Infiltration Rate<br/>(mm/hr)</b> | <b>Design Infiltration Rate<br/>(mm/hr)</b> |
|-----------------|-----------------------------------------------|---------------------------------------------|
| BH8             | 204                                           | 68                                          |
| BH9             | 141                                           | 47                                          |
| BH10            | 150                                           | 50                                          |

Based on the infiltration rates noted above, to ensure the most conservative estimate is considered, an infiltration rate of 47 mm/hr has been applied across the development area.

### 7.3.5 Proposed Infiltration Facilities

In order to work towards achieving the groundwater recharge/water balance requirements for the proposed development, we have designed the infiltration facilities to retain and infiltrate the 5 mm rainfall event on site.

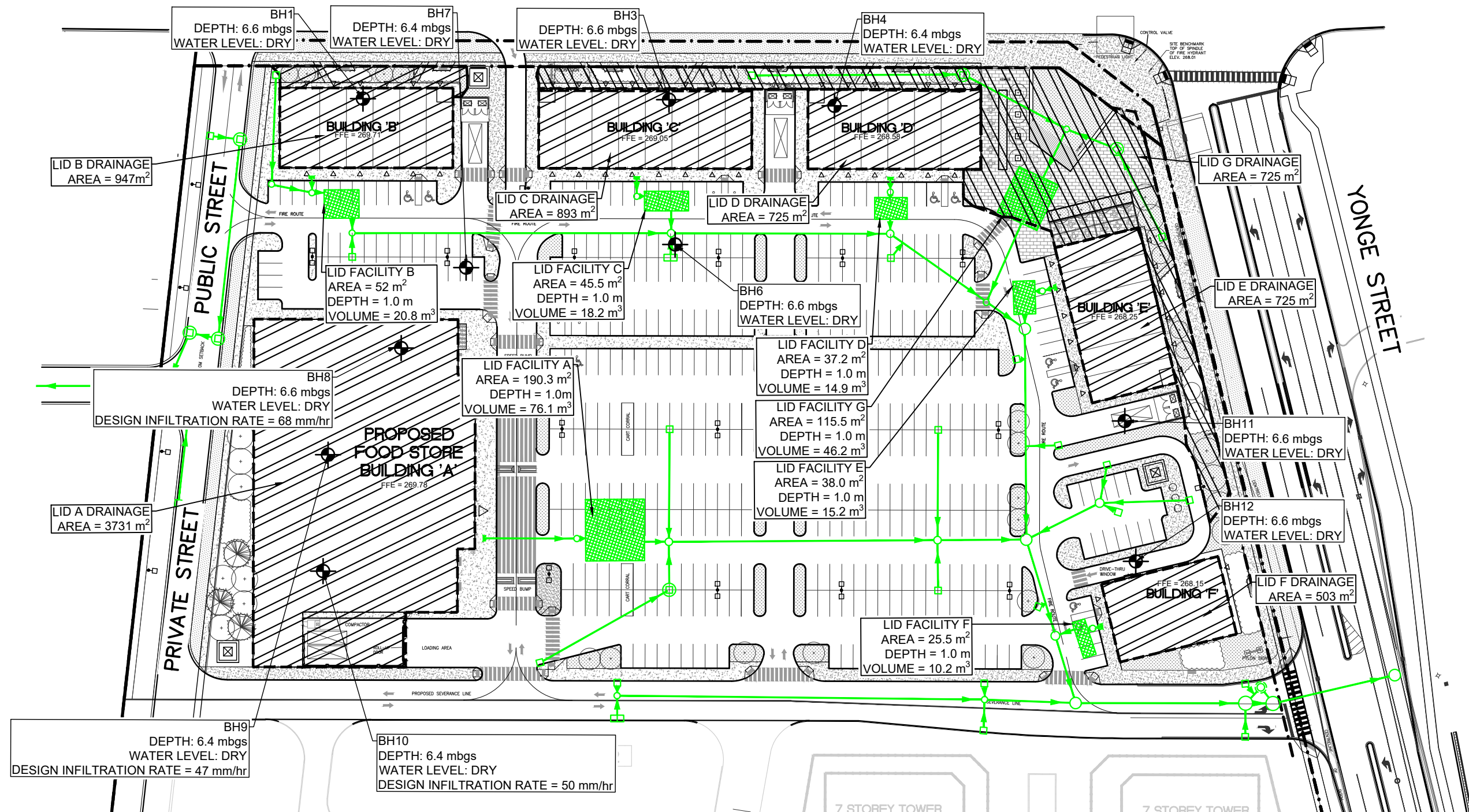
Seven (7) infiltration facilities have been proposed; one for each building rooftop drainage, as well as a facility which will capture drainage from the landscaped areas at the corner of Mapleview Road East and Yonge Street.

The design considerations that were taken into account for each infiltration facility include:

- Based on the STEPS LID SWM Planning and Design Guideline, the recommended impervious drainage is to facility area ratio should be between 5% to 20%. Each infiltration facility detailed below has maintained a ratio close to 5%.
- An infiltration rate of 47.0 mm/hr (includes a safety correction factor of 3) was applied to each facility.
- A minimum separation of 5 m has been considered between each facility and the proposed buildings.
- A void ratio of 0.40 was considered for the aggregate used.
- A maximum 48-hour time to drain was applied.
- The maximum depth of storage for each facility is 5.64 m.

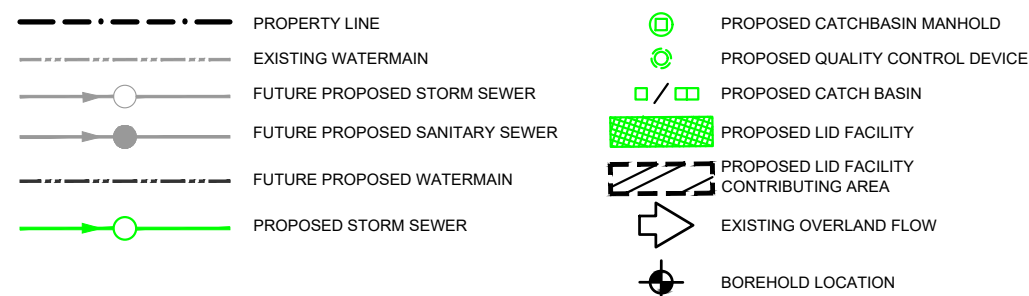
Refer to Figure 9 Low Impacts Development Features for the locations of each infiltration facility on site and the stormwater management calculations, enclosed, for further details.

# MAPLEVIEW DRIVE EAST



- Notes**
- This drawing is the exclusive property of R. J. Burnside & Associates Limited. The reproduction of any part without prior written consent of this office is strictly prohibited.
  - The contractor shall verify all dimensions, levels, and datums on site and report any discrepancies or omissions to this office prior to construction.
  - This drawing is to be read and understood in conjunction with all other plans and documents applicable to this project.

## LEGEND



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Client

**CROMBIE REIT**

5935 AIRPORT ROAD, SUITE 810  
MISSISSAUGA, ON  
L4V 1W5

Project Name

**MAPLEVIEW ROAD AND YONGE STREET  
BARRIE, ON**

Drawing Title

**LOW IMPACT DEVELOPMENT FEATURES**

|                  |                          |                  |                            |
|------------------|--------------------------|------------------|----------------------------|
| Drawn<br>CL      | Checked<br>JS            | Date<br>21/12/16 | Drawing No.<br><b>FIG9</b> |
| Scale<br>1:1,000 | Project No.<br>300035146 |                  |                            |

### 7.3.5.1 Infiltration Facility A

Infiltration Facility A is proposed to capture the rooftop drainage from proposed Building A and will be located downstream of the proposed storm sewer lateral for the building. To ensure that the low impact development feature will receive stormwater with a low TSS loading, the proposed rooftop will drain directly to the infiltration gallery.

Building A is 3731 m<sup>2</sup>, as such an infiltration facility area of 190.30 m<sup>2</sup> has been proposed to provide a 5.1% impervious drainage area to treatment facility range. The design parameters for the infiltration facility are identified in Table 10.

**Table 10: Infiltration Facility A Design Parameters**

| Description | Building Drainage Area (m <sup>2</sup> ) | Footprint Area (m <sup>2</sup> ) | Depth (m) | Void Ratio | Volume (m <sup>3</sup> ) |
|-------------|------------------------------------------|----------------------------------|-----------|------------|--------------------------|
| Facility A  | 3731                                     | 190.3                            | 1         | 0.40       | 76.1                     |

Based on the available infiltration volume of 76.1 m<sup>3</sup> and the infiltration parameters noted above, the annual volume of infiltration achieved by Infiltration Facility A is 3132.5 m<sup>3</sup>/year. This corresponds to a precipitation depth of 839.6 mm (90% of the total annual average rainfall) which corresponds to a daily rainfall depth of 20.4 mm being captured and conveyed to the infiltration gallery.

The proposed stormwater infiltration facility will consist of clear stone bedding with a void ratio of 0.40. The provided depth of 1.0 m will ensure a minimum 1.0 m separation between the bottom of the infiltration facility and the groundwater elevation.

The proposed infiltration facility has the capacity to infiltrate 76.1 m<sup>3</sup> of rainwater with a drawdown time of 8.5 hours. Refer to Figure 9 and Appendix E for the low impact development and infiltration calculations.

### 7.3.5.2 Infiltration Facility B

Infiltration Facility B is proposed to capture the rooftop drainage from proposed Building B and the swale area located behind Building B. The infiltration facility will be located downstream of the proposed storm sewer lateral for the building and the swale connection. To ensure that the low impact development feature will receive stormwater with a low TSS loading, the proposed rooftop and swale drainage will drain directly to the infiltration gallery.

The contributing area for Infiltration Facility B is 947 m<sup>2</sup>, as such an infiltration facility area of 52.0 m<sup>2</sup> has been proposed to provide a 5.5% impervious drainage area to treatment facility range. The design parameters for the infiltration facility are identified in Table 11, below.

**Table 11: Infiltration Facility B Design Parameters**

| Description | Building & Swale<br>Drainage Area<br>(m <sup>2</sup> ) | Footprint<br>Area (m <sup>2</sup> ) | Depth<br>(m) | Void Ratio | Volume<br>(m <sup>3</sup> ) |
|-------------|--------------------------------------------------------|-------------------------------------|--------------|------------|-----------------------------|
| Facility B  | 947                                                    | 52.0                                | 1.00         | 0.40       | 20.8                        |

Based on the available infiltration volume of 20.8 m<sup>3</sup> and the infiltration parameters noted above, the annual volume of infiltration achieved by Infiltration Facility B is 812.8 m<sup>3</sup>/year. This corresponds to a precipitation depth of 858.3 mm (92% of the total annual average rainfall) which corresponds to a daily rainfall depth of 22.0 mm being captured and conveyed to the infiltration gallery.

The proposed stormwater infiltration facility will consist of clear stone bedding with a void ratio of 0.40. The provided depth of 1.0 m will ensure a minimum 1.0 m separation between the bottom of the infiltration facility and the groundwater elevation.

The proposed infiltration facility has the capacity to infiltrate 20.8 m<sup>3</sup> of rainwater with a drawdown time of 8.5 hours. Refer to Figure 9 and Appendix E for the low impact development and infiltration calculations.

### 7.3.5.3 Infiltration Facility C

Infiltration Facility C is proposed to capture the rooftop drainage from proposed Building C and will be located downstream of the proposed storm sewer lateral for the building. To ensure that the low impact development feature will receive stormwater with a low TSS loading, the proposed rooftop will drain directly to the infiltration gallery.

Building C is 893 m<sup>2</sup>, as such an infiltration facility area of 45.5 m<sup>2</sup> has been proposed to provide a 5.1% impervious drainage area to treatment facility range. The design parameters for the infiltration facility are identified in Table 12, below.

**Table 12: Infiltration Facility C Design Parameters**

| Description | Building<br>Drainage Area<br>(m <sup>2</sup> ) | Footprint<br>Area (m <sup>2</sup> ) | Depth<br>(m) | Void Ratio | Volume<br>(m <sup>3</sup> ) |
|-------------|------------------------------------------------|-------------------------------------|--------------|------------|-----------------------------|
| Facility C  | 893                                            | 45.5                                | 1            | 0.40       | 18.2                        |

Based on the available infiltration volume of 18.2 m<sup>3</sup> and the infiltration parameters noted above, the annual volume of infiltration achieved by Infiltration Facility C is 749.8 m<sup>3</sup>/year. This corresponds to a precipitation depth of 839.6 mm (90% of the total annual average rainfall) which corresponds to a daily rainfall depth of 20.4 mm being captured and conveyed to the infiltration gallery.

The proposed stormwater infiltration facility will consist of clear stone bedding with a void ratio of 0.40. The provided depth of 1.0 m will ensure a minimum 1.0 m separation between the bottom of the infiltration facility and the groundwater elevation.

The proposed infiltration facility has the capacity to infiltrate 18.2 m<sup>3</sup> of rainwater with a drawdown time of 8.5 hours. Refer to Figure 5 and the stormwater management calculations, enclosed for further details.

#### 7.3.5.4 Infiltration Facility D

Infiltration Facility D is proposed to capture the rooftop drainage from proposed Building D and will be located downstream of the proposed storm sewer lateral for the building. To ensure that the low impact development feature will receive stormwater with a low TSS loading, the proposed rooftop will drain directly to the infiltration gallery.

Building D is 725 m<sup>2</sup>, as such an infiltration facility area of 37.2 m<sup>2</sup> has been proposed to provide a 5.1% impervious drainage area to treatment facility range. The design parameters for the infiltration facility are identified in Table 13, below.

**Table 13: Infiltration Facility D Design Parameters**

| Description | Building Drainage Area (m <sup>2</sup> ) | Footprint Area (m <sup>2</sup> ) | Depth (m) | Void Ratio | Volume (m <sup>3</sup> ) |
|-------------|------------------------------------------|----------------------------------|-----------|------------|--------------------------|
| Facility D  | 725                                      | 37.2                             | 1.0       | 0.40       | 14.9                     |

Based on the available infiltration volume of 14.9 m<sup>3</sup> and the infiltration parameters noted above, the annual volume of infiltration achieved by Infiltration Facility D is 608.8 m<sup>3</sup>/year. This corresponds to a precipitation depth of 839.6 mm (90% of the total annual average rainfall) which corresponds to a daily rainfall depth of 20.5 mm being captured and conveyed to the infiltration gallery.

The proposed stormwater infiltration facility will consist of clear stone bedding with a void ratio of 0.40. The provided depth of 1.0 m will ensure a minimum 1.0 m separation between the bottom of the infiltration facility and the groundwater elevation.

The proposed infiltration facility has the capacity to infiltrate 14.90m<sup>3</sup> of rainwater with a drawdown time of 8.5 hours. Refer to Figure 9 and Appendix E for the low impact development and infiltration calculations.

#### 7.3.5.5 Infiltration Facility E

Infiltration Facility E is proposed to capture the rooftop drainage from proposed Building E and will be located downstream of the proposed storm sewer lateral for the building. To ensure that the low impact development feature will receive stormwater with a low TSS loading, the proposed rooftop will drain directly to the infiltration gallery.

Building E is 725 m<sup>2</sup>, as such an infiltration facility area of 38.0 m<sup>2</sup> has been proposed to provide a 5.2% impervious drainage area to treatment facility range. The design parameters for the infiltration facility are identified in Table 14, below.

**Table 14: Infiltration Facility E Design Parameters**

| Description | Building Drainage Area (m <sup>2</sup> ) | Footprint Area (m <sup>2</sup> ) | Depth (m) | Void Ratio | Volume (m <sup>3</sup> ) |
|-------------|------------------------------------------|----------------------------------|-----------|------------|--------------------------|
| Facility E  | 725                                      | 38.0                             | 1.0       | 0.40       | 15.2                     |

Based on the available infiltration volume of 15.2 m<sup>3</sup> and the infiltration parameters noted above, the annual volume of infiltration achieved by Infiltration Facility E is 615.4 m<sup>3</sup>/year. This corresponds to a precipitation depth of 848.9 mm (91% of the total annual average rainfall) which corresponds to a daily rainfall depth of 21.0 mm being captured and conveyed to the infiltration gallery.

The proposed stormwater infiltration facility will consist of clear stone bedding with a void ratio of 0.40. The provided depth of 1.0 m will ensure a minimum 1.0 m separation between the bottom of the infiltration facility and the groundwater elevation.

The proposed infiltration facility has the capacity to infiltrate 15.2 m<sup>3</sup> of rainwater with a drawdown time of 8.5 hours. Refer to Figure 9 and Appendix E for the low impact development and infiltration calculations.

#### 7.3.5.6 Infiltration Facility F

Infiltration Facility F is proposed to capture the rooftop drainage from proposed Building F and will be located downstream of the proposed storm sewer lateral for the building. To ensure that the low impact development feature will receive stormwater with a low TSS loading, the proposed rooftop will drain directly to the infiltration gallery.

Building F is 503 m<sup>2</sup>, as such an infiltration facility area of 25.5 m<sup>2</sup> has been proposed to provide a 5.1% impervious drainage area to treatment facility range. The design parameters for the infiltration facility are identified in Table 15.

**Table 15: Infiltration Facility F Design Parameters**

| Description | Building Drainage Area (m <sup>2</sup> ) | Footprint Area (m <sup>2</sup> ) | Depth (m) | Void Ratio | Volume (m <sup>3</sup> ) |
|-------------|------------------------------------------|----------------------------------|-----------|------------|--------------------------|
| Facility F  | 505                                      | 25.5                             | 1.0       | 0.40       | 10.2                     |

Based on the available infiltration volume of 10.2 m<sup>3</sup> and the infiltration parameters noted above, the annual volume of infiltration achieved by Infiltration Facility F is 421.9 m<sup>3</sup>/year. This corresponds to a precipitation depth of 839.6 mm (90% of the total

annual average rainfall) which corresponds to a daily rainfall depth of 20.3 mm being captured and conveyed to the infiltration gallery.

The proposed stormwater infiltration facility will consist of clear stone bedding with a void ratio of 0.40. The provided depth of 1.0 m will ensure a minimum 1.0 m separation between the bottom of the infiltration facility and the groundwater elevation.

The proposed infiltration facility has the capacity to infiltrate 10.2 m<sup>3</sup> of rainwater with a drawdown time of 8.5 hours. Refer to Figure 9 and Appendix E for the low impact development and infiltration calculations.

#### 7.3.5.7 Infiltration Facility G

Infiltration Facility G will be located within the landscape area at the northeast corner of the site and will capture the landscape area drainage. The storm drainage will be captured by catchbasins proposed in the swale and landscaped areas and conveyed by an internal storm sewer system.

To ensure that the low impact development feature will receive stormwater with a low TSS loading, the storm flows from the landscaped areas inlet directly to the infiltration facility to ensure it is not mixed with parking lot drainage.

Infiltration Facility G is proposed to be 115.5 m<sup>2</sup>, with a contributing area of 2277 m<sup>2</sup> to provide a 5.1% impervious drainage area to treatment facility range. The design parameters for the infiltration facility are identified in Table 16.

**Table 16: Infiltration Facility G Design Parameters**

| Description | Site Drainage Area (m <sup>2</sup> ) | Footprint Area (m <sup>2</sup> ) | Depth (m) | Void Ratio | Volume (m <sup>3</sup> ) |
|-------------|--------------------------------------|----------------------------------|-----------|------------|--------------------------|
| Facility G  | 2277                                 | 115.5                            | 1.0       | 0.40       | 46.2                     |

Based on the available infiltration volume of 46.2 m<sup>3</sup> and the infiltration parameters noted above, the annual volume of infiltration achieved by Infiltration Facility G is 1911.8 m<sup>3</sup>/year. This corresponds to a precipitation depth of 839.6 mm (90% of the total annual average rainfall) which corresponds to a daily rainfall depth of 20.3 mm being captured and conveyed to the infiltration gallery.

The proposed stormwater infiltration facility will consist of clear stone bedding with a void ratio of 0.40. The provided depth of 1.0 m will ensure a minimum 1.0 m separation between the bottom of the infiltration facility and the groundwater elevation.

The proposed infiltration facility has the capacity to infiltrate 46.2 m<sup>3</sup> of rainwater with a drawdown time of 8.5 hours. Refer to Figure 9 and Appendix E for the low impact development and infiltration calculations.

### 7.3.6 Infiltration Summary

The proposed infiltration facilities noted in Section 7.3.5 have been proposed to provide groundwater recharge and water balance as well as volume control. The volume control and the annual infiltration volumes are summarized in Table 17.

**Table 17: Volume Control and Infiltration Volumes**

| <b>Infiltration Facility</b> | <b>Volume Provided (m<sup>3</sup>)</b> | <b>Annual Infiltration Volume (m<sup>3</sup>/year)</b> |
|------------------------------|----------------------------------------|--------------------------------------------------------|
| Infiltration Facility A      | 76.1                                   | 3132.5                                                 |
| Infiltration Facility B      | 20.8                                   | 812.8                                                  |
| Infiltration Facility C      | 18.2                                   | 479.8                                                  |
| Infiltration Facility D      | 14.9                                   | 608.8                                                  |
| Infiltration Facility E      | 15.2                                   | 615.4                                                  |
| Infiltration Facility F      | 10.2                                   | 421.9                                                  |
| Infiltration Facility G      | 46.2                                   | 1911.8                                                 |
| <b>Total</b>                 | <b>155.4</b>                           | <b>8253.0</b>                                          |

The 25 mm rainfall event volume control requirement for the proposed site area of 32,941 m<sup>2</sup> is 823.53 m<sup>3</sup>. Volume control for the proposed development will be achieved using low-impact development techniques in addition to the volume control provided at SWMF#7.

The 5 mm rainfall event for the site results in a volume of 137.43 m<sup>3</sup>; the volume proposed to be retained and managed on site is 155.4 m<sup>3</sup> which exceeds the 5 mm rainfall event. As such, volume control for 5 mm rainfall events will be managed on site, and the remaining volume control up to the 25 mm rainfall event will be managed within SWMF#7.

Based on the water balance assessment in the Draft Hydrogeology Assessment – Proposed Commercial Development, prepared by Pinchin Ltd, dated December 21, 2021. The sitewide assessment identified an average annual infiltration volume of 11,336 m<sup>3</sup>/year in the pre-development condition. To meet the water balance requirements in the post-development condition, 11,336 m<sup>3</sup>/year is required to be infiltrated on-site using low impact development techniques.

The infiltration facilities provided on site cumulatively provides an annual infiltration volume of 8,253.0 m<sup>3</sup>. To achieve the full 11,336 m<sup>3</sup>/year water balance requirements, the use of infiltration facilities within the parking lot areas would be required.

### **7.3.7 Stormwater Quality Control**

### **7.3.8 TSS Removal**

As per the stormwater management criteria indicated within the LSRCA Technical Guidelines for Stormwater Management Submissions (2016), stormwater must be treated to provide the MOECC Enhanced Protection Level which corresponds to a TSS removal of 80%.

The stormwater on site is generated by the proposed rooftops (mixed stormwater downstream of infiltration facilities), landscaped areas, and parking areas on site which are proposed to outlet to the future proposed 1200 mm diameter storm sewer in Yonge Street.

To meet the TSS removal requirements, the stormwater will require additional treatment by a filtration unit capable of achieving 80% TSS removal in accordance with New Jersey Department of Environmental Protection (NJDEP) Verification.

As such, the use of a filtration unit for quality treatment upstream of Control Manhole 1 will meet the enhanced 80% TSS removal as recommended by the LSRCA and MECP guidelines.

## **7.4 Phosphorus Removal**

As per the stormwater management criteria indicated within the LSRCA Technical Guidelines for Stormwater Management Submissions (2016), stormwater management for Major Developments must be treated to provide removal of 80% of the annual Total Phosphorous (TP) load in the post-development condition.

As per the LSRCA stormwater management criteria, the typical phosphorous reduction for infiltration systems is 87%, and for wet stormwater management ponds is 63%. Stormwater generated on site will be infiltrated using the seven infiltration galleries on site, any stormwater that ultimately outlets to SWMF#7 will be treated for phosphorous removal in the stormwater management pond.

As noted in the SIS Report, infiltration of stormwater in conjunction with an end of pipe stormwater management facility is an approach that could reduce the post-development phosphorous loading to meet the LSRCA targets.

The existing site consists of a forested area which has a phosphorous export coefficient of 0.05 kg/ha/yr. The pre-development phosphorous loading of 0.18 kg/yr has been calculated in Table 18 below.

**Table 18: Pre-Development Phosphorus Loading**

| Land Use     | Total Area (ha) | Phosphorus Export Coefficient* (kg/ha/yr) | Phosphorus Loading (kg/yr) |
|--------------|-----------------|-------------------------------------------|----------------------------|
| Forest       | 3.69            | 0.05                                      | 0.18                       |
| <b>Total</b> | <b>3.69</b>     |                                           | <b>0.18</b>                |

\*Land-use specific phosphorus export coefficient for the Hewitt's Creek Lake Simcoe Subwatershed per Hutchinson, 2012.

In the post-development condition, the phosphorous loading has been determined based on the area breakdown of low-intensity and high-intensity development areas. The proposed phosphorous loading in the proposed condition is 5.53 kg/year which is an increase from the existing condition. Refer to Table 19 for details.

**Table 19: Post-Development Phosphorus Loading**

| Land Use                                                      | Total Area (ha) | Phosphorus Export Coefficient (kg/ha/yr) | Phosphorus Loading (kg/yr) |
|---------------------------------------------------------------|-----------------|------------------------------------------|----------------------------|
| Low-Intensity Development (Roof areas)                        | 0.70            | 0.13                                     | 0.09                       |
| High-Intensity Development (Asphalt parking, landscape areas) | 2.99            | 1.82                                     | 5.44                       |
| <b>Total</b>                                                  | <b>3.69</b>     |                                          | <b>5.53</b>                |

\*Land-use specific phosphorus export coefficient for the Hewitt's Creek Lake Simcoe Subwatershed per Hutchinson, 2012.

To meet the LSRCA TP removal requirements, stormwater must be treated to provide removal of 80% of the annual Total Phosphorous (TP) load in the post-development condition. This has been achieved on site through the use of low impact development techniques and the use of the downstream wet stormwater management pond SWMF#7. When the TP reduction has been applied with the onsite infiltration mitigation measures, the phosphorous loading for the proposed development is 3.51 kg/year, as calculated in Table 20.

**Table 20: Post-Development Phosphorus Loading with LID Mitigation**

| Land Use                                                      | Total Area (ha) | Phosphorus Export Coefficient (kg/ha/yr) | LIDs and Reduction Factors*                    | Reduction Factor (%) | Phosphorus Loading (kg/yr) |
|---------------------------------------------------------------|-----------------|------------------------------------------|------------------------------------------------|----------------------|----------------------------|
| Low-Intensity Development (Roof areas)                        | 0.70            | 0.13                                     | Infiltration facility (87%),<br>Wet pond (63%) | 95.19                | 0.09                       |
| High-Intensity Development (Asphalt parking, landscape areas) | 2.99            | 2.99                                     | Wet pond (63%)                                 | 63.00                | 3.43                       |
| <b>Total</b>                                                  | <b>3.69</b>     |                                          |                                                |                      | <b>3.51</b>                |

\*Median Phosphorus Removal Efficiencies for Major Classes of LID per Hutchinson, 2012.

As such, the proposed phosphorus removal mitigation measures applied on site result in a 64% Net Reduction in Post-Development Loading, therefore further on-site mitigation is required.

A filtration unit is proposed upstream of the outlet from the site at Control MH1. Filtration units provide an additional 50% TP reduction. When this is applied to the site in a treatment train approach, the total phosphorus reduction from the proposed development in the post development condition is 85%, which exceeds the LSRCA 80% TP removal requirement.

## 8.0 Erosion and Sediment Control

The Erosion and Sediment Control Plan for the site will be designed in conformance with the LSRCA Erosion and Sediment Control Minimum Requirements and the Erosion Sediment Control Guidelines for Urban Construction (STEPS, 2019).

The erosion and sediment control strategy for the proposed Phase 1 Development will include the following:

- Erosion and Sediment Control (ESC) measures will be implemented prior to construction and will be maintained during the full construction period to prevent entry of sediment into nearby storm sewers, natural features, water features and adjacent lands.
- Temporary sediment control fence shall be installed at construction limits and/or downstream of any disturbed areas prior to grading.
- Gravel mud mats to be installed at vehicle access points to minimize off-site tracking of sediments.
- Sediment traps to be installed in existing and proposed catchbasins.
- The location of existing vegetation to be preserved or removed will be provided and any necessary tree hoarding provided.
- Disturbed areas will be minimized to the extent possible and temporary or permanently stabilized or restored as the work progresses. Disturbed areas will be replanted using native species within 30 days of construction completion.
- Routine inspection, monitoring, and repair as necessary of all erosion and sediment control measures during construction.
- Removal of temporary controls once the areas they serve are restored and stable.
- If site construction activities are interrupted and/or inactivity exceeds 30 days, all stripped or bare soil areas are to be stabilized.
- All damaged erosion and sediment control measures should be repaired and/or replaced within 48 hours of the inspection.
- After hours contact numbers are to be posted on-site for emergencies.

All reasonable measures will be taken to ensure that the sediment loading is minimized both during and following construction.

## 9.0 Conclusions and Recommendations

The servicing analysis provided above is summarized as follows:

### 9.1 Water Servicing

- A 200 mm diameter fire line and a 150 mm diameter domestic connection will be provided from the 300 mm diameter service connection to the proposed 300 mm diameter watermain within Yonge Street.
- Fire protection will be met through the use of proposed hydrants in the Municipal ROWs in addition to four private hydrants internal to the site.
- The total demands for the proposed commercial Buildings A through F are 3,330 GPM (210 L/s), 2060 GPM (130 L/s), 2403 GPM (152 L/s), 2060 GPM (130 L/s), 1902 GPM (120 L/s), and 1519 GPM (96 L/s), respectively.

### 9.2 Sanitary Servicing

- A 250 mm diameter sanitary connection will be provided to the future 250 mm diameter sanitary sewer within Yonge Street.
- The total sanitary flow from the proposed development is 1.35 L/s.

### 9.3 Stormwater Management

- The post-development peak flow rates will be controlled to the proposed catchment area discharge rates indicated in the SIS Report for the 2, 5, 10, 25, 50, and 100-year design storm events.
- The runoff generated on site will be collected by an internal storm sewer system and stored using parking lot ponding and low-impact development techniques across the site. Orifice controls will be provided to control the release of the stormwater to the proposed municipal sewer.
- Seven (7) infiltration facilities have been provided to retain and manage the 5 mm rainfall event on site to meet volume control requirements.
- Low impact development techniques have been provided in an effort to increase the post-development groundwater recharge to the pre-development levels.
- Enhanced level of quality control provides 80% TSS removal through the use of a filtration unit on site.
- Total Phosphorous Loading is reduced by the infiltration of stormwater in conjunction with an end of pipe stormwater management facility and a filtration unit on site.
- Erosion and Sediment Control measures will be implemented on site to ensure that sediment loading is minimized.

Functional Servicing and Stormwater Management Report  
April 2022

In summary, the site can be serviced by the future surrounding municipal infrastructure with the construction of the on-site stormwater management measures capable of satisfying the applicable SWM criteria.

Accordingly, we hereby recommend the adoption of this report as it relates to the provision of servicing and stormwater management works, and for the purposes of this and future Re-Zoning and future Site Plan Applications.



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## Appendix A

### **Hewitt's Secondary Plan Area Subwatershed Impact Study Figures and Addendums**

Hewitt's Secondary Plan Area Subwatershed Impact Study  
Lover's, Hewitt's, and Sandy Cove Creeks



## Addendum No. 2

---

**Date:** December 9, 2021 **Project No.:** 300032860.0000

**Project Name:** Hewitt's Secondary Plan Area Subwatershed Impact Study

**Client Name:** Hewitt's Creek Landowners Group Inc.

**Submitted By:** Michelle Zettel, P.Eng.

**Reviewed By:** James Orr, P.Eng.

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The Hewitt's Secondary Plan Area (SPA) Subwatershed Impact Study (SIS) was originally completed in September 2016. Following the receipt of comments from the City of Barrie (City) and the Lake Simcoe Region Conservation Authority (LSRCA), Addendum No. 1 was completed in November 2017 to rectify any issues raised by the agencies. Addendum No. 1, in concert with the original SIS, has set the framework for all developments within the Hewitt's SPA advancing through preliminary and detailed design. This memo, noted as Addendum No. 2 of the SIS, is presented to address a change in the proposed Lover's Creek and Hewitt's Creek subwatersheds, relative to Addendum No. 1.

Within the Hewitt's SPA there is an existing subwatershed divide between the Lover's Creek watershed and the Hewitt's Creek watershed. The grading design in the original Subwatershed Impact Study (SIS) and subsequent Addendum No. 1 (November 2017) resulted in a minor adjustment to this drainage divide. The SIS drainage divide between Hewitt's Creek and Lover's Creek watersheds were initially designed to limit the diversion of drainage from one watershed to the other, while optimizing earthworks across the site. As developers advance their individual designs, several landowners along this divide expressed interest in adjusting the proposed SIS divide in order to coincide better with property limits and phasing limits.

Through 2020, preliminary drainage divide revisions were circulated for coordination between landowners, and for discussion with the LSRCA. Most recently, a small area from the Lover's Creek watershed has been redirected to Hewitt's Creek, representing about 100m of ROW. With no further coordination or adjustments anticipated at this time, Addendum 2 has been finalized for approval as follows.

For reference, the previous drainage Figures 9 and 10 from Addendum 1 (November 2017) are included in Appendix A. The revised Figures 9 and 10 have been included, which are to replace the previously submitted drainage divide figures. An additional figure, DD, has also been included for clarity. The Addendum 2 Figures are found in Appendix B.

A comparison between the revised drainage divide and the SIS Addendum 1, is summarized in tabular form below.

**Table 1: Summary of the Revised Drainage Divide and the Original SIS**

| <b>SIS Addendum 1</b>                       |                |                 |                                                                                  |
|---------------------------------------------|----------------|-----------------|----------------------------------------------------------------------------------|
|                                             | <b>Lover's</b> | <b>Hewitt's</b> | <b>Description</b>                                                               |
| <b>Swapped Area (ha)</b>                    | -5.8           | 5.8             | North commercial area and some residential to drain east.                        |
|                                             | 11.2           | -11.2           | Central residential and part of recreation centre area to drain west.            |
|                                             | -3.9           | 3.9             | Part of school block to drain east.                                              |
| <b>Net Diversion (ha)</b>                   | <b>1.5</b>     | <b>-1.5</b>     |                                                                                  |
| <b>Percent Change in Watershed Area (%)</b> | <b>0.61%</b>   | <b>0.47%</b>    |                                                                                  |
| <b>Revised Scenario – Addendum 2</b>        |                |                 |                                                                                  |
|                                             | <b>Lover's</b> | <b>Hewitt's</b> | <b>Description</b>                                                               |
| <b>Swapped Area (ha)</b>                    | -4.6           | 4.6             | North commercial area to drain east.                                             |
|                                             | 13.1           | -13.1           | Central residential and additional 6.72 ha residential diverted to west.         |
|                                             | -8.6           | 8.6             | Rec Centre and site plan diverted to east<br>Part of school block to drain east. |
| <b>Net Diversion (ha)</b>                   | <b>-0.1</b>    | <b>0.1</b>      |                                                                                  |
| <b>Percent Change in Watershed Area (%)</b> | <b>0.04%</b>   | <b>0.03%</b>    |                                                                                  |

As noted above, the proposed update will result in a negligible area being swapped between the Lover's Creek and Hewitt's Creek watersheds. The complete details of the calculations are in Appendix C. It is noted that Stormwater Management Facilities 3 and 7 will receive decreased drainage from the development area, while SWMFs 4 and 5 will need to accept an increased drainage area, relative to SIS Addendum 1. However, catchment 7a (draining to SWMF7) has been expanded to include the north portion of Yonge Street and any increased drainage associated with the proposed widening. Appropriate coordination has been had with all impacted developers to ensure that the ponds will still function as intended.

In keeping with the original SIS, the drainage diversion has been kept to a minimum. Once approved, this addendum is set to be the framework for all development and review moving forward.

**R.J. Burnside & Associates Limited**

  
Michelle Zettel, P.Eng.  
Water Resources Engineer  
MLZ:sp:sc

Enclosure(s)      **Appendix A**  
Addendum 1 Figures  
**Appendix B**  
Figure 9 – Proposed Storm Sewer Plan (1 of 3)  
Figure 10 – Proposed Storm Sewer Plan (2 of 3)  
Figure DD – Proposed Drainage Divide  
**Appendix C**  
Drainage Divide Calculations

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211207 - Drainage Divide Addendum (032860)  
09/12/2021 3:09 PM

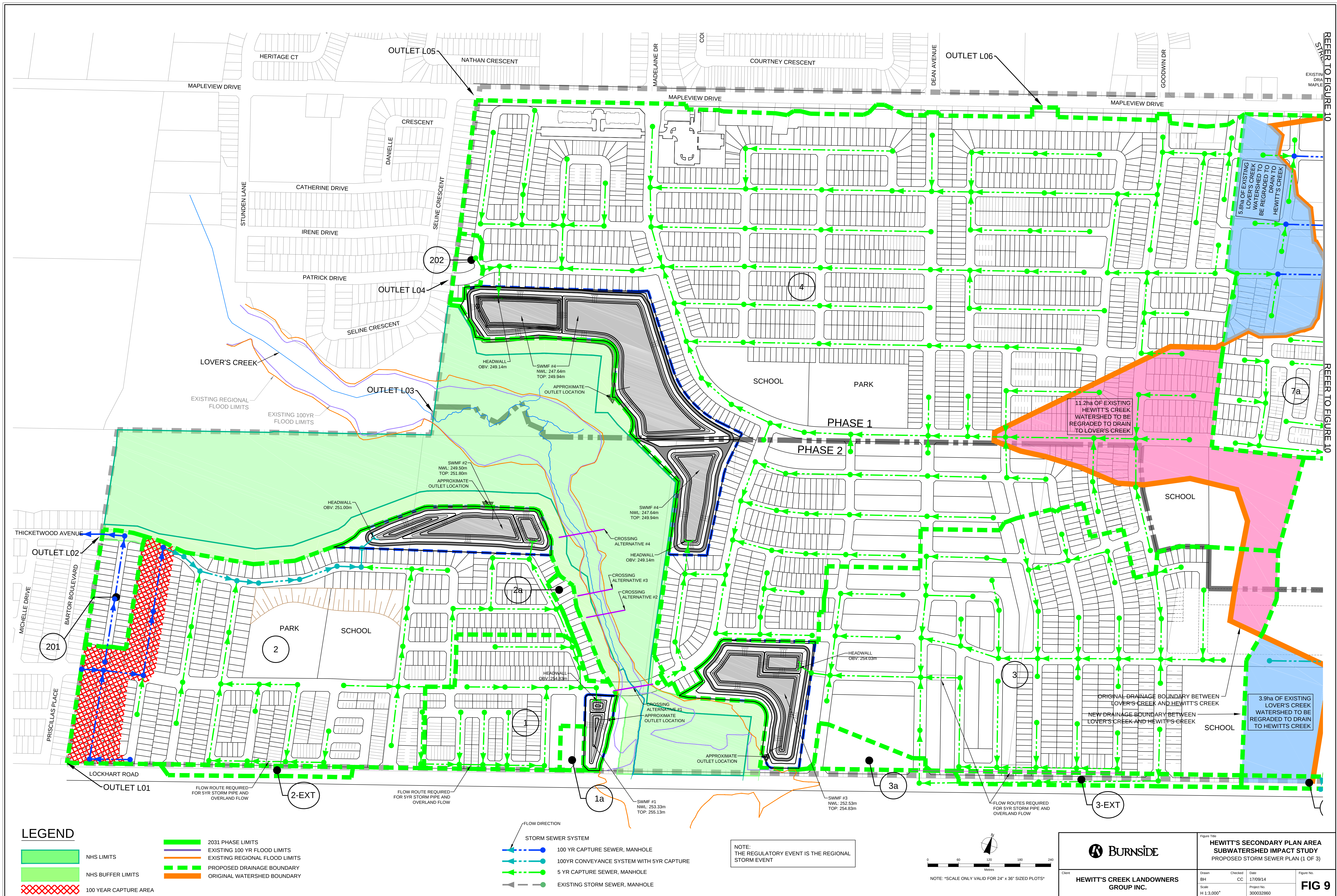


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## Appendix A

### Addendum 1 Figures

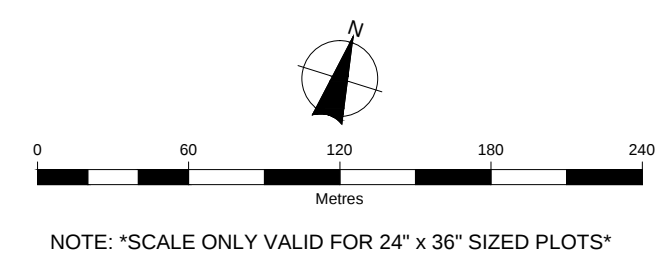


LEGEND

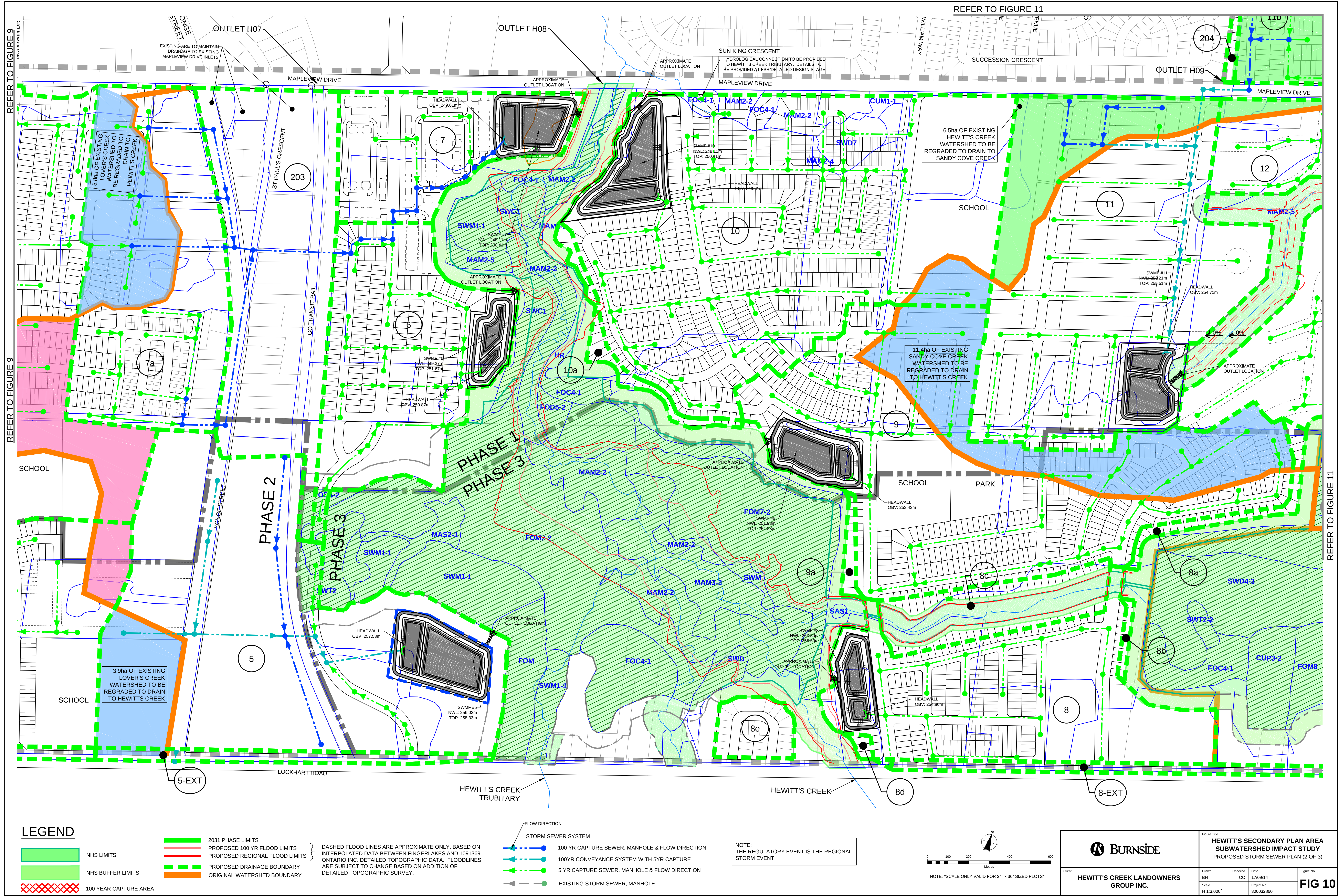
- NHS LIMITS
- NHS BUFFER LIMITS
- 100 YEAR CAPTURE AREA
- 2031 PHASE LIMITS
- EXISTING 100 YR FLOOD LIMITS
- EXISTING REGIONAL FLOOD LIMITS
- PROPOSED DRAINAGE BOUNDARY
- ORIGINAL WATERSHED BOUNDARY

- FLOW DIRECTION
- STORM SEWER SYSTEM
- 100 YR CAPTURE SEWER, MANHOLE
- 100YR CONVEYANCE SYSTEM WITH 5YR CAPTURE
- 5 YR CAPTURE SEWER, MANHOLE
- EXISTING STORM SEWER, MANHOLE

NOTE:  
THE REGULATORY EVENT IS THE REGIONAL  
STORM EVENT



|        |                                      |                                      |                                                                                           |
|--------|--------------------------------------|--------------------------------------|-------------------------------------------------------------------------------------------|
|        |                                      | HEWITT'S CREEK LANDOWNERS GROUP INC. |                                                                                           |
| Client | HEWITT'S CREEK LANDOWNERS GROUP INC. | Figure Title                         | HEWITT'S SECONDARY PLAN AREA SUBWATERSHED IMPACT STUDY PROPOSED STORM SEWER PLAN (1 OF 3) |
| Drawn  | BH                                   | Checked                              | CC                                                                                        |
| Date   | 17/09/14                             | Project No.                          | 300032860                                                                                 |
| Scale  | H:1:3,000*                           | Figure No.                           | FIG 9                                                                                     |





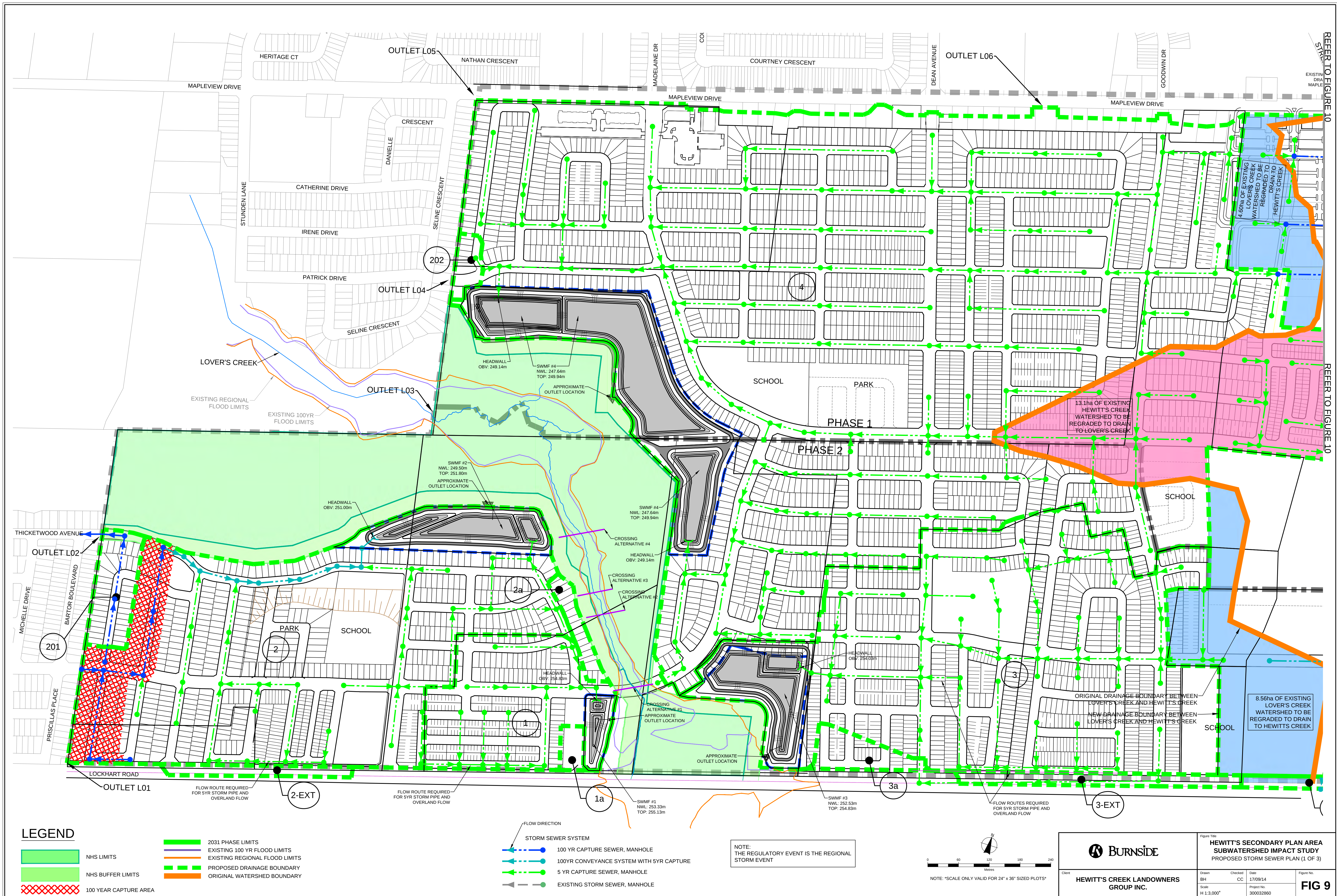
# BURNSIDE

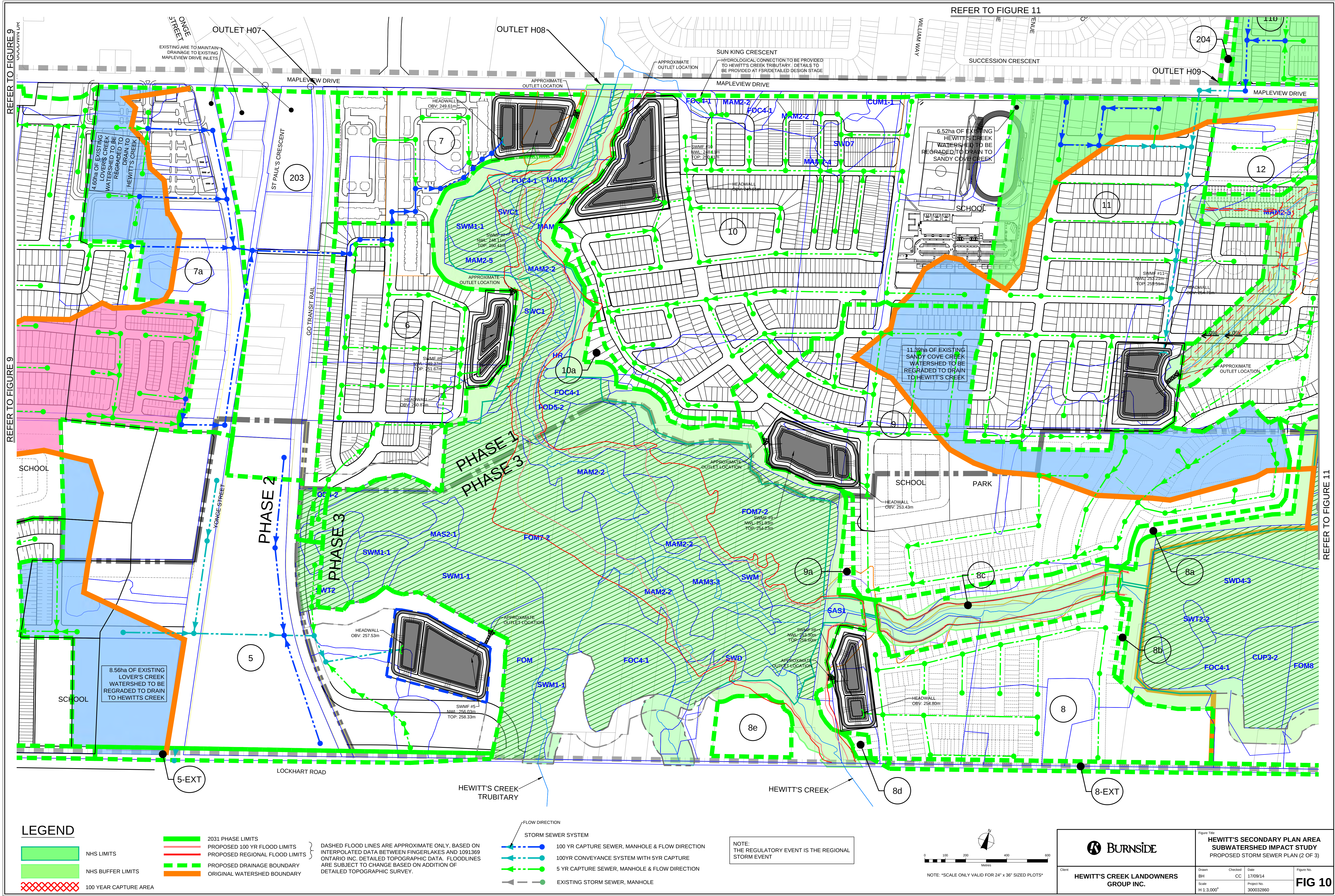
[ THE DIFFERENCE IS OUR PEOPLE ]

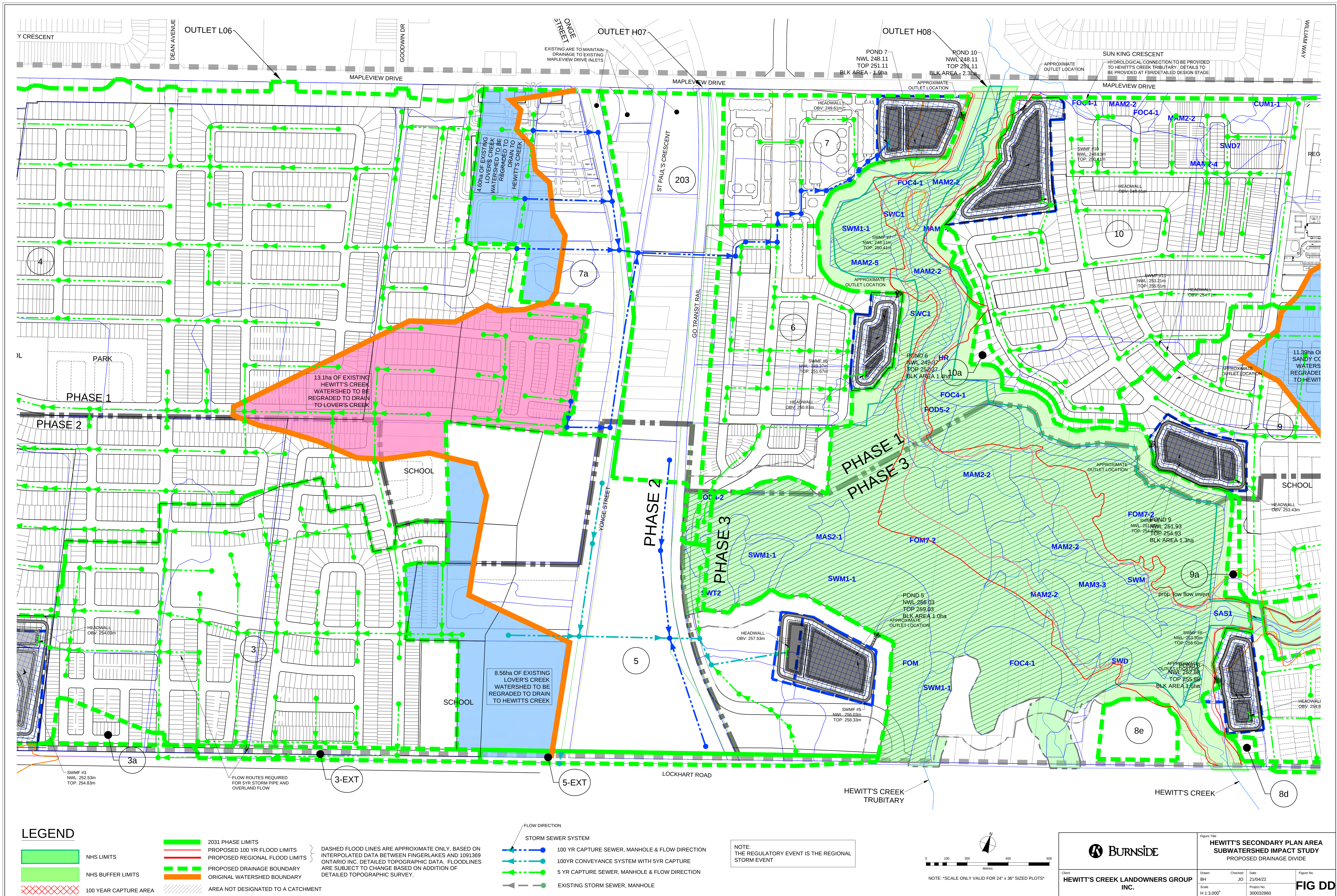
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## Appendix B

**Figure 9 – Proposed Storm Sewer Plan (1 of 3)**  
**Figure 10 – Proposed Storm Sewer Plan (2 of 3)**  
**Figure DD – Proposed Drainage Divide**









# BURNSIDE

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## Appendix C

### Drainage Divide Calculations

**Project Number:** 300032860

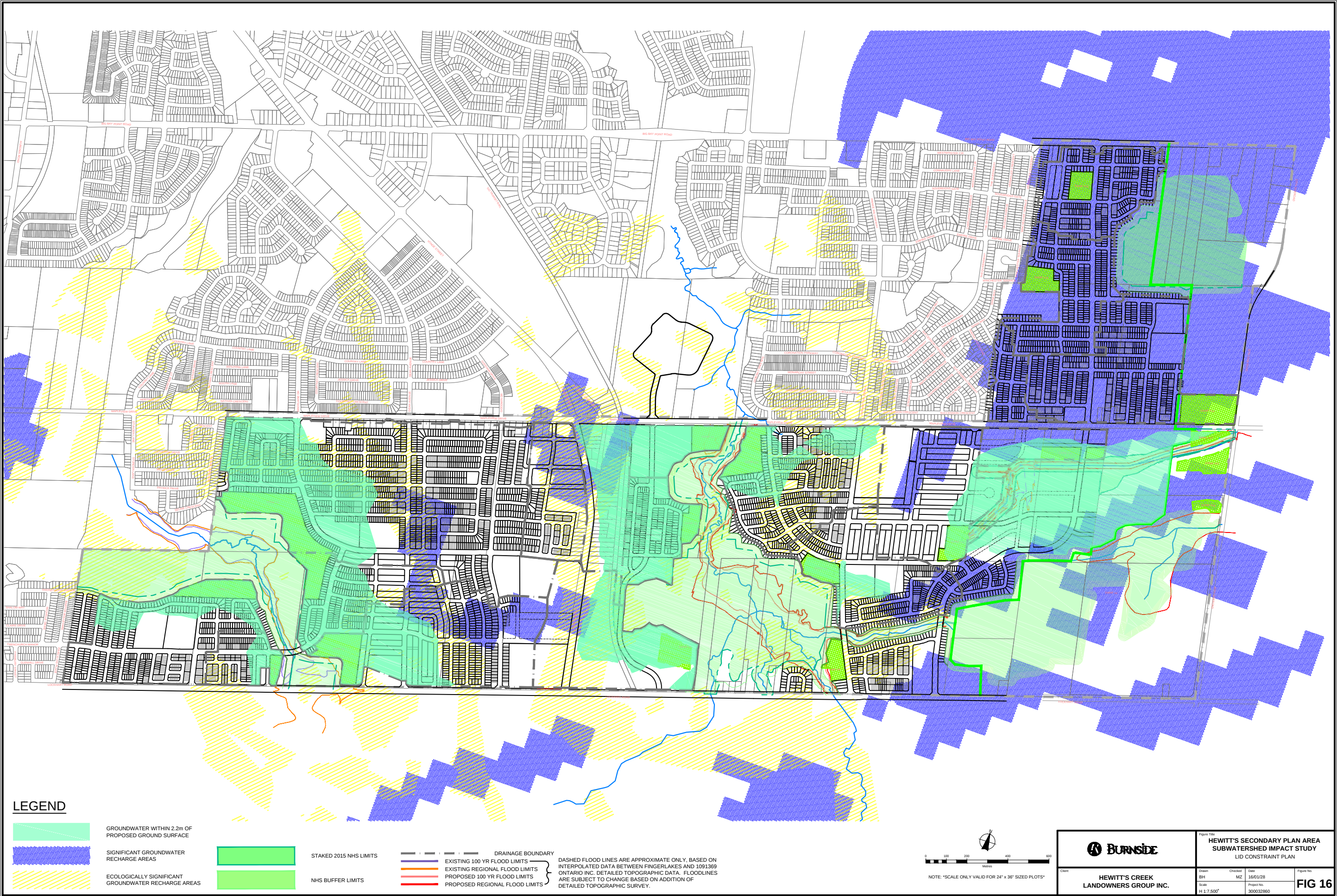
**Date:** Dec-21

**Author:** MZ

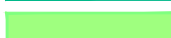
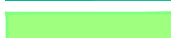
## **Hewitt's and Lover's Drainage Divide Revision**

|                                                | <b>Lover's Creek</b> | <b>Hewitt's Creek</b> |
|------------------------------------------------|----------------------|-----------------------|
| <b>Existing Watershed in Hewitt's SPA (ha)</b> | 245.69               | 320.77                |
| <b>Proposed Gains/Losses (ha)</b>              | 1.5                  | -1.5                  |
| <b>Proposed Watershed in Hewitt's SPA (ha)</b> | 247.19               | 319.27                |
| <b>Percent Change in Watershed Area (%)</b>    | 0.61%                | 0.47%                 |

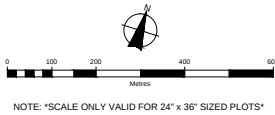
|                                                | <b>Lover's Creek</b> | <b>Hewitt's Creek</b> |
|------------------------------------------------|----------------------|-----------------------|
| <b>Existing Watershed in Hewitt's SPA (ha)</b> | 245.69               | 320.77                |
| <b>Proposed Gains/Losses (ha)</b>              | -0.1                 | 0.1                   |
| <b>Proposed Watershed in Hewitt's SPA (ha)</b> | 245.59               | 320.87                |
| <b>Percent Change in Watershed Area (%)</b>    | 0.04%                | 0.03%                 |



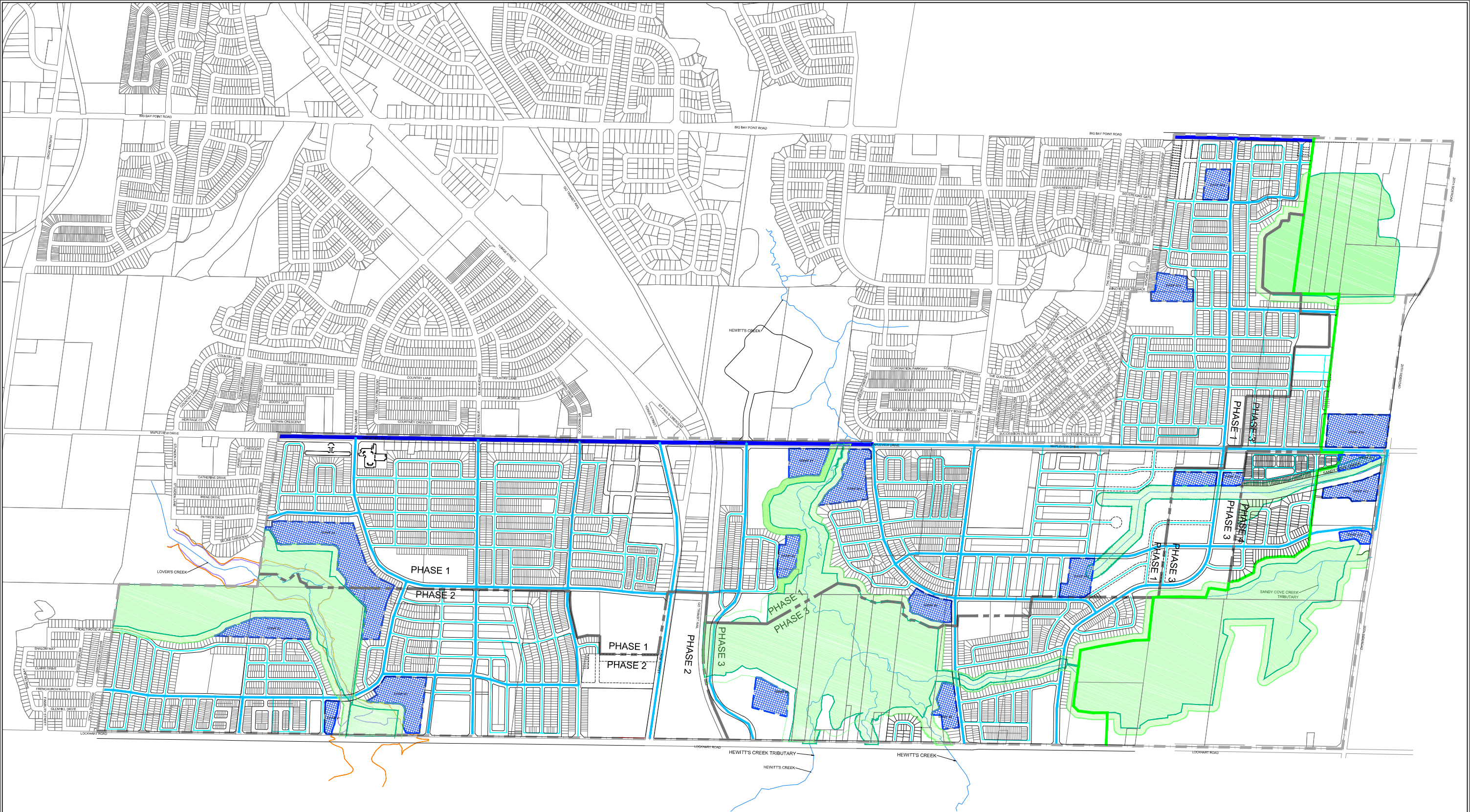
LEGEND

- |                                                                                     |                                                    |                                                                                     |                                        |                                                                                       |                                                     |                                                                                     |                        |                                                                                     |                   |
|-------------------------------------------------------------------------------------|----------------------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------|---------------------------------------------------------------------------------------|-----------------------------------------------------|-------------------------------------------------------------------------------------|------------------------|-------------------------------------------------------------------------------------|-------------------|
|  | GROUNDWATER WITHIN 2.2m OF PROPOSED GROUND SURFACE |  | SIGNIFICANT GROUNDWATER RECHARGE AREAS |    | ECOLOGICALLY SIGNIFICANT GROUNDWATER RECHARGE AREAS |  | STAKED 2015 NHS LIMITS |  | NHS BUFFER LIMITS |
|                                                                                     |                                                    |                                                                                     |                                        |  | DRAINAGE BOUNDARY                                   |                                                                                     |                        |                                                                                     |                   |
|                                                                                     |                                                    |                                                                                     |                                        |  | EXISTING 100 YR FLOOD LIMITS                        |                                                                                     |                        |                                                                                     |                   |
|                                                                                     |                                                    |                                                                                     |                                        |  | EXISTING REGIONAL FLOOD LIMITS                      |                                                                                     |                        |                                                                                     |                   |
|                                                                                     |                                                    |                                                                                     |                                        |  | PROPOSED 100 YR FLOOD LIMITS                        |                                                                                     |                        |                                                                                     |                   |
|                                                                                     |                                                    |                                                                                     |                                        |  | PROPOSED REGIONAL FLOOD LIMITS                      |                                                                                     |                        |                                                                                     |                   |

DASHED FLOOD LINES ARE APPROXIMATE ONLY, BASED ON INTERPOLATED DATA BETWEEN FINGERLAKES AND 1091369 ONTARIO INC. DETAILED TOPOGRAPHIC DATA. FLOODLINES ARE SUBJECT TO CHANGE BASED ON ADDITION OF DETAILED TOPOGRAPHIC SURVEY.

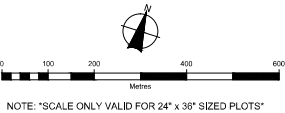


|                                                                                       |                                         |                                                                                  |                      |
|---------------------------------------------------------------------------------------|-----------------------------------------|----------------------------------------------------------------------------------|----------------------|
|  |                                         | HEWITT'S SECONDARY PLAN AREA<br>SUBWATERSHED IMPACT STUDY<br>LID CONSTRAINT PLAN |                      |
| Client                                                                                | HEWITT'S CREEK<br>LANDOWNERS GROUP INC. | Drawn<br>BH                                                                      | Checked<br>MZ        |
|                                                                                       |                                         | Date<br>16/01/28                                                                 | Figure No.<br>FIG 16 |
|                                                                                       |                                         | Project No.<br>300032860                                                         |                      |
|                                                                                       |                                         | Scale<br>H=1:7,500'                                                              |                      |



LEGEND

- |  |                            |  |                                        |
|--|----------------------------|--|----------------------------------------|
|  | DC TRUNK WATERMAIN         |  | 2031 PHASE LINE                        |
|  | LOCAL TRUNK WATERMAIN      |  | PHASING LIMITS                         |
|  | LOCAL WATERMAIN            |  | LIMIT OF HEWITT'S CREEK SECONDARY PLAN |
|  | SURVEYED NHS LIMITS (2015) |  | STAKED 2015 NHS LIMITS                 |
|  | NHS BUFFER LIMITS          |  | NHS BUFFER LIMITS                      |



NOTE: "SCALE ONLY VALID FOR 24" x 36" SIZED PLOTS"



Client:  
**HEWITT'S CREEK LANDOWNERS GROUP  
INC.**

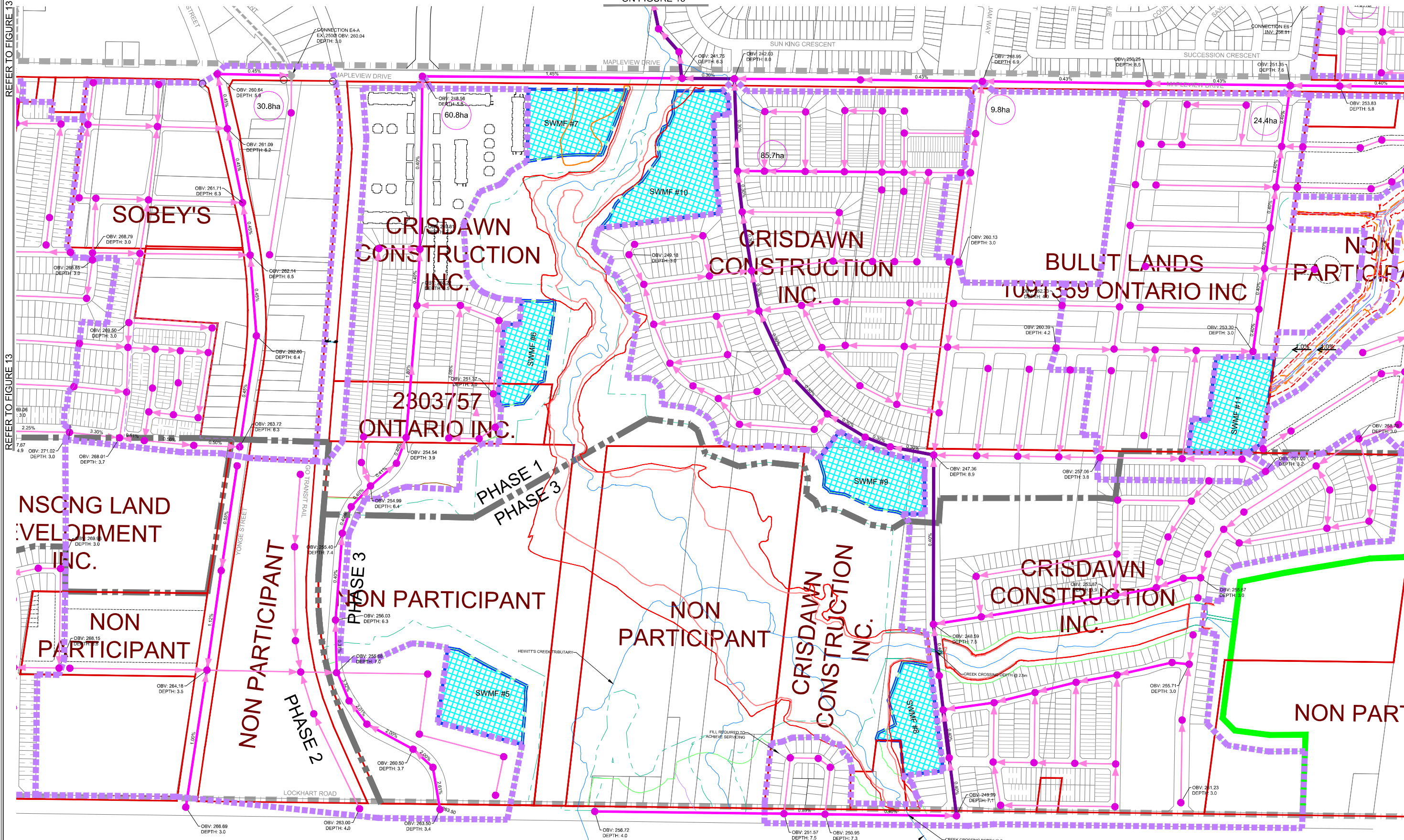
Figure 18b:  
**HEWITT'S SECONDARY PLAN AREA  
SUBWATERSHED IMPACT STUDY  
PROPOSED WATER DISTRIBUTION PLAN**

|                     |                          |                  |
|---------------------|--------------------------|------------------|
| Drawn<br>AQ         | Checked<br>BH            | Date<br>15/01/28 |
| Scale<br>H 1:4,000' | Project No.<br>300032860 |                  |

Figure No.  
**FIG 12**

REFER TO DETAIL A  
ON FIGURE 15

REFER TO FIGURE 15



REFER TO FIGURE 13

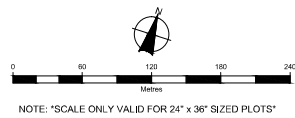
REFER TO FIGURE 15

LEGEND

- SURVEYED NHS LIMIT (2015)
- NHS BUFFER LIMIT
- 2031 PHASE LIMITS
- DEV. LIMITS
- PHASING LIMITS
- 2031 PHASE LIMITS
- EXISTING 100 YR FLOOD LIMITS
- EXISTING REGIONAL FLOOD LIMITS
- PROPOSED 100 YR FLOOD LIMITS
- PROPOSED REGIONAL FLOOD LIMITS
- PROPOSED DRAINAGE BOUNDARY

DASHED FLOOD LINES ARE APPROXIMATE ONLY, BASED ON INTERPOLATED DATA BETWEEN FINGERLAKES AND 1091369 ONTARIO INC. DETAILED TOPOGRAPHIC DATA. FLOODLINES ARE SUBJECT TO CHANGE BASED ON ADDITION OF DETAILED TOPOGRAPHIC SURVEY.

- FLOW DIRECTION ARROW
- SANITARY DC TRUNK SEWER
- SANITARY LOCAL TRUNK SEWER
- SANITARY LOCAL COLLECTOR SEWER
- SANITARY FORCEMAIN
- SANITARY MANHOLE
- EXISTING SANITARY SEWER
- PUMP STATION
- FLOW DIRECTION ARROW DEPICTS SEWER CONTINUES ON IN ARROW DIRECTION



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Client  
**HEWITT'S CREEK LANDOWNERS GROUP INC.**

Figure Title  
**HEWITT'S SECONDARY PLAN AREA SUBWATERSHED IMPACT STUDY**  
PROPOSED SANITARY SEWER PLAN (2 OF 3)

|             |               |                  |                         |
|-------------|---------------|------------------|-------------------------|
| Drawn<br>BH | Checked<br>CC | Date<br>16/09/07 | Figure No.<br>300032860 |
|-------------|---------------|------------------|-------------------------|

**FIG 14**



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## Appendix B

### Water Supply and Distribution Calculations

Project: **Sobey's Barrie - Mapleview Dr. E and Yonge St.**
**Fire Flow Calculations**

Prepared by: HH  
Checked by: JS  
Project No: 300035146  
Date: March 29, 2022

**Fire Flow Calculation: Building A**

Based on Fire Underwriters Survey

1  $F = 220 C (\sqrt{A})$

Where F = Fire flow in Lpm

C = construction type coefficient

= 1 for ordinary construction

A = total floor area in sq.m. excluding basements, includes garage

| Total   | Area (sq.m) | %    |
|---------|-------------|------|
| Level 1 | 3,734       | 100% |
| Level 2 | 588         | 25%  |

Largest Area = 3,881 sq.m

F = 13,705 L/min

Round to nearest 1000 l/min

F = 14,000 l/min

2 **Occupancy Reduction**

0% reduction for normal residential occupancy

Reduction = 0 L/min

F = 14,000 L/min

3 **Separation Charge**

5% North Side 30.1m to 45m

0% East Side Greater than 45m

0% South Side Greater than 45m

10% West Side 20.1m to 30m

15% Total Separation Charge **2100** L/min

Note: Maximum Total Separation Charge is 75%

4 **Sprinkler Reduction**

25% Reduction for NFPA Sprinkler System

Reduction = **3500** L/min

5 **Commercial Flow Calculations**

Ave. Water Consumption Rate = 28 m<sup>3</sup>/ha/day

Area (ha) = 0.388 ha

Ave. Day Demand = 7.545 L/min

Max. Hourly Peaking Factor = 2.0

Max. Domestic Flow Rate  $F_{dom}$  = 15.1 L/min

F = 16,100 - 3500 + 15 = 12,615 l/min

F = 210 L/s

F = 3330 GPM

\*Minimum required fire flow for Commercial use = 283 L/s

Project: **Sobey's Barrie - Maplevue Dr. E and Yonge St.**
**Fire Flow Calculations**

Prepared by: HH

Checked by: JS

Project No: 300035146

Date: March 29, 2022

**Fire Flow Calculation: Building B**

Based on Fire Underwriters Survey

1  $F = 220 C (\sqrt{A})$

Where F = Fire flow in Lpm

C = construction type coefficient

= 1 for ordinary construction

A = total floor area in sq.m. excluding basements, includes garage

| Total   | Area (sq.m) | %    |
|---------|-------------|------|
| Level 1 | 726         | 100% |

Largest Area = 726 sq.m

F = 5,928 L/min

Round to nearest 1000 l/min

F = 6,000 l/min

2 Occupancy Reduction

0% reduction for normal residential occupancy

Reduction = 0 L/min

F = 6,000 L/min

3 Separation Charge

0% North Side Greater than 45m

15% East Side 10.1m to 20m

5% South Side 30.1m to 45m

10% West Side 20.1m to 30m

30% Total Separation Charge **1800** L/min

Note: Maximum Total Separation Charge is 75%

4 Sprinkler Reduction

0% Reduction for NFPA Sprinkler System

Reduction = 0 L/min

5 Commercial Flow Calculations

Ave. Water Consumption Rate = 28 m<sup>3</sup>/ha/day

Area (ha) = 0.073 ha

Ave. Day Demand = 1.412 L/min

Max. Hourly Peaking Factor = 2.0

Max. Domestic Flow Rate  $F_{dom}$  = 2.8 L/min

F = 7,800 - 0 + 3 = 7,803 L/min

F = 130 L/s

F = 2060 GPM

\*Minimum required fire flow for Commercial use = 283 L/s

Project: **Sobey's Barrie - Maplevue Dr. E and Yonge St.**
**Fire Flow Calculations**

Prepared by: HH

Checked by: JS

Project No: 300035146

Date: March 29, 2022

**Fire Flow Calculation: Building C**

Based on Fire Underwriters Survey

1  $F = 220 C (\sqrt{A})$

Where F= Fire flow in Lpm

C= construction type coefficient

= 1 for ordinary construction

A = total floor area in sq.m. excluding basements, includes garage

| Total   | Area (sq.m) | %    |
|---------|-------------|------|
| Level 1 | 893         | 100% |

Largest Area= 893 sq.m

F = 6,574 L/min

Round to nearest 1000 l/min

F = 7,000 l/min

2 **Occupancy Reduction**

0% reduction for normal residential occupancy

Reduction = 0 L/min

F = 7,000 L/min

3 **Separation Charge**

0% North Side Greater than 45m

15% East Side 10.1m to 20m

0% South Side Greater than 45m

15% West Side 10.1m to 20m

30% Total Separation Charge **2100** L/min

Note: Maximum Total Separation Charge is 75%

4 **Sprinkler Reduction**

0% Reduction for NFPA Sprinkler System

Reduction = 0 L/min

5 **Commercial Flow Calculations**

Ave. Water Consumption Rate = 28 m3/ha/day

Area (ha) = 0.089 ha

Ave. Day Demand = 1.736 L/min

Max. Hourly Peaking Factor = 2.0

Max. Domestic Flow Rate  $F_{dom}$  = 3.5 L/min

F = 9,100 - 0 + 3 = 9,103 L/min

F = 152 L/s

F = 2403 GPM

\*Minimum required fire flow for Commercial use = 283 L/s

Project: **Sobey's Barrie - Maplevue Dr. E and Yonge St.**
**Fire Flow Calculations**

Prepared by: HH

Checked by: JS

Project No: 300035146

Date: March 29, 2022

**Fire Flow Calculation: Building D**

Based on Fire Underwriters Survey

1  $F = 220 C (\sqrt{A})$

Where F= Fire flow in Lpm

C= construction type coefficient

= 1 for ordinary construction

A = total floor area in sq.m. excluding basements, includes garage

| Total   | Area (sq.m) | %    |
|---------|-------------|------|
| Level 1 | 725         | 100% |

Largest Area= 725 sq.m

F = 5,924 L/min

Round to nearest 1000 l/min

F = 6,000 l/min

2 **Occupancy Reduction**

0% reduction for normal residential occupancy

Reduction = 0 L/min

F = 6,000 L/min

3 **Separation Charge**

0% North Side Greater than 45m

15% East Side 10.1m to 20m

0% South Side Greater than 45m

15% West Side 10.1m to 20m

30% Total Separation Charge **1800** L/min

Note: Maximum Total Separation Charge is 75%

4 **Sprinkler Reduction**

0% Reduction for NFPA Sprinkler System

Reduction = 0 L/min

5 **Commercial Flow Calculations**

Ave. Water Consumption Rate = 28 m3/ha/day

Area (ha) = 0.073 ha

Ave. Day Demand = 1.410 L/min

Max. Hourly Peaking Factor = 2.0

Max. Domestic Flow Rate  $F_{dom}$  = 2.8 L/min

F = 7,800 - 0 + 3 = 7,803 L/min

F = 130 L/s

F = 2060 GPM

\*Minimum required fire flow for Commercial use = 283 L/s

Project: **Sobey's Barrie - Maplevue Dr. E and Yonge St.**
**Fire Flow Calculations**

Prepared by: HH

Checked by: JS

Project No: 300035146

Date: March 29, 2022

**Fire Flow Calculation: Building E**

Based on Fire Underwriters Survey

1  $F = 220 C (\sqrt{A})$

Where F = Fire flow in Lpm

C = construction type coefficient

= 1 for ordinary construction

A = total floor area in sq.m. excluding basements, includes garage

| Total   | Area (sq.m) | %    |
|---------|-------------|------|
| Level 1 | 725         | 100% |

Largest Area = 725 sq.m

F = 5,924 L/min

Round to nearest 1000 l/min

F = 6,000 l/min

2 **Occupancy Reduction**

0% reduction for normal residential occupancy

Reduction = 0 L/min

F = 6,000 L/min

3 **Separation Charge**

15% North Side 10.1m to 20m

0% East Side Greater than 45m

5% South Side 30.1m to 45m

0% West Side Greater than 45m

20% Total Separation Charge **1200** L/min

Note: Maximum Total Separation Charge is 75%

4 **Sprinkler Reduction**

0% Reduction for NFPA Sprinkler System

Reduction = 0 L/min

5 **Commercial Flow Calculations**

Ave. Water Consumption Rate = 28 m<sup>3</sup>/ha/day

Area (ha) = 0.073 ha

Ave. Day Demand = 1.410 L/min

Max. Hourly Peaking Factor = 2.0

Max. Domestic Flow Rate  $F_{dom}$  = 2.8 L/min

F = 7,200 - 0 + 3 = 7,203 L/min

F = 120 L/s

F = 1902 GPM

\*Minimum required fire flow for Commercial use = 283 L/s

Project: **Sobey's Barrie - Maplevue Dr. E and Yonge St.**
**Fire Flow Calculations**

Prepared by: HH

Checked by: JS

Project No: 300035146

Date: March 29, 2022

**Fire Flow Calculation: Building F**

Based on Fire Underwriters Survey

1  $F = 220 C (\text{sqrt}(A))$

Where F = Fire flow in Lpm

C = construction type coefficient

= 1 for ordinary construction

A = total floor area in sq.m. excluding basements, includes garage

| Total   | Area (sq.m) | %    |
|---------|-------------|------|
| Level 1 | 502         | 100% |

Largest Area = 502 sq.m

F = 4,929 L/min

Round to nearest 1000 l/min

F = 5,000 l/min

2 **Occupancy Reduction**

0% reduction for normal residential occupancy

Reduction = 0 L/min

F = 5,000 L/min

3 **Separation Charge**

5% North Side 30.1m to 45m

0% East Side Greater than 45m

10% South Side 20.1m to 30m

0% West Side Greater than 45m

15% Total Separation Charge **750** L/min

Note: Maximum Total Separation Charge is 75%

4 **Sprinkler Reduction**

0% Reduction for NFPA Sprinkler System

Reduction = 0 L/min

5 **Commercial Flow Calculations**

Ave. Water Consumption Rate = 28 m<sup>3</sup>/ha/day

Area (ha) = 0.050 ha

Ave. Day Demand = 0.976 L/min

Max. Hourly Peaking Factor = 2.0

Max. Domestic Flow Rate  $F_{dom}$  = 2.0 L/min

F = 5,750 - 0 + 2 = 5,752 L/min

F = 96 L/s

F = 1519 GPM

\*Minimum required fire flow for Commercial use = 283 L/s



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## Appendix C

### Sanitary Servicing Calculations

Project: **300036146 Sobeys Yonge St. and Mapleview Dr. E.  
Barrie, Ontario**

*Sanitary Servicing Analysis*

Prepared by: HH  
Checked by: JS  
Project No: 300036146  
Date: 3/29/2022

**Proposed Site Flows**

Commercial

| Building | GFA (m <sup>2</sup> ) | GFA (ha) | Flow Rate<br>(L/ha/day) | Flow (L/s)* |
|----------|-----------------------|----------|-------------------------|-------------|
| A        | 4,024                 | 0.402    | 28,000                  | 0.26        |
| B        | 732                   | 0.073    | 28,000                  | 0.05        |
| C        | 905                   | 0.091    | 28,000                  | 0.06        |
| D        | 732                   | 0.073    | 28,000                  | 0.05        |
| E        | 738                   | 0.074    | 28,000                  | 0.05        |
| F        | 505                   | 0.051    | 28,000                  | 0.03        |

Infiltration Allowance= 0.26 L/s/ha  
A= 3.29 ha  
Q<sub>infiltration</sub>= 0.86 L/s

\*Includes Peaking Factor = 2

**Q<sub>Proposed Total</sub> = 1.35 L/s**

SANITARY SEWER DESIGN SHEET

Proposed Sanitary Sewer Network  
Sobey's - Yonge St. and Maplevue Dr. E., Barrie



Project #: 300035146  
Date: 30-Mar-22  
Designed: HH  
Checked: JS

Min Diameter = 150 mm  
Mannings 'n'= 0.013  
Min. Velocity = 0.60 m/s  
Max. Velocity = 3.00 m/s

Avg. Domestic Flow = 0.0 l/c/d  
Infiltration = 0.260 l/s/ha  
Max. Peaking Factor = 4.00  
Min. Peaking Factor = 2.00

Factor of Safety = 15 %

NOMINAL PIPE SIZE USED

| DESCRIPTION | FROM MH    | TO MH | RESIDENTIAL |                |           |                |                  |     | COMMERCIAL/INDUSTRIAL/INSTITUTIONAL |           |                |                    |                    |             | FLOW CALCULATIONS  |                    |                   |                |                 |                           | PIPE DATA               |                  |           |                    |                          |                          |                       |
|-------------|------------|-------|-------------|----------------|-----------|----------------|------------------|-----|-------------------------------------|-----------|----------------|--------------------|--------------------|-------------|--------------------|--------------------|-------------------|----------------|-----------------|---------------------------|-------------------------|------------------|-----------|--------------------|--------------------------|--------------------------|-----------------------|
|             |            |       | AREA (ha)   | ACC. AREA (ha) | UNITS (U) | DENSITY (P/ha) | DENSITY (P/unit) | POP | ACCUM. RES. POP.                    | AREA (ha) | ACC. AREA (ha) | EQUIV. POP. (p/ha) | FLOW RATE (l/s/ha) | EQUIV. POP. | ACCUM. EQUIV. POP. | INFILTRATION (l/s) | TOTAL ACCUM. POP. | PEAKING FACTOR | POP. FLOW (l/s) | CONSTANT COMM. FLOW (l/s) | ACCUM. COMM. FLOW (l/s) | TOTAL FLOW (l/s) | SLOPE (%) | PIPE DIAMETER (mm) | FULL FLOW CAPACITY (l/s) | FULL FLOW VELOCITY (m/s) | ACTUAL VELOCITY (m/s) |
|             | SAN STUB B | MH1A  |             |                |           |                |                  |     |                                     | 0.07      | 0.07           |                    | 0.648              |             |                    | 0.0                |                   |                | 0.0             | 0.0                       | 0.07                    | 2.00             | 150       | 21.5               | 1.22                     | 0.32                     | 0%                    |
|             | SAN STUB A | MH1A  |             |                |           |                |                  |     |                                     | 0.40      | 0.40           |                    | 0.648              |             |                    | 0.1                |                   |                | 0.3             | 0.3                       | 0.37                    | 2.00             | 150       | 21.5               | 1.22                     | 0.38                     | 2%                    |
|             | MH1A       | MH2A  |             |                |           |                |                  |     |                                     |           | 0.48           |                    |                    |             |                    | 0.1                |                   |                |                 | 0.3                       | 0.4                     | 0.50             | 150       | 10.8               | 0.61                     | 0.29                     | 4%                    |
|             | SAN STUB C | MH2A  |             |                |           |                |                  |     |                                     | 0.09      | 0.09           |                    | 0.324              |             |                    | 0.0                |                   |                | 0.0             | 0.0                       | 0.1                     | 2.00             | 150       | 21.5               | 1.22                     | 0.32                     | 0%                    |
|             | MH2A       | MH3A  |             |                |           |                |                  |     |                                     |           | 0.57           |                    |                    |             |                    | 0.1                |                   |                |                 | 0.3                       | 0.5                     | 0.50             | 150       | 10.8               | 0.61                     | 0.30                     | 4%                    |
|             | SAN STUB D | MH3A  |             |                |           |                |                  |     |                                     | 0.07      | 0.07           |                    | 0.324              |             |                    | 0.0                |                   |                | 0.0             | 0.0                       | 0.0                     | 2.00             | 150       | 21.5               | 1.22                     | 0.32                     | 0%                    |
|             | MH3A       | MH4A  |             |                |           |                |                  |     |                                     |           | 0.64           |                    |                    |             |                    | 0.2                |                   |                |                 | 0.4                       | 0.5                     | 0.50             | 150       | 10.8               | 0.61                     | 0.32                     | 5%                    |
|             | SAN STUB E | MH4A  |             |                |           |                |                  |     |                                     | 0.07      | 0.07           |                    | 0.324              |             |                    | 0.0                |                   |                | 0.0             | 0.0                       | 0.0                     | 2.00             | 150       | 21.5               | 1.22                     | 0.32                     | 0%                    |
|             | MH4A       | MH5A  |             |                |           |                |                  |     |                                     |           | 0.71           |                    |                    |             |                    | 0.2                |                   |                |                 | 0.4                       | 0.6                     | 0.50             | 150       | 10.8               | 0.61                     | 0.32                     | 5%                    |
|             | MH5A       | MH6A  |             |                |           |                |                  |     |                                     |           | 0.71           |                    |                    |             |                    | 0.2                |                   |                |                 | 0.4                       | 0.6                     | 0.50             | 150       | 10.8               | 0.61                     | 0.32                     | 5%                    |
|             | SAN STUB F | MH6A  |             |                |           |                |                  |     |                                     | 0.05      | 0.05           |                    | 0.324              |             |                    | 0.0                |                   |                | 0.0             | 0.0                       | 0.0                     | 2.00             | 150       | 21.5               | 1.22                     | 0.32                     | 0%                    |
|             | MH6A       | MH7A  |             |                |           |                |                  |     |                                     |           | 0.76           |                    |                    |             |                    | 0.2                |                   |                |                 | 0.4                       | 0.6                     | 0.50             | 150       | 10.8               | 0.61                     | 0.33                     | 6%                    |
|             | MH7A       | MH8A  |             |                |           |                |                  |     |                                     |           | 0.76           |                    |                    |             |                    | 0.2                |                   |                |                 | 0.4                       | 0.6                     | 0.50             | 150       | 10.8               | 0.61                     | 0.33                     | 6%                    |
|             | MH8A       | MH9A  |             |                |           |                |                  |     |                                     |           | 0.76           |                    |                    |             |                    | 0.2                |                   |                |                 | 0.4                       | 0.6                     | 2.00             | 150       | 21.5               | 1.22                     | 0.51                     | 3%                    |



BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

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## Appendix D

### Stormwater Management Calculations

Created By: JS  
 Checked By: PM  
 Date: 3/29/2022

Project Title: Sobeyes - Yonge Street and Mapleview Drive East  
 Project #: 300035146

| EXISTING SITE                            |              |           |
|------------------------------------------|--------------|-----------|
| DESCRIPTION                              | AREA (sq.m.) | AREA (ha) |
| EXISTING SITE AREA                       | 36055        | 3.61      |
| EXTERNAL DRAINAGE AREA                   | 4045         | 0.40      |
| EASEMENT AREA                            | 1784         | 0.18      |
| PROPOSED SITE                            |              |           |
| LOVER'S CREEK DRAINAGE AREA ROW          |              |           |
| DESCRIPTION                              | AREA (sq.m.) | AREA (ha) |
| CONTROLLED HARDSCAPE                     | 1030         | 0.10      |
| CONTROLLED LANDSCAPE                     | 351          | 0.04      |
| TOTAL AREA                               | 1381         | 0.14      |
| LOVER'S CREEK DRAINAGE AREA PRIVATE ROAD |              |           |
| DESCRIPTION                              | AREA (sq.m.) | AREA (ha) |
| CONTROLLED HARDSCAPE                     | 840          | 0.08      |
| CONTROLLED LANDSCAPE                     | 893          | 0.09      |
| TOTAL AREA                               | 1733         | 0.17      |
| HEWITT'S CREEK DRAINAGE                  |              |           |
| DESCRIPTION                              | AREA (sq.m.) | AREA (ha) |
| BUILDING A ROOFTOP                       | 3436         | 0.34      |
| BUILDING B ROOFTOP                       | 726          | 0.07      |
| BUILDING C ROOFTOP                       | 893          | 0.09      |
| BUILDING D ROOFTOP                       | 725          | 0.07      |
| BUILDING E ROOFTOP                       | 725          | 0.07      |
| BUILDING F ROOFTOP                       | 503          | 0.05      |
| CONTROLLED HARDSCAPE                     | 23386        | 2.34      |
| CONTROLLED LANDSCAPE                     | 2223         | 0.22      |
| UNCONTROLLED HARDSCAPE                   | 75           | 0.01      |
| UNCONTROLLED LANDSCAPE                   | 250          | 0.02      |
| TOTAL AREA                               | 32941        | 3.29      |



Project: **Sobeys - Yonge Street and Maplevue Drive East**  
Task: **Pre-Development Flows - Lover's Creek (Catchment 4) - ROW**  
Date: **29-Mar-22**

Prepared by: **JS**  
Checked by: **PM**  
Project no.: **300035146**

Based on Table 11: Lover's Creek, Proposed Condition Modelling Results in the Hewitt's Secondary Plan Area Subwatershed Impact Study Lover's, Hewitt's, and Sandy Cove Creek Report, dated September 2016 (SIS Report), prepared by R.J. Burnside & Associates Limited

|                                            | Area (ha) | Allowable Discharge to SWMF#4 (m3/s) |        |         |         |         |          |
|--------------------------------------------|-----------|--------------------------------------|--------|---------|---------|---------|----------|
|                                            |           | 2-Year                               | 5-Year | 10-Year | 25-Year | 50-Year | 100-Year |
| Catchment 4                                | 120       | 9.99                                 | 15.16  | 18.81   | 23.62   | 27.31   | 31.04    |
| Proposed Development<br>(discretized flow) | 0.14      | 0.011                                | 0.017  | 0.022   | 0.027   | 0.031   | 0.036    |

**Proposed Development Allowable Discharge (L/s)**

| Storm Event | Allowable Release Rate<br>(L/s) |
|-------------|---------------------------------|
| 2-Year      | 11.50                           |
| 5-Year      | 17.45                           |
| 10-Year     | 21.65                           |
| 25-Year     | 27.18                           |
| 50-Year     | 31.43                           |
| 100-Year    | 35.72                           |



Project: **Sobeys - Yonge Street and Mapleview Drive East**

Task: **Pre-Development Flows - Lover's Creek (Catchment 4) - Private Road**

Date: **29-Mar-22**

Prepared by: **JS**

Checked by: **PM**

Project no.: **300035146**

Based on Table 11: Lover's Creek, Proposed Condition Modelling Results in the Hewitt's Secondary Plan Area Subwatershed Impact Study Lover's, Hewitt's, and Sandy Cove Creek

|                                                    | Area (ha) | Allowable Discharge to SWMF#4 (m3/s) |        |         |         |         |          |
|----------------------------------------------------|-----------|--------------------------------------|--------|---------|---------|---------|----------|
|                                                    |           | 2-Year                               | 5-Year | 10-Year | 25-Year | 50-Year | 100-Year |
| <b>Catchment 4</b>                                 | 120       | 9.99                                 | 15.16  | 18.81   | 23.62   | 27.31   | 31.04    |
| <b>Proposed Development<br/>(discretized flow)</b> | 0.17      | 0.014                                | 0.022  | 0.027   | 0.034   | 0.039   | 0.045    |

**Proposed Development Allowable Discharge (L/s)**

| Storm Event | Allowable Release Rate<br>(L/s) |
|-------------|---------------------------------|
| 2-Year      | 14.43                           |
| 5-Year      | 21.89                           |
| 10-Year     | 27.16                           |
| 25-Year     | 34.11                           |
| 50-Year     | 39.44                           |
| 100-Year    | 44.83                           |



Project: **Sobeys - Yonge Street and Maplevue Drive East**  
Task: **Pre-Development Flows - Hewitt's Creek (Catchment 7a) - Site**  
Date: **29-Mar-22**

Prepared by: **JS**  
Checked by: **PM**  
Project no.: **300035146**

Based on Table 12: Hewitt's Creek, Proposed Condition Modelling Results in the Hewitt's Secondary Plan Area Subwatershed Impact Study Lover's, Hewitt's, and Sandy Cove Creek

|                                            | Area (ha) | Allowable Discharge to SWMF#7 (m3/s) |        |         |         |         |          |
|--------------------------------------------|-----------|--------------------------------------|--------|---------|---------|---------|----------|
|                                            |           | 2-Year                               | 5-Year | 10-Year | 25-Year | 50-Year | 100-Year |
| Catchment 7a                               | 17.6      | 2.10                                 | 3.00   | 3.78    | 4.69    | 5.36    | 6.08     |
| Proposed Development<br>(discretized flow) | 3.29      | 0.393                                | 0.561  | 0.707   | 0.878   | 1.003   | 1.138    |

**Proposed Development Allowable Discharge (L/s)**

| Storm Event | Allowable Release Rate<br>(L/s) |
|-------------|---------------------------------|
| 2-Year      | 393.05                          |
| 5-Year      | 561.49                          |
| 10-Year     | 707.48                          |
| 25-Year     | 877.80                          |
| 50-Year     | 1003.20                         |
| 100-Year    | 1137.96                         |



### Composite Runoff Coefficient Calculations

#### Controlled Site Area

| Area ID              | Area (ha) | RC   | Area x RC |
|----------------------|-----------|------|-----------|
| Rooftop              | 0.701     | 0.95 | 0.666     |
| Controlled Landscape | 0.222     | 0.25 | 0.056     |
| Controlled Hardscape | 2.339     | 0.95 | 2.222     |
| <b>Total:</b>        | 3.262     |      | 2.943     |

**Composite RC: 0.90**



### Composite Runoff Coefficient Calculations

#### Uncontrolled Site Area

| Area ID                | Area (ha) | RC   | Area x RC |
|------------------------|-----------|------|-----------|
| Uncontrolled Landscape | 0.025     | 0.25 | 0.006     |
| Uncontrolled Hardscape | 0.007     | 0.95 | 0.007     |
| <b>Total:</b>          | 0.032     |      | 0.013     |

**Composite RC: 0.41**



### Composite Runoff Coefficient Calculations

#### Public ROW Area

| Area ID              | Area (ha) | RC   | Area x RC |
|----------------------|-----------|------|-----------|
| Controlled Landscape | 0.035     | 0.25 | 0.009     |
| Controlled Hardscape | 0.103     | 0.95 | 0.098     |
| <b>Total:</b>        | 0.138     |      | 0.107     |

**Composite RC:** 0.77



### Composite Runoff Coefficient Calculations

#### Private Road to Lover's Creek

| Area ID              | Area (ha) | RC   | Area x RC |
|----------------------|-----------|------|-----------|
| Controlled Landscape | 0.089     | 0.25 | 0.022     |
| Controlled Hardscape | 0.084     | 0.95 | 0.080     |
| <b>Total:</b>        | 0.173     |      | 0.102     |

**Composite RC:** 0.59



Project: **Sobeys - Yonge Street and Mapleview Drive East**  
Task: **Post-Development**  
Date: **29-Mar-22**

Prepared by:

JS

Checked by:

PM

Project no.:

**300035146**

2-Year Post-Development Flows

|   |         |     |
|---|---------|-----|
| A | 675.586 |     |
| B | 4.681   |     |
| C | 0.780   |     |
| T | 10.00   | min |

|  | Land Use<br>Description | Runoff<br>Coefficient | Intensity<br>(mm/hr) | Area<br>(ha) | Runoff<br>(L/s) |
|--|-------------------------|-----------------------|----------------------|--------------|-----------------|
|  | BUILDING A ROOFTOP      | 0.90                  | 83.10                | 0.34         | 71.4            |
|  | BUILDING B ROOFTOP      | 0.90                  | 83.10                | 0.07         | 15.1            |
|  | BUILDING C ROOFTOP      | 0.90                  | 83.10                | 0.09         | 18.6            |
|  | BUILDING D ROOFTOP      | 0.90                  | 83.10                | 0.07         | 15.1            |
|  | BUILDING E ROOFTOP      | 0.90                  | 83.10                | 0.07         | 15.1            |
|  | BUILDING F ROOFTOP      | 0.90                  | 83.10                | 0.05         | 10.4            |
|  | CONTROLLED HARDSCAPE    | 0.90                  | 83.10                | 2.34         | 485.8           |
|  | CONTROLLED LANDSCAPE    | 0.25                  | 83.10                | 0.22         | 12.8            |
|  | <b>TOTAL</b>            |                       |                      | <b>3.26</b>  | <b>644.3</b>    |

Uncontrolled Flows

|              |      |       |      |     |
|--------------|------|-------|------|-----|
| Uncontrolled | 0.41 | 83.10 | 0.03 | 3.1 |
|--------------|------|-------|------|-----|

$$Q_{\text{Allowable Release}} = \frac{CiA}{0.36}$$

**647.3 L/s**

Project: **Sobeys - Yonge Street and Mapleview Drive East**Task: **Post-Development**Date: **29-Mar-22**

Prepared by:

**JS**

Checked by:

**PM**

Project no.:

**300035146****5-Year Post-Development Flows**

|   |         |     |
|---|---------|-----|
| A | 843.019 |     |
| B | 4.582   |     |
| C | 0.736   |     |
| T | 10.00   | min |

|  | Land Use<br>Description | Runoff<br>Coefficient | Intensity<br>(mm/hr) | Area<br>(ha) | Runoff<br>(L/s) |
|--|-------------------------|-----------------------|----------------------|--------------|-----------------|
|  | BUILDING A ROOFTOP      | 0.90                  | 116.71               | 0.34         | 100.3           |
|  | BUILDING B ROOFTOP      | 0.90                  | 117.29               | 0.07         | 21.3            |
|  | BUILDING C ROOFTOP      | 0.90                  | 117.29               | 0.09         | 26.2            |
|  | BUILDING D ROOFTOP      | 0.90                  | 117.29               | 0.07         | 21.3            |
|  | BUILDING E ROOFTOP      | 0.90                  | 117.29               | 0.07         | 21.3            |
|  | BUILDING F ROOFTOP      | 0.90                  | 117.29               | 0.05         | 14.7            |
|  | CONTROLLED HARDSCAPE    | 0.90                  | 117.29               | 2.34         | 685.7           |
|  | CONTROLLED LANDSCAPE    | 0.25                  | 117.29               | 0.22         | 18.1            |
|  | <b>TOTAL</b>            |                       |                      | <b>3.26</b>  | <b>908.8</b>    |

Uncontrolled Flows

|              |      |        |      |     |
|--------------|------|--------|------|-----|
| Uncontrolled | 0.41 | 117.29 | 0.03 | 4.4 |
|--------------|------|--------|------|-----|

$$Q_{\text{Allowable Release}} = \frac{CiA}{0.36}$$

**913.2 L/s**



Project: **Sobeys - Yonge Street and Mapleview Drive East**

Task: **Post-Development**

Date: **29-Mar-22**

Prepared by:

**JS**

Checked by:

**PM**

Project no.:

**300035146**

10-Year Post-Development Flows

A 976.868

B 4.745

C 0.760

T 10.00 min

| Land Use Description | Runoff Coefficient | Intensity (mm/hr) | Area (ha) | Runoff (L/s) |
|----------------------|--------------------|-------------------|-----------|--------------|
| BUILDING A ROOFTOP   | 0.90               | 126.79            | 0.34      | 108.9        |
| BUILDING B ROOFTOP   | 0.90               | 126.38            | 0.07      | 22.9         |
| BUILDING C ROOFTOP   | 0.90               | 126.38            | 0.09      | 28.2         |
| BUILDING D ROOFTOP   | 0.90               | 126.38            | 0.07      | 22.9         |
| BUILDING E ROOFTOP   | 0.90               | 126.38            | 0.07      | 22.9         |
| BUILDING F ROOFTOP   | 0.90               | 126.38            | 0.05      | 15.9         |
| CONTROLLED HARDSCAPE | 0.90               | 126.38            | 2.34      | 738.8        |
| CONTROLLED LANDSCAPE | 0.25               | 126.38            | 0.22      | 19.5         |
| TOTAL                |                    |                   | 3.26      | 980.1        |

Uncontrolled Flows

|              |      |        |      |     |
|--------------|------|--------|------|-----|
| Uncontrolled | 0.41 | 126.38 | 0.03 | 4.7 |
|--------------|------|--------|------|-----|

$$Q_{\text{Allowable Release}} = \frac{CiA}{0.36}$$

**984.8 L/s**



Project: **Sobeys - Yonge Street and Mapleview Drive East**

Task: **Post-Development**

Date: **29-Mar-22**

Prepared by:

**JS**

Checked by:

**PM**

Project no.:

**300035146**

25-Year Post-Development Flows

|   |          |     |
|---|----------|-----|
| A | 1133.123 |     |
| B | 4.734    |     |
| C | 0.756    |     |
| T | 10.00    | min |

| Land Use Description | Runoff Coefficient | Intensity (mm/hr) | Area (ha) | Runoff (L/s) |
|----------------------|--------------------|-------------------|-----------|--------------|
| BUILDING A ROOFTOP   | 0.90               | 148.67            | 0.34      | 127.7        |
| BUILDING B ROOFTOP   | 0.90               | 148.26            | 0.07      | 26.9         |
| BUILDING C ROOFTOP   | 0.90               | 148.26            | 0.09      | 33.1         |
| BUILDING D ROOFTOP   | 0.90               | 148.26            | 0.07      | 26.9         |
| BUILDING E ROOFTOP   | 0.90               | 148.26            | 0.07      | 26.9         |
| BUILDING F ROOFTOP   | 0.90               | 148.26            | 0.05      | 18.6         |
| CONTROLLED HARDSCAPE | 0.90               | 148.26            | 2.34      | 866.8        |
| CONTROLLED LANDSCAPE | 0.25               | 148.26            | 0.22      | 22.9         |
| TOTAL                |                    |                   | 3.26      | 1149.8       |

Uncontrolled Flows

|              |      |        |      |     |
|--------------|------|--------|------|-----|
| Uncontrolled | 0.41 | 148.26 | 0.03 | 5.5 |
|--------------|------|--------|------|-----|

$$Q_{\text{Allowable Release}} = \frac{CiA}{0.36}$$

**1155.3 L/s**



Project: **Sobeys - Yonge Street and Mapleview Drive East**

Task: **Post-Development**

Date: **29-Mar-22**

Prepared by:

**JS**

Checked by:

**PM**

Project no.:

**300035146**

50-Year Post-Development Flows

|   |          |     |
|---|----------|-----|
| A | 1251.473 |     |
| B | 4.847    |     |
| C | 0.753    |     |
| T | 10.00    | min |

|  | Land Use<br>Description | Runoff<br>Coefficient | Intensity<br>(mm/hr) | Area<br>(ha) | Runoff<br>(L/s) |
|--|-------------------------|-----------------------|----------------------|--------------|-----------------|
|  | BUILDING A ROOFTOP      | 0.90                  | 165.52               | 0.34         | 142.2           |
|  | BUILDING B ROOFTOP      | 0.90                  | 164.13               | 0.07         | 29.8            |
|  | BUILDING C ROOFTOP      | 0.90                  | 164.13               | 0.09         | 36.6            |
|  | BUILDING D ROOFTOP      | 0.90                  | 164.13               | 0.07         | 29.8            |
|  | BUILDING E ROOFTOP      | 0.90                  | 164.13               | 0.07         | 29.7            |
|  | BUILDING F ROOFTOP      | 0.90                  | 164.13               | 0.05         | 20.6            |
|  | CONTROLLED HARDSCAPE    | 0.90                  | 164.13               | 2.34         | 959.5           |
|  | CONTROLLED LANDSCAPE    | 0.25                  | 164.13               | 0.22         | 25.3            |
|  | <b>TOTAL</b>            |                       |                      | <b>3.26</b>  | <b>1273.6</b>   |

Uncontrolled Flows

|              |      |        |      |     |
|--------------|------|--------|------|-----|
| Uncontrolled | 0.41 | 164.13 | 0.03 | 6.1 |
|--------------|------|--------|------|-----|

$$Q_{\text{Allowable Release}} = \frac{CiA}{0.36}$$

**1279.7 L/s**

Project: **Sobeys - Yonge Street and Mapleview Drive East**Task: **Post-Development**Date: **29-Mar-22**

Prepared by:

**JS**

Checked by:

**PM**

Project no.:

**300035146****100-Year Post-Development Flows**

A 1383.628

B 4.905

C 0.754

T 10.00 min

|  | Land Use<br>Description | Runoff<br>Coefficient | Intensity<br>(mm/hr) | Area<br>(ha) | Runoff<br>(L/s) |
|--|-------------------------|-----------------------|----------------------|--------------|-----------------|
|  | BUILDING A ROOFTOP      | 0.95                  | 180.44               | 0.34         | 163.6           |
|  | BUILDING B ROOFTOP      | 0.95                  | 180.44               | 0.07         | 34.6            |
|  | BUILDING C ROOFTOP      | 0.95                  | 180.44               | 0.09         | 42.5            |
|  | BUILDING D ROOFTOP      | 0.95                  | 180.44               | 0.07         | 34.5            |
|  | BUILDING E ROOFTOP      | 0.95                  | 180.44               | 0.07         | 34.5            |
|  | BUILDING F ROOFTOP      | 0.95                  | 180.44               | 0.05         | 23.9            |
|  | CONTROLLED HARDSCAPE    | 0.95                  | 180.44               | 2.34         | 1113.5          |
|  | CONTROLLED LANDSCAPE    | 0.25                  | 180.44               | 0.22         | 27.9            |
|  | <b>TOTAL</b>            |                       |                      | <b>3.26</b>  | <b>1475.0</b>   |

**Uncontrolled Flows**

|              |      |        |      |     |
|--------------|------|--------|------|-----|
| Uncontrolled | 0.41 | 180.44 | 0.03 | 6.7 |
|--------------|------|--------|------|-----|

$$Q_{\text{Allowable Release}} = \frac{CiA}{0.36}$$

**1481.7 L/s**



Project: **Sobeys - Yonge Street and Mapleview Drive East**

Task: **Post-Development**

Date: **29-Mar-22**

Prepared by:

**JS**

Checked by:

**PM**

Project no.:

**300035146**

#### 2-Year Post-Development Flows

|   |           |
|---|-----------|
| A | 675.586   |
| B | 4.681     |
| C | 0.780     |
| T | 10.00 min |

| Land Use<br>Description | Runoff<br>Coefficient | Intensity<br>(mm/hr) | Area<br>(ha) | Runoff<br>(L/s) |
|-------------------------|-----------------------|----------------------|--------------|-----------------|
| EXTERNAL AREA           | 0.30                  | 83.10                | 0.40         | 28.01           |
| TOTAL                   |                       |                      | 0.40         | <b>28.01</b>    |

$$Q_{\text{Allowable Release}} = \frac{CiA}{0.36}$$

**28.0 L/s**



Project: **Sobeys - Yonge Street and Mapleview Drive East**

Task: **Post-Development**

Date: **29-Mar-22**

Prepared by:

**JS**

Checked by:

**PM**

Project no.:

**300035146**

5-Year Post-Development Flows

|   |         |     |
|---|---------|-----|
| A | 843.019 |     |
| B | 4.582   |     |
| C | 0.736   |     |
| T | 10.00   | min |

| Land Use<br>Description | Runoff<br>Coefficient | Intensity<br>(mm/hr) | Area<br>(ha) | Runoff<br>(L/s) |
|-------------------------|-----------------------|----------------------|--------------|-----------------|
| EXTERNAL AREA           | 0.30                  | 117.29               | 0.40         | 39.54           |
| TOTAL                   |                       |                      | 0.40         | <b>39.54</b>    |

$$Q_{\text{Allowable Release}} = \frac{CiA}{0.36}$$

**39.5 L/s**



Project: **Sobeys - Yonge Street and Mapleview Drive East**

Task: **Post-Development**

Date: **29-Mar-22**

Prepared by:

**JS**

Checked by:

**PM**

Project no.:

**300035146**

10-Year Post-Development Flows

A 976.868

B 4.745

C 0.760

T 10.00 min

Land Use  
Description

Runoff  
Coefficient

Intensity  
(mm/hr)

Area  
(ha)

Runoff  
(L/s)

EXTERNAL AREA

0.30

126.38

0.40

42.60

TOTAL

0.40

**42.60**

$$Q_{\text{Allowable Release}} = \frac{CiA}{0.36}$$

**42.6 L/s**



Project: **Sobeys - Yonge Street and Mapleview Drive East**

Task: **Post-Development**

Date: **29-Mar-22**

Prepared by:

**JS**

Checked by:

**PM**

Project no.:

**300035146**

25-Year Post-Development Flows

A 1133.123

B 4.734

C 0.756

T 10.00 min

Land Use  
Description

Runoff  
Coefficient

Intensity  
(mm/hr)

Area  
(ha)

Runoff  
(L/s)

EXTERNAL AREA

0.30

148.26

0.40

49.98

TOTAL

0.40

**49.98**

$$Q_{\text{Allowable Release}} = \frac{CiA}{0.36}$$

**50.0 L/s**



Project: **Sobeys - Yonge Street and Mapleview Drive East**

Task: **Post-Development**

Date: **29-Mar-22**

Prepared by:

**JS**

Checked by:

**PM**

Project no.:

**300035146**

50-Year Post-Development Flows

|   |          |     |
|---|----------|-----|
| A | 1251.473 |     |
| B | 4.847    |     |
| C | 0.753    |     |
| T | 10.00    | min |

| Land Use Description | Runoff Coefficient | Intensity (mm/hr) | Area (ha) | Runoff (L/s) |
|----------------------|--------------------|-------------------|-----------|--------------|
| EXTERNAL AREA        | 0.30               | 164.13            | 0.40      | 55.33        |
| TOTAL                |                    |                   | 0.40      | <b>55.33</b> |

$$Q_{\text{Allowable Release}} = \frac{CiA}{0.36}$$

**55.3 L/s**



Project: **Sobeys - Yonge Street and Mapleview Drive East**

Task: **Post-Development**

Date: **29-Mar-22**

Prepared by:

**JS**

Checked by:

**PM**

Project no.:

**300035146**

100-Year Post-Development Flows

A 1383.628

B 4.905

C 0.754

T 10.00 min

Land Use  
Description

Runoff  
Coefficient

Intensity  
(mm/hr)

Area  
(ha)

Runoff  
(L/s)

EXTERNAL AREA

0.30

180.44

0.40

60.83

TOTAL

0.40

**60.83**

$$Q_{\text{Allowable Release}} = \frac{CiA}{0.36}$$

**60.8 L/s**



Project: **Sobeys - Yonge Street and Mapleview Drive East**  
Task: **Post-Development**  
Date: **29-Mar-22**

Prepared by: **JS**  
Checked by: **PM**  
Project no.: **300035146**

#### 2-Year Post-Development Flows

|   |         |     |
|---|---------|-----|
| A | 675.586 |     |
| B | 4.681   |     |
| C | 0.780   |     |
| T | 10.00   | min |

| Land Use Description | Runoff Coefficient | Intensity (mm/hr) | Area (ha) | Runoff (L/s) |
|----------------------|--------------------|-------------------|-----------|--------------|
| CONTROLLED HARDSCAPE | 0.90               | 83.10             | 0.10      | 21.4         |
| CONTROLLED LANDSCAPE | 0.25               | 83.10             | 0.04      | 2.0          |
| TOTAL                |                    |                   | 0.14      | 23.4         |

$$Q_{\text{Allowable Release}} = \frac{CiA}{0.36}$$

**23.4 L/s**



Project: **Sobeys - Yonge Street and Mapleview Drive East**

Task: **Post-Development**

Date: **29-Mar-22**

Prepared by:

**JS**

Checked by:

**PM**

Project no.:

**300035146**

5-Year Post-Development Flows

|   |         |     |
|---|---------|-----|
| A | 843.019 |     |
| B | 4.582   |     |
| C | 0.736   |     |
| T | 10.00   | min |

| Land Use Description | Runoff Coefficient | Intensity (mm/hr) | Area (ha) | Runoff (L/s) |
|----------------------|--------------------|-------------------|-----------|--------------|
| CONTROLLED HARDSCAPE | 0.90               | 117.29            | 0.10      | 30.2         |
| CONTROLLED LANDSCAPE | 0.25               | 117.29            | 0.04      | 2.9          |
| TOTAL                |                    |                   | 0.14      | <b>33.1</b>  |

$$Q_{\text{Allowable Release}} = \frac{CiA}{0.36}$$

**33.1 L/s**



Project: **Sobeys - Yonge Street and Mapleview Drive East**

Task: **Post-Development**

Date: **29-Mar-22**

Prepared by:

**JS**

Checked by:

**PM**

Project no.:

**300035146**

10-Year Post-Development Flows

A 976.868

B 4.745

C 0.760

T 10.00 min

Land Use  
Description

Runoff  
Coefficient

Intensity  
(mm/hr)

Area  
(ha)

Runoff  
(L/s)

CONTROLLED HARDSCAPE

0.90

126.38

0.10

32.5

CONTROLLED LANDSCAPE

0.25

126.38

0.04

3.1

TOTAL

0.14

**35.6**

$$Q_{\text{Allowable Release}} = \frac{C_i A}{0.36}$$

**35.6 L/s**



Project: **Sobeys - Yonge Street and Mapleview Drive East**

Task: **Post-Development**

Date: **29-Mar-22**

Prepared by:

**JS**

Checked by:

**PM**

Project no.:

**300035146**

#### 25-Year Post-Development Flows

A 1133.123

B 4.734

C 0.756

T 10.00 min

Land Use  
Description

Runoff  
Coefficient

Intensity  
(mm/hr)

Area  
(ha)

Runoff  
(L/s)

CONTROLLED HARDSCAPE

0.90

148.26

0.10

38.2

CONTROLLED LANDSCAPE

0.25

148.26

0.04

3.6

TOTAL

0.14

**41.8**

$$Q_{\text{Allowable Release}} = \frac{CiA}{0.36}$$

**41.8 L/s**



Project: **Sobeys - Yonge Street and Mapleview Drive East**

Task: **Post-Development**

Date: **29-Mar-22**

Prepared by:

**JS**

Checked by:

**PM**

Project no.:

**300035146**

50-Year Post-Development Flows

A 1251.473

B 4.847

C 0.753

T 10.00 min

Land Use  
Description

Runoff  
Coefficient

Intensity  
(mm/hr)

Area  
(ha)

Runoff  
(L/s)

CONTROLLED HARDSCAPE

0.90

164.13

0.10

42.3

CONTROLLED LANDSCAPE

0.25

164.13

0.04

4.0

TOTAL

0.14

**46.3**

$$Q_{\text{Allowable Release}} = \frac{CiA}{0.36}$$

**46.3 L/s**



Project: **Sobeys - Yonge Street and Mapleview Drive East**

Task: **Post-Development**

Date: **29-Mar-22**

Prepared by:

**JS**

Checked by:

**PM**

Project no.:

**300035146**

100-Year Post-Development Flows

A 1383.628

B 4.905

C 0.754

T 10.00 min

Land Use  
Description

Runoff  
Coefficient

Intensity  
(mm/hr)

Area  
(ha)

Runoff  
(L/s)

CONTROLLED HARDSCAPE

0.95

180.44

0.10

49.1

CONTROLLED LANDSCAPE

0.25

180.44

0.04

4.4

TOTAL

0.14

**53.4**

$$Q_{\text{Allowable Release}} = \frac{CiA}{0.36}$$

**53.4 L/s**



Project: **Sobeys - Yonge Street and Mapleview Drive East**  
Task: **Post-Development**  
Date: **29-Mar-22**

Prepared by: **JS**  
Checked by: **PM**  
Project no.: **300035146**

#### 2-Year Post-Development Flows

|   |         |     |
|---|---------|-----|
| A | 675.586 |     |
| B | 4.681   |     |
| C | 0.780   |     |
| T | 10.00   | min |

| Land Use Description | Runoff Coefficient | Intensity (mm/hr) | Area (ha) | Runoff (L/s) |
|----------------------|--------------------|-------------------|-----------|--------------|
| CONTROLLED HARDSCAPE | 0.90               | 83.10             | 0.10      | 21.4         |
| CONTROLLED LANDSCAPE | 0.25               | 83.10             | 0.04      | 2.0          |
| TOTAL                |                    |                   | 0.14      | 23.4         |

$$Q_{\text{Allowable Release}} = \frac{CiA}{0.36}$$

**23.4 L/s**



Project: **Sobeys - Yonge Street and Mapleview Drive East**

Task: **Post-Development**

Date: **29-Mar-22**

Prepared by:

**JS**

Checked by:

**PM**

Project no.:

**300035146**

5-Year Post-Development Flows

A 843.019

B 4.582

C 0.736

T 10.00 min

Land Use  
Description

Runoff  
Coefficient

Intensity  
(mm/hr)

Area  
(ha)

Runoff  
(L/s)

CONTROLLED HARDSCAPE

0.90

117.29

0.10

30.2

CONTROLLED LANDSCAPE

0.25

117.29

0.04

2.9

TOTAL

0.14

**33.1**

$$Q_{\text{Allowable Release}} = \frac{CiA}{0.36}$$

**33.1 L/s**



Project: **Sobeys - Yonge Street and Mapleview Drive East**

Task: **Post-Development**

Date: **29-Mar-22**

Prepared by:

**JS**

Checked by:

**PM**

Project no.:

**300035146**

10-Year Post-Development Flows

A 976.868

B 4.745

C 0.760

T 10.00 min

Land Use  
Description

Runoff  
Coefficient

Intensity  
(mm/hr)

Area  
(ha)

Runoff  
(L/s)

CONTROLLED HARDSCAPE

0.90

126.38

0.10

32.5

CONTROLLED LANDSCAPE

0.25

126.38

0.04

3.1

TOTAL

0.14

**35.6**

$$Q_{\text{Allowable Release}} = \frac{CiA}{0.36}$$

**35.6 L/s**



Project: **Sobeys - Yonge Street and Mapleview Drive East**

Task: **Post-Development**

Date: **29-Mar-22**

Prepared by:

**JS**

Checked by:

**PM**

Project no.:

**300035146**

25-Year Post-Development Flows

A 1133.123

B 4.734

C 0.756

T 10.00 min

Land Use  
Description

Runoff  
Coefficient

Intensity  
(mm/hr)

Area  
(ha)

Runoff  
(L/s)

CONTROLLED HARDSCAPE

0.90

148.26

0.10

38.2

CONTROLLED LANDSCAPE

0.25

148.26

0.04

3.6

TOTAL

0.14

**41.8**

$$Q_{\text{Allowable Release}} = \frac{CiA}{0.36}$$

**41.8 L/s**



Project: **Sobeys - Yonge Street and Mapleview Drive East**

Task: **Post-Development**

Date: **29-Mar-22**

Prepared by:

**JS**

Checked by:

**PM**

Project no.:

**300035146**

50-Year Post-Development Flows

A 1251.473

B 4.847

C 0.753

T 10.00 min

Land Use  
Description

Runoff  
Coefficient

Intensity  
(mm/hr)

Area  
(ha)

Runoff  
(L/s)

CONTROLLED HARDSCAPE

0.90

164.13

0.10

42.3

CONTROLLED LANDSCAPE

0.25

164.13

0.04

4.0

TOTAL

0.14

**46.3**

$$Q_{\text{Allowable Release}} = \frac{CiA}{0.36}$$

**46.3 L/s**



Project: **Sobeys - Yonge Street and Mapleview Drive East**

Task: **Post-Development**

Date: **29-Mar-22**

Prepared by:

**JS**

Checked by:

**PM**

Project no.:

**300035146**

100-Year Post-Development Flows

A 1383.628

B 4.905

C 0.754

T 10.00 min

Land Use  
Description

Runoff  
Coefficient

Intensity  
(mm/hr)

Area  
(ha)

Runoff  
(L/s)

CONTROLLED HARDSCAPE

0.95

180.44

0.10

49.1

CONTROLLED LANDSCAPE

0.25

180.44

0.04

4.4

TOTAL

0.14

**53.4**

$$Q_{\text{Allowable Release}} = \frac{CiA}{0.36}$$

**53.4 L/s**

**MODIFIED RATIONAL METHOD**  
**POST-DEVELOPMENT CONTROLLED FLOWS**  
**HEWITT'S CREEK - SITE**

Rainfall IDF Coefficients      2 -year

|     |             |
|-----|-------------|
| A = | A = 675.586 |
| C = | B = 4.681   |
|     | C = 0.780   |

Area = 3.26 ha  
 Runoff Coefficient, C = 0.90  
 C\*A = 2.94  
 Time of Concentration,  $t_c$  = 10.0 min  
 Storm Duration Increment = 10.0 min  
 Target Release Rate = 421.06 L/s  
 Constant Inflow = 28 L/s  
 Uncontrolled Outflow = 3.08 L/s  
 Max. Allowable Outflow = 417.98 L/s

| Storm Duration (min) | Rainfall Intensity (mm/hr) | Max. Runoff Flow (L/s) | Runoff Volume (m <sup>3</sup> ) | Released Volume (m <sup>3</sup> ) | Storage Volume (m <sup>3</sup> ) | Max. Storage Volume Required (m <sup>3</sup> ) | Drawdown Time (hrs) |
|----------------------|----------------------------|------------------------|---------------------------------|-----------------------------------|----------------------------------|------------------------------------------------|---------------------|
| 10.0                 | 83.10                      | 707.35                 | 424                             | 251                               | 174                              |                                                |                     |
| 20.0                 | 55.42                      | 481.03                 | 577                             | 376                               | 201                              | 201                                            | 0.41                |
| 30.0                 | 42.50                      | 375.46                 | 676                             | 502                               | 174                              |                                                |                     |
| 40.0                 | 34.88                      | 313.16                 | 752                             | 627                               | 125                              |                                                |                     |
| 50.0                 | 29.80                      | 271.60                 | 815                             | 752                               | 62                               |                                                |                     |
| 60.0                 | 26.14                      | 241.69                 | 870                             | 878                               | 0                                |                                                |                     |
| 70.0                 | 23.37                      | 219.02                 | 920                             | 1003                              | 0                                |                                                |                     |
| 80.0                 | 21.18                      | 201.19                 | 966                             | 1129                              | 0                                |                                                |                     |
| 90.0                 | 19.42                      | 186.75                 | 1008                            | 1254                              | 0                                |                                                |                     |
| 100.0                | 17.95                      | 174.79                 | 1049                            | 1379                              | 0                                |                                                |                     |
| 110.0                | 16.72                      | 164.71                 | 1087                            | 1505                              | 0                                |                                                |                     |
| 120.0                | 15.67                      | 156.08                 | 1124                            | 1630                              | 0                                |                                                |                     |
| 130.0                | 14.75                      | 148.60                 | 1159                            | 1755                              | 0                                |                                                |                     |
| 140.0                | 13.95                      | 142.05                 | 1193                            | 1881                              | 0                                |                                                |                     |
| 150.0                | 13.24                      | 136.26                 | 1226                            | 2006                              | 0                                |                                                |                     |
| 160.0                | 12.61                      | 131.09                 | 1259                            | 2132                              | 0                                |                                                |                     |

**MODIFIED RATIONAL METHOD**  
**POST-DEVELOPMENT CONTROLLED FLOWS**  
**HEWITT'S CREEK - SITE**

Rainfall IDF Coefficients 5 -year

A = 843.019  
 B = 4.582  
 C = 0.760

Area = 3.26 ha  
 Runoff Coefficient, C = 0.90  
 C\*A = 2.94  
 Time of Concentration,  $t_c$  = 10.0 min  
 Storm Duration Increment = 10.0 min  
 Target Release Rate = 601.03 L/s  
 Constant Inflow = 40 L/s  
 Uncontrolled Outflow = 4.35 L/s  
 Max. Allowable Outflow = 596.68 L/s

| Storm Duration (min) | Rainfall Intensity (mm/hr) | Max. Runoff Flow (L/s) | Runoff Volume (m <sup>3</sup> ) | Released Volume (m <sup>3</sup> ) | Storage Volume (m <sup>3</sup> ) | Max. Storage Volume Required (m <sup>3</sup> ) | Drawdown Time (hrs) |
|----------------------|----------------------------|------------------------|---------------------------------|-----------------------------------|----------------------------------|------------------------------------------------|---------------------|
| 10.0                 | 109.99                     | 938.65                 | 563                             | 358                               | 205                              |                                                |                     |
| 20.0                 | 73.96                      | 644.11                 | 773                             | 537                               | 236                              | 236                                            | 0.38                |
| 30.0                 | 57.06                      | 505.97                 | 911                             | 716                               | 195                              |                                                |                     |
| 40.0                 | 47.04                      | 424.09                 | 1018                            | 895                               | 123                              |                                                |                     |
| 50.0                 | 40.33                      | 369.27                 | 1108                            | 1074                              | 34                               |                                                |                     |
| 60.0                 | 35.49                      | 329.69                 | 1187                            | 1253                              | 0                                |                                                |                     |
| 70.0                 | 31.82                      | 299.62                 | 1258                            | 1432                              | 0                                |                                                |                     |
| 80.0                 | 28.91                      | 275.90                 | 1324                            | 1611                              | 0                                |                                                |                     |
| 90.0                 | 26.56                      | 256.66                 | 1386                            | 1790                              | 0                                |                                                |                     |
| 100.0                | 24.61                      | 240.69                 | 1444                            | 1969                              | 0                                |                                                |                     |
| 110.0                | 22.96                      | 227.21                 | 1500                            | 2148                              | 0                                |                                                |                     |
| 120.0                | 21.54                      | 215.64                 | 1553                            | 2327                              | 0                                |                                                |                     |
| 130.0                | 20.31                      | 205.61                 | 1604                            | 2506                              | 0                                |                                                |                     |
| 140.0                | 19.24                      | 196.80                 | 1653                            | 2685                              | 0                                |                                                |                     |
| 150.0                | 18.28                      | 189.01                 | 1701                            | 2864                              | 0                                |                                                |                     |
| 160.0                | 17.43                      | 182.06                 | 1748                            | 3043                              | 0                                |                                                |                     |

**MODIFIED RATIONAL METHOD**  
**POST-DEVELOPMENT CONTROLLED FLOWS**  
**HEWITT'S CREEK - SITE**

Rainfall IDF Coefficients 10 -year

A = 976.868  
 B = 4.745  
 C = 0.760

Area = 3.26 ha  
 Runoff Coefficient, C = 0.90  
 C\*A = 2.94  
 Time of Concentration,  $t_c$  = 10.0 min  
 Storm Duration Increment = 10.0 min  
 Target Release Rate = 750.08 L/s  
 Constant Inflow = 43 L/s  
 Uncontrolled Outflow = 4.69 L/s  
 Max. Allowable Outflow = 745.39 L/s

| Storm Duration (min) | Rainfall Intensity (mm/hr) | Max. Runoff Flow (L/s) | Runoff Volume (m <sup>3</sup> ) | Released Volume (m <sup>3</sup> ) | Storage Volume (m <sup>3</sup> ) | Max. Storage Volume Required (m <sup>3</sup> ) | Drawdown Time (hrs) |
|----------------------|----------------------------|------------------------|---------------------------------|-----------------------------------|----------------------------------|------------------------------------------------|---------------------|
| 10.0                 | 126.38                     | 1075.70                | 645                             | 447                               | 198                              |                                                |                     |
| 20.0                 | 85.27                      | 739.65                 | 888                             | 671                               | 217                              | 217                                            | 0.33                |
| 30.0                 | 65.88                      | 581.16                 | 1046                            | 894                               | 152                              |                                                |                     |
| 40.0                 | 54.36                      | 486.97                 | 1169                            | 1118                              | 51                               |                                                |                     |
| 50.0                 | 46.63                      | 423.82                 | 1271                            | 1342                              | 0                                |                                                |                     |
| 60.0                 | 41.05                      | 378.18                 | 1361                            | 1565                              | 0                                |                                                |                     |
| 70.0                 | 36.81                      | 343.48                 | 1443                            | 1789                              | 0                                |                                                |                     |
| 80.0                 | 33.46                      | 316.09                 | 1517                            | 2013                              | 0                                |                                                |                     |
| 90.0                 | 30.74                      | 293.87                 | 1587                            | 2236                              | 0                                |                                                |                     |
| 100.0                | 28.48                      | 275.42                 | 1653                            | 2460                              | 0                                |                                                |                     |
| 110.0                | 26.57                      | 259.83                 | 1715                            | 2683                              | 0                                |                                                |                     |
| 120.0                | 24.94                      | 246.46                 | 1775                            | 2907                              | 0                                |                                                |                     |
| 130.0                | 23.52                      | 234.86                 | 1832                            | 3131                              | 0                                |                                                |                     |
| 140.0                | 22.27                      | 224.68                 | 1887                            | 3354                              | 0                                |                                                |                     |
| 150.0                | 21.17                      | 215.66                 | 1941                            | 3578                              | 0                                |                                                |                     |
| 160.0                | 20.19                      | 207.62                 | 1993                            | 3802                              | 0                                |                                                |                     |

**MODIFIED RATIONAL METHOD**  
**POST-DEVELOPMENT CONTROLLED FLOWS**  
**HEWITT'S CREEK - SITE**

Rainfall IDF Coefficients 25 -year

|     |  |     |          |
|-----|--|-----|----------|
| A = |  | A = | 1133.123 |
| C = |  | B = | 4.734    |
|     |  | C = | 0.756    |

Area = 3.26 ha  
 Runoff Coefficient, C = 0.90  
 C\*A = 2.94  
 Time of Concentration,  $t_c$  = 10.0 min  
 Storm Duration Increment = 10.0 min  
 Target Release Rate = 927.78 L/s  
 Constant Inflow = 50 L/s  
 Uncontrolled Outflow = 5.50 L/s  
 Max. Allowable Outflow = 922.28 L/s

| Storm Duration (min) | Rainfall Intensity (mm/hr) | Max. Runoff Flow (L/s) | Runoff Volume (m <sup>3</sup> ) | Released Volume (m <sup>3</sup> ) | Storage Volume (m <sup>3</sup> ) | Max. Storage Volume Required (m <sup>3</sup> ) | Drawdown Time (hrs) |
|----------------------|----------------------------|------------------------|---------------------------------|-----------------------------------|----------------------------------|------------------------------------------------|---------------------|
| 10.0                 | 148.26                     | 1261.98                | 757                             | 553                               | 204                              |                                                |                     |
| 20.0                 | 100.22                     | 869.24                 | 1043                            | 830                               | 213                              | 213                                            | 0.31                |
| 30.0                 | 77.53                      | 683.76                 | 1231                            | 1107                              | 124                              |                                                |                     |
| 40.0                 | 64.03                      | 573.42                 | 1376                            | 1383                              | 0                                |                                                |                     |
| 50.0                 | 54.97                      | 499.38                 | 1498                            | 1660                              | 0                                |                                                |                     |
| 60.0                 | 48.42                      | 445.84                 | 1605                            | 1937                              | 0                                |                                                |                     |
| 70.0                 | 43.44                      | 405.10                 | 1701                            | 2213                              | 0                                |                                                |                     |
| 80.0                 | 39.51                      | 372.93                 | 1790                            | 2490                              | 0                                |                                                |                     |
| 90.0                 | 36.31                      | 346.81                 | 1873                            | 2767                              | 0                                |                                                |                     |
| 100.0                | 33.66                      | 325.13                 | 1951                            | 3044                              | 0                                |                                                |                     |
| 110.0                | 31.42                      | 306.80                 | 2025                            | 3320                              | 0                                |                                                |                     |
| 120.0                | 29.49                      | 291.07                 | 2096                            | 3597                              | 0                                |                                                |                     |
| 130.0                | 27.82                      | 277.42                 | 2164                            | 3874                              | 0                                |                                                |                     |
| 140.0                | 26.36                      | 265.44                 | 2230                            | 4150                              | 0                                |                                                |                     |
| 150.0                | 25.06                      | 254.82                 | 2293                            | 4427                              | 0                                |                                                |                     |
| 160.0                | 23.90                      | 245.35                 | 2355                            | 4704                              | 0                                |                                                |                     |

**MODIFIED RATIONAL METHOD**  
**POST-DEVELOPMENT CONTROLLED FLOWS**  
**HEWITT'S CREEK - SITE**

Rainfall IDF Coefficients 50 -year

|     |              |
|-----|--------------|
| A = | A = 1251.473 |
| C = | B = 4.847    |
|     | C = 0.753    |

Area = 3.26 ha  
 Runoff Coefficient, C = 0.90  
 C\*A = 2.94  
 Time of Concentration,  $t_c$  = 10.0 min  
 Storm Duration Increment = 10.0 min  
 Target Release Rate = 1058.53 L/s  
 Constant Inflow = 55 L/s  
 Uncontrolled Outflow = 6.09 L/s  
 Max. Allowable Outflow = 1052.44 L/s

| Storm Duration (min) | Rainfall Intensity (mm/hr) | Max. Runoff Flow (L/s) | Runoff Volume (m <sup>3</sup> ) | Released Volume (m <sup>3</sup> ) | Storage Volume (m <sup>3</sup> ) | Max. Storage Volume Required (m <sup>3</sup> ) | Drawdown Time (hrs) |
|----------------------|----------------------------|------------------------|---------------------------------|-----------------------------------|----------------------------------|------------------------------------------------|---------------------|
| 10.0                 | 164.13                     | 1397.02                | 838                             | 631                               | 207                              |                                                |                     |
| 20.0                 | 111.37                     | 965.78                 | 1159                            | 947                               | 212                              | 212                                            | 0.30                |
| 30.0                 | 86.33                      | 761.07                 | 1370                            | 1263                              | 107                              |                                                |                     |
| 40.0                 | 71.39                      | 638.96                 | 1534                            | 1579                              | 0                                |                                                |                     |
| 50.0                 | 61.35                      | 556.88                 | 1671                            | 1894                              | 0                                |                                                |                     |
| 60.0                 | 54.08                      | 497.45                 | 1791                            | 2210                              | 0                                |                                                |                     |
| 70.0                 | 48.55                      | 452.19                 | 1899                            | 2526                              | 0                                |                                                |                     |
| 80.0                 | 44.17                      | 416.43                 | 1999                            | 2842                              | 0                                |                                                |                     |
| 90.0                 | 40.62                      | 387.37                 | 2092                            | 3157                              | 0                                |                                                |                     |
| 100.0                | 37.67                      | 363.23                 | 2179                            | 3473                              | 0                                |                                                |                     |
| 110.0                | 35.17                      | 342.82                 | 2263                            | 3789                              | 0                                |                                                |                     |
| 120.0                | 33.03                      | 325.30                 | 2342                            | 4105                              | 0                                |                                                |                     |
| 130.0                | 31.16                      | 310.09                 | 2419                            | 4420                              | 0                                |                                                |                     |
| 140.0                | 29.53                      | 296.73                 | 2492                            | 4736                              | 0                                |                                                |                     |
| 150.0                | 28.08                      | 284.89                 | 2564                            | 5052                              | 0                                |                                                |                     |
| 160.0                | 26.79                      | 274.32                 | 2634                            | 5367                              | 0                                |                                                |                     |

**MODIFIED RATIONAL METHOD**  
**POST-DEVELOPMENT CONTROLLED FLOWS**  
**HEWITT'S CREEK - SITE**

Rainfall IDF Coefficients 100 -year

|     |              |
|-----|--------------|
| A = | A = 1383.628 |
| C = | B = 4.905    |
|     | C = 0.754    |

Area = 3.26 ha  
 Runoff Coefficient, C = 0.90  
 C\*A = 2.94  
 Time of Concentration,  $t_c$  = 10.0 min  
 Storm Duration Increment = 10.0 min  
 Target Release Rate = 1198.79 L/s  
 Constant Inflow = 61 L/s  
 Uncontrolled Outflow = 6.70 L/s  
 Max. Allowable Outflow = 1192.09 L/s

| Storm Duration (min) | Rainfall Intensity (mm/hr) | Max. Runoff Flow (L/s) | Runoff Volume (m <sup>3</sup> ) | Released Volume (m <sup>3</sup> ) | Storage Volume (m <sup>3</sup> ) | Max. Storage Volume Required (m <sup>3</sup> ) | Drawdown Time (hrs) |
|----------------------|----------------------------|------------------------|---------------------------------|-----------------------------------|----------------------------------|------------------------------------------------|---------------------|
| 10.0                 | 180.44                     | 1535.86                | 922                             | 715                               | 206                              | 206                                            | 0.23                |
| 20.0                 | 122.52                     | 1062.43                | 1275                            | 1073                              | 202                              |                                                |                     |
| 30.0                 | 94.99                      | 837.36                 | 1507                            | 1431                              | 77                               |                                                |                     |
| 40.0                 | 78.56                      | 703.02                 | 1687                            | 1788                              | 0                                |                                                |                     |
| 50.0                 | 67.51                      | 612.69                 | 1838                            | 2146                              | 0                                |                                                |                     |
| 60.0                 | 59.51                      | 547.28                 | 1970                            | 2503                              | 0                                |                                                |                     |
| 70.0                 | 53.41                      | 497.46                 | 2089                            | 2861                              | 0                                |                                                |                     |
| 80.0                 | 48.60                      | 458.09                 | 2199                            | 3219                              | 0                                |                                                |                     |
| 90.0                 | 44.68                      | 426.10                 | 2301                            | 3576                              | 0                                |                                                |                     |
| 100.0                | 41.43                      | 399.53                 | 2397                            | 3934                              | 0                                |                                                |                     |
| 110.0                | 38.68                      | 377.05                 | 2489                            | 4292                              | 0                                |                                                |                     |
| 120.0                | 36.32                      | 357.77                 | 2576                            | 4649                              | 0                                |                                                |                     |
| 130.0                | 34.28                      | 341.02                 | 2660                            | 5007                              | 0                                |                                                |                     |
| 140.0                | 32.48                      | 326.31                 | 2741                            | 5364                              | 0                                |                                                |                     |
| 150.0                | 30.88                      | 313.28                 | 2820                            | 5722                              | 0                                |                                                |                     |
| 160.0                | 29.46                      | 301.65                 | 2896                            | 6080                              | 0                                |                                                |                     |

**MODIFIED RATIONAL METHOD**  
**POST-DEVELOPMENT CONTROLLED FLOWS**  
**LOVER'S CREEK - ROW**

Rainfall IDF Coefficients 2 -year

|     |             |
|-----|-------------|
| A = | A = 675.586 |
| C = | B = 4.681   |
|     | C = 0.780   |

Area = 0.14 ha  
 Runoff Coefficient, C = 0.77  
 C\*A = 0.11  
 Time of Concentration,  $t_c$  = 10.0 min  
 Storm Duration Increment = 10.0 min  
 Target Release Rate = 11.50 L/s  
 Constant Inflow = 0 L/s  
 Uncontrolled Outflow = 0.00 L/s  
 Max. Allowable Outflow = 11.50 L/s

| Storm Duration (min) | Rainfall Intensity (mm/hr) | Max. Runoff Flow (L/s) | Runoff Volume (m <sup>3</sup> ) | Released Volume (m <sup>3</sup> ) | Storage Volume (m <sup>3</sup> ) | Max. Storage Volume Required (m <sup>3</sup> ) | Drawdown Time (hrs) |
|----------------------|----------------------------|------------------------|---------------------------------|-----------------------------------|----------------------------------|------------------------------------------------|---------------------|
| 10.0                 | 83.10                      | 24.62                  | 15                              | 7                                 | 8                                |                                                |                     |
| 20.0                 | 55.42                      | 16.42                  | 20                              | 10                                | 9                                | 9                                              | 0.57                |
| 30.0                 | 42.50                      | 12.59                  | 23                              | 14                                | 9                                |                                                |                     |
| 40.0                 | 34.88                      | 10.33                  | 25                              | 17                                | 8                                |                                                |                     |
| 50.0                 | 29.80                      | 8.83                   | 26                              | 21                                | 6                                |                                                |                     |
| 60.0                 | 26.14                      | 7.74                   | 28                              | 24                                | 4                                |                                                |                     |
| 70.0                 | 23.37                      | 6.92                   | 29                              | 28                                | 1                                |                                                |                     |
| 80.0                 | 21.18                      | 6.28                   | 30                              | 31                                | 0                                |                                                |                     |
| 90.0                 | 19.42                      | 5.75                   | 31                              | 34                                | 0                                |                                                |                     |
| 100.0                | 17.95                      | 5.32                   | 32                              | 38                                | 0                                |                                                |                     |
| 110.0                | 16.72                      | 4.95                   | 33                              | 41                                | 0                                |                                                |                     |
| 120.0                | 15.67                      | 4.64                   | 33                              | 45                                | 0                                |                                                |                     |
| 130.0                | 14.75                      | 4.37                   | 34                              | 48                                | 0                                |                                                |                     |
| 140.0                | 13.95                      | 4.13                   | 35                              | 52                                | 0                                |                                                |                     |
| 150.0                | 13.24                      | 3.92                   | 35                              | 55                                | 0                                |                                                |                     |
| 160.0                | 12.61                      | 3.74                   | 36                              | 59                                | 0                                |                                                |                     |

**MODIFIED RATIONAL METHOD**  
**POST-DEVELOPMENT CONTROLLED FLOWS**  
**LOVER'S CREEK - ROW**

Rainfall IDF Coefficients 5 -year

A = 843.019  
 C = 4.582  
 C = 0.760

Area = 0.14 ha  
 Runoff Coefficient, C = 0.77  
 C\*A = 0.11  
 Time of Concentration,  $t_c$  = 10.0 min  
 Storm Duration Increment = 10.0 min  
 Target Release Rate = 17.45 L/s  
 Constant Inflow = 0 L/s  
 Uncontrolled Outflow = 0.00 L/s  
 Max. Allowable Outflow = 17.45 L/s

| Storm Duration (min) | Rainfall Intensity (mm/hr) | Max. Runoff Flow (L/s) | Runoff Volume (m <sup>3</sup> ) | Released Volume (m <sup>3</sup> ) | Storage Volume (m <sup>3</sup> ) | Max. Storage Volume Required (m <sup>3</sup> ) | Drawdown Time (hrs) |
|----------------------|----------------------------|------------------------|---------------------------------|-----------------------------------|----------------------------------|------------------------------------------------|---------------------|
| 10.0                 | 109.99                     | 32.58                  | 20                              | 10                                | 9                                |                                                |                     |
| 20.0                 | 73.96                      | 21.91                  | 26                              | 16                                | 11                               | 11                                             | 0.47                |
| 30.0                 | 57.06                      | 16.90                  | 30                              | 21                                | 9                                |                                                |                     |
| 40.0                 | 47.04                      | 13.93                  | 33                              | 26                                | 7                                |                                                |                     |
| 50.0                 | 40.33                      | 11.95                  | 36                              | 31                                | 4                                |                                                |                     |
| 60.0                 | 35.49                      | 10.51                  | 38                              | 37                                | 1                                |                                                |                     |
| 70.0                 | 31.82                      | 9.42                   | 40                              | 42                                | 0                                |                                                |                     |
| 80.0                 | 28.91                      | 8.56                   | 41                              | 47                                | 0                                |                                                |                     |
| 90.0                 | 26.56                      | 7.87                   | 42                              | 52                                | 0                                |                                                |                     |
| 100.0                | 24.61                      | 7.29                   | 44                              | 58                                | 0                                |                                                |                     |
| 110.0                | 22.96                      | 6.80                   | 45                              | 63                                | 0                                |                                                |                     |
| 120.0                | 21.54                      | 6.38                   | 46                              | 68                                | 0                                |                                                |                     |
| 130.0                | 20.31                      | 6.02                   | 47                              | 73                                | 0                                |                                                |                     |
| 140.0                | 19.24                      | 5.70                   | 48                              | 79                                | 0                                |                                                |                     |
| 150.0                | 18.28                      | 5.42                   | 49                              | 84                                | 0                                |                                                |                     |
| 160.0                | 17.43                      | 5.16                   | 50                              | 89                                | 0                                |                                                |                     |

**MODIFIED RATIONAL METHOD**  
**POST-DEVELOPMENT CONTROLLED FLOWS**  
**LOVER'S CREEK - ROW**

Rainfall IDF Coefficients 10 -year

|     |  |     |         |
|-----|--|-----|---------|
| A = |  | A = | 976.868 |
| C = |  | B = | 4.745   |
|     |  | C = | 0.760   |

Area = 0.14 ha  
 Runoff Coefficient, C = 0.77  
 C\*A = 0.11  
 Time of Concentration,  $t_c$  = 10.0 min  
 Storm Duration Increment = 10.0 min  
 Target Release Rate = 21.65 L/s  
 Constant Inflow = 0 L/s  
 Uncontrolled Outflow = 0.00 L/s  
 Max. Allowable Outflow = 21.65 L/s

| Storm Duration (min) | Rainfall Intensity (mm/hr) | Max. Runoff Flow (L/s) | Runoff Volume (m <sup>3</sup> ) | Released Volume (m <sup>3</sup> ) | Storage Volume (m <sup>3</sup> ) | Max. Storage Volume Required (m <sup>3</sup> ) | Drawdown Time (hrs) |
|----------------------|----------------------------|------------------------|---------------------------------|-----------------------------------|----------------------------------|------------------------------------------------|---------------------|
| 10.0                 | 126.38                     | 37.44                  | 22                              | 13                                | 9                                |                                                |                     |
| 20.0                 | 85.27                      | 25.26                  | 30                              | 19                                | 11                               | 11                                             | 0.42                |
| 30.0                 | 65.88                      | 19.52                  | 35                              | 26                                | 9                                |                                                |                     |
| 40.0                 | 54.36                      | 16.10                  | 39                              | 32                                | 6                                |                                                |                     |
| 50.0                 | 46.63                      | 13.81                  | 41                              | 39                                | 2                                |                                                |                     |
| 60.0                 | 41.05                      | 12.16                  | 44                              | 45                                | 0                                |                                                |                     |
| 70.0                 | 36.81                      | 10.90                  | 46                              | 52                                | 0                                |                                                |                     |
| 80.0                 | 33.46                      | 9.91                   | 48                              | 58                                | 0                                |                                                |                     |
| 90.0                 | 30.74                      | 9.10                   | 49                              | 65                                | 0                                |                                                |                     |
| 100.0                | 28.48                      | 8.44                   | 51                              | 71                                | 0                                |                                                |                     |
| 110.0                | 26.57                      | 7.87                   | 52                              | 78                                | 0                                |                                                |                     |
| 120.0                | 24.94                      | 7.39                   | 53                              | 84                                | 0                                |                                                |                     |
| 130.0                | 23.52                      | 6.97                   | 54                              | 91                                | 0                                |                                                |                     |
| 140.0                | 22.27                      | 6.60                   | 55                              | 97                                | 0                                |                                                |                     |
| 150.0                | 21.17                      | 6.27                   | 56                              | 104                               | 0                                |                                                |                     |
| 160.0                | 20.19                      | 5.98                   | 57                              | 110                               | 0                                |                                                |                     |

**MODIFIED RATIONAL METHOD**  
**POST-DEVELOPMENT CONTROLLED FLOWS**  
**LOVER'S CREEK - ROW**

Rainfall IDF Coefficients 25 -year

|     |              |
|-----|--------------|
| A = | A = 1133.123 |
| C = | B = 4.734    |
|     | C = 0.756    |

Area = 0.14 ha  
 Runoff Coefficient, C = 0.77  
 C\*A = 0.11  
 Time of Concentration,  $t_c$  = 10.0 min  
 Storm Duration Increment = 10.0 min  
 Target Release Rate = 27.18 L/s  
 Constant Inflow = 0 L/s  
 Uncontrolled Outflow = 0.00 L/s  
 Max. Allowable Outflow = 27.18 L/s

| Storm Duration (min) | Rainfall Intensity (mm/hr) | Max. Runoff Flow (L/s) | Runoff Volume (m <sup>3</sup> ) | Released Volume (m <sup>3</sup> ) | Storage Volume (m <sup>3</sup> ) | Max. Storage Volume Required (m <sup>3</sup> ) | Drawdown Time (hrs) |
|----------------------|----------------------------|------------------------|---------------------------------|-----------------------------------|----------------------------------|------------------------------------------------|---------------------|
| 10.0                 | 148.26                     | 43.92                  | 26                              | 16                                | 10                               |                                                |                     |
| 20.0                 | 100.22                     | 29.69                  | 36                              | 24                                | 11                               | 11                                             | 0.38                |
| 30.0                 | 77.53                      | 22.97                  | 41                              | 33                                | 9                                |                                                |                     |
| 40.0                 | 64.03                      | 18.97                  | 46                              | 41                                | 5                                |                                                |                     |
| 50.0                 | 54.97                      | 16.28                  | 49                              | 49                                | 0                                |                                                |                     |
| 60.0                 | 48.42                      | 14.34                  | 52                              | 57                                | 0                                |                                                |                     |
| 70.0                 | 43.44                      | 12.87                  | 54                              | 65                                | 0                                |                                                |                     |
| 80.0                 | 39.51                      | 11.70                  | 56                              | 73                                | 0                                |                                                |                     |
| 90.0                 | 36.31                      | 10.76                  | 58                              | 82                                | 0                                |                                                |                     |
| 100.0                | 33.66                      | 9.97                   | 60                              | 90                                | 0                                |                                                |                     |
| 110.0                | 31.42                      | 9.31                   | 61                              | 98                                | 0                                |                                                |                     |
| 120.0                | 29.49                      | 8.74                   | 63                              | 106                               | 0                                |                                                |                     |
| 130.0                | 27.82                      | 8.24                   | 64                              | 114                               | 0                                |                                                |                     |
| 140.0                | 26.36                      | 7.81                   | 66                              | 122                               | 0                                |                                                |                     |
| 150.0                | 25.06                      | 7.42                   | 67                              | 130                               | 0                                |                                                |                     |
| 160.0                | 23.90                      | 7.08                   | 68                              | 139                               | 0                                |                                                |                     |

**MODIFIED RATIONAL METHOD**  
**POST-DEVELOPMENT CONTROLLED FLOWS**  
**LOVER'S CREEK - ROW**

Rainfall IDF Coefficients 50 -year

A = 1251.473  
 C = 4.847  
 C = 0.753

Area = 0.14 ha  
 Runoff Coefficient, C = 0.77  
 C\*A = 0.11  
 Time of Concentration,  $t_c$  = 10.0 min  
 Storm Duration Increment = 10.0 min  
 Target Release Rate = 31.43 L/s  
 Constant Inflow = 0 L/s  
 Uncontrolled Outflow = 0.00 L/s  
 Max. Allowable Outflow = 31.43 L/s

| Storm Duration (min) | Rainfall Intensity (mm/hr) | Max. Runoff Flow (L/s) | Runoff Volume (m <sup>3</sup> ) | Released Volume (m <sup>3</sup> ) | Storage Volume (m <sup>3</sup> ) | Max. Storage Volume Required (m <sup>3</sup> ) | Drawdown Time (hrs) |
|----------------------|----------------------------|------------------------|---------------------------------|-----------------------------------|----------------------------------|------------------------------------------------|---------------------|
| 10.0                 | 164.13                     | 48.62                  | 29                              | 19                                | 10                               |                                                |                     |
| 20.0                 | 111.37                     | 32.99                  | 40                              | 28                                | 11                               | 11                                             | 0.36                |
| 30.0                 | 86.33                      | 25.57                  | 46                              | 38                                | 8                                |                                                |                     |
| 40.0                 | 71.39                      | 21.15                  | 51                              | 47                                | 4                                |                                                |                     |
| 50.0                 | 61.35                      | 18.17                  | 55                              | 57                                | 0                                |                                                |                     |
| 60.0                 | 54.08                      | 16.02                  | 58                              | 66                                | 0                                |                                                |                     |
| 70.0                 | 48.55                      | 14.38                  | 60                              | 75                                | 0                                |                                                |                     |
| 80.0                 | 44.17                      | 13.08                  | 63                              | 85                                | 0                                |                                                |                     |
| 90.0                 | 40.62                      | 12.03                  | 65                              | 94                                | 0                                |                                                |                     |
| 100.0                | 37.67                      | 11.16                  | 67                              | 104                               | 0                                |                                                |                     |
| 110.0                | 35.17                      | 10.42                  | 69                              | 113                               | 0                                |                                                |                     |
| 120.0                | 33.03                      | 9.78                   | 70                              | 123                               | 0                                |                                                |                     |
| 130.0                | 31.16                      | 9.23                   | 72                              | 132                               | 0                                |                                                |                     |
| 140.0                | 29.53                      | 8.75                   | 73                              | 141                               | 0                                |                                                |                     |
| 150.0                | 28.08                      | 8.32                   | 75                              | 151                               | 0                                |                                                |                     |
| 160.0                | 26.79                      | 7.94                   | 76                              | 160                               | 0                                |                                                |                     |

**MODIFIED RATIONAL METHOD**  
**POST-DEVELOPMENT CONTROLLED FLOWS**  
**LOVER'S CREEK - ROW**

Rainfall IDF Coefficients 100 -year

A = 1383.628  
 C = 4.905  
 C = 0.754

Area = 0.14 ha  
 Runoff Coefficient, C = 0.77  
 C\*A = 0.11  
 Time of Concentration,  $t_c$  = 10.0 min  
 Storm Duration Increment = 10.0 min  
 Target Release Rate = 35.72 L/s  
 Constant Inflow = 0 L/s  
 Uncontrolled Outflow = 0.00 L/s  
 Max. Allowable Outflow = 35.72 L/s

| Storm Duration (min) | Rainfall Intensity (mm/hr) | Max. Runoff Flow (L/s) | Runoff Volume (m <sup>3</sup> ) | Released Volume (m <sup>3</sup> ) | Storage Volume (m <sup>3</sup> ) | Max. Storage Volume Required (m <sup>3</sup> ) | Drawdown Time (hrs) |
|----------------------|----------------------------|------------------------|---------------------------------|-----------------------------------|----------------------------------|------------------------------------------------|---------------------|
| 10.0                 | 180.44                     | 53.45                  | 32                              | 21                                | 11                               |                                                |                     |
| 20.0                 | 122.52                     | 36.29                  | 44                              | 32                                | 11                               | 11                                             | 0.34                |
| 30.0                 | 94.99                      | 28.14                  | 51                              | 43                                | 8                                |                                                |                     |
| 40.0                 | 78.56                      | 23.27                  | 56                              | 54                                | 2                                |                                                |                     |
| 50.0                 | 67.51                      | 20.00                  | 60                              | 64                                | 0                                |                                                |                     |
| 60.0                 | 59.51                      | 17.63                  | 63                              | 75                                | 0                                |                                                |                     |
| 70.0                 | 53.41                      | 15.82                  | 66                              | 86                                | 0                                |                                                |                     |
| 80.0                 | 48.60                      | 14.40                  | 69                              | 96                                | 0                                |                                                |                     |
| 90.0                 | 44.68                      | 13.24                  | 71                              | 107                               | 0                                |                                                |                     |
| 100.0                | 41.43                      | 12.27                  | 74                              | 118                               | 0                                |                                                |                     |
| 110.0                | 38.68                      | 11.46                  | 76                              | 129                               | 0                                |                                                |                     |
| 120.0                | 36.32                      | 10.76                  | 77                              | 139                               | 0                                |                                                |                     |
| 130.0                | 34.28                      | 10.15                  | 79                              | 150                               | 0                                |                                                |                     |
| 140.0                | 32.48                      | 9.62                   | 81                              | 161                               | 0                                |                                                |                     |
| 150.0                | 30.88                      | 9.15                   | 82                              | 171                               | 0                                |                                                |                     |
| 160.0                | 29.46                      | 8.73                   | 84                              | 182                               | 0                                |                                                |                     |

**MODIFIED RATIONAL METHOD**  
**POST-DEVELOPMENT CONTROLLED FLOWS**  
**LOVER'S CREEK - PRIVATE ROAD**

Rainfall IDF Coefficients      2 -year

|     |  |     |         |
|-----|--|-----|---------|
| A = |  | A = | 675.586 |
| C = |  | B = | 4.681   |
|     |  | C = | 0.780   |

Area = 0.17 ha  
 Runoff Coefficient, C = 0.59  
 C\*A = 0.10  
 Time of Concentration,  $t_c$  = 10.0 min  
 Storm Duration Increment = 10.0 min  
 Target Release Rate = 14.43 L/s  
 Constant Inflow = 0 L/s  
 Uncontrolled Outflow = 0.00 L/s  
 Max. Allowable Outflow = 14.43 L/s

| Storm Duration (min) | Rainfall Intensity (mm/hr) | Max. Runoff Flow (L/s) | Runoff Volume (m <sup>3</sup> ) | Released Volume (m <sup>3</sup> ) | Storage Volume (m <sup>3</sup> ) | Max. Storage Volume Required (m <sup>3</sup> ) | Drawdown Time (hrs) |
|----------------------|----------------------------|------------------------|---------------------------------|-----------------------------------|----------------------------------|------------------------------------------------|---------------------|
| 10.0                 | 83.10                      | 23.57                  | 14                              | 9                                 | 5                                |                                                |                     |
| 20.0                 | 55.42                      | 15.72                  | 19                              | 13                                | 6                                | 6                                              | 0.38                |
| 30.0                 | 42.50                      | 12.06                  | 22                              | 17                                | 4                                |                                                |                     |
| 40.0                 | 34.88                      | 9.89                   | 24                              | 22                                | 2                                |                                                |                     |
| 50.0                 | 29.80                      | 8.45                   | 25                              | 26                                | 0                                |                                                |                     |
| 60.0                 | 26.14                      | 7.41                   | 27                              | 30                                | 0                                |                                                |                     |
| 70.0                 | 23.37                      | 6.63                   | 28                              | 35                                | 0                                |                                                |                     |
| 80.0                 | 21.18                      | 6.01                   | 29                              | 39                                | 0                                |                                                |                     |
| 90.0                 | 19.42                      | 5.51                   | 30                              | 43                                | 0                                |                                                |                     |
| 100.0                | 17.95                      | 5.09                   | 31                              | 48                                | 0                                |                                                |                     |
| 110.0                | 16.72                      | 4.74                   | 31                              | 52                                | 0                                |                                                |                     |
| 120.0                | 15.67                      | 4.44                   | 32                              | 56                                | 0                                |                                                |                     |
| 130.0                | 14.75                      | 4.18                   | 33                              | 61                                | 0                                |                                                |                     |
| 140.0                | 13.95                      | 3.96                   | 33                              | 65                                | 0                                |                                                |                     |
| 150.0                | 13.24                      | 3.76                   | 34                              | 69                                | 0                                |                                                |                     |
| 160.0                | 12.61                      | 3.58                   | 34                              | 74                                | 0                                |                                                |                     |

**MODIFIED RATIONAL METHOD**  
**POST-DEVELOPMENT CONTROLLED FLOWS**  
**LOVER'S CREEK - PRIVATE ROAD**

Rainfall IDF Coefficients 5 -year

|     |  |     |         |
|-----|--|-----|---------|
| A = |  | A = | 843.019 |
| C = |  | B = | 4.582   |
|     |  | C = | 0.760   |

Area = 0.17 ha  
 Runoff Coefficient, C = 0.59  
 C\*A = 0.10  
 Time of Concentration,  $t_c$  = 10.0 min  
 Storm Duration Increment = 10.0 min  
 Target Release Rate = 21.89 L/s  
 Constant Inflow = 0 L/s  
 Uncontrolled Outflow = 0.00 L/s  
 Max. Allowable Outflow = 21.89 L/s

| Storm Duration (min) | Rainfall Intensity (mm/hr) | Max. Runoff Flow (L/s) | Runoff Volume (m <sup>3</sup> ) | Released Volume (m <sup>3</sup> ) | Storage Volume (m <sup>3</sup> ) | Max. Storage Volume Required (m <sup>3</sup> ) | Drawdown Time (hrs) |
|----------------------|----------------------------|------------------------|---------------------------------|-----------------------------------|----------------------------------|------------------------------------------------|---------------------|
| 10.0                 | 109.99                     | 31.20                  | 19                              | 13                                | 6                                | 6                                              | 0.26                |
| 20.0                 | 73.96                      | 20.98                  | 25                              | 20                                | 5                                |                                                |                     |
| 30.0                 | 57.06                      | 16.19                  | 29                              | 26                                | 3                                |                                                |                     |
| 40.0                 | 47.04                      | 13.34                  | 32                              | 33                                | 0                                |                                                |                     |
| 50.0                 | 40.33                      | 11.44                  | 34                              | 39                                | 0                                |                                                |                     |
| 60.0                 | 35.49                      | 10.07                  | 36                              | 46                                | 0                                |                                                |                     |
| 70.0                 | 31.82                      | 9.03                   | 38                              | 53                                | 0                                |                                                |                     |
| 80.0                 | 28.91                      | 8.20                   | 39                              | 59                                | 0                                |                                                |                     |
| 90.0                 | 26.56                      | 7.53                   | 41                              | 66                                | 0                                |                                                |                     |
| 100.0                | 24.61                      | 6.98                   | 42                              | 72                                | 0                                |                                                |                     |
| 110.0                | 22.96                      | 6.51                   | 43                              | 79                                | 0                                |                                                |                     |
| 120.0                | 21.54                      | 6.11                   | 44                              | 85                                | 0                                |                                                |                     |
| 130.0                | 20.31                      | 5.76                   | 45                              | 92                                | 0                                |                                                |                     |
| 140.0                | 19.24                      | 5.46                   | 46                              | 99                                | 0                                |                                                |                     |
| 150.0                | 18.28                      | 5.19                   | 47                              | 105                               | 0                                |                                                |                     |
| 160.0                | 17.43                      | 4.95                   | 47                              | 112                               | 0                                |                                                |                     |

**MODIFIED RATIONAL METHOD**  
**POST-DEVELOPMENT CONTROLLED FLOWS**  
**LOVER'S CREEK - PRIVATE ROAD**

Rainfall IDF Coefficients 10 -year

|     |  |     |         |
|-----|--|-----|---------|
| A = |  | A = | 976.868 |
| C = |  | B = | 4.745   |
|     |  | C = | 0.760   |

Area = 0.17 ha  
 Runoff Coefficient, C = 0.59  
 C\*A = 0.10  
 Time of Concentration,  $t_c$  = 10.0 min  
 Storm Duration Increment = 10.0 min  
 Target Release Rate = 27.16 L/s  
 Constant Inflow = 0 L/s  
 Uncontrolled Outflow = 0.00 L/s  
 Max. Allowable Outflow = 27.16 L/s

| Storm Duration (min) | Rainfall Intensity (mm/hr) | Max. Runoff Flow (L/s) | Runoff Volume (m <sup>3</sup> ) | Released Volume (m <sup>3</sup> ) | Storage Volume (m <sup>3</sup> ) | Max. Storage Volume Required (m <sup>3</sup> ) | Drawdown Time (hrs) |
|----------------------|----------------------------|------------------------|---------------------------------|-----------------------------------|----------------------------------|------------------------------------------------|---------------------|
| 10.0                 | 126.38                     | 35.85                  | 22                              | 16                                | 5                                | 5                                              | 0.23                |
| 20.0                 | 85.27                      | 24.19                  | 29                              | 24                                | 5                                |                                                |                     |
| 30.0                 | 65.88                      | 18.69                  | 34                              | 33                                | 1                                |                                                |                     |
| 40.0                 | 54.36                      | 15.42                  | 37                              | 41                                | 0                                |                                                |                     |
| 50.0                 | 46.63                      | 13.23                  | 40                              | 49                                | 0                                |                                                |                     |
| 60.0                 | 41.05                      | 11.65                  | 42                              | 57                                | 0                                |                                                |                     |
| 70.0                 | 36.81                      | 10.44                  | 44                              | 65                                | 0                                |                                                |                     |
| 80.0                 | 33.46                      | 9.49                   | 46                              | 73                                | 0                                |                                                |                     |
| 90.0                 | 30.74                      | 8.72                   | 47                              | 81                                | 0                                |                                                |                     |
| 100.0                | 28.48                      | 8.08                   | 48                              | 90                                | 0                                |                                                |                     |
| 110.0                | 26.57                      | 7.54                   | 50                              | 98                                | 0                                |                                                |                     |
| 120.0                | 24.94                      | 7.07                   | 51                              | 106                               | 0                                |                                                |                     |
| 130.0                | 23.52                      | 6.67                   | 52                              | 114                               | 0                                |                                                |                     |
| 140.0                | 22.27                      | 6.32                   | 53                              | 122                               | 0                                |                                                |                     |
| 150.0                | 21.17                      | 6.01                   | 54                              | 130                               | 0                                |                                                |                     |
| 160.0                | 20.19                      | 5.73                   | 55                              | 139                               | 0                                |                                                |                     |

**MODIFIED RATIONAL METHOD**  
**POST-DEVELOPMENT CONTROLLED FLOWS**  
**LOVER'S CREEK - PRIVATE ROAD**

Rainfall IDF Coefficients 25 -year

|     |  |     |          |
|-----|--|-----|----------|
| A = |  | A = | 1133.123 |
| C = |  | B = | 4.734    |
|     |  | C = | 0.756    |

Area = 0.17 ha  
 Runoff Coefficient, C = 0.59  
 C\*A = 0.10  
 Time of Concentration,  $t_c$  = 10.0 min  
 Storm Duration Increment = 10.0 min  
 Target Release Rate = 34.11 L/s  
 Constant Inflow = 0 L/s  
 Uncontrolled Outflow = 0.00 L/s  
 Max. Allowable Outflow = 34.11 L/s

| Storm Duration (min) | Rainfall Intensity (mm/hr) | Max. Runoff Flow (L/s) | Runoff Volume (m <sup>3</sup> ) | Released Volume (m <sup>3</sup> ) | Storage Volume (m <sup>3</sup> ) | Max. Storage Volume Required (m <sup>3</sup> ) | Drawdown Time (hrs) |
|----------------------|----------------------------|------------------------|---------------------------------|-----------------------------------|----------------------------------|------------------------------------------------|---------------------|
| 10.0                 | 148.26                     | 42.06                  | 25                              | 20                                | 5                                | 5                                              | 0.21                |
| 20.0                 | 100.22                     | 28.43                  | 34                              | 31                                | 3                                |                                                |                     |
| 30.0                 | 77.53                      | 21.99                  | 40                              | 41                                | 0                                |                                                |                     |
| 40.0                 | 64.03                      | 18.16                  | 44                              | 51                                | 0                                |                                                |                     |
| 50.0                 | 54.97                      | 15.59                  | 47                              | 61                                | 0                                |                                                |                     |
| 60.0                 | 48.42                      | 13.74                  | 49                              | 72                                | 0                                |                                                |                     |
| 70.0                 | 43.44                      | 12.32                  | 52                              | 82                                | 0                                |                                                |                     |
| 80.0                 | 39.51                      | 11.21                  | 54                              | 92                                | 0                                |                                                |                     |
| 90.0                 | 36.31                      | 10.30                  | 56                              | 102                               | 0                                |                                                |                     |
| 100.0                | 33.66                      | 9.55                   | 57                              | 113                               | 0                                |                                                |                     |
| 110.0                | 31.42                      | 8.91                   | 59                              | 123                               | 0                                |                                                |                     |
| 120.0                | 29.49                      | 8.37                   | 60                              | 133                               | 0                                |                                                |                     |
| 130.0                | 27.82                      | 7.89                   | 62                              | 143                               | 0                                |                                                |                     |
| 140.0                | 26.36                      | 7.48                   | 63                              | 154                               | 0                                |                                                |                     |
| 150.0                | 25.06                      | 7.11                   | 64                              | 164                               | 0                                |                                                |                     |
| 160.0                | 23.90                      | 6.78                   | 65                              | 174                               | 0                                |                                                |                     |

**MODIFIED RATIONAL METHOD**  
**POST-DEVELOPMENT CONTROLLED FLOWS**  
**LOVER'S CREEK - PRIVATE ROAD**

Rainfall IDF Coefficients 50 -year

A = 1251.473  
 C = 4.847  
 C = 0.753

Area = 0.17 ha  
 Runoff Coefficient, C = 0.59  
 C\*A = 0.10  
 Time of Concentration,  $t_c$  = 10.0 min  
 Storm Duration Increment = 10.0 min  
 Target Release Rate = 39.44 L/s  
 Constant Inflow = 0 L/s  
 Uncontrolled Outflow = 0.00 L/s  
 Max. Allowable Outflow = 39.44 L/s

| Storm Duration (min) | Rainfall Intensity (mm/hr) | Max. Runoff Flow (L/s) | Runoff Volume (m <sup>3</sup> ) | Released Volume (m <sup>3</sup> ) | Storage Volume (m <sup>3</sup> ) | Max. Storage Volume Required (m <sup>3</sup> ) | Drawdown Time (hrs) |
|----------------------|----------------------------|------------------------|---------------------------------|-----------------------------------|----------------------------------|------------------------------------------------|---------------------|
| 10.0                 | 164.13                     | 46.56                  | 28                              | 24                                | 4                                | 4                                              | 0.20                |
| 20.0                 | 111.37                     | 31.59                  | 38                              | 35                                | 2                                |                                                |                     |
| 30.0                 | 86.33                      | 24.49                  | 44                              | 47                                | 0                                |                                                |                     |
| 40.0                 | 71.39                      | 20.25                  | 49                              | 59                                | 0                                |                                                |                     |
| 50.0                 | 61.35                      | 17.40                  | 52                              | 71                                | 0                                |                                                |                     |
| 60.0                 | 54.08                      | 15.34                  | 55                              | 83                                | 0                                |                                                |                     |
| 70.0                 | 48.55                      | 13.77                  | 58                              | 95                                | 0                                |                                                |                     |
| 80.0                 | 44.17                      | 12.53                  | 60                              | 106                               | 0                                |                                                |                     |
| 90.0                 | 40.62                      | 11.52                  | 62                              | 118                               | 0                                |                                                |                     |
| 100.0                | 37.67                      | 10.68                  | 64                              | 130                               | 0                                |                                                |                     |
| 110.0                | 35.17                      | 9.98                   | 66                              | 142                               | 0                                |                                                |                     |
| 120.0                | 33.03                      | 9.37                   | 67                              | 154                               | 0                                |                                                |                     |
| 130.0                | 31.16                      | 8.84                   | 69                              | 166                               | 0                                |                                                |                     |
| 140.0                | 29.53                      | 8.38                   | 70                              | 177                               | 0                                |                                                |                     |
| 150.0                | 28.08                      | 7.97                   | 72                              | 189                               | 0                                |                                                |                     |
| 160.0                | 26.79                      | 7.60                   | 73                              | 201                               | 0                                |                                                |                     |

**MODIFIED RATIONAL METHOD**  
**POST-DEVELOPMENT CONTROLLED FLOWS**  
**LOVER'S CREEK - PRIVATE ROAD**

Rainfall IDF Coefficients 100 -year

|     |  |     |          |
|-----|--|-----|----------|
| A = |  | A = | 1383.628 |
| C = |  | B = | 4.905    |
|     |  | C = | 0.754    |

Area = 0.17 ha  
 Runoff Coefficient, C = 0.59  
 C\*A = 0.10  
 Time of Concentration,  $t_c$  = 10.0 min  
 Storm Duration Increment = 10.0 min  
 Target Release Rate = 44.83 L/s  
 Constant Inflow = 0 L/s  
 Uncontrolled Outflow = 0.00 L/s  
 Max. Allowable Outflow = 44.83 L/s

| Storm Duration (min) | Rainfall Intensity (mm/hr) | Max. Runoff Flow (L/s) | Runoff Volume (m <sup>3</sup> ) | Released Volume (m <sup>3</sup> ) | Storage Volume (m <sup>3</sup> ) | Max. Storage Volume Required (m <sup>3</sup> ) | Drawdown Time (hrs) |
|----------------------|----------------------------|------------------------|---------------------------------|-----------------------------------|----------------------------------|------------------------------------------------|---------------------|
| 10.0                 | 180.44                     | 51.19                  | 31                              | 27                                | 4                                | 4                                              | 0.19                |
| 20.0                 | 122.52                     | 34.76                  | 42                              | 40                                | 1                                |                                                |                     |
| 30.0                 | 94.99                      | 26.95                  | 49                              | 54                                | 0                                |                                                |                     |
| 40.0                 | 78.56                      | 22.29                  | 53                              | 67                                | 0                                |                                                |                     |
| 50.0                 | 67.51                      | 19.15                  | 57                              | 81                                | 0                                |                                                |                     |
| 60.0                 | 59.51                      | 16.88                  | 61                              | 94                                | 0                                |                                                |                     |
| 70.0                 | 53.41                      | 15.15                  | 64                              | 108                               | 0                                |                                                |                     |
| 80.0                 | 48.60                      | 13.79                  | 66                              | 121                               | 0                                |                                                |                     |
| 90.0                 | 44.68                      | 12.68                  | 68                              | 134                               | 0                                |                                                |                     |
| 100.0                | 41.43                      | 11.75                  | 71                              | 148                               | 0                                |                                                |                     |
| 110.0                | 38.68                      | 10.97                  | 72                              | 161                               | 0                                |                                                |                     |
| 120.0                | 36.32                      | 10.30                  | 74                              | 175                               | 0                                |                                                |                     |
| 130.0                | 34.28                      | 9.72                   | 76                              | 188                               | 0                                |                                                |                     |
| 140.0                | 32.48                      | 9.21                   | 77                              | 202                               | 0                                |                                                |                     |
| 150.0                | 30.88                      | 8.76                   | 79                              | 215                               | 0                                |                                                |                     |
| 160.0                | 29.46                      | 8.36                   | 80                              | 229                               | 0                                |                                                |                     |



Project: **Sobeys - Yonge Street and Maplevue Drive East**  
Task: **Retention Volume Calculations**  
Date: **3/29/2022**

Prepared by: **JS**  
Checked by: **PM**  
Project no.: **300035146**

### Retention Volume Calculations

| Redevelopment Area |        |                |
|--------------------|--------|----------------|
| Area =             | 32941  | m <sup>2</sup> |
| Rainfall depth =   | 25.00  | mm             |
| Required volume =  | 823.53 | m <sup>3</sup> |

| Redevelopment Area |        |                |
|--------------------|--------|----------------|
| Area =             | 32941  | m <sup>2</sup> |
| Rainfall depth =   | 12.50  | mm             |
| Required volume =  | 411.76 | m <sup>3</sup> |

| Redevelopment Area |        |                |
|--------------------|--------|----------------|
| Area =             | 36055  | m <sup>2</sup> |
| Rainfall depth =   | 5.00   | mm             |
| Required volume =  | 180.27 | m <sup>3</sup> |



Project: **Sobeys - Yonge Street and Mapleview Drive East**  
Task: **TSS Removal Calculations**  
Date: **29-Mar-22**

Prepared by: **JS**  
Checked by: **PM**  
Project no.: **300035146**

### TSS Removal Calculations

| SURFACE         | Effective<br>TSS<br>Removal<br>(%) | Treated Area<br>(m2) | % of Total<br>Area | TSS<br>Removal<br>Over Total<br>Site |
|-----------------|------------------------------------|----------------------|--------------------|--------------------------------------|
| IMPERVIOUS ROOF | 80%                                | 7007.48              | 21.3%              | 17.0%                                |
| HARDSCAPE       | 5.0%                               | 23460.48             | 71.2%              | 3.6%                                 |
| LANDSCAPE       | 80%                                | 2473.04              | 7.5%               | 6.0%                                 |
| <b>Total</b>    |                                    | <b>32941.00</b>      | <b>100%</b>        | <b>26.6%</b>                         |

New Jersey Stormwater Best Practices Manual Equation for TSS Removal Rates for BMPs in Series

$$R = A + B - [(A \times B) / 100]$$

R= Total TSS Removal Rate

A = TSS Removal Rate of First BMP

B = TSS Removal Rate of Second BMP

**Filter Unit** - Treats stormwater at an additional 80% TSS Removal

$$\text{TSS Removal} = 26.8\% + 80\% - [(26.8\% \times 80\%) / 100]$$

$$\text{TSS Removal} = 85.32\%$$

**Treatment Train Total TSS Removal = 85.32%**

## Phosphorus Loading Calculations

### Pre-Development Phosphorus Loading

| Land Use     | Total Area<br>(ha) | Phosphorus Export<br>Coefficient* (kg/ha/yr) | Phosphorus<br>Loading<br>(kg/yr) |
|--------------|--------------------|----------------------------------------------|----------------------------------|
| Forest       | 3.69               | 0.05                                         | 0.18                             |
| <b>Total</b> | <b>3.69</b>        |                                              | <b>0.18</b>                      |

\*Land-use specific phosphorus export coefficient for the Hewitts Creek Lake Simcoe Subwatershed per Hutchinson, 2012.

### Post-Development Phosphorus Loading

| Land Use                                                                                          | Total Area<br>(ha) | Phosphorus Export<br>Coefficient* (kg/ha/yr) | Phosphorus<br>Loading<br>(kg/yr) |
|---------------------------------------------------------------------------------------------------|--------------------|----------------------------------------------|----------------------------------|
| Low-Intensity<br>Development (Roof<br>areas)                                                      | 0.7                | 0.13                                         | 0.09                             |
| High-Intensity<br>Development -<br>Commercial/Industrial<br>(Asphalt parking,<br>landscape areas) | 2.99               | 1.82                                         | 5.44                             |
| <b>Total</b>                                                                                      | <b>3.69</b>        |                                              | <b>5.53</b>                      |

### Post-Development Phosphorus Loading with LID Mitigation

| Land Use                                                               | Total<br>Area<br>(ha) | Phosphorus<br>Export<br>Coefficient<br>(kg/ha/yr) | LIDs and<br>Reduction<br>Factors*                    | Phosphorus<br>Reduction<br>Factor<br>(%) | Phosphorus<br>Loading<br>(kg/yr) |
|------------------------------------------------------------------------|-----------------------|---------------------------------------------------|------------------------------------------------------|------------------------------------------|----------------------------------|
| Low-Intensity<br>Development (Roof<br>areas)                           | 0.7                   | 0.13                                              | Infiltration<br>facility (87%),<br>Wet pond<br>(63%) | 95.19%                                   | 0.09                             |
| High-Intensity<br>Development (Asphalt<br>parking, landscape<br>areas) | 2.99                  | 1.82                                              | Wet pond<br>(63%)                                    | 63%                                      | 3.43                             |
| <b>Total</b>                                                           | <b>3.69</b>           |                                                   |                                                      | <b>69%</b>                               | <b>3.51</b>                      |

\*Median Phosphorus Removal Efficiencies for Major Classes of LID per Hutchinson, 2012.

Phosphorus Reduction Factor  $R = A + B - [(A \times B) / 100]$   
Where:  
R = Total Phosphorus Reduction Factor  
A = Phosphorus Reduction Factor of the First or Upstream LID  
B = Phosphorus Reduction Factor of the Second or Downstream LID

Low-Intensity Development  
Phosphorus Reduction Factor =  $87\% + 100\% - [(63\% \times 100\%) / 100]$   
95.19%

High-Intensity Development  
Phosphorus Reduction Factor =  $63\%$   
63.00%

Pre-Development 0.18 kg/yr  
Post-Development 5.53 kg/yr  
Change (Increase) 5.35 kg/yr

Post-Development 5.53 kg/yr  
Post-Development with LID Mitigation 3.51 kg/yr  
Change (Decrease) 2.02 kg/yr

64% Net Reduction in Post-Development Loading

Treatment Train Approach  
Mitigation with Filtration Unit  
Phosphorus Reduction Factor =  $69\% + 100\% - [(50\% \times 100\%) / 100]$   
84.50%

Post-Development 5.53 kg/yr  
Post-Development with LID Mitigation 3.51 kg/yr  
Post-Development with Filtration Unit  
Treatment Train 0.86 kg/yr  
Change (Decrease) 4.68 kg/yr

85% TP Removal

# STORM SEWER DESIGN SHEET: (100 Year Storm)

Proposed Storm Sewer Network 1 of 2  
Sobey's - Yonge St. and Mapleview Dr. E.



Project #: 300035146.0  
Date: 1-Apr-22  
Designed: HH  
Checked: JS

Min. Diameter = 250 mm  
Mannings 'n' = 0.013  
Starting Tc = 10 min  
Factor of Safety = 15 %

Rainfall Intensity =  $\frac{A}{(Tc+B)^c}$  where Tc is in minutes  
A = 1383.628  
B = 4.905  
C = 0.754 (100 Yr)

NOMINAL PIPE SIZE USED

| DESCRIPTION | FROM MH | TO MH | AREA (ha) | RUNOFF COEFFICIENT 'R' | 'AR' | ACCUM. 'AR' | RAINFALL INTENSITY (mm/hr) | FLOW (m3/s) | CONSTANT FLOW (m3/s) | ACCUM. CONSTANT FLOW (m3/s) | TOTAL FLOW (m3/s) | LENGTH (m) | SLOPE (%) | PIPE DIAMETER (mm) | FULL FLOW CAPACITY (m3/s) | FULL FLOW VELOCITY (m/s) | INITIAL Tc (min) | TIME OF CONCENTRATION (min) | ACC. TIME OF CONCENTRATION (min) | PERCENT FULL (%) |
|-------------|---------|-------|-----------|------------------------|------|-------------|----------------------------|-------------|----------------------|-----------------------------|-------------------|------------|-----------|--------------------|---------------------------|--------------------------|------------------|-----------------------------|----------------------------------|------------------|
| CB13        | CB13    | MH1   | 0.02      | 0.50                   | 0.01 | 0.01        | 180.4                      | 0.006       |                      |                             | 0.006             | 25.0       | 2.00      | 250                | 0.084                     | 1.71                     | 10.00            | 0.24                        | 10.24                            | 7%               |
|             | MH1     | MH2   |           |                        |      | 0.01        | 178.2                      | 0.005       |                      |                             | 0.005             | 9.4        | 1.00      | 250                | 0.059                     | 1.21                     | 10.24            | 0.13                        | 10.37                            | 9%               |
| STUB B      | STUB B  | MH2   | 0.07      | 0.95                   | 0.07 | 0.07        | 180.4                      | 0.035       |                      |                             | 0.035             | 3.7        | 2.00      | 250                | 0.084                     | 1.71                     | 10.00            | 0.04                        | 10.04                            | 41%              |
|             | MH2     | LID B |           |                        |      | 0.08        | 177.1                      | 0.040       |                      |                             | 0.040             | 2.8        | 2.00      | 250                | 0.084                     | 1.71                     | 10.37            | 0.03                        | 10.40                            | 47%              |
|             | LID B   | MH3   |           |                        |      | 0.08        | 176.9                      | 0.039       |                      |                             | 0.039             | 3.4        | 2.00      | 250                | 0.084                     | 1.71                     | 10.40            | 0.03                        | 10.43                            | 47%              |
| CB1         | CB1     | MH3   | 0.17      | 0.95                   | 0.16 | 0.16        | 180.4                      | 0.080       |                      |                             | 0.080             | 5.5        | 2.00      | 300                | 0.137                     | 1.93                     | 10.00            | 0.05                        | 10.05                            | 58%              |
|             | MH3     | MH4   |           |                        |      | 0.24        | 176.6                      | 0.117       |                      |                             | 0.117             | 73.0       | 0.50      | 450                | 0.202                     | 1.27                     | 10.43            | 0.96                        | 11.39                            | 58%              |
|             | STUB C  | MH5   | 0.09      | 0.95                   | 0.08 | 0.08        | 180.4                      | 0.042       |                      |                             | 0.042             | 4.4        | 2.00      | 250                | 0.084                     | 1.71                     | 10.00            | 0.04                        | 10.04                            | 50%              |
|             | MH5     | LID C |           |                        |      | 0.08        | 180.0                      | 0.042       |                      |                             | 0.042             | 1.7        | 2.00      | 250                | 0.084                     | 1.71                     | 10.04            | 0.02                        | 10.06                            | 50%              |
|             | LID C   | MH4   |           |                        |      | 0.08        | 179.9                      | 0.042       |                      |                             | 0.042             | 5.1        | 2.00      | 250                | 0.084                     | 1.71                     | 10.06            | 0.05                        | 10.11                            | 50%              |
| DCB1        | DCB1    | MH4   | 0.31      | 0.95                   | 0.29 | 0.29        | 180.4                      | 0.147       |                      |                             | 0.147             | 5.6        | 2.00      | 375                | 0.248                     | 2.25                     | 10.00            | 0.04                        | 10.04                            | 59%              |
|             | MH4     | MH6   |           |                        |      | 0.62        | 168.7                      | 0.289       |                      |                             | 0.289             | 50.2       | 0.50      | 600                | 0.434                     | 1.54                     | 11.39            | 0.54                        | 11.94                            | 67%              |
| STUB D      | STUB D  | MH7   | 0.07      | 0.95                   | 0.07 | 0.07        | 180.4                      | 0.035       |                      |                             | 0.035             | 3.2        | 2.00      | 250                | 0.084                     | 1.71                     | 10.00            | 0.03                        | 10.03                            | 41%              |
|             | MH7     | LID D |           |                        |      | 0.07        | 180.2                      | 0.035       |                      |                             | 0.035             | 1.3        | 2.00      | 250                | 0.084                     | 1.71                     | 10.03            | 0.01                        | 10.04                            | 41%              |
|             | LID D   | MH6   |           |                        |      | 0.07        | 180.0                      | 0.035       |                      |                             | 0.035             | 3.3        | 2.00      | 250                | 0.084                     | 1.71                     | 10.04            | 0.03                        | 10.08                            | 41%              |
|             | MH6     | BL-1  |           |                        |      | 0.69        | 164.6                      | 0.314       |                      |                             | 0.314             | 3.5        | 0.50      | 675                | 0.594                     | 1.66                     | 11.94            | 0.04                        | 11.97                            | 53%              |
| CB2         | CB2     | BL-1  | 0.22      | 0.95                   | 0.21 | 0.21        | 180.4                      | 0.106       |                      |                             | 0.106             | 4.5        | 2.00      | 300                | 0.137                     | 1.93                     | 10.00            | 0.04                        | 10.04                            | 78%              |
|             | BL-1    | MH10  |           |                        |      | 0.90        | 164.3                      | 0.410       |                      |                             | 0.410             | 34.2       | 0.50      | 675                | 0.594                     | 1.66                     | 11.97            | 0.34                        | 12.32                            | 69%              |
| CB14        | CB14    | CBMH1 | 0.03      | 0.50                   | 0.01 | 0.01        | 180.4                      | 0.007       |                      |                             | 0.007             | 48.5       | 1.00      | 250                | 0.059                     | 1.21                     | 10.00            | 0.67                        | 10.67                            | 11%              |
| CBMH1       | CBMH1   | MH9   | 0.03      | 0.50                   | 0.01 | 0.03        | 174.6                      | 0.013       |                      |                             | 0.013             | 26.7       | 1.00      | 250                | 0.059                     | 1.21                     | 10.67            | 0.37                        | 11.03                            | 22%              |
|             |         |       |           |                        |      |             |                            |             |                      |                             |                   |            |           |                    |                           |                          |                  |                             |                                  |                  |
|             |         |       |           |                        |      |             |                            |             |                      |                             |                   |            |           |                    |                           |                          |                  |                             |                                  |                  |
|             |         |       |           |                        |      |             |                            |             |                      |                             |                   |            |           |                    |                           |                          |                  |                             |                                  |                  |
| CB15        | CB15    | CBMH2 | 0.05      | 0.50                   | 0.02 | 0.02        | 180.4                      | 0.012       |                      |                             | 0.012             | 22.7       | 1.00      | 250                | 0.059                     | 1.21                     | 10.00            | 0.31                        | 10.31                            | 20%              |
| CBMH2       | CBMH2   | MH9   | 0.13      | 0.50                   | 0.07 | 0.09        | 177.6                      | 0.044       |                      |                             | 0.044             | 12.4       | 1.00      | 300                | 0.097                     | 1.37                     | 10.31            | 0.15                        | 10.46                            | 45%              |
|             | MH9     | LIDG  |           |                        |      | 0.12        | 171.5                      | 0.055       |                      |                             | 0.055             | 12.2       | 0.50      | 300                | 0.068                     | 0.97                     | 11.03            | 0.21                        | 11.24                            | 81%              |
|             | LIDG    | MH10  |           |                        |      | 0.12        | 169.8                      | 0.055       |                      |                             | 0.055             | 19.8       | 0.50      | 300                | 0.068                     | 0.97                     | 11.24            | 0.34                        | 11.59                            | 80%              |
|             | MH10    | MH8   |           |                        |      | 1.01        | 161.8                      | 0.456       |                      |                             | 0.456             | 10.7       | 0.50      | 675                | 0.594                     | 1.66                     | 12.32            | 0.11                        | 12.42                            | 77%              |
| STUB E      | STUB E  | MH11  | 0.07      | 0.95                   | 0.07 | 0.07        | 180.4                      | 0.035       |                      |                             | 0.035             | 3.2        | 2.00      | 250                | 0.084                     | 1.71                     | 10.00            | 0.03                        | 10.03                            | 41%              |
|             | MH11    | LID E |           |                        |      | 0.07        | 180.2                      | 0.035       |                      |                             | 0.035             | 1.7        | 2.00      | 250                | 0.084                     | 1.71                     | 10.03            | 0.02                        | 10.05                            | 41%              |
|             | LID E   | MH8   |           |                        |      | 0.07        | 180.0                      | 0.035       |                      |                             | 0.035             | 3.4        | 0.50      | 300                | 0.068                     | 0.97                     | 10.05            | 0.06                        | 10.11                            | 51%              |
|             | MH8     | BL-2  |           |                        |      | 1.08        | 161.1                      | 0.485       |                      |                             | 0.485             | 6.9        | 0.50      | 750                | 0.787                     | 1.78                     | 12.42            | 0.06                        | 12.49                            | 62%              |
| CB7         | CB7     | BL-2  | 0.09      | 0.95                   | 0.08 | 0.08        | 180.4                      | 0.041       |                      |                             | 0.041             | 2.0        | 2.00      | 250                | 0.084                     | 1.71                     | 10.00            | 0.02                        | 10.02                            | 49%              |
|             | BL-2    | BL-3  |           |                        |      | 1.17        | 160.6                      | 0.520       |                      |                             | 0.520             | 19.9       | 0.50      | 750                | 0.787                     | 1.78                     | 12.49            | 0.19                        | 12.67                            | 66%              |
| CB8         | CB8     | BL-3  | 0.03      | 0.95                   | 0.03 | 0.03        | 180.4                      | 0.015       |                      |                             | 0.015             | 7.5        | 2.00      | 250                | 0.084                     | 1.71                     | 10.00            | 0.07                        | 10.07                            | 18%              |
|             | BL-3    | MH12  |           |                        |      | 1.20        | 159.3                      | 0.529       |                      |                             | 0.529             | 21.4       | 0.50      | 750                | 0.787                     | 1.78                     | 12.67            | 0.20                        | 12.87                            | 67%              |
| CB9         | CB9     | MH13  | 0.02      | 0.95                   | 0.02 | 0.02        | 180.4                      | 0.011       |                      |                             | 0.011             | 8.9        | 2.00      | 250                | 0.084                     | 1.71                     | 10.00            | 0.09                        | 10.09                            | 14%              |
| CB10        | CB10    | MH13  | 0.04      | 0.95                   | 0.04 | 0.04        | 180.4                      | 0.018       |                      |                             | 0.018             | 4.8        | 2.00      | 250                | 0.084                     | 1.71                     | 10.00            | 0.05                        | 10.05                            | 21%              |
| CB11        | CB11    | MH13  | 0.04      | 0.95                   | 0.03 | 0.03        | 180.4                      | 0.017       |                      |                             | 0.017             | 20.5       | 2.00      | 250                | 0.084                     | 1.71                     | 10.00            | 0.20                        | 10.20                            | 20%              |
|             | MH13    | MH12  |           |                        |      | 0.09        | 178.6                      | 0.046       |                      |                             | 0.046             | 18.8       | 2.00      | 250                | 0.084                     | 1.71                     | 10.20            | 0.18                        | 10.38                            | 54%              |

# STORM SEWER DESIGN SHEET: (100 Year Storm)

Proposed Storm Sewer Network 1 of 2  
Sobey's - Yonge St. and Mapleview Dr. E.



Project #: 300035146.0  
Date: 1-Apr-22  
Designed: HH  
Checked: JS

Min. Diameter = 250 mm  
Mannings 'n' = 0.013  
Starting Tc = 10 min  
Factor of Safety = 15 %

Rainfall Intensity =  $\frac{A}{(Tc+B)^c}$  where Tc is in minutes  
A = 1383.628  
B = 4.905  
C = 0.754 (100 Yr)

NOMINAL PIPE SIZE USED

| DESCRIPTION | FROM MH     | TO MH       | AREA (ha) | RUNOFF COEFFICIENT 'R' | 'AR' | ACCUM. 'AR' | RAINFALL INTENSITY (mm/hr) | FLOW (m3/s) | CONSTANT FLOW (m3/s) | ACCUM. CONSTANT FLOW (m3/s) | TOTAL FLOW (m3/s) | LENGTH (m) | SLOPE (%) | PIPE DIAMETER (mm) | FULL FLOW CAPACITY (m3/s) | FULL FLOW VELOCITY (m/s) | INITIAL Tc (min) | TIME OF CONCENTRATION (min) | ACC. TIME OF CONCENTRATION (min) | PERCENT FULL (%) |
|-------------|-------------|-------------|-----------|------------------------|------|-------------|----------------------------|-------------|----------------------|-----------------------------|-------------------|------------|-----------|--------------------|---------------------------|--------------------------|------------------|-----------------------------|----------------------------------|------------------|
| STUB A      | STUB A      | MH14        | 0.37      | 0.95                   | 0.35 | 0.35        | 180.4                      | 0.178       |                      |                             | 0.178             | 21.4       | 2.00      | 375                | 0.248                     | 2.25                     | 10.00            | 0.16                        | 10.16                            | 72%              |
|             | MH14        | LID A       |           |                        |      | 0.35        | 179.0                      | 0.176       |                      |                             | 0.176             | 1.9        | 2.00      | 375                | 0.248                     | 2.25                     | 10.16            | 0.01                        | 10.17                            | 71%              |
|             | LID A       | MH15        |           |                        |      | 0.35        | 178.9                      | 0.176       |                      |                             | 0.176             | 5.6        | 2.00      | 375                | 0.248                     | 2.25                     | 10.17            | 0.04                        | 10.21                            | 71%              |
| CB5         | CB5         | CBMH4       | 0.10      | 0.95                   | 0.10 | 0.10        | 180.4                      | 0.048       |                      |                             | 0.048             | 34.0       | 2.00      | 250                | 0.084                     | 1.71                     | 10.00            | 0.33                        | 10.33                            | 57%              |
| CBMH4       | CBMH4       | MH15        | 0.17      | 0.95                   | 0.16 | 0.26        | 177.5                      | 0.127       |                      |                             | 0.127             | 11.0       | 2.00      | 375                | 0.248                     | 2.25                     | 10.33            | 0.08                        | 10.41                            | 51%              |
| CB3         | CB3         | MH15        | 0.23      | 0.95                   | 0.22 | 0.22        | 180.4                      | 0.110       |                      |                             | 0.110             | 25.8       | 2.00      | 300                | 0.137                     | 1.93                     | 10.00            | 0.22                        | 10.22                            | 80%              |
|             | MH15        | MH16        |           |                        |      | 0.83        | 176.8                      | 0.408       |                      |                             | 0.408             | 61.5       | 0.50      | 675                | 0.594                     | 1.66                     | 10.41            | 0.62                        | 11.03                            | 69%              |
| CB4         | CB4         | MH16        | 0.22      | 0.95                   | 0.21 | 0.21        | 180.4                      | 0.106       |                      |                             | 0.106             | 25.3       | 2.00      | 300                | 0.137                     | 1.93                     | 10.00            | 0.22                        | 10.22                            | 78%              |
| CB6         | CB6         | MH16        | 0.22      | 0.95                   | 0.21 | 0.21        | 180.4                      | 0.106       |                      |                             | 0.106             | 11.5       | 2.00      | 300                | 0.137                     | 1.93                     | 10.00            | 0.10                        | 10.10                            | 78%              |
|             | MH16        | MH12        |           |                        |      | 1.25        | 171.6                      | 0.598       |                      |                             | 0.598             | 20.3       | 0.50      | 750                | 0.787                     | 1.78                     | 11.03            | 0.19                        | 11.22                            | 76%              |
|             | MH12        | BL-4        |           |                        |      | 2.54        | 158.0                      | 1.115       |                      |                             | 1.115             | 15.4       | 0.50      | 975                | 1.585                     | 2.12                     | 12.87            | 0.12                        | 13.00                            | 70%              |
| CB12        | CB12        | BL-4        | 0.08      | 0.95                   | 0.08 | 0.08        | 180.4                      | 0.038       |                      |                             | 0.038             | 1.8        | 2.00      | 250                | 0.084                     | 1.71                     | 10.00            | 0.02                        | 10.02                            | 45%              |
|             | BL-4        | MH17        |           |                        |      | 2.62        | 157.2                      | 1.143       |                      |                             | 1.143             | 7.6        | 0.50      | 975                | 1.585                     | 2.12                     | 13.00            | 0.06                        | 13.06                            | 72%              |
| STUB F      | STUB F      | MH18        | 0.05      | 0.95                   | 0.05 | 0.05        | 180.4                      | 0.024       |                      |                             | 0.024             | 2.2        | 2.00      | 250                | 0.084                     | 1.71                     | 10.00            | 0.02                        | 10.02                            | 28%              |
|             | MH18        | LID F       |           |                        |      | 0.05        | 180.2                      | 0.024       |                      |                             | 0.024             | 1.1        | 2.00      | 250                | 0.084                     | 1.71                     | 10.02            | 0.01                        | 10.03                            | 28%              |
|             | LID F       | MH17        |           |                        |      | 0.05        | 180.1                      | 0.024       |                      |                             | 0.024             | 4.5        | 2.00      | 250                | 0.084                     | 1.71                     | 10.03            | 0.04                        | 10.08                            | 28%              |
|             | MH17        | MH19        |           |                        |      | 2.66        | 156.8                      | 1.160       |                      |                             | 1.160             | 16.1       | 0.50      | 975                | 1.585                     | 2.12                     | 13.06            | 0.13                        | 13.18                            | 73%              |
| PR1.CB5     | PR1.CB5     | MH20        | 0.08      | 0.95                   | 0.08 | 0.08        | 180.4                      | 0.040       |                      |                             | 0.040             | 3.0        | 2.00      | 250                | 0.084                     | 1.71                     | 10.00            | 0.03                        | 10.03                            | 48%              |
| PR1.DCB1    | PR1.DCB1    | MH20        | 0.41      | 0.95                   | 0.39 | 0.39        | 180.4                      | 0.196       |                      |                             | 0.196             | 5.2        | 2.00      | 375                | 0.248                     | 2.25                     | 10.00            | 0.04                        | 10.04                            | 79%              |
|             | MH20        | MH21        |           |                        |      | 0.47        | 180.1                      | 0.236       |                      |                             | 0.236             | 84.1       | 1.00      | 450                | 0.285                     | 1.79                     | 10.04            | 0.78                        | 10.82                            | 83%              |
| PR1.CB3     | PR1.CB3     | MH21        | 0.06      | 0.95                   | 0.05 | 0.05        | 180.4                      | 0.026       |                      |                             | 0.026             | 3.7        | 2.00      | 250                | 0.084                     | 1.71                     | 10.00            | 0.04                        | 10.04                            | 31%              |
| PR1.CB4     | PR1.CB4     | MH21        | 0.09      | 0.95                   | 0.08 | 0.08        | 180.4                      | 0.042       |                      |                             | 0.042             | 7.1        | 2.00      | 250                | 0.084                     | 1.71                     | 10.00            | 0.07                        | 10.07                            | 50%              |
|             | MH21        | MH17        |           |                        |      | 0.61        | 173.3                      | 0.293       |                      |                             | 0.293             | 20.9       | 1.00      | 525                | 0.430                     | 1.99                     | 10.82            | 0.18                        | 11.00                            | 68%              |
|             | MH17        | MH22        |           |                        |      | 3.27        | 156.8                      | 1.425       |                      |                             | 1.425             | 38.9       | 0.50      | 1050               | 1.931                     | 2.23                     | 13.06            | 0.29                        | 13.35                            | 74%              |
| PR1.CB2     | PR1.CB2     | MH22        | 0.03      | 0.95                   | 0.03 | 0.03        | 180.4                      | 0.016       |                      |                             | 0.016             | 7.7        | 2.00      | 250                | 0.084                     | 1.71                     | 10.00            | 0.07                        | 10.07                            | 19%              |
|             | MH22        | CONTROL MH1 |           |                        |      | 3.30        | 154.9                      | 1.422       |                      |                             | 1.422             | 6.3        | 0.50      | 1050               | 1.931                     | 2.23                     | 13.35            | 0.05                        | 13.39                            | 74%              |
| PR1.CB1     | MH22        | BL-5        |           |                        |      | 3.30        | 154.9                      | 1.422       |                      |                             | 1.422             | 2.8        | 0.50      | 1050               | 1.931                     | 2.23                     | 13.35            | 0.02                        | 13.37                            | 74%              |
|             | PR1.CB1     | BL-5        | 0.07      | 0.95                   | 0.06 | 0.06        | 180.4                      | 0.031       |                      |                             | 0.031             | 3.3        | 2.00      | 250                | 0.084                     | 1.71                     | 10.00            | 0.03                        | 10.03                            | 37%              |
|             | BL-5        | FILTER      |           |                        |      | 3.37        | 154.8                      | 1.447       |                      |                             | 1.447             | 2.2        | 0.50      | 1050               | 1.931                     | 2.23                     | 13.37            | 0.02                        | 13.38                            | 75%              |
|             | FILTER      | CONTROL MH1 |           |                        |      | 3.37        | 154.6                      | 1.446       |                      |                             | 1.446             | 4.6        | 1.00      | 1050               | 2.731                     | 3.15                     | 13.38            | 0.02                        | 13.41                            | 53%              |
|             | CONTROL MH1 | MH23        |           |                        |      | 3.37        | 154.5                      | 1.445       |                      |                             | 1.445             | 28.6       | 1.00      | 1050               | 2.731                     | 3.15                     | 13.41            | 0.15                        | 13.56                            | 53%              |

## STORM SEWER DESIGN SHEET: (5 Year Storm)

**Proposed Storm Sewer Network 2 of 2**  
**Sobey's - Yonge St. and Maplevue Dr. E.**



Project #: 300035146.0  
Date: 1-Apr-22  
Designed: HH  
Checked: JS

|                    |        |             |
|--------------------|--------|-------------|
| Min. Diameter =    | 250 mm | (Tc+B)^A    |
| Mannings 'n' =     | 0.013  | A = 843.019 |
| Starting Tc =      | 10 min | B = 4.582   |
| Factor of Safety = | 15 %   | C = 0.736   |

Rainfall Intensity =  $\frac{A}{(Tc+B)^c}$  where  $Tc$  is in minutes

|     |         |          |
|-----|---------|----------|
| A = | 843.019 | } (5 Yr) |
| B = | 4.582   |          |
| C = | 0.736   |          |

NOMINAL PIPE SIZE USED

[illegible]



BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

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## Appendix E

### Low Impact Development and Infiltration Calculations

Project: **Sobeys - Yonge Street and Mapleview Drive East**  
 Project #: 300035146  
 Designed By: JS  
 Date: 29-Mar-2022



### Site Infiltration Gallery Sizing

Based on the STEPS LID SWM Planning and Design Guideline, a maximum impervious drainage area to an infiltration gallery is 20:1, or 5%.

#### Infiltration Facility Sizing

| Infiltration Facility Name | Catchment Area Description | Catchment Area (sq.m.) | Infiltration Facility Area (sq.m) |
|----------------------------|----------------------------|------------------------|-----------------------------------|
| Infiltration Facility A    | Building A Rooftop         | 3731                   | 190.3                             |
| Infiltration Facility B    | Building B Rooftop & Swale | 947                    | 52.0                              |
| Infiltration Facility C    | Building C Rooftop         | 893                    | 45.5                              |
| Infiltration Facility D    | Building D Rooftop         | 725                    | 37.2                              |
| Infiltration Facility E    | Building E Rooftop         | 725                    | 38.0                              |
| Infiltration Facility F    | Building F Rooftop         | 503                    | 25.5                              |
| Infiltration Facility G    | Landscape                  | 2277                   | 115.5                             |

| Infiltration Facility Name | Catchment Area (sq.m.) | 25 mm Volume Required | 12.5 mm Volume Required | 5 mm Volume Required |
|----------------------------|------------------------|-----------------------|-------------------------|----------------------|
| Infiltration Facility A    | 3731                   | 93.3                  | 46.6                    | 18.7                 |
| Infiltration Facility B    | 947                    | 23.7                  | 11.8                    | 4.7                  |
| Infiltration Facility C    | 893                    | 22.3                  | 11.2                    | 4.5                  |
| Infiltration Facility D    | 725                    | 18.1                  | 9.1                     | 3.6                  |
| Infiltration Facility E    | 725                    | 18.1                  | 9.1                     | 3.6                  |
| Infiltration Facility F    | 503                    | 12.6                  | 6.3                     | 2.5                  |
| Infiltration Facility G    | 2277                   | 56.9                  | 28.5                    | 11.4                 |
| <b>Total</b>               | <b>7523</b>            | <b>188.1</b>          | <b>94.0</b>             | <b>37.6</b>          |

Project: **Sobeys - Yonge Street and Mapleview Drive East**  
 Project #: 300035146  
 Designed By: JS  
 Date: 29-Mar-2022



## Site Infiltration Gallery Sizing Characteristics

### Infiltration Rate

Refer to Section 4.3 of the Draft Hydrogeology Assessment - Proposed Commercial Development, Prepared by Pinchin Ltd., Dated December 21, 2021 for further details of estimated hydraulic conductivity and soil infiltration rates shown below.

| Sample Location | Sample Depth          | Soil Composition                   | Hydraulic Conductivity - K (cm/sec) | Infiltration Rate (mm/hr) |
|-----------------|-----------------------|------------------------------------|-------------------------------------|---------------------------|
| BH8             | (3.0 mbgs - 3.3 mbgs) | Gravelly sand, trace silt and clay | 2.600E-02                           | 204                       |
| BH9             | (3.1 mbgs - 3.5 mbgs) | Sand, trace gravel, silt and clay  | 6.400E-03                           | 141                       |
| BH10            | (4.6 mbgs - 4.9 mbgs) | Sand, trace silt and clay          | 8.100E-03                           | 150                       |

**Note:** The hydraulic conductivity from Borehole 9 will be used for preliminary site-wide infiltration calculations as it is the most conservative estimate. Calculations will be revised as more hydraulic conductivity data is obtained throughout the detailed design.

### Design Infiltration Rate

Hydraulic conductivity at bottom of infiltration gallery = 6.400E-03 cm/s (3.0 mbgs - 3.3 mbgs)  
 Infiltration rate = 141.00 mm/hr (Draft Hydrogeology Assessment - Proposed Commercial Development, Prepared by Pinchin Ltd., Dated December 21, 2021)

Infiltration rate at the proposed bottom elevation of the infiltration gallery must be divided by a safety correction factor. As per the *STEPS LID SWM Planning and Design Guideline*, a safety factor of 3 shall be used in design calculations when a grain size analysis is used to determine the calculated infiltration rate.

Safety Correction Factor = 3  
 Design Infiltration Rate = 47 mm/hr

**Design Infiltration Rate = 47.0 mm/hr**

Project: **Sobeys - Yonge Street and Maplevue Drive East**  
 Project #: 300035146  
 Designed By: JS  
 Date: 29-Mar-2022



## Site Infiltration Gallery Sizing Characteristics

### Maximum Depth Calculation

Maximum depth of storage determined using the equation shown below:

$$d_{r\max} = i * t_s / V_r$$

Where:

$d_{r\max}$  = Maximum stone reservoir depth (mm)  
 $i$  = Infiltration rate for native soils (mm/hr)  
 $V_r$  = Void space ratio for aggregate used (typically 0.4 for 50 mm clear stone)  
 $t_s$  = Time to drain (design for 48 hour time to drain is recommended)

(Section 4.4, Page 4-57, Low Impact Stormwater Management Planning and Design Guide, TRCA, 2010)

$i$  = 47.0 mm/hr  
 $V_r$  = 0.40  
 $t_s$  = 48 hrs

Maximum depth of storage ( $d_{r\max}$ ) = 5.64 m

## Infiltration Facility A

### Infiltration Unit Characteristics

| Infiltration Rate (m/hr) | Infiltration Rate (m <sup>3</sup> /hr) | Gallery Footprint Area (m <sup>2</sup> ) | Water Volume (m <sup>3</sup> ) | Drawdown Time (hrs)* | Provided Depth (m) |
|--------------------------|----------------------------------------|------------------------------------------|--------------------------------|----------------------|--------------------|
| 0.0470                   | 8.9441                                 | 190.30                                   | 76.1                           | 8.5                  | 1.00               |

### Drawdown Time Calculation

\* Drawdown time determined using the equation shown below:

$$A_f = WQV / (d_r * V_r)$$

Where:

$A_f$  = Footprint surface area (m<sup>2</sup>)  
 $WQV$  = Water quality volume (m<sup>3</sup>)  
 $d_r$  = Stone reservoir depth (m)  
 $V_r$  = Void space ratio for aggregate used (typically 0.4 for 50 mm clear stone)

(Section 4.4, Page 4-58, Low Impact Stormwater Management Planning and Design Guide, TRCA, 2010)

Time to drain FULL VOLUME:

$d_r$  =  $i * t_s / V_r$  (See equation on previous page)  
 Rearranging the above equation for  $t_s$  =  $WQV / (A_f * i)$   
 $WQV$  = 76.1 m<sup>3</sup>  
 $A_f$  = 190.30 m<sup>2</sup>  
 $i$  = 47.0 mm/hr  
 Time to drain ( $t_s$ ) = 8.5 hrs

Project: **Sobeys - Yonge Street and Maplevue Drive East**  
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 Designed By: JS  
 Date: 29-Mar-2022



**Site Infiltration Gallery Sizing Characteristics**

**Infiltration Facility B**

**Infiltration Unit Characteristics**

| Infiltration Rate (m/hr) | Infiltration Rate (m <sup>3</sup> /hr) | Gallery Footprint Area (m <sup>2</sup> ) | Water Volume (m <sup>3</sup> ) | Drawdown Time (hrs)* | Provided Depth (m) |
|--------------------------|----------------------------------------|------------------------------------------|--------------------------------|----------------------|--------------------|
| 0.0470                   | 2.4440                                 | 52.00                                    | 20.8                           | 8.5                  | 1.00               |

**Drawdown Time Calculation**

\* Drawdown time determined using the equation shown below:

$$A_f = WQV / (d_r * V_r)$$

Where:

$A_f$  = Footprint surface area (m<sup>2</sup>)

$WQV$  = Water quality volume (m<sup>3</sup>)

$d_r$  = Stone reservoir depth (m)

$V_r$  = Void space ratio for aggregate used (typically 0.4 for 50 mm clear stone)

(Section 4.4, Page 4-58, Low Impact Stormwater Management Planning and Design Guide, TRCA, 2010)

**Time to drain FULL VOLUME:**

$$d_r = i * t_s / V_r \quad (\text{See equation on previous page})$$

$$\text{Rearranging the above equation for } t_s = WQV / (A_f * i)$$

$$WQV = 20.8 \quad m^3$$

$$A_f = 52.00 \quad m^2$$

$$i = 47.0 \quad mm/hr$$

$$\text{Time to drain } (t_s) = 8.5 \quad hrs$$

**Infiltration Facility C**

**Infiltration Unit Characteristics**

| Infiltration Rate (m/hr) | Infiltration Rate (m <sup>3</sup> /hr) | Gallery Footprint Area (m <sup>2</sup> ) | Water Volume (m <sup>3</sup> ) | Drawdown Time (hrs)* | Provided Depth (m) |
|--------------------------|----------------------------------------|------------------------------------------|--------------------------------|----------------------|--------------------|
| 0.0470                   | 2.1385                                 | 45.50                                    | 18.2                           | 8.5                  | 1.00               |

**Drawdown Time Calculation**

\* Drawdown time determined using the equation shown below:

$$A_f = WQV / (d_r * V_r)$$

Where:

$A_f$  = Footprint surface area (m<sup>2</sup>)

$WQV$  = Water quality volume (m<sup>3</sup>)

$d_r$  = Stone reservoir depth (m)

$V_r$  = Void space ratio for aggregate used (typically 0.4 for 50 mm clear stone)

(Section 4.4, Page 4-58, Low Impact Stormwater Management Planning and Design Guide, TRCA, 2010)

**Time to drain FULL VOLUME:**

$$d_r = i * t_s / V_r \quad (\text{See equation on previous page})$$

$$\text{Rearranging the above equation for } t_s = WQV / (A_f * i)$$

$$WQV = 18.2 \quad m^3$$

$$A_f = 45.50 \quad m^2$$

$$i = 47.0 \quad mm/hr$$

$$\text{Time to drain } (t_s) = 8.5 \quad hrs$$

Project: **Sobeys - Yonge Street and Mapleview Drive East**  
 Project #: 300035146  
 Designed By: JS  
 Date: 29-Mar-2022



**Site Infiltration Gallery Sizing Characteristics**

**Infiltration Facility D**

**Infiltration Unit Characteristics**

| Infiltration Rate (m/hr) | Infiltration Rate (m <sup>3</sup> /hr) | Gallery Footprint Area (m <sup>2</sup> ) | Water Volume (m <sup>3</sup> ) | Drawdown Time (hrs)* | Provided Depth (m) |
|--------------------------|----------------------------------------|------------------------------------------|--------------------------------|----------------------|--------------------|
| 0.0470                   | 1.7484                                 | 37.20                                    | 14.9                           | 8.5                  | 1.00               |

**Drawdown Time Calculation**

\* Drawdown time determined using the equation shown below:

$$A_f = WQV / (d_r * V_r)$$

Where:

$A_f$  = Footprint surface area (m<sup>2</sup>)

$WQV$  = Water quality volume (m<sup>3</sup>)

$d_r$  = Stone reservoir depth (m)

$V_r$  = Void space ratio for aggregate used (typically 0.4 for 50 mm clear stone)

(Section 4.4, Page 4-58, Low Impact Stormwater Management Planning and Design Guide, TRCA, 2010)

**Time to drain FULL VOLUME:**

$$d_r = i * t_s / V_r \quad (\text{See equation on previous page})$$

$$\text{Rearranging the above equation for } t_s = WQV / (A_f * i)$$

$$WQV = 14.9 \quad m^3$$

$$A_f = 37.20 \quad m^2$$

$$i = 47.0 \quad mm/hr$$

$$\text{Time to drain } (t_s) = 8.5 \quad hrs$$

**Infiltration Facility E**

**Infiltration Unit Characteristics**

| Infiltration Rate (m/hr) | Infiltration Rate (m <sup>3</sup> /hr) | Gallery Footprint Area (m <sup>2</sup> ) | Water Volume (m <sup>3</sup> ) | Drawdown Time (hrs)* | Provided Depth (m) |
|--------------------------|----------------------------------------|------------------------------------------|--------------------------------|----------------------|--------------------|
| 0.0470                   | 1.7860                                 | 38.00                                    | 15.2                           | 8.5                  | 1.00               |

**Drawdown Time Calculation**

\* Drawdown time determined using the equation shown below:

$$A_f = WQV / (d_r * V_r)$$

Where:

$A_f$  = Footprint surface area (m<sup>2</sup>)

$WQV$  = Water quality volume (m<sup>3</sup>)

$d_r$  = Stone reservoir depth (m)

$V_r$  = Void space ratio for aggregate used (typically 0.4 for 50 mm clear stone)

(Section 4.4, Page 4-58, Low Impact Stormwater Management Planning and Design Guide, TRCA, 2010)

**Time to drain FULL VOLUME:**

$$d_r = i * t_s / V_r \quad (\text{See equation on previous page})$$

$$\text{Rearranging the above equation for } t_s = WQV / (A_f * i)$$

$$WQV = 15.2 \quad m^3$$

$$A_f = 38.00 \quad m^2$$

$$i = 47.0 \quad mm/hr$$

$$\text{Time to drain } (t_s) = 8.5 \quad hrs$$

Project: **Sobeys - Yonge Street and Mapleview Drive East**  
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 Designed By: JS  
 Date: 29-Mar-2022



**Site Infiltration Gallery Sizing Characteristics**

**Infiltration Facility F**

**Infiltration Unit Characteristics**

| Infiltration Rate (m/hr) | Infiltration Rate (m <sup>3</sup> /hr) | Gallery Footprint Area (m <sup>2</sup> ) | Water Volume (m <sup>3</sup> ) | Drawdown Time (hrs)* | Provided Depth (m) |
|--------------------------|----------------------------------------|------------------------------------------|--------------------------------|----------------------|--------------------|
| 0.0470                   | 1.1985                                 | 25.50                                    | 10.2                           | 8.5                  | 1.00               |

**Drawdown Time Calculation**

\* Drawdown time determined using the equation shown below:

$$A_f = WQV / (d_r * V_r)$$

Where:

$A_f$  = Footprint surface area (m<sup>2</sup>)

$WQV$  = Water quality volume (m<sup>3</sup>)

$d_r$  = Stone reservoir depth (m)

$V_r$  = Void space ratio for aggregate used (typically 0.4 for 50 mm clear stone)

(Section 4.4, Page 4-58, Low Impact Stormwater Management Planning and Design Guide, TRCA, 2010)

**Time to drain FULL VOLUME:**

$$d_r = i * t_s / V_r \quad (\text{See equation on previous page})$$

$$\text{Rearranging the above equation for } t_s = WQV / (A_f * i)$$

$$WQV = 10.2 \quad \text{m}^3$$

$$A_f = 25.50 \quad \text{m}^2$$

$$i = 47.0 \quad \text{mm/hr}$$

$$\text{Time to drain } (t_s) = 8.5 \quad \text{hrs}$$

**Infiltration Facility G**

**Infiltration Unit Characteristics**

| Infiltration Rate (m/hr) | Infiltration Rate (m <sup>3</sup> /hr) | Gallery Footprint Area (m <sup>2</sup> ) | Water Volume (m <sup>3</sup> ) | Drawdown Time (hrs)* | Provided Depth (m) |
|--------------------------|----------------------------------------|------------------------------------------|--------------------------------|----------------------|--------------------|
| 0.0470                   | 5.4285                                 | 115.50                                   | 46.2                           | 8.5                  | 1.00               |

**Drawdown Time Calculation**

\* Drawdown time determined using the equation shown below:

$$A_f = WQV / (d_r * V_r)$$

Where:

$A_f$  = Footprint surface area (m<sup>2</sup>)

$WQV$  = Water quality volume (m<sup>3</sup>)

$d_r$  = Stone reservoir depth (m)

$V_r$  = Void space ratio for aggregate used (typically 0.4 for 50 mm clear stone)

(Section 4.4, Page 4-58, Low Impact Stormwater Management Planning and Design Guide, TRCA, 2010)

**Time to drain FULL VOLUME:**

$$d_r = i * t_s / V_r \quad (\text{See equation on previous page})$$

$$\text{Rearranging the above equation for } t_s = WQV / (A_f * i)$$

$$WQV = 46.2 \quad \text{m}^3$$

$$A_f = 115.50 \quad \text{m}^2$$

$$i = 47.0 \quad \text{mm/hr}$$

$$\text{Time to drain } (t_s) = 8.5 \quad \text{hrs}$$

Project: **Sobeys - Yonge Street and Maplevue Drive East**

Task: Water Balance Assessment

Date: 3/29/2022

Prepared by: JS

Checked by: PM

Project no.: 300035146

**Recharge Calculations for Water Balance**

As per the Draft Hydrogeology Assessment - Proposed Commercial Development, Prepared by Pinchin Ltd., Dated December 21, 2021:

Table 1:

**Annual Pre-Development Water Balance/Budget**

|            | Area (m <sup>2</sup> ) | Infiltration |                      |
|------------|------------------------|--------------|----------------------|
|            |                        | mm/year      | m <sup>3</sup> /year |
| Total Site | 34700                  | 326.7        | <b>11336.49</b>      |

Based on the water balance presented in the Hydrogeological Report 11,336 m<sup>3</sup>/year is required to be infiltrated to match pre-development conditions

Table 2:

**Annual Post-Development Water Balance/ Budget ( Not Mitigated)**

|                 | Area (m <sup>2</sup> ) | Infiltration |                      |
|-----------------|------------------------|--------------|----------------------|
|                 |                        | mm/year      | m <sup>3</sup> /year |
| Pervious Area   | 3470                   | 326.7        | 1133.65              |
| Impervious Area | 31230                  | 0            | 0                    |
| Total           |                        |              | 1133.65              |

\*Note: In order to achieve the infiltration target of 11,336 m<sup>3</sup>/year, 10,202 m<sup>3</sup>/year is required to be infiltrated using Low Impact Development Measures**Proposed LID Design: Site Drainage to Infiltration Galleries**

Based on the Low Impact Development Manual, a maximum impervious drainage area to an infiltration gallery is 20:1, or 5%, therefore the following site drainage areas and infiltration gallery footprints are proposed:

|                         | Drainage Area (m <sup>2</sup> ) | Infiltration Gallery Footprint Area (m <sup>2</sup> ) | Impervious Area % to Infiltration Gallery Area | Depth (m) | Void Ratio   | Volume (m <sup>3</sup> ) |
|-------------------------|---------------------------------|-------------------------------------------------------|------------------------------------------------|-----------|--------------|--------------------------|
| Infiltration Facility A | 3731                            | 190.30                                                | 5.1%                                           | 1.00      | 0.40         | <b>76.1</b>              |
| Infiltration Facility B | 947                             | 52.00                                                 | 5.5%                                           | 1.00      | 0.40         | <b>20.8</b>              |
| Infiltration Facility C | 893                             | 45.50                                                 | 5.1%                                           | 1.00      | 0.40         | <b>18.2</b>              |
| Infiltration Facility D | 725                             | 37.20                                                 | 5.1%                                           | 1.00      | 0.40         | <b>14.9</b>              |
| Infiltration Facility E | 725                             | 38.00                                                 | 5.2%                                           | 1.00      | 0.40         | <b>15.2</b>              |
| Infiltration Facility F | 503                             | 25.50                                                 | 5.1%                                           | 1.00      | 0.40         | <b>10.2</b>              |
| Infiltration Facility G | 2277                            | 115.50                                                | 5.1%                                           | 1.00      | 0.40         | <b>46.2</b>              |
|                         |                                 |                                                       |                                                |           | <b>Total</b> | <b>155.4</b>             |

**Proposed Recharge from Infiltration Galleries**

|                         | Daily Rainfall Event to be Infiltrated <sup>1</sup> | Volume of Infiltration Gallery (m <sup>3</sup> ) | % of Total Annual Avg Rainfall <sup>2</sup> | Annual Depth of Precipitation (mm) <sup>3</sup> | Annual Volume of Infiltration (m <sup>3</sup> /year) <sup>4</sup> |
|-------------------------|-----------------------------------------------------|--------------------------------------------------|---------------------------------------------|-------------------------------------------------|-------------------------------------------------------------------|
| Infiltration Facility A | 20.4                                                | 76.1                                             | 90%                                         | 839.6                                           | 3132.5                                                            |
| Infiltration Facility B | 22.0                                                | 20.8                                             | 92%                                         | 858.3                                           | 812.8                                                             |
| Infiltration Facility C | 20.4                                                | 18.2                                             | 90%                                         | 839.6                                           | 749.8                                                             |
| Infiltration Facility D | 20.5                                                | 14.9                                             | 90%                                         | 839.6                                           | 608.8                                                             |
| Infiltration Facility E | 21.0                                                | 15.2                                             | 91%                                         | 848.9                                           | 615.4                                                             |
| Infiltration Facility F | 20.3                                                | 10.2                                             | 90%                                         | 839.6                                           | 421.9                                                             |
| Infiltration Facility G | 20.3                                                | 46.2                                             | 90%                                         | 839.6                                           | 1911.8                                                            |
| TOTAL                   |                                                     |                                                  |                                             |                                                 | <b>8253.0</b>                                                     |

<sup>1</sup> Based on drainage area to infiltration gallery and volume provided in infiltration gallery<sup>2</sup> Refer to Figure 1a, Page 8 in the City of Toronto Wet Weather Flow Management Guidelines, attached<sup>3</sup> From the Hydrogeological Report, the total precipitation for the year is 932.9mm, therefore the event represents the associated depth of precipitation<sup>4</sup> Multiply annual precipitation depth by drainage area

