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FUNCTIONAL SERVICING REPORT

Millbrook South West Subdivision

787 & 825 Fallis Line
Community of Millbrook
Township of Cavan Monaghan
County of Peterborough

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CONTENTS

1.0 INTRODUCTION.....	4
1.1 Existing Conditions.....	4
1.2 Proposed Development.....	4
1.3 Purpose of Report.....	5
1.4 Approving Authorities.....	5
2.0 WATER SERVICING.....	5
2.1 Domestic Demand.....	6
2.2 Local Watermains & Service Connections.....	6
2.3 Fire Protection.....	7
3.0 WASTEWATER SERVICING.....	7
3.1 Wastewater Loading.....	8
3.2 External Sanitary Sewers.....	8
3.3 Local Sanitary Sewers & Service Connections.....	9
4.0 STORM CONVEYANCE SYSTEM.....	9
4.1 Minor System Design.....	9
4.2 Major System Design.....	10
4.3 Foundation Drainage.....	10
4.4 Roof Drainage.....	10
5.0 STORMWATER MANAGEMENT.....	10
5.1 Storm Drainage Areas.....	10
5.1.1 Pre-Development.....	11
5.1.2 Post Development.....	11
5.2 Stormwater Management Design Criteria.....	12
5.3 Stormwater Management Pond Design.....	12
5.3.1 Quality Control.....	12
5.3.2 Erosion Control.....	16
5.3.3 Quantity Control.....	18
5.3.4 Thermal Mitigation Measures.....	20
5.3.5 SWM Pond Inspection & Maintenance.....	20

CONTENTS (Continued)

5.4 Site Water Balance.....	24
6.0 VEHICULAR & PEDESTRIAN ACCESS.....	27
6.1 Municipal Roads.....	27
6.2 Private Roads, Parking Lots & Driveways.....	27
6.3 Sidewalks, Walkways & Trails.....	27
7.0 GRADING.....	28
7.1 Grading Criteria.....	28
7.2 Preliminary Design.....	28
7.3 Permitting.....	28
8.0 EROSION AND SEDIMENT CONTROL DURING CONSTRUCTION.....	29
8.1 Control Measures.....	29
8.2 Construction Sequencing.....	30
8.3 ESC Inspection and Maintenance.....	30
9.0 UTILITIES.....	31
10.0 SUMMARY.....	32
11.0 REFERENCES & BIBLIOGRAPHY.....	35

LIST OF TABLES

Table 1	Development Statistics.....	4
Table 2	Domestic Water Demand.....	6
Table 3	Wastewater Loading Summary.....	8
Table 4A	Summary of Storm Drainage Peak Flows – Flow Node #1.....	19
Table 4B	Summary of Storm Drainage Peak Flows – Flow Node #2.....	20
Table 5A	North SWM Pond Performance Summary.....	22
Table 5B	South SWM Pond Performance Summary.....	23

CONTENTS (Continued)

LIST OF FIGURES

Figure 1	Location Plan	Follows Text
Figure 2	External Water Servicing Plan	Follows Text
Figure 3	External Wastewater Servicing Plan	Follows Text
Figure 4A	SWM Drainage Plan: Pre-Development	Follows Text
Figure 4B	SWM Drainage Plan: Post-Development	Follows Text
Figure 5A	Preliminary North SWM Pond	Follows Text
Figure 5B	Preliminary South SWM Pond	Follows Text

LIST OF DRAWINGS

Dwg PSG-1	Preliminary Servicing & Grading Plan	Rear Pouch
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LIST OF APPENDICES

Appendix "A"	Draft Plan of Subdivision
Appendix "B"	Water Demand Calculations & Details
Appendix "C"	Wastewater Servicing Details & Calculations
Appendix "D"	Watershed Map & IDF Data
Appendix "E"	Stormwater Management Calculations
Appendix "F"	Excerpts from the Hydrogeological Assessment Report
Appendix "G"	Standard Road Cross Sections
Appendix "H"	Borehole Logs
Appendix "I"	Erosion & Sediment Control Details
Appendix "J"	Typical Joint Utility Trench Detail
Appendix "K"	Growth Management Strategy & Master Servicing Study Update

1.0 INTRODUCTION

Valdor Engineering Inc. has been retained by CSU Development Inc. to provide consulting engineering services for the proposed Millbrook South West Subdivision located on a 49.2 hectare parcel on the south of Fallis Line, west of County Road 10, in the Community of Millbrook, Township of Cavan Monaghan, County of Peterborough as illustrated in **Figure 1**. The subject site is known municipally as 787 & 825 Fallis Line

1.1 Existing Conditions

The subject site is bounded to the west by existing agricultural lands, to the north by Fallis Line, to the south by valley lands associated with Baxter Creek and to the east by the Millbrook Subdivision which is currently being serviced.

The subject site is currently occupied by two detached dwellings, a barn and various out buildings with driveway access to Fallis Line. The majority of the subject site is presently a vacant field and the south part of the site is tree covered. East half of the site is bisected by the relatively deep cut of a former railway corridor which traverses the site in a north-south alignment.

1.2 Proposed Development

The proposed residential development consists of lots for detached dwellings having frontages of 10.7 m, 13.7 m and 15.9 m, street townhouses having frontages of 7.6 m, and medium density blocks (5-storey buildings) fronting Fallis Line. The proposed development will also include parkland, walkway blocks, two stormwater management facilities, and a waste water treatment plant.

Access for the subdivision will consist of a road network with a road connection to the Millbrook Subdivision to the east which is currently under construction. A reduced copy of the proposed Draft Plan of Subdivision is contained in **Appendix "A"**. The development statistics and the equivalent population data are summarized in **Table 1**.

Table 1. Development Statistics

Land Use	Area (Ha)	Residential Units (No.)	Equivalent Population (persons)
Detached Dwellings	15.65	371	1,299
Street Townhomes	3.68	148	518
Medium Density	0.88	150	300
Parkland & Trails	2.06		
Natural Heritage Systems	16.31		
Stormwater Management Ponds	2.39		
Roads & Road Widening	7.84		
Future Development	0.39		
TOTAL	49.20	669	2,117

1.3 Purpose of Report

This report has been prepared in support of the application for draft plan approval for the subject property. The primary intent of the report is to demonstrate the viability of water and wastewater servicing, storm drainage and stormwater management, grading as well as vehicular and pedestrian access with respect to applicable guidelines, policies and design criteria.

This report has been prepared based on a review of the topographic survey and background studies, discussions with municipal staff and a visit to the site. This document provides guidance for detailed engineering design of the subdivision.

1.4 Approving Authorities

This report will be circulated for review, comment and approval to:

1. The Township of Cavan Monaghan;
2. The County of Peterborough; and
3. The Otonabee Region Conservation Authority (ORCA).

2.0 WATER SERVICING

The existing Millbrook water servicing system consists of a water treatment facility, with water taken from three local wells, a water storage tank and a network of watermains that service most of the existing urban area of the community.

The existing Millbrook Water Treatment Plant (WTP) consists of 3 wells, each with 25L/s capacity, chlorine disinfection and a chlorine contact tank. The existing water storage tank was built in 1976 and is located on the east end of Millbrook on a local high point of land. The existing 10.4m diameter tank has a useable storage capacity of 1,410m³ with a top water level at an elevation of 278.0m.

The municipal water system was expanded including the northerly extension of a watermain with a water storage tank constructed on the site of the Township's municipal office. The water system was further expanded to service the existing subdivision to the east. The external water distribution system is illustrated in **Figure 2**.

The Township is currently undergoing a Growth Management and Master Servicing Study in which a presentation was made to Council on October 18, 2021 by RV Anderson Associates Limited and Watson & Associates. This development is included in the study area for planned expansion. A summary of the presentation is included in Appendix K.

Upgrades to the water distribution system will be required to meet long term growth by the Municipality. Based on the study to date and after accounting for capacity that is already committed to developments in Millbrook, with water capacity operating at 85% of 3,000 m³/day there is remaining capacity of 450 m³/day which can service a population of approximately 1,000. Discussion with the Municipality also confirmed that water capacity will not be a concern since a new well to be funded through Development Charges as well as re-use of an existing standpipe for additional storage capacity is an alternative along with further planned upgrades.

The following is a summary of the water servicing requirements for the subject site.

2.1 Domestic Demand

The domestic water demand is to be calculated using the Township and Ministry of the Environment design standards which includes the following parameters:

Residential Average Day Demand:	450 L/person/day
Maximum Day Factor:	2.00
Peak Hour Factor	3.00

A detailed tabulation of the domestic water demand calculation is detailed in **Table B1** of **Appendix "B"**. The demands are summarized in **Table 2** below.

Table 2. Domestic Water & Fire Flow Demand

Land Use	Equivalent Population (Persons)	Domestic Demand (L/min)	Maximum Day Demand (L/min)	Peak Hour Demand (L/min)	Fire Flow (L/min)	Maximum Day Plus Fire Flow (L/min)
Detached Dwellings	1,299	405.9	811.9	1,217.8	8,000	
Street Townhomes	518	162.0	324.0	486.0	7,000	
Medium Density	300	93.8	187.6	281.4		
TOTAL	2,117	661.7	1,323.5	1,985.2	8,000	9,324

2.2 Local Watermains & Service Connections

The local water distribution system within the subdivision will consist of watermains ranging in diameter from 150mm to 250mm. This water system will connect to the existing watermain on Fallis Line and the existing watermain within the adjacent Millbrook Subdivision.

In accordance with Township standards the individual detached dwellings are each to have separate water connections. Based on Ontario Building Code (OBC 2012) regulations (7.6.3.4.(1) and (5) and Table 7.6.3.4), the dwellings will be serviced with 25mm diameter water connections given that it is anticipated that the dwellings will each have more than 16 fixture units.

Water meters are to be purchased from the Township and will be installed in the basement of each dwelling with a remote readout device located on the exterior ground floor wall of the house. Generally, residential water meters are selected to be one size smaller than the water service and therefore 20mm x 25mm water meters will be installed.

The configuration of the site watermain is illustrated on the **Preliminary Servicing & Grading Plan**. A copy of the Township standard water service connection and water meter details is included in **Appendix "B"**.

2.3 Fire Protection

The fire flow required for the proposed dwelling units was calculated using the criteria indicated in the *Water Supply for Public Fire Protection Manual*, 1999, by the Fire Underwriters Survey (FUS). The calculation incorporates various parameters such as coefficient for fire-resistant construction, an area reduction accounting for a fire-resistant (one hour rating) protection, a reduction for low-hazard occupancies, and a factor for neighbouring building proximity.

The calculation was completed to reflect the governing conditions which is the largest detached dwelling. Based on the calculations, the minimum fire suppression flow required for the detached dwellings and street townhomes are 8,000 L/min and 7,000 L/min, respectively. The detailed fire flow calculation is provided in **Table B2-1** and **Table B2-2** which are contained in **Appendix "B"**. In accordance with the Township standards, this flow must be available at the nearest hydrant with a minimum pressure of 140 KPa.

Fire hydrants will be provided along the municipal roads such that a fire hydrant will be available within 90m of the principle entrance of each unit as set out in the Ontario Building Code (OBC 2012). A copy of the standard fire hydrant detail is included in **Appendix "B"**.

3.0 WASTEWATER SERVICING

The community of Millbrook is currently serviced by the existing Millbrook Wastewater Treatment Plant (WWTP) located at the east limit of Centennial Lane. This WWTP was built in 1975 and the plant was upgraded in 2004 to improve the treatment quality. The WWTP has recently been expanded and upgraded to accommodate the additional flow from the urban expansion area which included a high-level tertiary treatment that would be able to provide improved effluent quality to meet the new effluent discharge criteria.

The Township as mentioned has recently initiated a Water and Wastewater Master Servicing Study and Growth Management Study as part of a Municipal Class Environmental Assessment to examine water and wastewater servicing alternatives within the current urban boundary and beyond. This study has considered the proposed draft plan for the subject site and the presentation to Council is included in Appendix K.

After considering development that is already committed, the wastewater treatment plant is operating at 37% of the 3,000 m³/day average day capacity and 79% of the 8,242 m³/day peak capacity. Remaining capacity is therefore 1,890 m³/day which at 450 l/c/day can serve an additional population of 4,200. However, based on peak flow available capacity of 1,730 m³/day and assuming a peaking factor of 3 or 1,350 l/c/day the plant has sufficient capacity to serve a population of 1,281. Long term upgrades to the existing wastewater treatment plant are planned and will be incorporated as part of the final Water and Wastewater Master Servicing Study.

The following is a summary of the wastewater servicing analysis for the subject site.

3.1 Wastewater Loading

The wastewater loading is to be calculated using the Township engineering design standards which include the following parameters:

Residential Average Daily Flow: 450 L/person/day

Residential Peaking Factor: $K_H = 1 + \frac{14}{4 + \sqrt{P}}$

Where: K_H = Harmon Peaking Factor
 (Max. 4.0, Min. 2.75)
 p = Population in thousands

Extraneous Flow, I : 0.28 L/s/Ha (Infiltration)

Design Flow, Q = $Q \times K_H + I$

Based on the above criteria the sewage flow calculations are provided in **Table C1** contained in **Appendix “C”** and the total flow is summarized in **Table 3**.

Table 3. Wastewater Loading Summary

Land Use	Area (Ha)	Equivalent Population (Persons)	Average Daily Flow (L/s)	Harmon Peaking Factor	Peak Daily Flow (L/s)	Infiltration Rate (L/s)	Total Flow (L/s)
Detached Dwellings	15.65	1,299	6.77	3.72	25.19	4.38	29.58
Street Townhomes	3.68	518	2.70	3.97	10.70	1.03	11.73
Medium Density	0.88	300	1.56	4.08	6.37	0.25	6.62
Roads	7.84					2.20	2.20
Total	28.05	2,116	11.03		42.27	7.85	50.12

3.2 External Sanitary Sewers

A trunk sanitary sewer was constructed from the existing Millbrook community, along County Road 10, to service the urban expansion area including the subject lands. This 375mm diameter trunk sanitary sewer extends through the existing adjacent subdivision to the west along Highland Boulevard. It is proposed to service the lots on Street “A” via a connection to the existing 250mm diameter sanitary sewer on Pristine Trail at the east limit of the subject site. The external sanitary sewers are illustrated in **Figure 3**.

Availability of treatment capacity to service new development in the existing WWTP is currently being reviewed by the Township of Cavan Monaghan. In addition, the Township has been searching for a location to construct a new treatment facility in order to meet its projected growth target over the long term. As mentioned above, based on the Master Servicing Study to date there is sufficient capacity to service an additional population of close to 1,300 and long term plans are to either expand the current treatment capacity in the existing plant or construct a new treatment plant. We are proposing a second treatment

on the subject site to service the subject lands which can be phased to also service future development. The treatment plant will be designed in accordance to Ministry requirements. Additional land has been allocated to accommodate future expansion. Treatment capacity will therefore be available either through the existing WWTP or the proposed WWTP and it will be a condition of development that will need to be satisfied for registration and release of building permits. As such it is expected that prior to approval there will be sufficient planned capacity in a centralized waste water treatment facility to service the proposed development. A schematic for the WWTP and the manufactures brochure is included in **Appendix "C"**.

3.3 Local Sanitary Sewers & Service Connections

The subject site will be serviced by a local sanitary system consisting of 200mm diameter sewers. The local sewers will be designed such that the upstream end of each length will have a minimum 1% slope to assist with self-cleansing. In accordance with standard practice, manholes will be provided for maintenance access at a maximum spacing of 120m. The proposed sanitary sewers are indicated on the **Preliminary Servicing & Grading Plan**.

Each dwelling unit will be provided with a 100mm diameter single connection in accordance with Township standards. The Township's standard detail for sanitary service connections is included in **Appendix "C"**.

4.0 STORM CONVEYANCE SYSTEM

The subject site is located in the Baxter Creek watershed, which is one of the twelve watersheds under the jurisdiction of the Otonabee Region Conservation Authority (ORCA). Baxter Creek originates from the Oak Ridges Moraine and flows in an easterly direction and outlets into the Otonabee River. Baxter Creek meets the Otonabee River approximately 20 km upstream of Rice Lake. A map illustrating the Baxter Creek watershed is contained in **Appendix "D"**.

In accordance with Township standards, a major / minor system storm conveyance concept has been incorporated into the functional servicing design for the subject development. The following sections provide a brief summary of the storm drainage components:

4.1 Minor System Design

In accordance with the Township standards, the subject development will be serviced with a minor storm sewer system that has been designed to convey runoff from the 5-year storm event. Minor system flows from the north half of the development will be conveyed to the North SWM Pond located in the north-east corner of the development through a servicing block. Minor system flows from the south half of the development will be conveyed to the South SWM Pond located near the south limit of the development through a servicing block.

The rainfall intensity values, I , are calculated in accordance with the 2014 rainfall intensity duration frequency (IDF) data for the Peterborough Airport weather station. Based on this data the rainfall intensity for the 5- and 100-year rainfall events is calculated as follows:

$$I_5 = \frac{1098}{(t+10.1)^{0.83}} \quad I_{100} = \frac{2507}{(t+14.8)^{0.88}}$$

The peak flows are calculated using the following formula:

$$Q = R \times A \times I \times 2.778$$

where: Q = peak flow (L/s)

A = area in hectares (Ha)

I = rainfall intensity (mm/hr)

R = composite runoff coefficient

t = time of concentration (min)

The IDF curve data is included in **Appendix “D”**. A schematic design of the minor system is illustrated on the **Preliminary Servicing & Grading Plan**.

4.2 Major System Design

The major system will generally be comprised of an overland flow route along the municipal road network directing drainage to a safe outlet. This major system will convey flows which are in excess of the capacity of the minor storm sewer system. Major system flows from the north half of the development will be conveyed to the North SWM Pond. Major system flows from the south half of the development will be conveyed to the South SWM Pond. The major system flow route is illustrated on the **Preliminary Servicing & Grading Plan**.

4.3 Foundation Drainage

In accordance with Township standards, storm service connections are to be provided to each dwelling unit. It is anticipated that the dwellings will have basements and therefore a foundation weeping tile system will be required which will discharge to storm service connections.

An independent foundation drainage system will be provided for the lots on Street A, discharging to the rail cut, just upstream of the outlet from the South SWM Pond.

4.4 Roof Drainage

It is anticipated that the proposed dwellings will have conventional peaked roof with eaves troughs and downspouts. As per standard practice the downspouts are to discharge to grade over splash pads, preferably towards sodded areas. Roof downspouts are not to be connected to the storm sewer.

5.0 STORMWATER MANAGEMENT

5.1 Storm Drainage Areas

Based on the topographic survey and the proposed draft plan of subdivision, the following is a summary of the pre- and post-development drainage areas, accounting.

5.1.1 Pre-Development

Under existing conditions, drainage from the subject site is generally split between two separate tributaries of Baxter Creek, located to the north and south of the site. The northern half of the site (*Catchment 1-101*, 18.07 ha) drains northward to a tributary of Baxter Creek (referred to as the North Tributary in this report) via an existing 600 mm CSP culvert under Fallis Line. It is noted that this tributary will be realigned as part of the Millbrook Subdivision, Phase 2, located on the north side of Fallis Line. The southern half of the site (*Catchment 2-101*, 14.78 ha) drains southward to a tributary of the Baxter Creek (referred to as the South Tributary in this report) via a wetland. The North and South Tributaries join at a confluence approximately 2.2 km east of County Road 10.

Drainage from the lands to the west of the subject site is similarly split between drainage to the north and south. Some of this external drainage to the north will drain through the subject site (*Catchment 1-301*, 5.08 ha), whereas the remainder of external drainage to the north drains directly to Fallis Line (*Catchment 1-302*, 6.51 ha). The external drainage to the south will not flow through the subject site because it is intercepted by a raised hedgerow running along the length of property boundary which acts like a berm and serves to convey this flow directly to the valley lands associated with the South Tributary of Baxter Creek. As such, this external drainage area is not discussed in this report.

A small area along the south side of Fallis Line (*Catchment 1-303*, 0.66 ha) accounts for the road and ditch areas on southern side of Fallis Line, which drain directly to the North Tributary of Baxter Creek.

Elevations vary from 267.00 m along the west property line of the site, to approximately 244.00 m along the south limit of development. The existing slopes throughout the site range from 0.8% to approximately 10.0%.

The existing site land use is primarily agricultural with a wooded area at the south-east corner of the site. **Figure 4A** illustrates the drainage patterns for existing conditions.

5.1.2 Post-Development

Under proposed conditions, drainage from the subject site will be split between the North and South Tributaries of Baxter Creek to maintain the pre-development drainage patterns. The northern half of the site (*Catchment 1-201*, 18.81 ha) drains to the North SWM Pond and then to the North Tributary. The southern half of the site (*Catchment 2-201*, 10.88 ha) drains to the South SWM Pond and then to the South Tributary. The rear of lots along the southern limit (*Catchment 2-202*, 3.16 ha) will drain uncontrolled to the South Tributary, but adequate overcontrol will be provided by the South SWM Pond.

The external drainage area draining through the site (*Catchment 1-301*, 5.08 ha) will be captured and conveyed to the North SWM Pond. The external drainage areas draining to Fallis Line (*Catchment 1-302*, 6.51 ha, and *Catchment 1-303*, 0.66 ha) will be conveyed via a proposed storm sewer under Fallis Line to the North Tributary.

Figure 4B illustrates the details of the proposed drainage plan for the subject site.

5.2 Stormwater Management Design Criteria

The proposed SWM facility shall be designed to provide the following levels of control as per the requirements of the Ministry of the Environment (MOE), Otonabee Region Conservation Authority (ORCA) and Township of Cavan Monaghan:

- **Quality control:** The permanent pool shall be sized to provide Enhanced (Level 1) treatment of stormwater runoff for the proposed development.
- **Erosion control:** Stormwater runoff from the 25 mm storm event shall be stored and released over a minimum 24-hour period.
- **Flood control:** Flood storage and control shall be provided to maintain peak outflows from the pond at or below pre-development levels for the critical of the 6, 12 & 24-hour SCS, 6, 12 & 24-hour AES storm distributions, and 4-hour Chicago storm distribution, for the 2-year through 100-year design storm events.

5.3 Stormwater Management Pond Design

Two stormwater management wet ponds are proposed to serve the subject site, the North and South SWM Ponds. The North SWM Pond is located in the north-east corner of the site, as illustrated in **Figure 5A**, and services a total drainage area of approximately 23.89 ha. The South SWM Pond is located at the southern limit of the site, as illustrated in **Figure 5B**, and services a total drainage area of approximately 10.88 ha.

A Visual OTTHYMO 5.1 (VO5) model was created to determine the pre-development flows for the subject site and assess the post-development flows and performance of the proposed SWM ponds. Design storms were generated from the IDF curve and storm depth data provided in the City's standards. The supporting VO5 model documentation, model schematics and output are provided in **Appendix "E"**.

As per the Township standards and the MOE SWM pond criteria, the SWM pond design includes 3H:1V side slopes below and above the permanent pool, with a 5H:1V safety shelf for 3.0m on either side of the permanent pool elevation. A 4.0 m wide access road with maximum 10% slope is provided from the subdivision.

5.3.1 Quality Control

Various source controls, conveyance and end-of-pipe SWM facilities were considered to provide the appropriate level of stormwater quality control. Reduced lot grades, rear and side yard swales, and discharge of roof leaders to pervious surfaces will augment the control provided by the SWM facility and promote infiltration where possible. Based on a preliminary review of available controls, it appears that the primary and most effective option to provide water quality control for runoff from the contributing drainage areas is a SWM facility. The options reviewed are as follows:

- **Roof Leader to Ponding Areas or Soakaway Pits (Lot Level):** The Township design criteria do not address the use of ponding areas or soakaway pits in the rear yards. Roof leaders will discharge directly to pervious surfaces to encourage infiltration and filtration on the lots. Soakaway pits can be an effective means of improving infiltration of stormwater, but require a large area in comparison to typical residential rear yard dimensions. As a result, soakaway pits and ponding areas are not recommended.
- **Grassed Swales (Conveyance):** Rear and side yard swales will be incorporated into the grading plan. The swales will convey runoff to rear lot catch basins. The number of rear lot catch basins will be minimized in order to encourage infiltration via swales.
- **Stormwater Management Facilities (End-of-Pipe):** SWM facilities are required to provide water quality, extended detention and flood control of stormwater runoff. Stormwater management facilities will be constructed within the Subject Property.
- **Oil/Grit Separation Technologies (End-of-Pipe):** These SWMF's can be effective for smaller, high impervious sites where spill protection is desired and when area for a stormwater pond is unavailable. The construction of the stormwater pond will eliminate the need for any oil/grit separation units.
- **Infiltration Trenches/Basins (End-of-Pipe):** These SWMF's are most effective in areas with highly pervious soils and large areas.

Permanent Pool Sizing Calculations

In accordance with the ORCA requirements for development within the Baxter Creek watershed, Enhanced (Level 1) water quality protection shall be provided by the proposed SWM facility. This shall be achieved for both ponds with a permanent pool.

In order to maintain a permanent pool of water in the ponds and to prevent the mixing of surface water with ground water, the ponds must be constructed in native, undisturbed till material or lined with either an imported clay material or synthetic material. It is assumed that a pond liner will be required, but this will be confirmed at detailed design.

North SWM Pond

The drainage area to the North SWM Pond (23.89 ha) has an average imperviousness of approximately 60% (including external drainage areas). The required permanent pool volume for the North SWM Pond is provided below:

Volume required for catchment with 60% imperviousness:	201.7 m ³ /ha
<u>Less 40 m³/ha of extended detention storage zone:</u>	<u>- 40.0 m³/ha</u>
Permanent Pool Volume Required:	161.7 m ³ /ha

The permanent pool storage volume required for the North SWM Pond is 161.7 m³/ha × 23.89 ha = 3,862 m³.

The normal water level of the permanent pool for the North SWM Pond is set at an elevation of 247.00 m. The bottom of the pond in the main cell is set at an elevation of 245.00 m, providing a permanent pool depth of 2.00 m. The actual permanent pool storage volume provided is approximately 4,429 m³ which is greater than the minimum required volume. The required and provided quality control volume together with the elevation of the normal water level are summarized in **Table 5A**.

South SWM Pond

The drainage area to the South SWM Pond (10.88 ha) has an average imperviousness of approximately 60%. The required permanent pool volume for the South SWM Pond is provided below:

Volume required for catchment with 60% imperviousness:	201.7 m ³ /ha
Less 40 m ³ /ha of extended detention storage zone:	- 40.0 m ³ /ha
Permanent Pool Volume Required:	161.7 m ³ /ha

The permanent pool storage volume required for the South SWM Pond is 161.7 m³/ha × 10.88 ha = 1,759 m³.

The normal water level of the permanent pool for the South SWM Pond is set at an elevation of 245.50 m. The bottom of the pond in the main cell is set at an elevation of 243.50 m, providing a permanent pool depth of 2.00 m. The actual permanent pool storage volume provided is approximately 2,710 m³ which is greater than the minimum required volume. The required and provided quality control volume together with the elevation of the normal water level are summarized in **Table 5B**.

Forebay Sizing Calculations

The SWM ponds have been designed with forebays sized based on the MOE design criteria.

North SWM Pond

Using the methodology provided in the Stormwater Management Planning and Design Manual, the minimum recommended forebay length based on particulate settling is calculated using the following expression:

$$Dist = \sqrt{\frac{r \cdot Q_p}{V_s}} \quad [1]$$

- where: *Dist* is the forebay length (m)
r is the minimum length-to-width ratio of the forebay (2:1 or *r* = 2)
Q_p is the pond's peak discharge (0.027 m³/s, VO5 modelling of 25 mm storm)
V_s is the settling velocity (0.0003 m/s for 150 µm particles)

Solving [1] gives:

$$Dist = \sqrt{\frac{2 \times 0.027}{0.0003}} = 13.4 \text{ m}$$

The recommended forebay length based on flow dispersion calculations is calculated using the following expression:

$$Dist = \frac{8 \cdot Q}{d \cdot V_f} \quad [2]$$

where: *Dist* is the forebay length (m)
Q is the peak inlet flow (3.097 m³/s, VO modeling of 5-year storm)
d is the depth of the permanent pool in the forebay (2.00 m)
V_f is the desired velocity in the forebay (0.50 m/s)

Solving [2] gives:

$$Dist_w = \frac{8 \times 3.097}{2.00 \times 0.50} = 24.8 \text{ m}$$

The distance from the headwall to the forebay berm is 28 m; therefore, the proposed design satisfies the minimum forebay length recommendations.

The minimum recommended forebay bottom width is calculated as follows, based on the maximum distance from the calculations above:

$$Width = \frac{Dist}{8} = \frac{24.8}{8} = 3.1 \text{ m}$$

The design proposes an average forebay bottom width of 8.0 m, which satisfies this criterion.

South SWM Pond

Using the methodology provided in the Stormwater Management Planning and Design Manual, the minimum recommended forebay length based on particulate settling is calculated using the following expression:

$$Dist = \sqrt{\frac{r \cdot Q_p}{V_s}} \quad [1]$$

where: *Dist* is the forebay length (m)
r is the minimum length-to-width ratio of the forebay (2:1 or *r* = 2)
Q_p is the pond's peak discharge (0.012 m³/s, VO modelling of 25 mm storm)
V_s is the settling velocity (0.0003 m/s for 150 µm particles)

Solving [1] gives:

$$Dist = \sqrt{\frac{2 \times 0.012}{0.0003}} = 8.9 \text{ m}$$

The recommended forebay length based on flow dispersion calculations is calculated using the following expression:

$$Dist = \frac{8 \cdot Q}{d \cdot V_f} \quad [2]$$

where: *Dist* is the forebay length (m)
Q is the peak inlet flow (1.477 m³/s, VO5 modeling of 5-year storm)
d is the depth of the permanent pool in the forebay (2.00 m)
V_f is the desired velocity in the forebay (0.50 m/s)

Solving [2] gives:

$$Dist_w = \frac{8 \times 1.477}{2.00 \times 0.50} = 11.8 \text{ m}$$

The distance from the headwall to the forebay berm is 43 m; therefore, the proposed design satisfies the minimum forebay length recommendations.

The minimum recommended forebay bottom width is calculated as follows, based on the maximum distance from the calculations above:

$$Width = \frac{Dist}{8} = \frac{11.8}{8} = 1.5 \text{ m}$$

The design proposes an average forebay bottom width of 4.0 m, which satisfies this criterion.

5.3.2 Erosion Control

In accordance with the ORCA guidelines, erosion control shall be provided using an extended detention active storage zone sized to capture the runoff resulting from a 25 mm rainfall event (the 25 mm Chicago storm distribution) and to release the runoff over a period of at least 24 hours (48-hours preferred).

North SWM Pond

Based on hydrologic modelling of the 25 mm storm using the VO5 model, the estimated runoff volume is 12.87 mm distributed over the 23.89 ha catchment area draining to the North SWM Pond, for a required extended detention capture volume of 3,075 m³. The available volume provided in the extended detention storage zone, up to the elevation of 247.80, is approximately 3,113 m³, which meets the volumetric criterion. The proposed extended detention depth is 0.80 m, which is less than the maximum recommended extended detention depth of 1.00 m.

The required detention time and release rate will be achieved using an orifice plate installed within the pond outlet control structure. Based on the calculations below, the drawdown time for the North SWM Pond is approximately 51.4 hours with a 125 mm diameter orifice, which meets the minimum 24-hour release criteria.

The drawdown time can be calculated using the following expressions, from the *Stormwater Management Planning and Design Manual*:

$$t_d = \frac{0.66 \cdot C_2 \cdot h_1^{1.5} + 2 \cdot C_3 \cdot h_1^{0.5}}{2.75 \cdot A_o} \quad [4]$$

where: t_d is the drawdown time (s)
 h is the maximum water elevation above the orifice (0.7375 m)
 A_o is the cross-sectional area of the orifice (0.012272 m²)
 C_2 is the slope coefficient from area-depth linear regression (1431.3)
 C_3 is the intercept from area-depth linear regression (3288.0)

The variable h is the maximum water elevation above the centroid of the orifice and is calculated as follows (invert of orifice set at normal water level):

$$h_1 = HWL_{25mm} - \left[NWL + \frac{D}{2} \right] = 247.80 - \left[247.00 + \frac{0.125}{2} \right] = 0.7375 \text{ m}$$

where: HWL_{25mm} is the high water level for the 25 mm rainfall (247.80 m)
 NWL is the normal water level (247.00 m)
 D is the diameter of the orifice (0.125 m)

Solving [4] yields:

$$t_d = \frac{0.66 \times (1431.3) \times (0.7375)^{1.5} + 2 \times (3288.0) \times (0.7375)^{0.5}}{2.75 \times (0.012272)} = 185,068 \text{ s} = 51.4 \text{ h}$$

The orifice size, erosion control release rate, draw down time, extended detention volume and water level are summarized in **Table 5A**.

South SWM Pond

Based on hydrologic modelling of the 25 mm storm using the VO5 model, the estimated runoff volume is 12.16 mm distributed over the 10.88 ha catchment area draining to the South SWM Pond, for a required extended detention capture volume of 1,323 m³. The available volume provided in the extended detention storage zone, up to the elevation of 246.10, is approximately 1,563 m³, which meets the volumetric criterion. The proposed extended detention depth is 0.60 m, which is less than the maximum recommended extended detention depth of 1.00 m.

The required detention time and release rate will be achieved using an orifice plate installed within the pond outlet control structure. Based on the calculations below, the drawdown time for the South SWM Pond is approximately 52.0 hours with a 95 mm diameter orifice, which meets the minimum 24-hour release criteria.

The drawdown time can be calculated using the following expressions, from the *Stormwater Management Planning and Design Manual*:

$$t_d = \frac{0.66 \cdot C_2 \cdot h_1^{1.5} + 2 \cdot C_3 \cdot h_1^{0.5}}{2.75 \cdot A_o} \quad [4]$$

where: t_d is the drawdown time (s)
 h is the maximum water elevation above the orifice (0.5525 m)
 A_o is the cross-sectional area of the orifice (0.007088 m²)
 C_2 is the slope coefficient from area-depth linear regression (1293.3)
 C_3 is the intercept from area-depth linear regression (2217.0)

The variable h is the maximum water elevation above the centroid of the orifice and is calculated as follows (invert of orifice set at normal water level):

$$h_1 = HWL_{25mm} - \left[NWL + \frac{D}{2} \right] = 246.10 - \left[245.50 + \frac{0.095}{2} \right] = 0.5525 \text{ m}$$

where: HWL_{25mm} is the high water level for the 25 mm rainfall (246.10 m)
 NWL is the normal water level (245.50 m)
 D is the diameter of the orifice (0.095 m)

Solving [4] yields:

$$t_d = \frac{0.66 \times (1293.3) \times (0.5525)^{1.5} + 2 \times (2217.0) \times (0.5525)^{0.5}}{2.75 \times (0.007088)} = 187,064 \text{ s} = 52.0 \text{ h}$$

The orifice size, erosion control release rate, draw down time, extended detention volume and water level are summarized in **Table 5B**.

5.3.3 Quantity Control

As per the ORCA and the Township's standards, the SWM ponds shall be designed to control the post-development peak flow to pre-development levels for the 2-year through 100-year design storms and to safely convey the Regional flow.

A preliminary analysis of pond storage requirements based on the 6-hr, 12-hr and 24-hr SCS storm distribution, the 6-hr, 12-hr and 24-hr AES storm distribution and the 4-hour Chicago storm distribution was completed using the VO5 model to determine the critical storm distribution (see **Table E.10**). Based on this analysis, the 6-hour SCS storm requires the largest storage volume, for both SWM ponds. Therefore, the 6-hour SCS storm distribution was determined to be the critical storm and was used to design both SWM ponds. The design storms were created using the 2014 City of Peterborough airport IDF data.

Tables 4A and **4B** show the VO5 simulation results for pre- and post-development drainage to the north and south, respectively. **Tables 5A** and **5B** show the SWM facility performance characteristics for each return period event based on the preliminary rating curve for the North and South SWM Ponds, respectively. As shown

in **Tables 4A** and **4B**, the peak discharge rates are equal to or less than the target release rates.

It is to be noted that **Tables 4A & 4B** also includes the foundation drainage discharge, estimated at 0.075 L/s/lot. In order to be conservative at the preliminary design stage, no flow reduction has been applied to the foundation drainage discharge in order to demonstrate that the pre-development flow targets will not be exceeded. For the north drainage area, the foundation drainage discharge is estimated at 0.023 m³/s for 305 lots, and for the south drainage area, the foundation drainage discharge is estimated at 0.016 m³/s for 214 lots.

Table 4B also includes the discharge from the sanitary treatment plant (0.050 m³/s per **Table C1** in **Appendix C**), assuming no flow reduction in order to be conservative, to demonstrate that the total peak flow to the south does not exceed the pre-development flow targets.

The preliminary rating curve includes a control structure consisting of various orifices and an emergency spillway. The actual pond performance will be finalized and confirm at the detailed design stage. The preliminary rating curve is presented in **Table E.6** which is included in **Appendix “E”** together with the VO5 model schematic, catchments and modelling output.

North SWM Pond

The North SWM Pond has been designed with a total active storage volume of 9,165 m³ at an elevation of 249.00 m. The expected maximum storage required during 100-year storm conditions is approximately 8,027 m³. The provided active storage for the pond is therefore sufficient.

**Table 4A. Summary of Storm Drainage Peak Flows to the North
(Flow Node #1)**

Return Period	Existing Peak Flows (m ³ /s)	Discharge from South SWM Pond (m ³ /s)	Discharge from Foundation Drainage (m ³ /s)	Proposed Peak Flow (m ³ /s)
25mm Chicago	-	0.069	0.023	0.092
2-year	0.488	0.319		0.342
5-year	0.916	0.829		0.852
10-year	1.241	1.192		1.215
25-year	1.683	1.607		1.630
50-year	2.035	1.868		1.891
100-year	2.401	2.118		2.140

South SWM Pond

The South SWM Pond has been designed with a total active storage volume of 6,570 m³ at an elevation of 247.50 m. The expected maximum storage required during 100-

year storm conditions is approximately 3,820 m³. The provided active storage for the pond is therefore sufficient.

**Table 4B. Summary of Storm Drainage Peak Flows to the South
(Flow Node #2)**

Return Period	Existing Peak Flows (m ³ /s)	Discharge from South SWM Pond (m ³ /s)	Discharge from Foundation Drainage (m ³ /s)	Discharge from Sanitary Treatment Plant (m ³ /s)	Proposed Peak Flow (m ³ /s)
25mm Chicago	-	0.012	0.016	0.050	0.078
2-year	0.275	0.092			0.158
5-year	0.523	0.271			0.337
10-year	0.713	0.435			0.501
25-year	0.975	0.651			0.717
50-year	1.183	0.810			0.876
100-year	1.399	0.946			1.012

5.3.4 Thermal Mitigation Measures

Mitigation measures shall be incorporated into the SWM pond design to minimize thermal impacts to the receiving watercourse. These measures include a bottom draw pipe and a planting strategy to promote shading along the pond perimeter.

Bottom Draw Pipe

Instead of the common perforated riser configuration, a bottom draw pipe will be implemented for the extended detention component to discharge water from the deepest section of the pond where the water temperature is lowest. This outlet consists of a submerged intake headwall and a bottom draw pipe which discharges via an orifice plate in the quality control structure. Given that this pipe is sized for frequent rainfall events (25mm storm), it will provide the greatest benefit to the thermal regime of the receiving watercourse.

Planting Strategy

In accordance with the Township and ORCA requirements, the SWM facility will be planted to provide a natural appearance and to provide environmental benefits. The landscape plan will specify shade producing species to minimize solar heating of the permanent pool during summer months. The forebay design provides additional pond perimeter where shade producing vegetation can be planted.

5.3.5 SWM Pond Inspection & Maintenance

The SWM ponds should be inspected periodically to determine the frequency of maintenance activities. As such, maintenance activities will be performed on an as-required basis. During the first two years of operation, it is recommended that the

stormwater management facility be inspected following significant storm events to determine if and when maintenance activities are required. Subsequently, inspections should be carried out twice per year. The following items should be considered when inspecting the pond:

- Sediment accumulation to determine cleanout requirements;
- Erosion of side slopes and outfall channel;
- Safety hazards;
- Hydraulic operation of the pond;
- Drawdown time following a rainfall event (extended drawdown time greater than 52 hours may indicate a blocked orifice or intake);
- Condition of terrestrial and aquatic vegetation;
- Trash accumulation near hydraulic structures; and
- Surface sheen indicating possible oil contamination.

Table 5A: North SWM Pond Performance Summary

Quality Control		
Permanent Pool	Protection Level	Level 1 (Enhanced)
	Permanent Pool Required (m ³)	3,862
	Permanent Pool Provided (m ³)	4,429
	Normal Water Level, NWL (m)	247.00

Erosion Control		
25-mm 4-hour Chicago	Orifice Size (mm)	125
	Draw Down Time (hrs)	51.4
	Flow In (m ³ /s)	1.168
	Flow Out (m ³ /s)	0.027
	Storage Used (m ³)	2,808
	Pond W.S. Elevation (m)	247.73

Quantity Control		
2 Year Storm Event	Flow in (m ³ /s)	2.144
	Flow Out (m ³ /s)	0.209
	Storage Used (m ³)	3,838
	Pond W.S. Elevation (m)	247.96
5 Year Storm Event	Flow in (m ³ /s)	3.097
	Flow Out (m ³ /s)	0.581
	Storage Used (m ³)	4,781
	Pond W.S. Elevation (m)	248.16
10 Year Storm Event	Flow in (m ³ /s)	3.764
	Flow Out (m ³ /s)	0.841
	Storage Used (m ³)	5,425
	Pond W.S. Elevation (m)	248.29
25 Year Storm Event	Flow in (m ³ /s)	4.628
	Flow Out (m ³ /s)	1.141
	Storage Used (m ³)	6,388
	Pond W.S. Elevation (m)	248.48
50 Year Storm Event	Flow in (m ³ /s)	5.435
	Flow Out (m ³ /s)	1.309
	Storage Used (m ³)	7,183
	Pond W.S. Elevation (m)	248.64
100 Year Storm Event	Flow in (m ³ /s)	6.127
	Flow Out (m ³ /s)	1.462
	Storage Used (m ³)	8,027
	Pond W.S. Elevation (m)	248.79
Regional (Timmins)	Flow in (m ³ /s)	2.444
	Flow Out (m ³ /s)	1.547
	Storage Used (m ³)	8,846
	Pond W.S. Elevation (m)	248.94

Table 5B: South SWM Pond Performance Summary

Quality Control		
Permanent Pool	Protection Level	Level 1 (Enhanced)
	Permanent Pool Required (m ³)	1,759
	Permanent Pool Provided (m ³)	2,710
	Normal Water Level, NWL (m)	245.50

Erosion Control		
25-mm 4-hour Chicago	Orifice Size (mm)	95
	Draw Down Time (hrs)	52.0
	Flow In (m ³ /s)	0.540
	Flow Out (m ³ /s)	0.012
	Storage Used (m ³)	1,211
	Pond W.S. Elevation (m)	245.98

Quantity Control		
2 Year Storm Event	Flow in (m ³ /s)	1.007
	Flow Out (m ³ /s)	0.065
	Storage Used (m ³)	1,772
	Pond W.S. Elevation (m)	246.17
5 Year Storm Event	Flow in (m ³ /s)	1.477
	Flow Out (m ³ /s)	0.201
	Storage Used (m ³)	2,270
	Pond W.S. Elevation (m)	246.33
10 Year Storm Event	Flow in (m ³ /s)	1.810
	Flow Out (m ³ /s)	0.331
	Storage Used (m ³)	2,580
	Pond W.S. Elevation (m)	246.42
25 Year Storm Event	Flow in (m ³ /s)	2.343
	Flow Out (m ³ /s)	0.516
	Storage Used (m ³)	3,048
	Pond W.S. Elevation (m)	246.56
50 Year Storm Event	Flow in (m ³ /s)	2.696
	Flow Out (m ³ /s)	0.651
	Storage Used (m ³)	3,428
	Pond W.S. Elevation (m)	246.67
100 Year Storm Event	Flow in (m ³ /s)	3.058
	Flow Out (m ³ /s)	0.750
	Storage Used (m ³)	3,820
	Pond W.S. Elevation (m)	246.78
Regional (Timmins)	Flow in (m ³ /s)	1.099
	Flow Out (m ³ /s)	0.802
	Storage Used (m ³)	4,056
	Pond W.S. Elevation (m)	246.85

5.4 Site Water Balance

In accordance with the requirements of the ORCA, a site water balance assessment for the subject development area was completed by GHD Ltd. and included in the Hydrogeological Assessment Report (March 28, 2021). The goal of the water balance assessment is to determine the overall infiltration deficit under proposed conditions and to design infiltration mitigation measures as part of an overall mitigation strategy to maintain pre-development infiltration volumes. The water balance assessment was completed based on the preliminary draft plan with a total site area of 49.22 ha. Excerpts from the GHD letter report regarding the water balance analysis are included in **Appendix “F”**. The findings of the GHD water balance analysis are summarized below.

5.4.1 Pre-Development Infiltration Volume

For the pre-development condition, a total estimated infiltration of 70,356 m³/year for the site was determined.

5.4.2 Post-Development Infiltration Volume (Unmitigated)

For the post-development condition, without infiltration enhancements, a total estimated infiltration of 42,674 m³/year for the site was determined. This corresponds to a total infiltration deficit of 27,682 m³/year, a 39% decrease in annual infiltration compared to the pre-development condition.

The decrease in annual infiltration indicates the need for Low Impact Development (LID) strategies be implemented in order to maintain pre-development infiltration rates. The LID measures that are proposed in order to meet the infiltration deficit include roof downspout disconnections and infiltration trenches. The design of these LID measures is presented below.

5.4.3 Proposed Infiltration BMP – Roof Downspout Disconnection

As per *Section 4.3 – Roof Downspout Disconnection of the Low Impact Development Stormwater Management Planning and Design Guide* (Credit Valley Conservation, Toronto and Region Conservation, 2010), roof downspout disconnection is a common practice to achieve water balance benefits. In order to achieve the required infiltration, roof downspout disconnections must meet the following design criteria:

- *Available Space: Simple downspout disconnection requires a minimum flow path length across the pervious area (at least 5 metres) and suitable soil conditions. If the flow path length is less than 5 metres and soils are hydrologic soil group (HSG) C or D, roof downspouts should be directed to another LID practice such as a rainwater harvesting system, soakaway, swale, bioretention area or perforated pipe system.*

In order to meet this design criteria, houses will be required to direct roof downspouts to a discharge location a minimum distance of 5 m from the road right-of-way or rear-lot catchbasins. It is assumed that

all rear-draining roofs, as well as front-draining roofs on rear-draining lots, will achieve the minimum flow path length required.

Based on the hydrologic modelling completed for this site, the soil is classified as Otonabee Loam and falls into hydrologic soil group B, which is considered to be acceptable for roof downspout disconnections.

- *Site Topography: Disconnected downspouts should discharge to a gradual slope that conveys runoff away from the building. The slope should be between 1% and 5%. Grading should discourage flow from reconnecting with adjacent impervious surfaces.*

Lot grades will generally vary between 2-5%, which meets this criterion. Grading will be designed to discourage flow from reconnecting with adjacent impervious surfaces for a minimum of 5 m for the downspout discharge location.

- *Soils: If the infiltration rate of soils in the pervious area is less than 15 mm/hr (i.e., hydraulic conductivity less than 1×10^{-6} cm/s), they should be tilled to a depth of 300 mm and amended with compost to achieve an organic content in the range of 8 to 15% by weight or 30 to 40% by volume.*

As discussed in Section 4.2.5 – *Infiltration Testing* of the *Hydrogeological Assessment Report*, in-situ infiltration testing was completed at two locations. The measured infiltration rates varied between 12 and 50 mm/hr. The average infiltration rate will therefore be greater than 15 mm/hr and is considered acceptable.

However, it is noted that significant compaction of soils can occur during home building and that topsoil depths are typically not monitored. In order to address this issue, a minimum topsoil depth of 150 mm will be specified for pervious lot areas, and topsoil is to only be placed after the completion of construction works to minimize the extent of potential compaction within the soil profile. Topsoil shall be inspected for compaction prior to sodding and scarification will be provided as required.

- *Drainage Area: For simple downspout disconnection the roof drainage area should not be greater than 100 square metres.*

It is assumed that front- and rear-draining roofs will be serviced by separate roof downspouts (i.e. a total of two roof downspouts per lot). For lots in which the roof drainage area to a single downspout is greater than 100 m², a maximum roof area of 100 m² is considered applicable for the roof downspout disconnection benefit.

Based on the draft plan of subdivision there are a total of 201 residential lots with 10.7 m of frontage (average roof area of 140 m², 70 m² draining to the rear), 113 lots

with 13.7 m of frontage (average roof area of 170 m², 85 m² draining to the rear), 57 lots with 15.7 m of frontage (average roof area of 190 m², maximum assumed area of 95 m² draining to the rear) and 148 townhouse lots (average roof area of 120 m², 60 m² draining to the rear). The total residential roof area draining to the rear is therefore 37,970 m² (3.797 ha).

Section 4.3 – Roof Downspout Disconnection of the Low Impact Development Stormwater Management Planning and Design Guide indicates that “a conservative runoff reduction rate estimate for roof downspout disconnection is 25% for hydrologic soil group (HSG) C and D soils and 50% for HSG A and B soils. These values apply to disconnections that meet the physical suitability and constraints criteria outlined in this section.” As demonstrated above, the roof downspout disconnection design and applicable roof area meet the outlined design requirements and conditions for hydrologic soil group A and B soils. A runoff reduction of 50%, and the corresponding infiltration volume of 50%, is therefore considered acceptable.

Based on an annual precipitation depth of 855 mm (as per the *Hydrogeological Assessment Report*), and assuming 10% evaporation from roofs, the annual surplus from rear-draining roof areas is 29,218 m³/yr (855 mm/yr x 0.90 x 37,970 m² = 29,218 m³/yr).

Assuming an infiltration rate of 50% (corresponding to a runoff reduction of 50% for HSG B soils), the infiltration volume is therefore 14,609 m³/yr (29,218 m³/yr x 0.50 = 14,609 m³/yr).

Roof downspout disconnection will account for an annual infiltration volume of 14,609 m³/yr, which will reduce the post-development infiltration deficit from 27,682 m³/yr to 13,073 m³/yr.

5.4.4 Proposed Infiltration BMP – Infiltration Facilities

In an effort to better match the existing infiltration volumes, enhanced infiltration BMPs in the form of infiltration trenches or soakaway pits are required. These measures will serve to further promote the infiltration of runoff from the proposed development in order to maintain the pre-development water balance.

The precise location of where these infiltration facilities will be implemented will be evaluated in greater detail at the detailed design stage, once the grading plan has been finalized. Due to the relatively shallow groundwater depths within the subject development, infiltration LIDs can only be implemented where a minimum separation of 1 m can be achieved between the bottom of the LID and the high groundwater level.

The water balance calculations will be revised at detailed design once the final subdivision configuration and grading plan has been confirmed. The engineering plans will include the locations of all infiltration LIDs.

6.0 VEHICULAR & PEDESTRIAN ACCESS

The layout of the proposed subdivision has been developed with consideration for efficient and safe access and circulation of both vehicular and pedestrian traffic.

6.1 Municipal Roads

The subject site has frontage on Fallis Line which is an original 20.0m wide concession road which is operated and maintained by the Township. This municipal road allowance consists of a two lane rural paved road with roadside ditches.

The vehicular access to the subdivision will be facilitated by a connection Fallis Line as well as to Pristine Trail which was constructed in the adjacent subdivision to the east. The municipal roads will have an 8.5m pavement, crowned with 2% cross fall and edged with concrete curb and gutter. The longitudinal slope of the road will generally be 0.50% with some length of road ranging up to 5% slope. A copy of a typical road cross section is included in **Appendix "G"**.

Based on the recommendations contained in the Geotechnical Investigation Report for the site, the recommended minimum pavement structure for the proposed roads is as follows:

Municipal Roads

<u>Material</u>	<u>Compacted Depth</u>
HL3 Surface Course Asphalt	40mm
HL8 Base Course Asphalt	50mm
Granular "A"	150mm
Granular "B"	450mm

6.2 Driveways

Each dwelling will have an attached garage and driveway. The recommended pavement structure for the residential driveways is as follows:

Driveways

<u>Material</u>	<u>Compacted Depth</u>
HL3 Surface Course Asphalt	40mm
Granular "A"	150mm

The residential driveways will be either single or double car width. The slope of driveways is to be within the range of 1.0% to 7.0% in accordance with Township criteria.

6.3 Sidewalks, Walkways & Trails

Internal pedestrian access will be provided by standard 1.5m wide concrete sidewalks to safely guide residents through the subdivision for access to the proposed sidewalks on Fallis Line as well as the proposed sidewalks within the adjacent subdivision to the east. Sidewalks will be generally be constructed on one side of each road.

Walkway blocks will be provided at the south end of Street "A" as well as on the south side of Street "M" to facilitate access to the open space lands. Standard details for the sidewalk including details for the required tactile walking surface indicators is included in **Appendix "G"**.

7.0 GRADING

As is typical will all subdivision, earthmoving is required, to varying degrees, in order to achieve the municipal design criteria and accommodate the development form.

7.1 Grading Criteria

The subject site is to be graded in accordance with the Township grading criterion which dictates that road grades are to range from 0.5% to 5.0% and that sodded yard areas are to range from 2.0% to 5.0%. For large grade differentials, a maximum slope 3H : 1V can be used for sodded embankments. In areas where space is limited, retaining walls can be utilized to accommodate grade differentials, however, their use should be minimized.

7.2 Preliminary Design

Based on the topographic survey, the proposed subdivision configuration and the Township's criteria, a preliminary grading design has been prepared. The preliminary grading design, considered the following factors:

- Achieve the Township's lot grading criteria.
- Meet the Township's vertical road design parameters.
- Minimize the requirement for retaining walls.
- Match existing grades along the adjacent properties and road allowances.
- Grading along existing road allowances is to have consideration for their future urbanization and grades are to be established to accommodate future boulevard slopes in the range of 2 to 4%.
- Provide an overland flow route to direct drainage to a safe outlet.
- Provide sufficient cover over the sanitary sewer.

The design is provided on the **Preliminary Servicing & Grading Plan**. An analysis of the earthworks will be conducted using digital terrain modelling software at the detailed design stage to optimize the cut and fill volumes in an effort to achieve a balance. Based on the preliminary design, no significant difficulties are anticipated in achieving the municipal grading design standards.

7.3 Permitting

A review of the Regulation Mapping indicates that the subject site is located within an area that is regulated by the ORCA. A grading permit is therefore required from their office under Ontario Regulation 166/06 prior to commencing topsoil stripping and earthworks. The permit application should be submitted in conjunction with the detailed design at the subdivision engineering stage.

8.0 EROSION & SEDIMENT CONTROL DURING CONSTRUCTION

Construction activity, especially operations involving the handling of earthen material, dramatically increases the availability of particulate matter for erosion and transport by surface drainage. In order to mitigate the adverse environmental impacts caused by the release of silt-laden stormwater runoff into receiving watercourses, measures for erosion and sediment control are required for construction sites. This is an extremely important component of land development that plays a large role in the protection of downstream watercourses and aquatic habitat.

The impact of construction on the environment is recognized by the Greater Golden Horseshoe Area Conservation Authorities. In December 2006 they released their document titled Erosion & Sediment Control Guidelines for Urban Construction (ESC Guideline). This document provides guidance for the preparation of effective erosion and sediment control plans.

Control measures must be selected that are appropriate for the erosion potential of the site and it is important that they be implemented and modified on a staged basis to reflect the site activities. Furthermore, their effectiveness decreases with sediment loading and therefore inspection and maintenance is required. The selection, implementation, inspection and maintenance of the control features are summarized as follows:

8.1 Control Measures

On relatively large sites, measures for erosion and sediment control typically include the use of sediment control basins, silt fencing, a mud mat and sediment traps. The following is a description of the sediment controls to be implemented on the subject site:

- **Temporary Sediment Control Basins** are commonly used to clarify silt-laden stormwater runoff by promoting sedimentation of the suspended particles in the runoff through long detention times. The proposed SWM ponds will be utilized as temporary sediment control basins during construction. The basins are to be sized in accordance with the ESC Guideline based on a required storage volume of 250 m³ per hectare of disturbed area (125 m³/ha of permanent pool and 125 m³/ha of active storage). The basins' outlets are to have a Hickenbottom riser and a minimum 75 mm diameter orifice plate sized to provide a drawdown time in the order of 48 hours.
- **Silt Fences** are to be installed adjacent to all property limits subject to drainage from the development area prior to topsoil stripping and in other locations, such as at the bases of topsoil stockpiles. It is recommended that earthworks not extend immediately adjacent to the silt fence and instead 1m to 2m vegetated buffer be maintained for additional protection. The silt fences are to be constructed with 150 x 150mm wire farm fence fabric to properly support the geotextile. Heavy duty silt fence is recommended to be installed adjacent the South Wetland consisting of two rows of fence with a row of staked straw bales between.
- **Mud Mat** is to be installed at the construction entrance prior to commencing earthworks to minimize the tracking of mud onto municipal roads.
- **Sediment Traps** are to be installed at all catchbasin locations once the storm sewer system has been constructed to prevent silt laden runoff from entering.

- **Rock Check Dams** are to be constructed in swales and ditches to reduce velocities and trap sediment.

A set of Erosion and Sediment Control Plans are to be prepared at the detailed engineering design stage to reflect the various construction stages. Details of typical erosion and sediment control measures are included in **Appendix “I”**.

8.2 Construction Sequencing

The following is a summary of the scheduling of construction activities and the related implementation of sediment controls:

Stage 1 – Subdivision Earthworks

1. Construct mud mat for temporary construction access.
2. Install primary silt fencing around the limits of grading and secondary silt fencing along the south limit of the work area adjacent the existing wetland.
3. Install temporary swales and rock check dams.
4. Excavate and construct the temporary sediment basins including installation of hickenbottom drain and spillway and connect to temporary swales.
5. Strip any remaining topsoil, stockpile where indicated and install silt fence around the perimeter.
6. Rough grade the site by placing cut material in fill areas and spreading and compacting of imported fill. Maintain the mud mat to minimize the tracking of silt onto the municipal road and provide street sweeping as necessary.

Stage 2 – Subdivision Servicing & Road Construction

1. Install underground servicing, covering the end of the pipe at the end of each work day to ensure that silt does not enter the storm sewer.
2. Construct roads, install sediment controls on catchbasins and install temporary hickenbottom drains at low point of lot blocks.

Stage 3 – House Construction

1. Construct houses and maintain all sediment controls including regular street sweeping and catchbasin cleaning.
2. Stabilize all lot surfaces as soon as possible after completion of the houses.
3. Remove silt fencing on a phased basis as areas are stabilized.

8.3 ESC Inspection & Maintenance

In order to ensure that the erosion and sediment control measures operate effectively, they are to be regularly monitored and they will require periodic cleaning (e.g., removal of accumulated silt), maintenance and/or re-construction.

Inspections of all of the erosion and sediment controls on the construction site should be undertaken with the following frequency:

- On a weekly basis
- After every rainfall event
- After significant snow melt events
- Prior to forecasted rainfall events

If damaged control measures are found they should be repaired and/or replaced within 48 hours. Site inspection staff and construction managers should refer to the Erosion and Sediment Control Inspection Guide (2008) prepared by the Greater Golden Horseshoe Area Conservation Authorities. This Inspection Guide provides information related to the inspection reporting, problem response and proper installation techniques.

9.0 UTILITIES

While some external upgrades may be necessary by the utility providers, it is anticipated that utilities such as hydro, natural gas, cable television, and telephone service will be available to service the subject development. As per standard practice in subdivisions, utilities will be installed underground. Co-ordination with the local hydro authority, Hydro One Networks Inc., and the various utility companies including Enbridge Gas Distribution Inc. (natural gas) and Nexicom Inc. (cable & telephone) will be undertaken at the detailed engineering design stage to determine appropriate locations for pedestals, transformers and street lights.

It is recommended that the utility installation be in the form of a four party joint trench. The process of joint trenching allows all of the utility companies to co-ordinate the placement of their lines in a common trench excavated by a single utility contractor. Four party joint trenching maximizes the efficiency of the available area in the utility corridor and provides for a safe installation. A copy of a typical four party joint trench detail is included in **Appendix "J"**.

10.0 SUMMARY

Based on the analysis contained herein, the proposed residential subdivision can be adequately serviced with full municipal services (watermain, wastewater and storm) in accordance with the standards of the Township of Cavan Monaghan, the County of Peterborough and the Otonabee Region Conservation Authority design criteria and consists of the following:

Water

- The community of Millbrook is currently serviced by a well based water system with a treatment plant and water storage tank. A trunk watermain was constructed on County Road 10 which extends to a water storage tank located on the existing site of the municipal offices. This trunk system feeds the existing subdivision to the west including as well as the existing Fallis Line watermain. It is proposed to service the subject subdivision via the extension of the 250mm diameter Fallis Line watermain as well as a connection to the 250mm diameter water on the road stub of Pristine Trail in the adjacent subdivision. There is sufficient reserve capacity in the existing system to service additional lands with plans by the Municipality to expand the existing water treatment supply as per the Growth Management Study and Master Servicing Strategy currently underway.
- The water service connections for the individual detached dwelling units will be 25mm diameter.

Waste Water

- It is proposed to service the lots on Street "A" via a connection to the existing 250mm diameter sanitary sewer on Pristine Trail at the east limit of the subject site with the balance of the site to be serviced by a new WWTP to be constructed within the subject site.
- Availability of treatment capacity to service new development in the existing WWTP is currently being reviewed by the Township of Cavan Monaghan and based on the information available to date there is sufficient reserve capacity to service a population increase of approximately 1,300 with further planned expansion. In addition, the Township has been searching for a location to construct a new treatment facility in order to meet its projected growth target over the long term. A second treatment facility is therefore being proposed on the subject site to service the subject lands which can be phased to also service future development. Treatment capacity will therefore be available either through the existing WWTP or the proposed WWTP and it will be a condition of development that will need to be satisfied for registration and release of building permits. As such it is expected that prior to approval there will be sufficient planned capacity in a centralized waste water treatment facility to service the proposed development.
- The subject site will be serviced by a local sanitary system consisting of 200mm diameter sewers. Each dwelling unit will be provided with a 100mm diameter single connection in accordance with Township standards.

Storm Drainage

- The subject site is located in the Baxter Creek subwatershed. The Baxter Creek drains to the Otonabee River which discharges to Rice Lake.

- In accordance with Township criteria, the subject site will be serviced by minor system comprised of a municipal storm sewer sized for the 5-year storm event. The storm sewer system will outlet to one of two SWM ponds.
- The major system will be comprised of an overland flow route which will convey runoff from rainfall events in excess of the capacity of the municipal storm sewer to a safe outlet.

Stormwater Management

- Two SWM ponds will be constructed to service the subject property, for drainage to the north and to the south. These facilities have been designed as wet ponds to provide Enhanced (Level 1) water quality treatment, extended detention for erosion control and flood control using the calculated pre-development flow targets up to and including the 100-year storm event. The SWM ponds consists of a sediment forebay and a main cell separated by a forebay berm.
- Thermal mitigation measures are to be incorporated in the design of the SWM ponds, including bottom draw pipe and a planting strategy to provide shading around the pond perimeter.
- A site water balance assessment has been undertaken to ensure that pre-development infiltration volumes are maintained. Based on the analysis it was determined that the pre-development infiltration volumes can be achieved through a combination of roof downspout disconnections and enhanced infiltration measures such as infiltration trenches, which will be designed at detailed design.

Vehicular & Pedestrian Access

- Vehicular access to the subject site will be provided by a road connection to Fallis Line as well as a road connection to Pristine Trail in the adjacent subdivision to the east.
- The proposed local roads will be constructed to urban standards having an 8.5m pavement width within 18.0m and 20.0m wide road allowances.
- Pedestrian access will be provided by 1.5m wide concrete sidewalks which are to be generally located on one side of each road. In addition, walkway connections will be provided to the open space lands to the south

Grading

- As is typical with large subdivision projects, earthmoving will be required to achieve the proposed subdivision grading necessary to meet the criteria of the Township. A detailed analysis of the earthworks will be conducted at the detailed design stage to optimize the cut and fill volumes. Based on the preliminary design, no significant difficulties are anticipated in achieving the municipal grading design standards.
- Since the subject site is located in an area which regulated by the ORCA, a permit will be required from their office prior to commencing earthworks.

Erosion & Sediment Control During Construction

- Erosion and sediment control (ESC) measures are to be implemented during construction to prevent silt laden runoff downstream in accordance with the Erosion & Sediment Control Guidelines for Urban Construction (December 2006). The ESC plans are to be prepared at the detailed engineering design stage and are to reflect the various construction stages.

Subdivision Engineering Design

- Detailed design for the proposed development is to be prepared at the subdivision engineering stage. This detailed design is to include servicing and grading plans as well as a stormwater management report based on the criteria established in this Functional Servicing Report.

11.0 REFERENCES & BIBLIOGRAPHY

- Township of Cavan Monaghan, **Municipal Servicing Standards**, April 2017.
- Ontario Ministry of Environment, **Stormwater Management Planning and Design Manual**, March 2003.
- Ontario Ministry of Transportation, **Drainage Management Manual**, 1997.
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- Toronto and Region Conservation Authority, Credit Valley Conservation, **Low Impact Development Stormwater Management Planning and Design Guide**, 2010.
- GHD Inc., **Geotechnical Investigation Report, Proposed Subdivision Development, 787 and 825 Fallis Line, Millbrook, Ontario**, March 23, 2021.
- GHD Inc., **Hydrogeological Assessment Report, Proposed Subdivision Development, 787 and 825 Fallis Line, Millbrook, Ontario**, March 28, 2021.
- Biglieri Group Ltd., **Draft Plan of Subdivision, 787-825 Fallis Line West, Township of Cavan Monaghan**, December 15, 2021.

Respectfully Submitted,

VALDOR ENGINEERING INC.



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Senior Project Manager, Principal

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MILLBROOK SOUTH WEST SUBDIVISION

LOCATION MAP



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E-MAIL: info@valdor-engineering.com
www.valdor-engineering.com

SCALE N.T.S.

DATE Jan, 2022

PROJECT 16119

DRAWN BY V.L.

FIGURE 1



MILLBROOK SOUTH WEST SUBDIVISION

WATER SERVICING EXTERNAL



VALDOR ENGINEERING INC.
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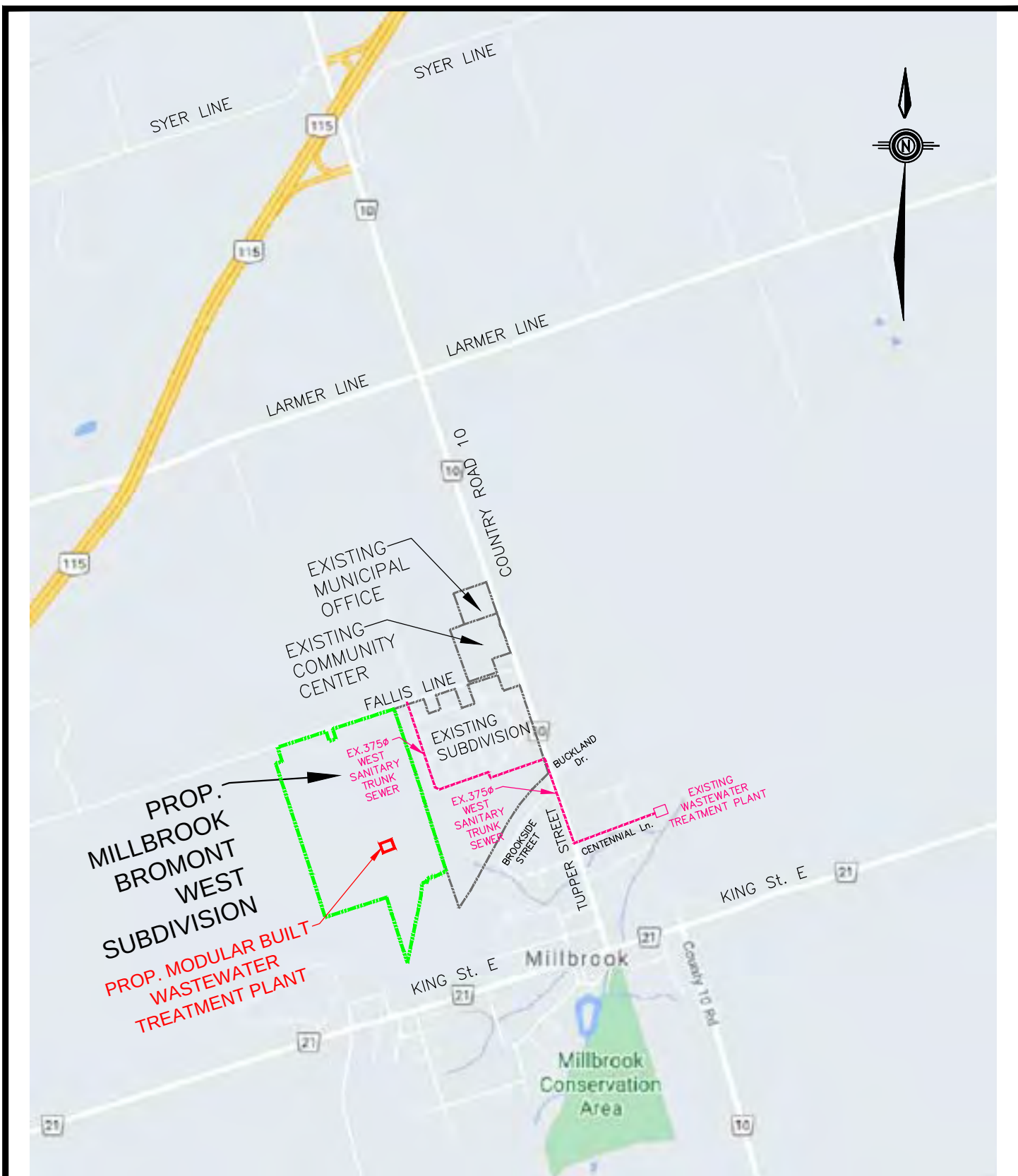
SCALE N.T.S.

DATE Jan, 2022

PROJECT 16119

DRAWN BY V.L.

FIGURE 2



MILLBROOK SOUTH WEST SUBDIVISION

WASTEWATER SERVICING EXTERNAL



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SCALE N.T.S.

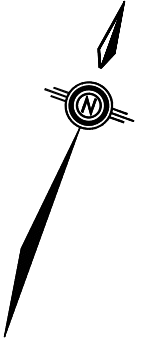
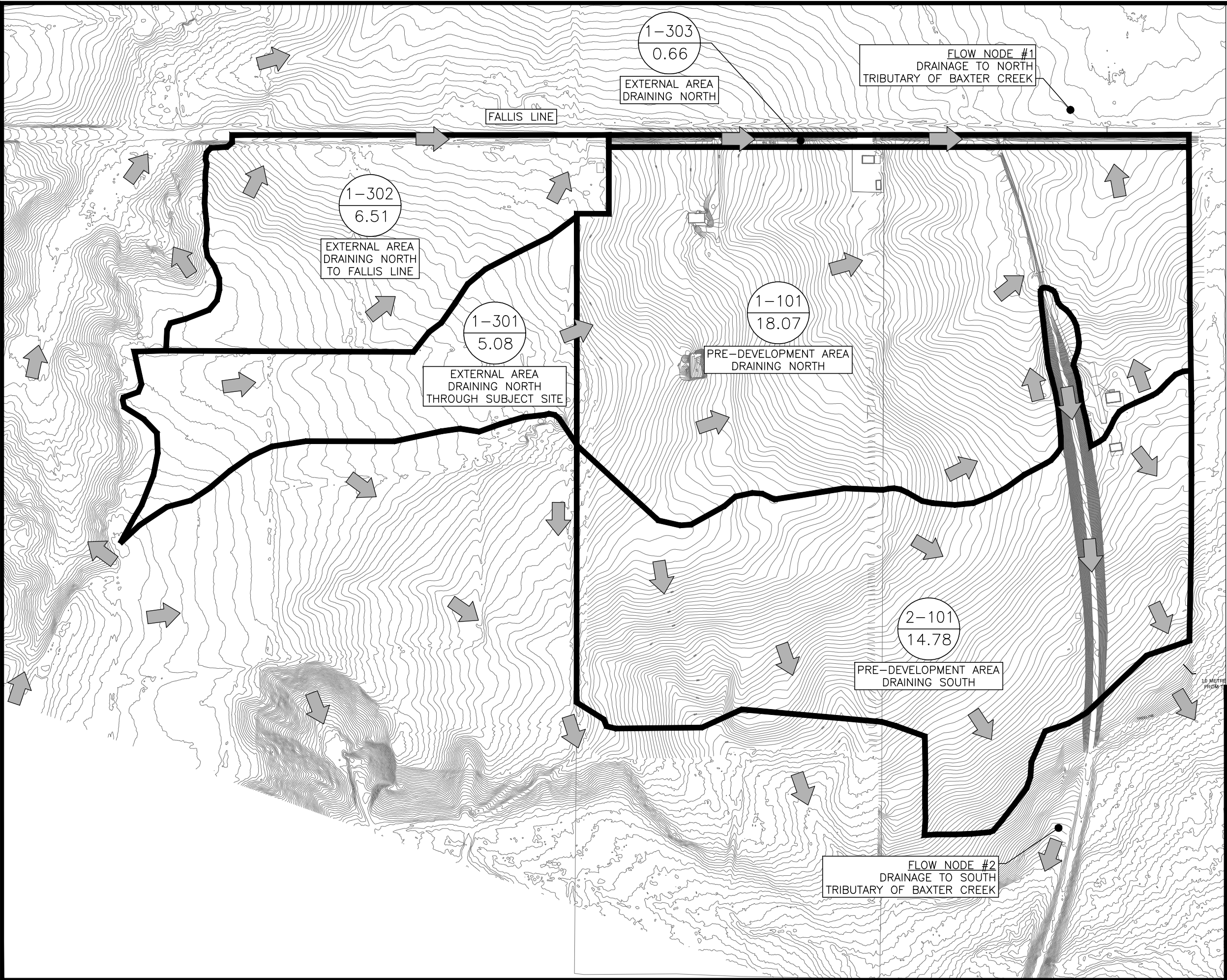
DATE Jan, 2022

PROJECT 16119

DRAWN BY V.L.

FIGURE 3

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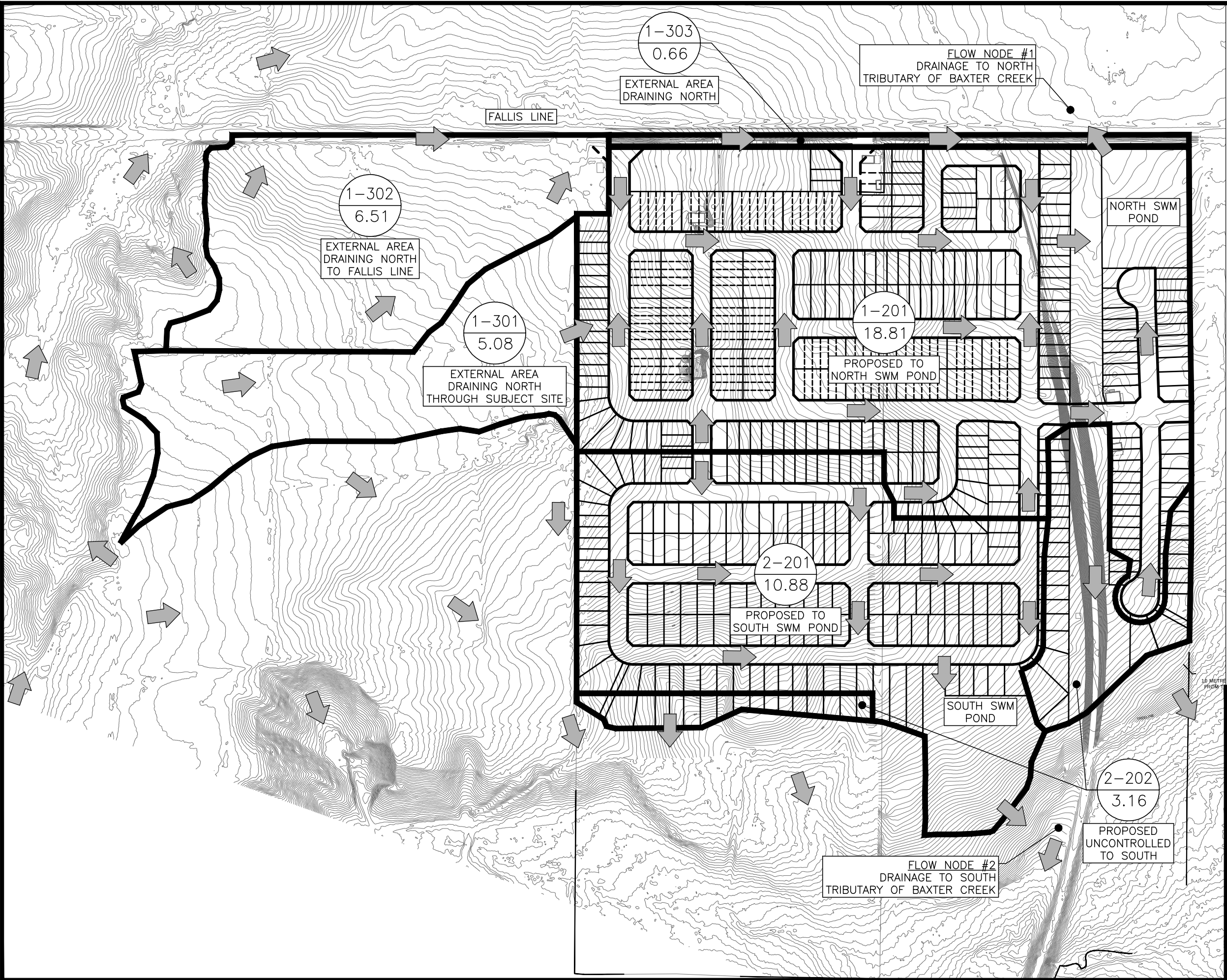


LEGEND

- EXISTING CONTOUR
- DRAINAGE BOUNDARY
- CATCHMENT ID
AREA (HA)
- OVERLAND FLOW

PROJECT		MILLBROOK SOUTH WEST SUBDIVISION	
TITLE		SWM DRAINAGE PLAN PRE-DEVELOPMENT	
		VALDOR ENGINEERING INC. Consulting Engineers - Project Managers 741 ROWNTREE DAIRY ROAD, SUITE 2, WOODBRIDGE, ONTARIO, L4L 5T9 TEL (905)264-0054, FAX (905)264-0069 E-MAIL: info@valdor-engineering.com www.valdor-engineering.com	
PREPARED BY	O.B.	CKD. BY	O.B.
SCALE	NTS	DATE	JAN. 2022
PROJECT	16119	FIGURE 4A	

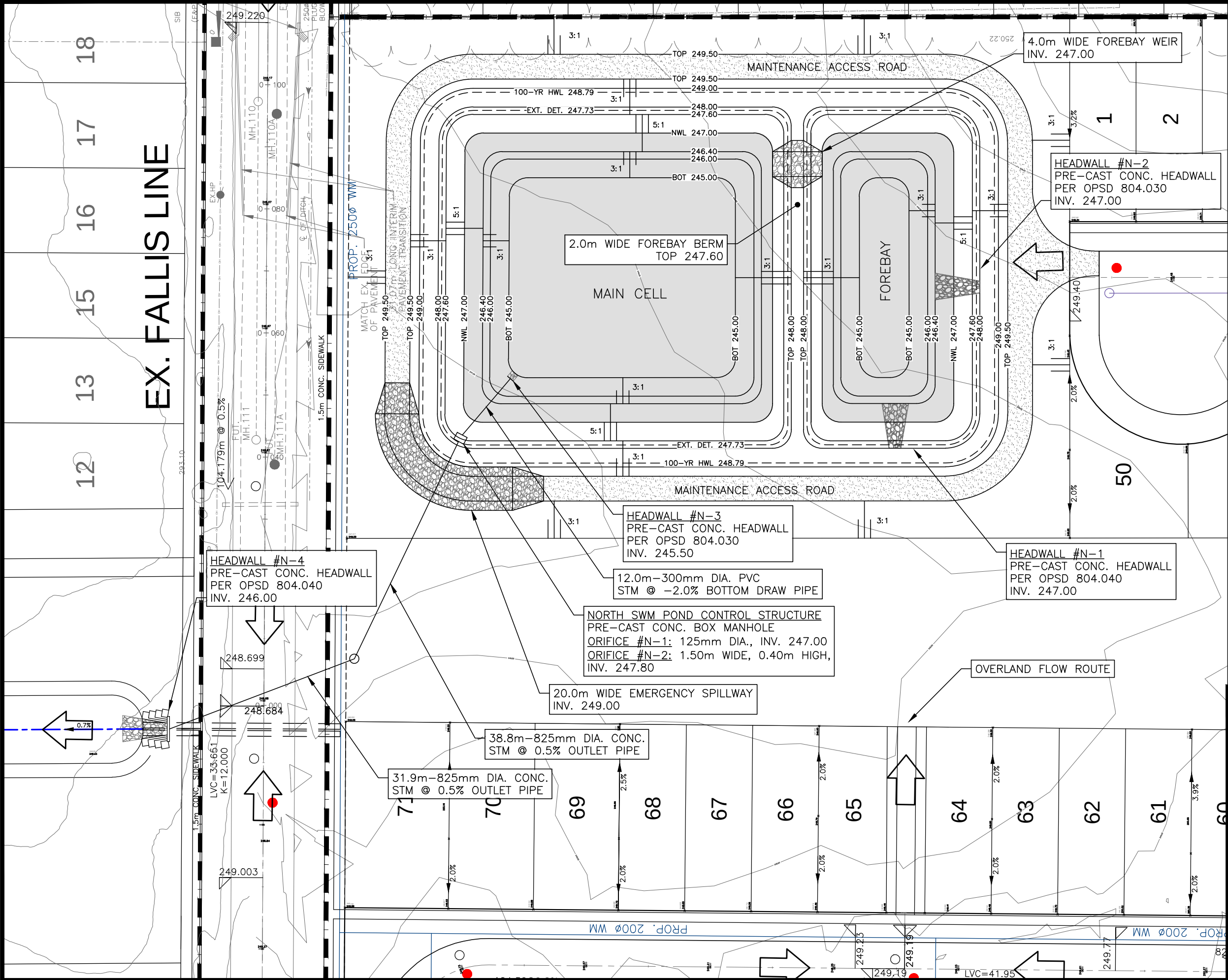
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LEGEND

- EXISTING CONTOUR
- DRAINAGE BOUNDARY
- CATCHMENT ID
- AREA (HA)
- OVERLAND FLOW

PROJECT	MILLBROOK SOUTH WEST SUBDIVISION		
TITLE	SWM DRAINAGE PLAN POST-DEVELOPMENT		
		VALDOR ENGINEERING INC. Consulting Engineers - Project Managers 741 ROWNTREE DAIRY ROAD, SUITE 2, WOODBRIDGE, ONTARIO, L4L 5T9 TEL (905)264-0054, FAX (905)264-0069 E-MAIL: info@valdor-engineering.com www.valdor-engineering.com	
PREPARED BY	O.B.	CKD. BY	O.B.
SCALE	NTS	DATE	JAN. 2022
PROJECT	16119	FIGURE 4B	



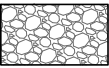
LEGEND



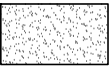
OVERLAND FLOW



PERMANENT POOL



RIP-RAP EROSION PROTECTION



MAINTENANCE ACCESS ROAD

RETURN PERIOD	POND WSEL (m)
25 mm	247.73
2-YEAR	247.96
5-YEAR	248.16
10-YEAR	248.29
25-YEAR	248.48
50-YEAR	248.64
100-YEAR	248.79
REGIONAL	248.94

PROJECT

**MILLBROOK SOUTH
WEST SUBDIVISION**

TITLE

**PRELIMINARY
NORTH SWM POND**



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O.B.

SCALE

1:600

DATE

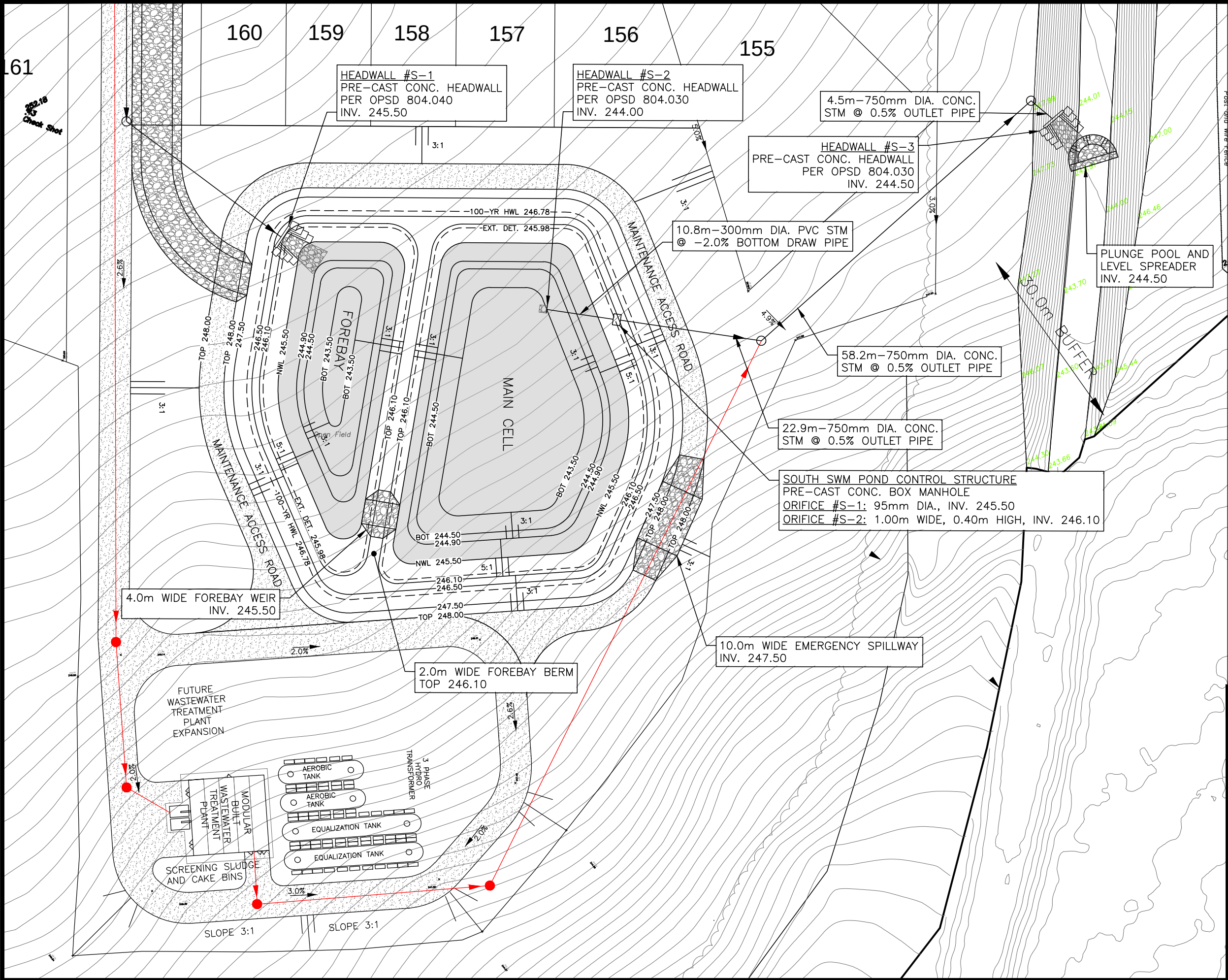
DEC. 2021

PROJECT

16119

FIGURE 5A

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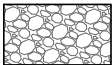
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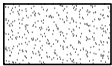
OVERLAND FLOW



PERMANENT POOL



RIP-RAP EROSION PROTECTION



MAINTENANCE ACCESS ROAD

RETURN PERIOD	POND WSEL (m)
25 mm	245.98
2-YEAR	246.17
5-YEAR	246.33
10-YEAR	246.42
25-YEAR	246.56
50-YEAR	246.67
100-YEAR	246.78
REGIONAL	246.85

PROJECT

**MILLBROOK SOUTH
WEST SUBDIVISION**

TITLE

**PRELIMINARY
SOUTH SWM POND**



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PREPARED BY

O.B.

CKD. BY

O.B.

SCALE

1:600

DATE

JAN. 2022

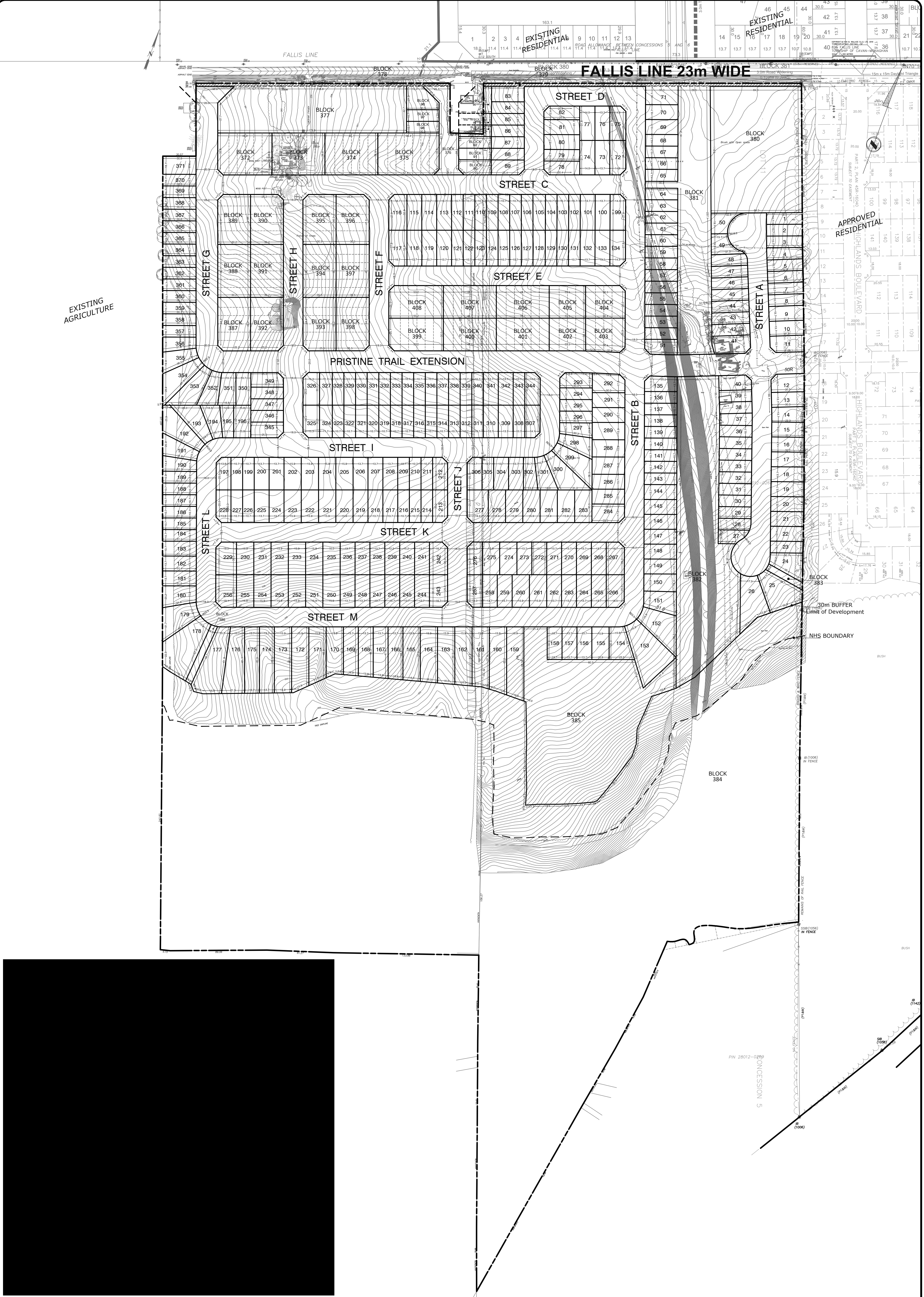
PROJECT

16119

FIGURE 5B

APPENDIX “A”

Draft Plan of Subdivision



TITLE:
DRAFT PLAN OF SUBDIVISION

LEGAL DESCRIPTION:
DRAFT PLAN OF PROPOSED SUBDIVISION
PART OF LOT 11, CONCESSION 5
(Geographic Village of Millbrook, Township of Cavan)
PART OF LOT 11, CONCESSION 5 (Geographic Township of Cavan)
TOWNSHIP OF CAVAN-MONAGHAN
NORTH MONAGHAN
(COUNTY OF PETERBOROUGH)

787 - 825 Fallis Line West
Township of Cavan Monaghan

KEY PLAN:

SUBJECT SITE

NTS

NOTE:
DISTANCES AND/OR COORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

SURVEYOR'S CERTIFICATE
I HEREBY CERTIFY THAT THE BOUNDARIES OF THE LANDS TO BE SUBDIVIDED AS SHOWN ON THIS PLAN AND THEIR RELATIONSHIP TO THE ADJACENT LANDS ARE ACCURATE AND CORRECTLY SHOWN IN ACCORDANCE WITH A PLAN OF SURVEY PREPARED BY SURVEYOR, COMPANY

DAVID COMERY
IBW SURVEYORS
2021/06/08
DATE

OWNER'S CERTIFICATE
I HEREBY AUTHORIZE THE BIGLIERI GROUP LTD. TO PREPARE AND SUBMIT THIS DRAFT PLAN OF SUBDIVISION TO THE MUNICIPALITY

SAVERIO MONTEMARANO
CS4 DEVELOPMENT
2021/06/08
DATE

REQUIRED INFORMATION
AS REQUIRED UNDER SECTION 51(17) OF THE PLANNING ACT R.S.O. 1990.
(a) SEE PLAN
(b) SEE PLAN
(c) SEE KEY MAP
(d) SEE SCHEDULE OF LAND USE
(e) SEE PLAN
(f) SEE PLAN
(g) SEE PLAN
(h) MUNICIPAL WATER AND SEWAGE AVAILABLE
(i) SANDY SILT / SILTY SAND TO CLAYEY SILT / SILTY CLAY
(j) SEE PLAN
(k) MUNICIPAL WATER AND SEWAGE AVAILABLE
(l) SEE PLAN
NOTE: CONTOURS RELATE TO CANADIAN GEODETIC DATUM

REVISIONS

No.	Description	Date	Int.
3			
2			
1	Stormwater Management Pond Revision	21/12/15	JS

PROJECT No.: 20697
DATE: May 16, 2021
SCALE: 1:1500
DRAFTED BY: JS
CHECKED BY: MT
DRAWING No.: **DP-01**

THE BIGLIERI GROUP LTD.
Planning | Development | Project Management | Urban Design
20 Leslie Street, Suite 122, Toronto, Ontario, M4M 1A4
125 Catherine Street North, Hamilton, Ontario, L8R 1J4
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thebiglierigroup.com

**VALDOR ENGINEERING INC.**

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TABLE: A1**EQUIVALENT POPULATION**

Project Name: **Millbrook South West Subdivision**
File: 16119
Date: January 2022

Land Use	Area (Hectares)	Criteria	No. of Units	Equivalent Population
Detached Dwellings	15.65	3.50 persons per unit	371	1,299
Street Townhomes	3.68	3.50 persons per unit	148	518
Medium Density	0.88	2.00 persons per unit	150	300
Parkland & Trails	2.06			
Natural Heritage Systems	16.31			
Stormwater Management Ponds	2.39			
Roads & Road Widening	7.84			
Future Development	0.39			
Total:	49.20		669	2,117

APPENDIX “B”

Water Demand Calculations & Details

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TABLE: B1**DOMESTIC WATER DEMAND CALCULATION**

Project Name: **Millbrook South West Subdivision, Township of Cavan Monaghan**

File: 16119

Date: January 2022

Conditions:

Residential Average Day Demand	450 L/person/day
Maximum Day Factor	2.0
Peak Hour Factor	3.0

Land Use	Equivalent Population (persons)	Domestic Demand (L/min)	Maximum Day Demand (L/min)	Peak Hour Demand (L/min)
Detached Dwellings	1,299	405.9	811.9	1,217.8
Street Townhomes	518	161.9	323.8	485.6
Medium Density	300	93.8	187.5	281.3
Total	2,116	661.6	1,323.1	1,984.7

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 www.valdor-engineering.com

TABLE: B2-1**CALCULATION OF REQUIRED FIRE FLOW**

In accordance to Water Supply for Public Fire Protection, Fire Underwriters Survey 1999

Project Name: **Millbrook South West Subdivision**

File: **16119**

Date: **January 2022**

Notes: **DETACHED DWELLING**

Assume:

- 3,500 sq.ft total floor area

- interior unit for max exposure

Type of Construction -

Wood Frame

$C = 1.5$

Total Floor Area: **325 sq.m**

$A = 325$ sq.m

(Total Floor Area includes all storeys, but excludes basements at least 50 percent below grade)

$$F = 220 C \sqrt{A}$$

$F = 5,949$ L/min

$F = 6,000$ (to nearest 1,000 L/min)

Occupancy Factor

Type: **Non-Combustible** Charge **-25%**

$f_1 = -25\%$

$$F' = F \times (1 + f_1)$$

$F' = 4,500$ L/min

Sprinkler Credit

NFPA 13 Sprinkler Standard: **NO** Charge **0%**

Standard Water Supply: **NO** Charge **0%**

Fully Supervised System: **NO** Charge **0%**

Total Charge to Fire Flow: $f_2 = 0\%$

Exposure Factor

Side 1 - Distance to Building (m): **0 to 3m** Charge **25%**

Side 2 - Distance to Building (m): **0 to 3m** Charge **25%**

Side 3 - Distance to Building (m): **3.1 to 10m** Charge **20%**

Side 4 - Distance to Building (m): **3.1 to 10m** Charge **20%**

$f_3 = 75\%$ (maximum of 75%)

$$F'' = F' + F' \times f_2 + F' \times f_3$$

$F'' = 7,875$ L/min

REQUIRED FIRE FLOW

$F'' = 8,000$ L/min (to nearest 1,000 L/min)

**VALDOR ENGINEERING INC.**

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 www.valdor-engineering.com

TABLE: B2-2**CALCULATION OF REQUIRED FIRE FLOW**

In accordance to Water Supply for Public Fire Protection, Fire Underwriters Survey 1999

Project Name: **Millbrook South West Subdivision**

File: 16119

Date: January 2022

Notes: **STREET TOWNHOMES DWELLING**

Assume:

- 2,500 sq.ft total floor area

- interior unit for max exposure

Type of Construction -

Wood Frame
 $C = 1.5$

Total Floor Area: 233 sq.m

$A = 233$ sq.m

(Total Floor Area includes all storeys, but excludes basements at least 50 percent below grade)

$$F = 220 C \sqrt{A}$$

$F = 5,037$ L/min

$F = 5,000$ (to nearest 1,000 L/min)

Occupancy Factor

Type: Non-Combustible Charge -25%
 $f_1 = -25\%$

$$F' = F \times (1 + f_1)$$

$F' = 3,750$ L/min

Sprinkler Credit

		Charge
NFPA 13 Sprinkler Standard:	NO	0%
Standard Water Supply:	NO	0%
Fully Supervised System:	NO	0%
Total Charge to Fire Flow:		$f_2 = 0\%$

Exposure Factor

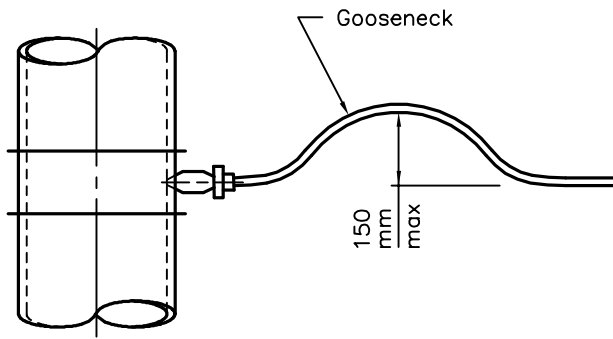
		Charge
Side 1 - Distance to Building (m):	0 to 3m	25%
Side 2 - Distance to Building (m):	0 to 3m	25%
Side 3 - Distance to Building (m):	3.1 to 10m	20%
Side 4 - Distance to Building (m):	3.1 to 10m	20%
		$f_3 = 75\%$ (maximum of 75%)

$$F'' = F' + F' \times f_2 + F' \times f_3$$

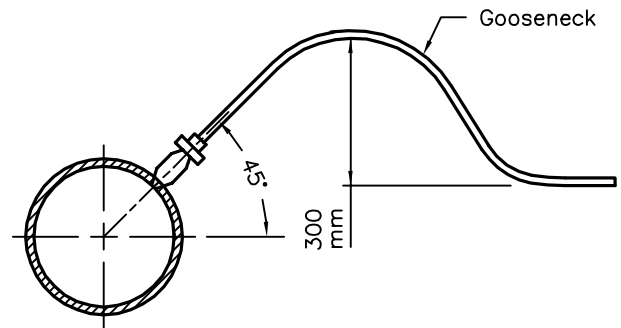
$F'' = 6,563$ L/min

REQUIRED FIRE FLOW

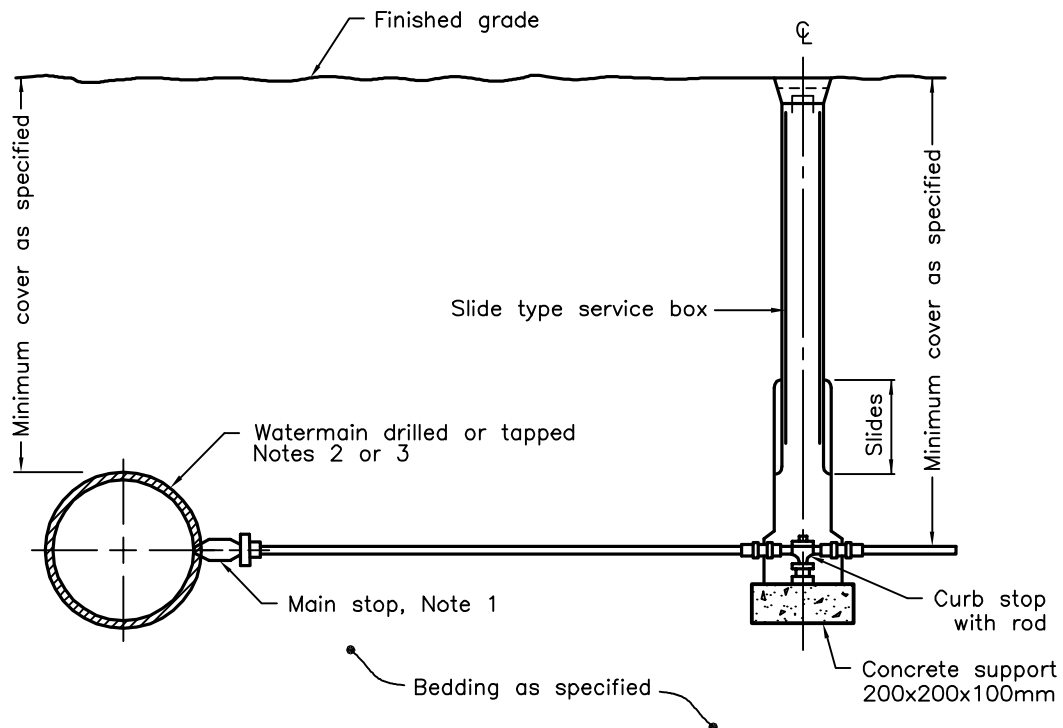
$F'' = 7,000$ L/min (to nearest 1,000 L/min)



HORIZONTAL GOOSENECK



VERTICAL GOOSENECK OPTION



VERTICAL SECTION

NOTES:

- 1 For plastic service pipes, install main stop at 15° above horizontal with a minimum 1.2m long gooseneck.
 - 2 Direct tap ductile iron pipe with approved tool with standard AWWA inlet thread.
 - 3 Service connections to plastic watermains shall be made using service saddles or factory made tees.
- A When specified, the vertical gooseneck option shall be used.

- B Couplings shall not be permitted unless the service length exceeds 20m between the main stop and curb stop.
- C All water services shall be installed 90° to the longitudinal axis of the watermain.
- D Backfill material within 500mm of service box shall be native or imported, as specified.
- E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2013

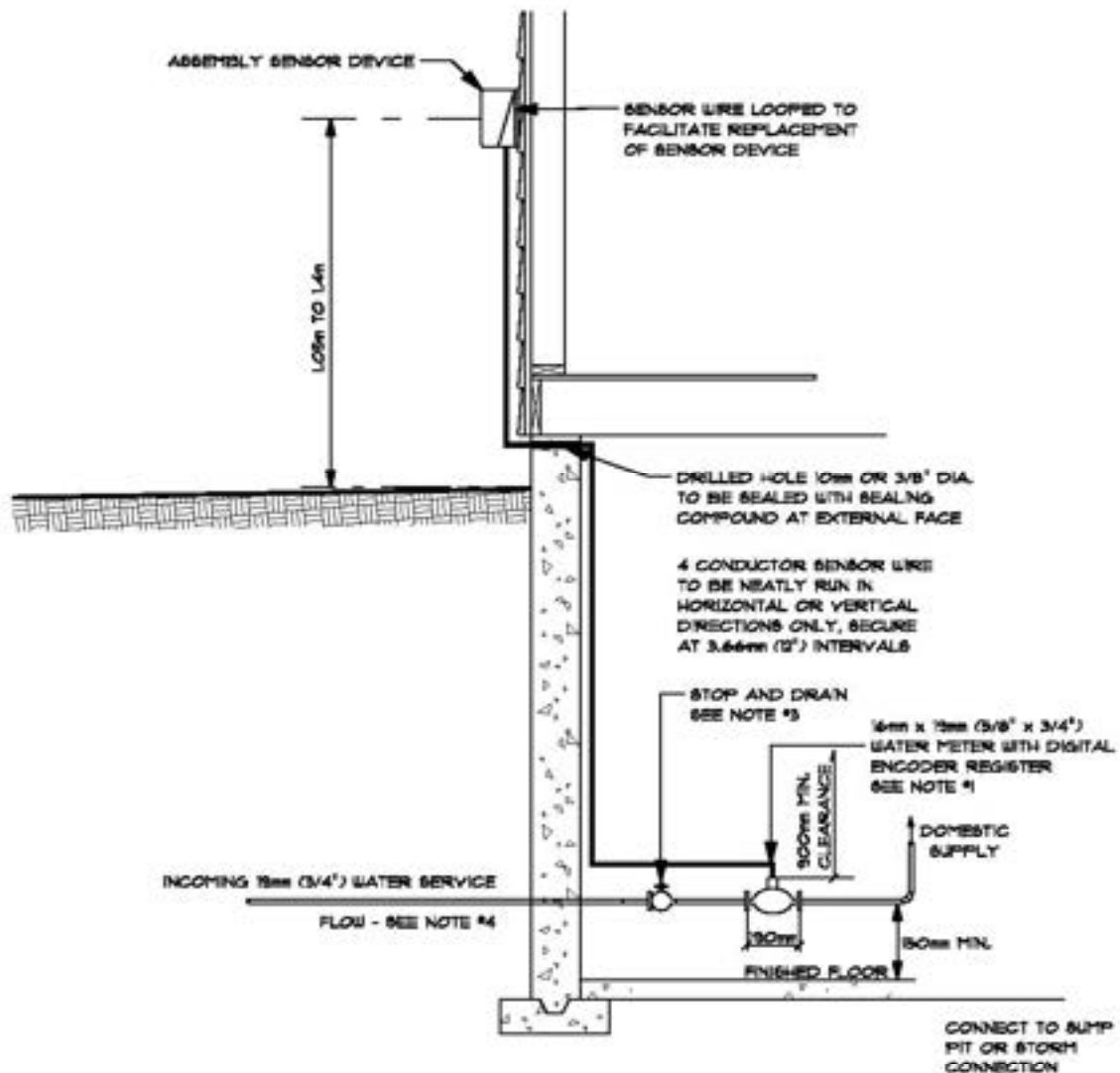
Rev 3

**WATER SERVICE
CONNECTION**

19 and 25mm DIAMETER SIZES

OPSD 1104.010





NOTES:

- 1 - METER SHALL BE 16mm (5/8") METER. REGISTRATION IN CUBIC METERS. 19mm (3/4") THREADED CONNECTIONS
- 2 - SUPPLY AND INSTALL REMOTE READOUT DEVICE ON OUTSIDE WALL WITHIN 2.0m OF THE FROST WALL AND IN THE SAME SIDE AS THE HYDRO METER. REMOTE READOUT DEVICE SHALL BE SUITABLE FOR TOUCH READ AUTOMATED READING AND BILLING SYSTEM.
- 3 - STOP AND DRAIN VALVE TO BE THE SAME SIZE AS INCOMING PIPE
- 4 - IF HOT WATER TANK IS WITHIN 3.0m OF THE METER, A CHECK VALVE IS REQUIRED BETWEEN THE METER AND THE HOT WATER TANK.
- 5 - METER SHALL BE INSTALLED USING THREADED CONNECTIONS ONLY

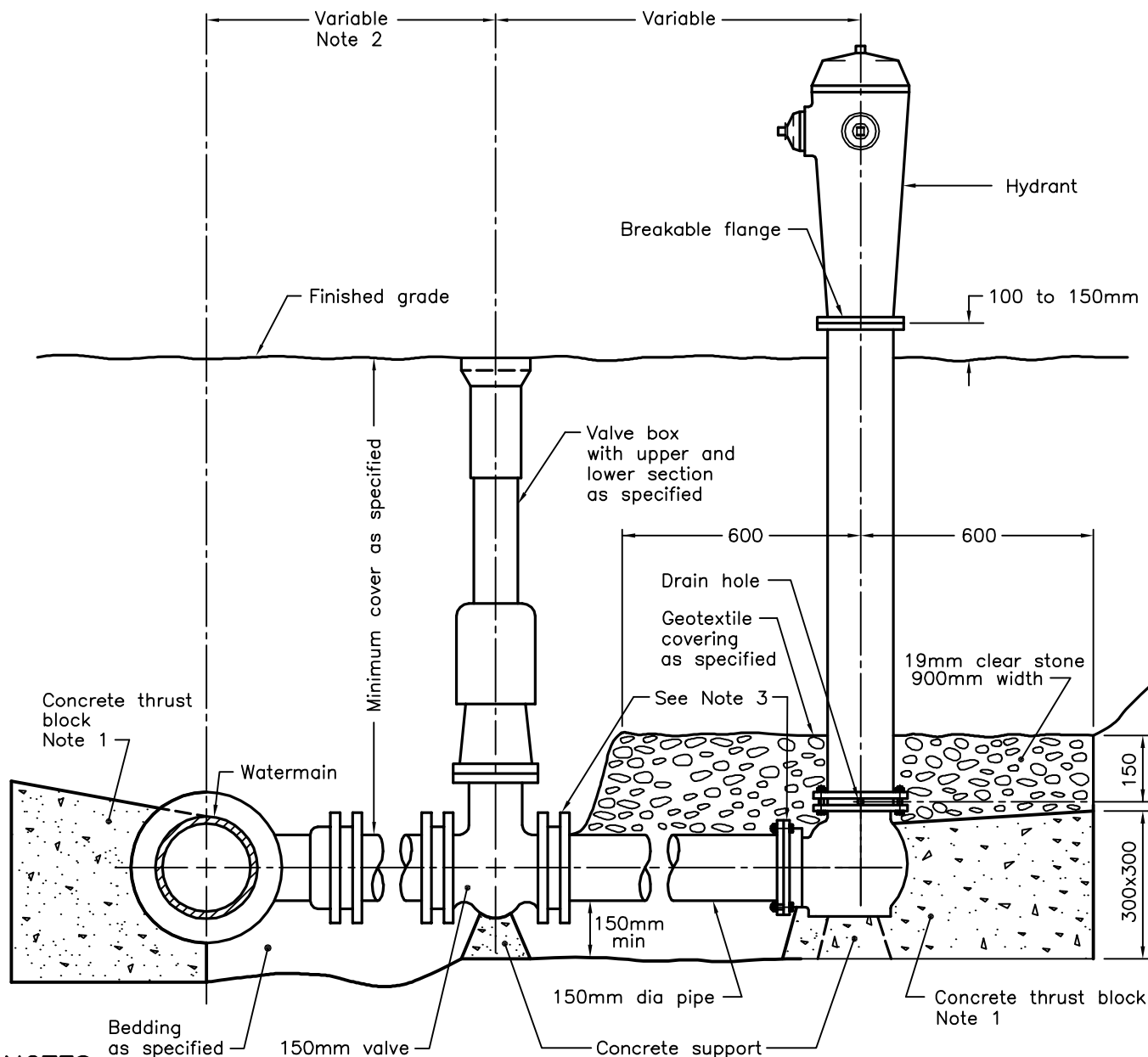
TOWNSHIP OF
CAVAN MONAGHAN

**TYPICAL WATER
METER INSTALLATION**

SCALE: NOT TO SCALE

DATE: AUGUST 2013

**STD.
S7**



NOTES:

- 1 All concrete thrust blocks shall be poured against undisturbed ground.
- 2 When specified, for watermain 400mm and less, locate valve within 1.0m of centreline of watermain. Retaining and restraining devices shall be utilized. For watermain 600mm and over, bolt valve with flanged end directly to flanged tee.
- 3 When specified, retaining and restraining devices shall be utilized, in addition to thrust blocks.
- A Bond breaker shall be used between the concrete and the fittings and appurtenances.
- B Bolts and nuts for buried flange to flange connections shall be stainless steel.
- C When required, flange of standpipe extensions shall not be in frost zone.
- D This OPSD shall be read in conjunction with OPSD 1103.010 and 1103.020.
- E Backfill material within 500mm of service box shall be native or imported, as specified.
- F All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2013

Rev 2



HYDRANT INSTALLATION

OPSD 1105.010

APPENDIX “C”

Wastewater Servicing Calculations & Details

**VALDOR ENGINEERING INC.**

741 Rowntree Dairy Road, Suite 2, Woodbridge, ON L4L 5T9
Tel: 905-264-0054 Fax: 905-264-0069 info@valdor-engineering.com
www.valdor-engineering.com

TABLE: C1**WASTEWATER FLOW CALCULATIONS**

Project Name: **Millbrook South West Subdivision, Township of Cavan Monaghan**

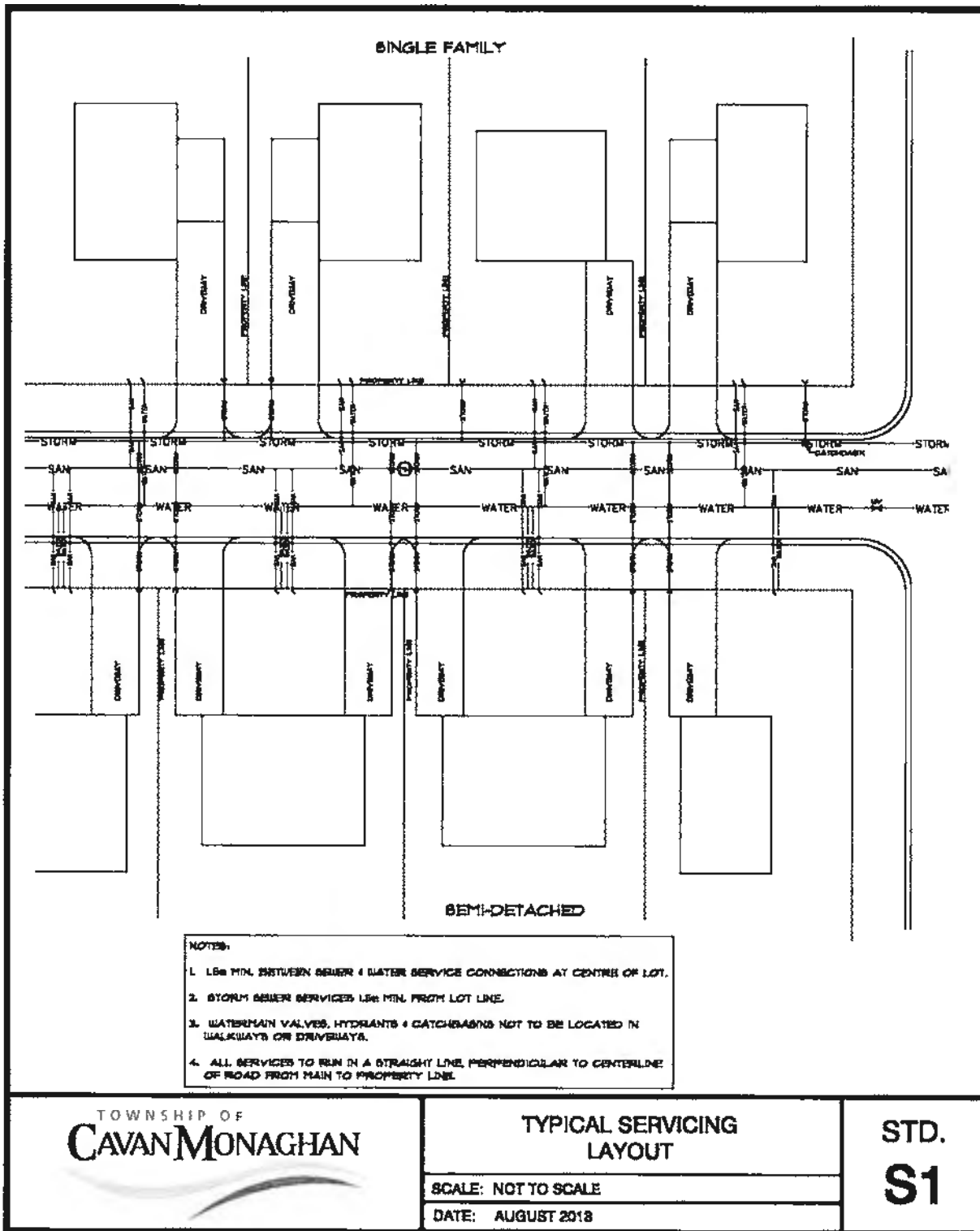
File: 16119

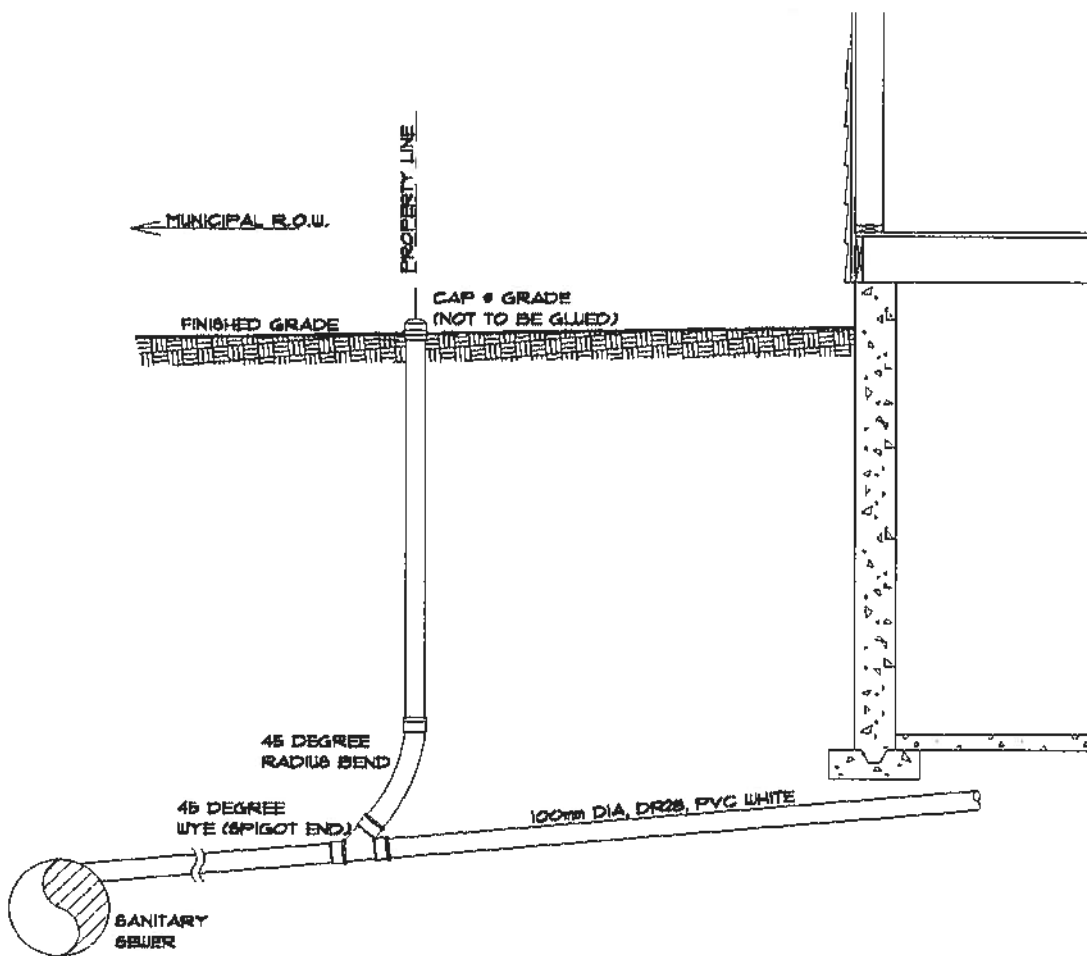
Date: Jan 2022

Conditions:

Residential Average Daily Flow: 450 L/person/day
Residential Peaking Factor: $K_H = 1 + \frac{14}{4 + \sqrt{P}}$ where K_H = Harmon Peaking Factor
(max. 4.5, min. 2.0)
p = population in thousands
Extraneous Flow (I): 0.28 L/s/ha. (infiltration)
Design Flow (Q_D): $Q \times K_H + I$
Commercial/institutional Average Daily Flow: 1.15 L/s/ha
Commercial/Institutional Peaking Factor: 2.5

Land Use	Area (ha.)	Equivalent Population (persons)	Average Daily Flow (L/s)	Harmon Peaking Factor	Peak Daily Flow (L/s)	Extraneous Flow (L/s)	Total Flow (L/s)
Detached Dwellings	15.65	1,299	6.77	3.72	25.19	4.38	29.58
Street Townhomes	3.68	518	2.70	3.97	10.70	1.03	11.73
Medium Density	0.88	300	1.56	4.08	6.37	0.25	6.62
Roads	7.84					2.20	2.20
Total	28.05	2,116	11.03		42.27	7.85	50.12





TOWNSHIP OF
CAVAN MONAGHAN

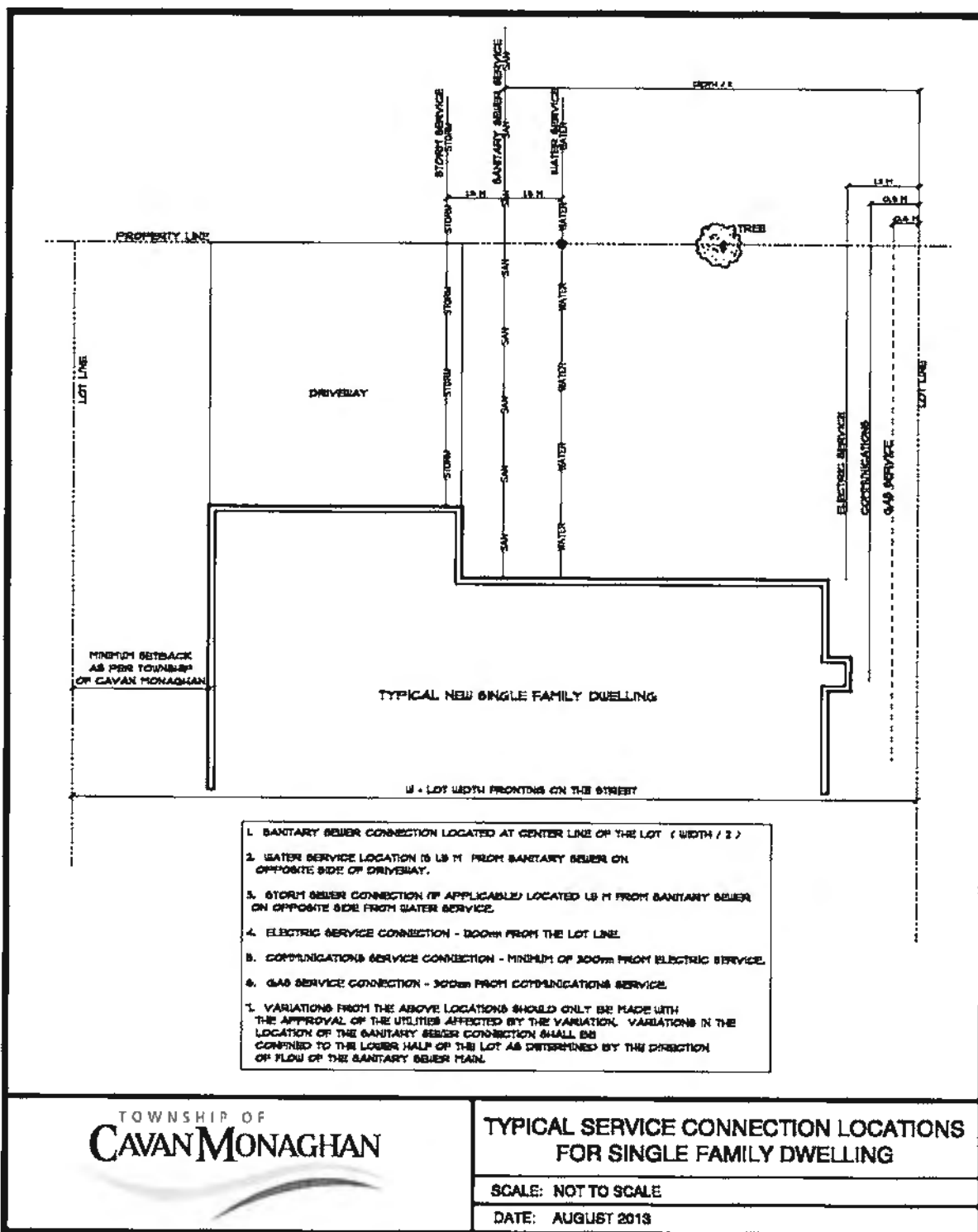
**SANITARY SERVICE CONNECTION
WITH CLEAN-OUT**

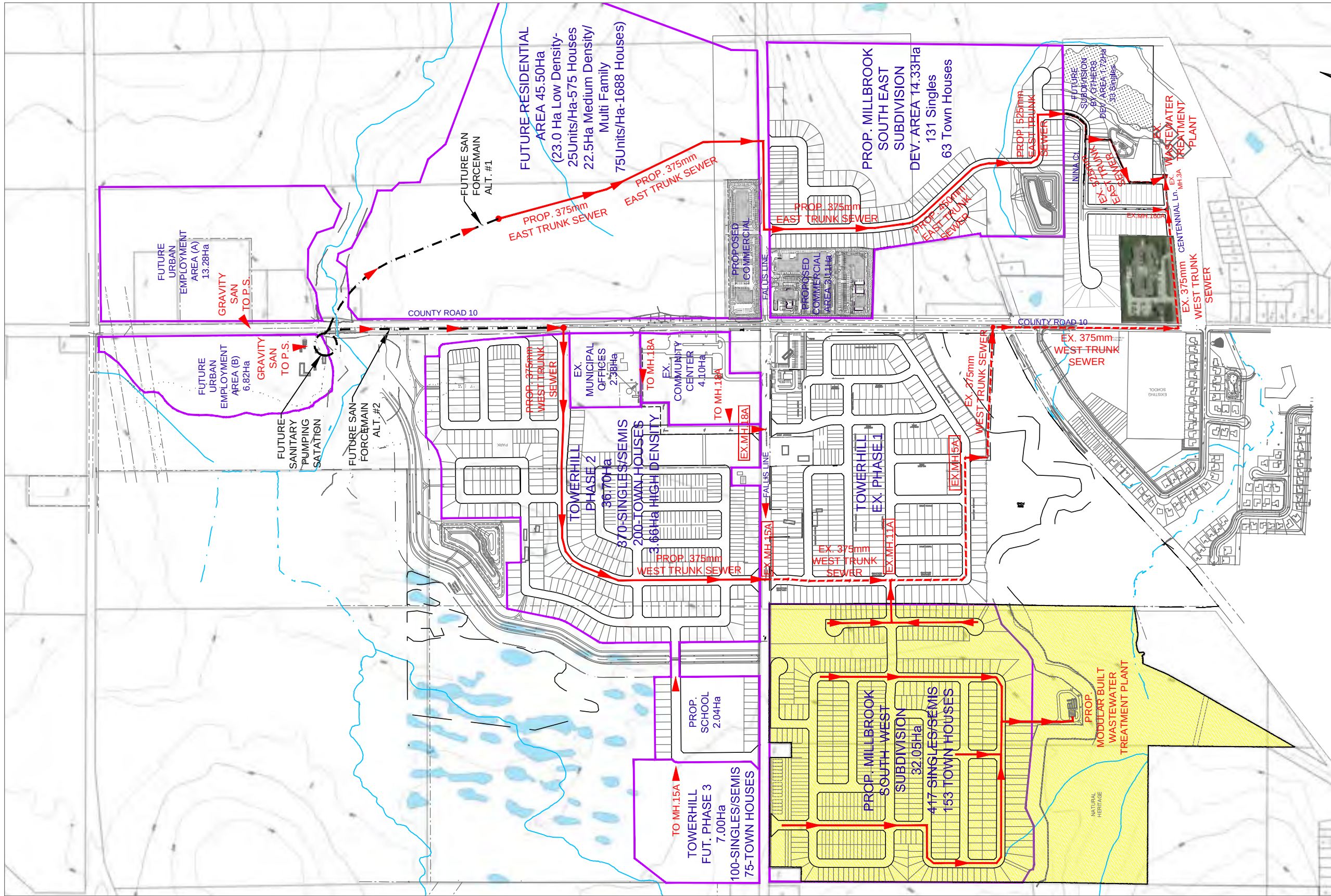
SCALE: NOT TO SCALE

DATE: AUGUST 2013

STD.

S3





MILLBROOK SOUTH WEST SUBDIVISION

SANITARY DRAINAGE PLAN

DRAWN BY	V.L.	 VALDOR ENGINEERING INC. Consulting Engineers - Project Managers 741 ROWNTREE DAIRY ROAD, SUITE 2, WOODBRIDGE, ONTARIO, L4L 5T9 TEL (905)264-0054, FAX (905)264-0069 E-MAIL: info@valdor-engineering.com www.valdor-engineering.com		
CKD. BY	D.G.			
DATE	May, 2021	SCALE	N.T.S.	PROJECT
				16119
				FIGURE C



Modular Decentralized Water & Wastewater Systems

Scalable, cost-effective solutions for development projects and existing wastewater treatment plant retrofits.



Newterra Pre-Fabricated Modular Systems Are Designed To Grow As Your Development Grows

Newterra is leading the way with decentralized wastewater solutions that help you reduce project costs with a sustainable treatment approach. Our modular membrane bioreactor (MBR) systems are scalable – allowing treatment infrastructure to be added in stages as capacity requirements grow.



The Right Solution for a Wide Range of Projects

Newterra's innovative wastewater treatment systems are ideally suited to many types of projects, including:

- Greenfield & Retrofit Projects
- Existing Infrastructure Tie-ins
- Municipal WWTPs
- New Residential Developments
- Hotels, Resorts & Restaurants
- Campgrounds & Trailer Parks
- Mobile Home Communities
- Off-Grid & Remote Municipal Plants
- New Commercial Developments
- Service Area Expansions
- LEED® Certified & Green Buildings
- Schools & Hospitals
- Golf Courses
- Sports & Recreational Facilities
- Highway Rest Areas

Self-Contained and Enclosed Systems

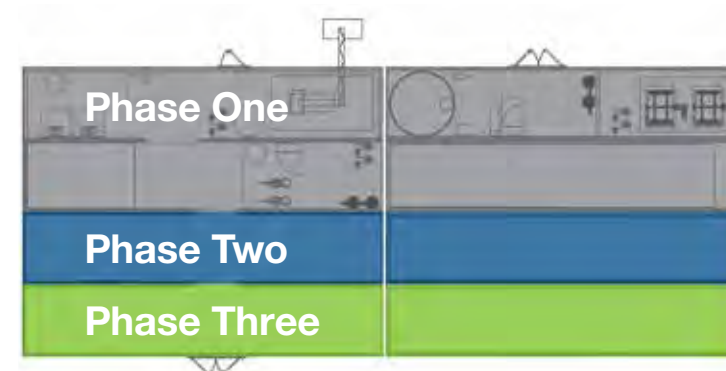
Newterra MBR wastewater systems are modular, and can be configured as fully self-contained units that can be clad with a variety of materials to blend in with surrounding structures, or integrated into new or existing treatment structures. They are built in our MET-certified manufacturing facility and have UL electrical certification.



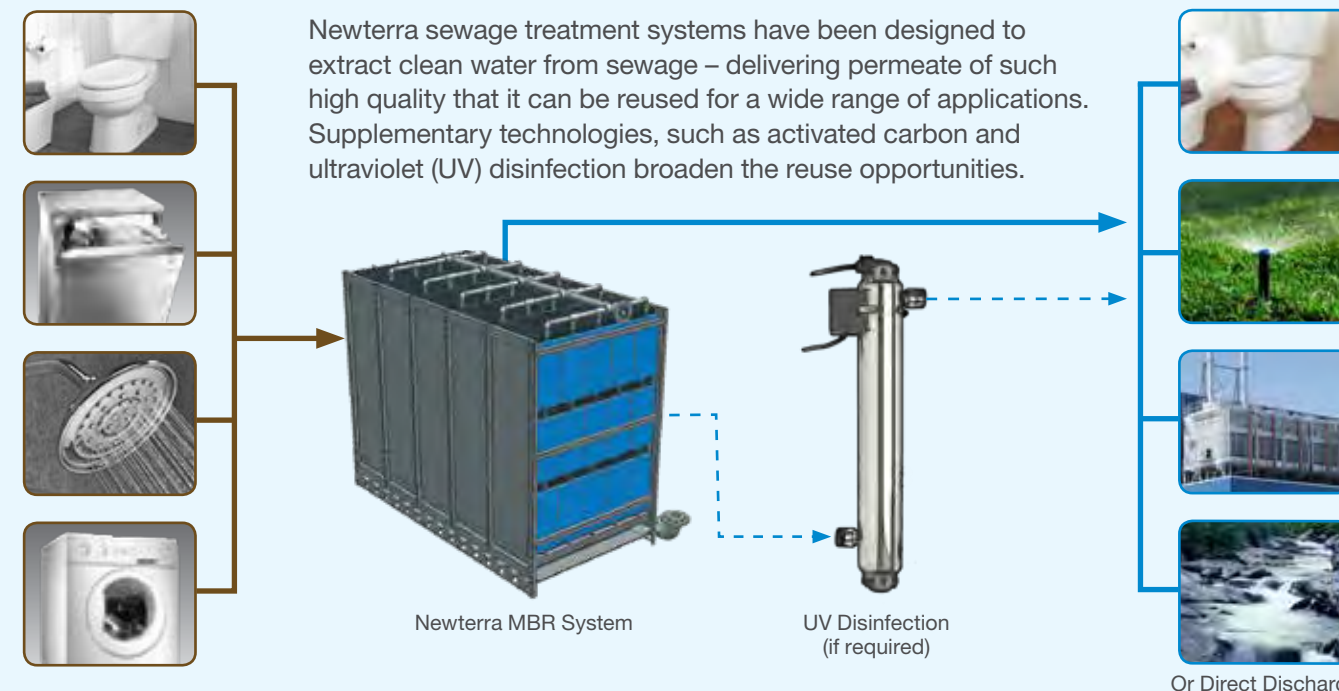
Newterra systems can be clad to blend in with their surroundings (above), or be loose-shipped for use with inground tanks and buildings (inset, right).

Add Infrastructure with Each Phase of a Project

Our modular, scalable treatment technology allows you to phase in wastewater infrastructure in parallel with the treatment demands of your development. Newterra MBR systems can handle high loads, and are very resilient to flow and loading fluctuations. They are also extremely space efficient – reducing land requirements and providing more options of where the plant can be located. Newterra systems can be loose-shipped or pre-manufactured, and we offer you the option of renting or leasing to minimize your initial capital expenditures.



Sewage Treatment That Offers A Wide Range of Reuse Applications





Compact, Operator-Friendly & Sustainable

Designed & Built for Minimal Maintenance

Newterra MBR systems are field proven in some of the most extreme conditions on the planet. Feedback from operators has been a key ingredient in the development and refinement of our low maintenance solutions:

- Intuitive, user-friendly controls and instrumentation
- Built-in telemetry & remote monitoring reduce plant visits by operator
- Air scouring & periodic membrane relaxation minimize CIP requirements
- Built-in redundancy to eliminate downtime
- Proven in a wide range of regions, climates and altitudes

Ambient Temperatures

-40°F to +104°F

-40°C to +40°C

High Altitudes

13,125 ft.

4,000 m



Integrated cellular telemetry and our SiteLink™ technology allow 24/7 monitoring and operation by your staff, and proactive troubleshooting by our technical team

Cost-Effective for New Facilities & Retrofits

At Newterra, we offer both custom-designed and pre-engineered, packaged MBR treatment systems for new facilities. Our technology is also very well suited to retrofitting conventional BNR and ENR plants to comply with higher regulatory standards or expand capacity. Newterra MBR modules can be easily incorporated into existing clarification tanks – more than tripling plant capacity within the current footprint and eliminating the need for costly infrastructure expansion.



A Global Water Technology Leader

Newterra is recognized as a leader in the development of modular treatment solutions for water, sewage, wastewater and groundwater remediation for industrial, municipal, land development, commercial & residential markets. Our heritage of innovation in providing clean water solutions dates all the way back to 1863. Over that time, Newterra has grown to over 200 people and we've installed thousands of treatment systems – some of which operate in the most extreme conditions on the planet.

Full Control from Start to Finish

At Newterra, we take full control of virtually every aspect of the treatment systems we build – from process design and engineering to manufacturing, installation, operations and ongoing parts & service support. That also includes manufacturing our own MicroClear® UF membranes in Newterra's ISO 9001:2008 certified facility. This award-winning approach ensures Newterra treatment systems meet our high standards for quality and on-time delivery.

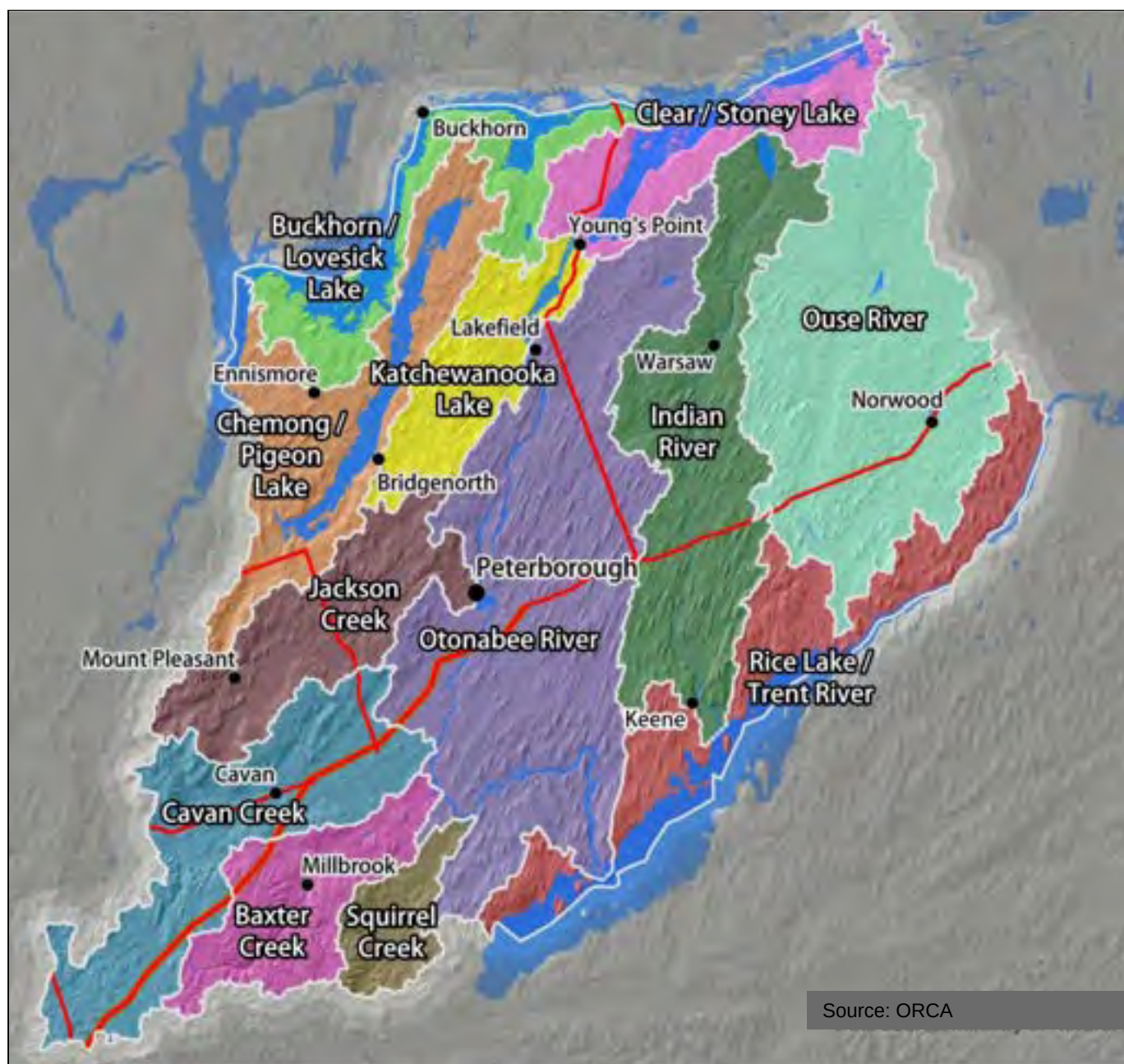
200+
Employees

40+
Professional
Engineers

10,000+
Installations
Worldwide

APPENDIX “D”

Watershed Map & IDF Data

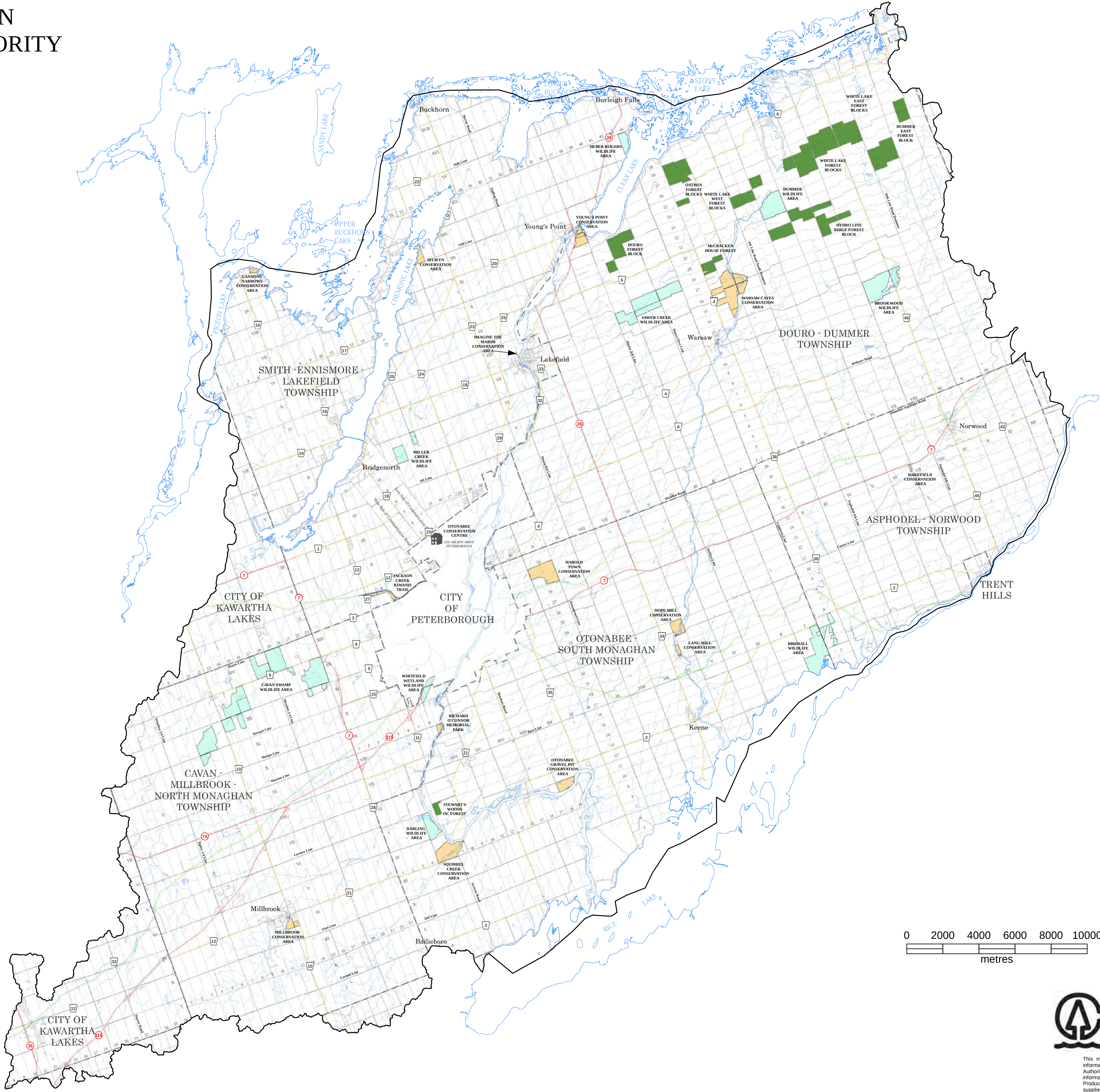


OTONABEE REGION
CONSERVATION AUTHORITY
LANDS



Legend

- Conservation Area
- Forest Land
- Wildlife Area
- Right-of-Way
- Township Road
- County Road
- King's Highway
- Lot Parcel Line
- Township Boundary
- Watershed Boundary

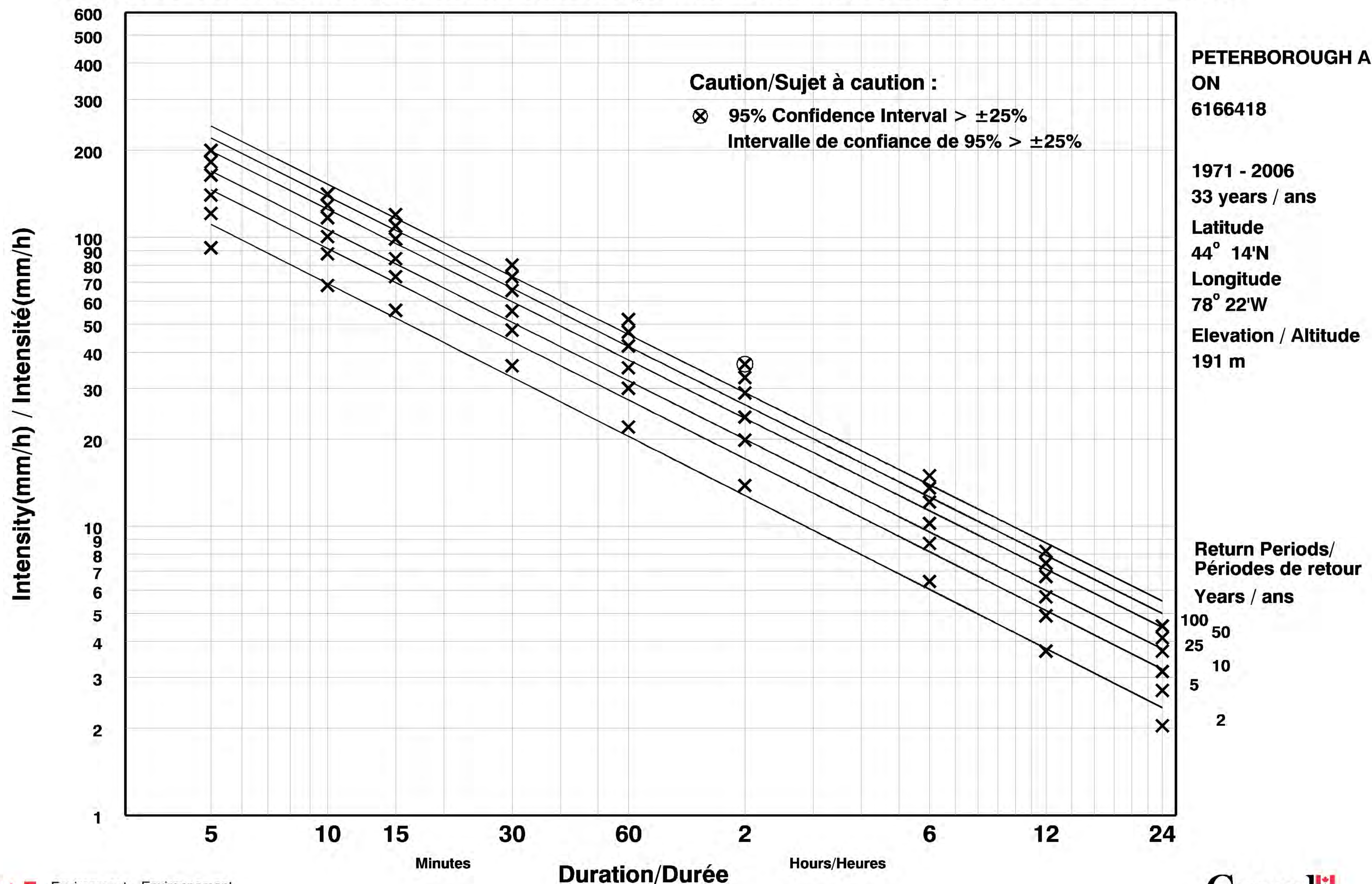


This map is for information purposes only based on the best available information at the time of production. The Otonabee Region Conservation Authority takes no responsibility for, nor guarantees, the accuracy of the information contained within the map.
Produced by the Otonabee Region Conservation Authority with data supplied under licence by members of the Ontario Geospatial Data Exchange.

Short Duration Rainfall Intensity-Duration-Frequency Data

2014/12/21

Données sur l'intensité, la durée et la fréquence des chutes de pluie de courte durée



Intensity Duration Frequency Statistics for Peterborough

Location - Peterborough Airport

2014 Data

$$\text{Rainfall Intensity} = a / (T_c + b)^c$$

T_c = Time of Concentration

2 Year Return Period		
a	b	c
583.351	6.010	0.773
Duration	Intensity	
5	92.0	
10	68.2	
15	56.0	
30	35.9	
60	22.1	
120	13.9	
360	6.4	
720	3.7	
1440	2.0	

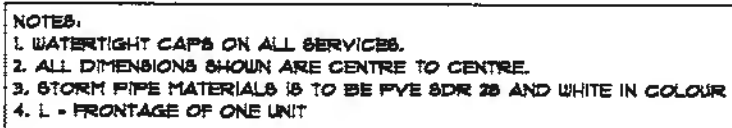
5 Year Return Period		
a	b	c
843.799	7.500	0.783
Duration	Intensity	
5	121.0	
10	87.7	
15	73.1	
30	47.8	
60	30.1	
120	19.9	
360	8.7	
720	4.9	
1440	2.7	

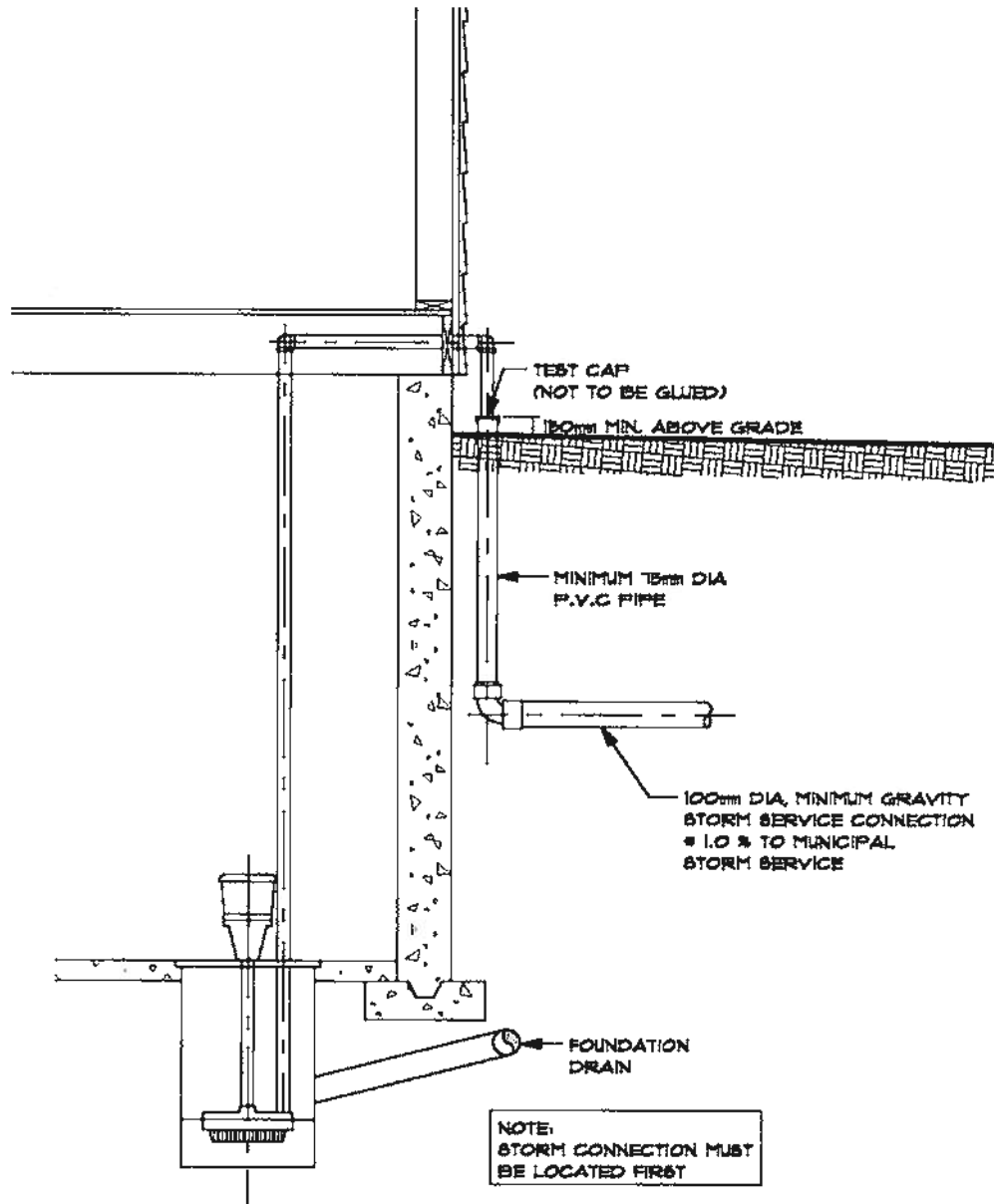
10 Year Return Period		
a	b	c
1034.243	8.265	0.791
Duration	Intensity	
5	140.2	
10	100.7	
15	84.5	
30	55.6	
60	35.4	
120	23.9	
360	10.2	
720	5.7	
1440	3.1	

25 Year Return Period		
a	b	c
1263.414	9.012	0.795
Duration	Intensity	
5	164.4	
10	117.0	
15	98.8	
30	65.5	
60	42.1	
120	29.0	
360	12.2	
720	6.7	
1440	3.7	

50 Year Return Period		
a	b	c
1468.915	9.751	0.801
Duration	Intensity	
5	182.3	
10	129.1	
15	109.4	
30	72.9	
60	47.1	
120	32.7	
360	13.6	
720	7.5	
1440	4.1	

100 Year Return Period		
a	b	c
1696.952	10.502	0.808
Duration	Intensity	
5	200.2	
10	141.1	
15	120.0	
30	80.2	
60	52.0	
120	36.4	
360	15.0	
720	8.2	
1440	4.5	





TOWNSHIP OF
CAVAN MONAGHAN

**SUMP PUMP TO
STORM SEWER CONNECTION**

SCALE: NOT TO SCALE

DATE: AUGUST 2013

STD.
S2

APPENDIX “E”

Stormwater Management Calculations

VALDOR ENGINEERING INC.

File: 16119

Date: December 2021

Table E.1: VO Model Parameters - Pre-Development							
Subcatchment	Area (ha)	VO Routine	TIMP	XIMP	CN II	IA (mm)	Tp (hr)
<i>Flow Node #1: Drainage to North</i>							
1-101	18.07	NasHyd	-	-	75	7.3	0.50
1-301	5.08	NasHyd	-	-	77	6.5	0.49
1-302	6.51	NasHyd	-	-	79	6.7	0.42
1-303	0.66	StandHyd	0.70	0.70	61	5.0	-
Total	30.32						
<i>Flow Node #2: Drainage to South</i>							
2-101	14.78	NasHyd	-	-	77	7.4	0.39
Total	14.78						

VALDOR ENGINEERING INC.

File: 16119

Date: December 2021

Table E.2: VO Model Parameters - Post-Development							
Subcatchment	Area (ha)	VO Routine	TIMP	XIMP	CN II	IA (mm)	Tp (hr)
<i>Flow Node #1: Drainage to North</i>							
1-201	18.81	StandHyd	0.75	0.60	61	5.0	-
1-301	5.08	NasHyd	-	-	77	6.5	0.49
1-302	6.51	NasHyd	-	-	79	6.7	0.42
1-303	0.66	StandHyd	0.70	0.70	61	5.0	-
Total	31.06						
<i>Flow Node #2: Drainage to South</i>							
2-201	10.88	StandHyd	0.60	0.45	61	5.0	-
2-202	3.16	NasHyd	-	-	66	6.2	0.42
Total	14.04						

VALDOR ENGINEERING INC.

File: 16119

Date: December 2021

Table E.3: Calculation of CN Values, Initial Abstractions and Runoff Coefficients

Subcatchment	Area (ha)	Land Use and Land Cover		CN II	Area Weighted CN II	IA (mm)	Area Weighted IA (mm)	C-Value	Area Weighted C-Value
		Type	Area (ha)						
1-101	18.07	Forest (HSG 'B')	1.10	55	75	10	7.3	0.25	0.33
		Meadow (HSG 'B')	3.14	58		8		0.28	
		Row Crops (HSG 'B')	13.13	81		7		0.35	
		Open Space (HSG 'B')	0.56	61		5		0.11	
		Other Impervious	0.14	98		2		0.95	
1-301	5.08	Forest (HSG 'B')	0.00	55	77	10	6.5	0.25	0.30
		Meadow (HSG 'B')	0.00	58		8		0.28	
		Row Crops (HSG 'B')	3.93	81		7		0.35	
		Open Space (HSG 'B')	1.13	61		5		0.11	
		Other Impervious	0.02	98		2		0.95	
1-302	6.51	Forest (HSG 'B')	0.00	55	79	10	6.7	0.25	0.33
		Meadow (HSG 'B')	0.00	58		8		0.28	
		Row Crops (HSG 'B')	5.66	81		7		0.35	
		Open Space (HSG 'B')	0.80	61		5		0.11	
		Other Impervious	0.05	98		2		0.95	
2-101	14.78	Forest (HSG 'B')	1.75	55	77	10	7.4	0.25	0.34
		Meadow (HSG 'B')	0.31	58		8		0.28	
		Row Crops (HSG 'B')	12.70	81		7		0.35	
		Open Space (HSG 'B')	0.00	61		5		0.11	
		Other Impervious	0.02	98		2		0.95	
2-202	3.16	Forest (HSG 'B')	1.14	55	66	10	6.2	0.25	0.32
		Meadow (HSG 'B')	0.00	58		8		0.28	
		Row Crops (HSG 'B')	0.00	81		7		0.35	
		Open Space (HSG 'B')	1.41	61		5		0.11	
		Other Impervious	0.61	98		2		0.95	

VALDOR ENGINEERING INC.

File: 16119

Date: December 2021

Table E.4: Calculation of Time to Peak (Airport Method)							
Subcatchment	C Runoff Coefficient (Area Weighted)	L(m) Catchment Length	Highest Elevation (m)	Lowest Elevation (m)	S(%) Catchment Slope	T _c (min)	T _p (hr)
1-101	0.33	625	265.00	247.20	2.85	44.6	0.50
1-301	0.30	560	280.00	264.00	2.86	43.8	0.49
1-302	0.33	475	276.50	261.00	3.26	37.4	0.42
2-101	0.34	485	261.60	242.00	4.04	34.6	0.39
2-202	0.32	270	247.60	244.00	1.33	38.0	0.42

Note:

1) T_p calculation is based on Airport Method

$$T_c = 3.26 \times (1.1 - C) \times L^{0.5} / S_w^{0.33} \quad \text{and} \quad T_p = 0.67 T_c$$

VALDOR ENGINEERING INC.

File: 16119

Date: December 2021

Table E.5-A: Calculation of Impervious Area Catchment 1-201			
Land Use	Area (ha)	¹Runoff Coefficient	Imperviousness
Single Family Lot (9 m width)	0.00	0.75	0.79
Single Family Lot (10.7 m width)	7.85	0.69	0.70
Single Family Lot (12 m width)	0.00	0.65	0.64
Single Family Lot (13.7 m width)	2.70	0.59	0.56
Single Family Lot (15 m width)	0.00	0.55	0.50
Single Family Lot (15.9 m width)	0.32	0.52	0.46
Townhouse	5.18	0.85	0.93
Apartment	1.02	0.90	1.00
Park	0.76	0.25	0.07
SWM	0.98	0.55	0.50
Total:	18.81	0.71	0.72

Notes:

1) Runoff coefficients per City of Peterborough Engineering Design Standards (April 2019).

VALDOR ENGINEERING INC.

File: 16119

Date: December 2021

Table E.5-B: Calculation of Impervious Area Catchment 2-201			
Land Use	Area (ha)	¹Runoff Coefficient	Imperviousness
Single Family Lot (9 m width)	0.00	0.75	0.79
Single Family Lot (10.7 m width)	2.84	0.69	0.70
Single Family Lot (12 m width)	0.00	0.65	0.64
Single Family Lot (13.7 m width)	3.19	0.59	0.56
Single Family Lot (15 m width)	0.00	0.55	0.50
Single Family Lot (15.9 m width)	3.49	0.52	0.46
Townhouse	0.00	0.85	0.93
Apartment	0.00	0.90	1.00
Park	0.00	0.25	0.07
SWM	1.36	0.55	0.50
Total:	10.88	0.59	0.56

Notes:

1) Runoff coefficients per City of Peterborough Engineering Design Standards (April 2019).

Stage Storage Curve						Outlet Structure						Comments:	
Elevation	Sec Area	Avg Area	Sec Volume	Cumulative Volume	Volume Above NWL	Invert Elevation (m) Diameter (mm)/Length (m) Height (m) Orifice Area (m²)	Stage Active (m)	Discharge m³/s					
(m)	(m²)	(m²)	(m³)	(m³)	(m³)			Orifice #N-1	Orifice #N-2		Spillway		Total
									(Weir Flow)	(Orifice Flow)			
								247.00	247.80	247.80	249.00	Flow	
								125	1.50	1.50	20.00		
								-	0.40	0.40			
								0.0123	-	0.6000	-		
Forebay Below NWL						Bottom of Forebay							Weir Equation: $Q=1.837xLxH^{1.5}$ Orifice Eq'n: $Q = 0.6A(2gH)^{0.5}$ Spillway Design: $Q=1.67xLxH^{1.5}$
245.00	249	-	-	0									
246.00	526	388	388	388									
246.40	657	592	237	624									
247.00	980	819	491	1,115	NWL								
Main Cell Below NWL						Bottom of Main Cell							
245.00	1,167	-	-	0									
246.00	1,615	1,391	1,391	1,391									
246.40	1,815	1,715	686	2,077									
247.00	2,308	2,062	1,237	3,314	NWL								
Forebay & Main Cell Above NWL						NWL	0.00	0.000				0.000	
247.00	3,288	-	-	4,429	0								
247.20	3,595	3,441	688	5,117	688								
247.40	3,902	3,748	750	5,867	1,438								
247.60	4,209	4,055	811	6,678	2,249								
247.80	4,433	4,321	864	7,542	3,113	Extended Detention	0.60	0.024				0.024	
247.80	4,433	4,321	864	7,542	3,113		0.80	0.028	0.000	-		0.028	Extended Detention Provided
248.00	4,657	4,545	909	8,451	4,022		1.00	0.032	0.224	-		0.256	
248.20	4,851	4,754	951	9,402	4,973		1.20	0.035	0.634	-		0.669	
248.40	5,045	4,948	990	10,392	5,963	1.40	0.038	-	1.009		1.046	100-year Storage Provided	
248.60	5,240	5,142	1,028	11,420	6,991	1.60	0.040	-	1.235		1.276		
248.80	5,434	5,337	1,067	12,488	8,059	1.80	0.043	-	1.426		1.469		
249.00	5,628	5,531	1,106	13,594	9,165	2.00	0.045	-	1.595	0.000	1.640		
249.10	5,718	5,673	567	14,161	9,732	2.10	0.047	-	1.672	1.056	2.775		
249.20	5,808	5,763	576	14,737	10,308	2.20	0.048	-	1.747	2.987	4.782		
249.50	6,077	5,942	1,783	16,520	12,091	2.50	0.051	-	1.953	11.809	13.813		

Table E.6-B: Stage-Storage-Discharge Table - South SWM Pond

Stage Storage Curve						Outlet Structure						Comments:	
Elevation	Sec Area	Avg Area	Sec Volume	Cumulative Volume	Volume Above NWL	Invert Elevation (m) Diameter (mm)/Length (m) Height (m) Orifice Area (m ²)	Stage Active (m)	¹ Discharge m ³ /s					
(m)	(m ²)	(m ²)	(m ³)	(m ³)	(m ³)			Orifice #S-1	Orifice #S-2		Spillway		Total
									(Weir Flow)	(Orifice Flow)			
								245.50	246.10	246.10	247.50	Flow	
								95	1.00	1.00	20.00		
								-	0.40	0.40			
								0.0071	-	0.4000	-		
Forebay Below NWL						Bottom of Forebay							Weir Equation: Q=1.837xLxH ^{1.5} Orifice Eq'n: Q = 0.6A(2gH) ^{0.5} Spillway Design: Q=1.67xLxH ^{1.5}
243.50	82	-	-	0									
244.50	291	187	187	187									
244.90	407	349	140	326									
245.50	684	546	327	653		NWL							
Main Cell Below NWL						Bottom of Main Cell							
243.50	647	-	-	0									
244.50	995	821	821	821									
244.90	1,154	1,075	430	1,251									
245.50	1,533	1,344	806	2,057		NWL							
Forebay & Main Cell Above NWL						NWL	0.00	0.000				0.000	
245.50	2,217	-	-	2,710	0								
245.70	2,476	2,346	469	3,180	469								
245.90	2,734	2,605	521	3,701	990								
246.10	2,993	2,864	573	4,273	1,563	Extended Detention	0.60	0.014	0.000	-	0.014	Extended Detention Provided	
246.30	3,193	3,093	619	4,892	2,182		0.80	0.016	0.149	-	0.166		
246.50	3,393	3,293	659	5,551	2,840		1.00	0.018	0.422	-	0.441		
246.70	3,528	3,460	692	6,243	3,532		1.20	0.020	-	0.672	0.693		
246.90	3,662	3,595	719	6,962	4,251	Emergency Spillway	1.40	0.022	-	0.823	0.845	100-year Storage Provided	
247.10	3,797	3,729	746	7,707	4,997		1.60	0.023	-	0.951	0.974		
247.30	3,931	3,864	773	8,480	5,770		1.80	0.025	-	1.063	1.088		
247.50	4,066	3,999	800	9,280	6,570		2.00	0.026	-	1.165	0.000		1.191
247.75	4,245	4,156	1,039	10,319	7,609	Top of Berm	2.25	0.028	-	1.280	4.175	5.483	
248.00	4,424	4,335	1,084	11,403	8,692		2.50	0.030	-	1.386	11.809	13.224	

Table E.7-A: Permanent Pool Volume Requirements - North SWM Pond

Protection Level	SWMP Type	Storage Volume (m ³ /ha) for			
		Impervious Level			
		35%	55%	70%	85%
Level 1	<i>Infiltration</i>	25	30	35	40
	<i>Wetlands</i> ²	80	105	120	140
	<i>Wet Pond</i> ²	140	190	225	250
	<i>Hybrid Wet Pond/Wetland</i> ⁴	110	150	175	195
Level 2	<i>Infiltration</i>	20	20	25	30
	<i>Wetlands</i>	60	70	80	90
	<i>Wet Pond</i>	90	110	130	150
	<i>Hybrid Wet Pond/Wetland</i>	75	90	105	120
Level 3	<i>Infiltration</i>	20	20	20	20
	<i>Wetlands</i>	60	60	60	60
	<i>Wet Pond</i>	60	75	85	95
	<i>Hybrid Wet Pond/Wetland</i>	60	70	75	80
	<i>Dry Pond</i>	90	150	200	240

Source: Stormwater Management Planning and Design Manual (Table 3.2),
Ministry of the Environment, Ontario, March 2003

- Table 3.2 was based on specific design parameters (depth, length to width ratio) for each type of end-of-pipe stormwater management facility. The values of these parameters are provided in Appendix I of the Manual. All values in Table 4.1 are based on a 24 hour detention.
- For wetlands, wet ponds and hybrid ponds, all of the storage, except 40 m³/ha, in Table 3.2 represents the permanent pool volume. The 40 m³/ha represents the extended detention storage.
- For hybrid ponds, 50% to 60% of the permanent pool volume shall be contained in deeper portions of the facility.

PERMANENT POOL VOLUME CALCULATOR

SWMP Type:	WET POND	(IN - infiltration, WET - wetlands, WP - wet pond, HYB - hybrid wet pond/wetland, DP - dry pond)
Protection Level:	1	(1 - 80% TSS, 2 - 70% TSS, 3 - 60% TSS)
Average Imperviousness:	60.0 %	
Volume Level:	161.7 m ³ /ha	Excluding Extended Detention
Area:	23.89 ha	
Total Required Volume:	3,862 m ³	

Table E.7-B: Permanent Pool Volume Requirements - South SWM Pond

Protection Level	SWMP Type	Storage Volume (m ³ /ha) for			
		Impervious Level			
		35%	55%	70%	85%
Level 1	<i>Infiltration</i>	25	30	35	40
	<i>Wetlands</i> ²	80	105	120	140
	<i>Wet Pond</i> ²	140	190	225	250
	<i>Hybrid Wet Pond/Wetland</i> ⁴	110	150	175	195
Level 2	<i>Infiltration</i>	20	20	25	30
	<i>Wetlands</i>	60	70	80	90
	<i>Wet Pond</i>	90	110	130	150
	<i>Hybrid Wet Pond/Wetland</i>	75	90	105	120
Level 3	<i>Infiltration</i>	20	20	20	20
	<i>Wetlands</i>	60	60	60	60
	<i>Wet Pond</i>	60	75	85	95
	<i>Hybrid Wet Pond/Wetland</i>	60	70	75	80
	<i>Dry Pond</i>	90	150	200	240

Source: Stormwater Management Planning and Design Manual (Table 3.2),
Ministry of the Environment, Ontario, March 2003

- Table 3.2 was based on specific design parameters (depth, length to width ratio) for each type of end-of-pipe stormwater management facility. The values of these parameters are provided in Appendix I of the Manual. All values in Table 4.1 are based on a 24 hour detention.
- For wetlands, wet ponds and hybrid ponds, all of the storage, except 40 m³/ha, in Table 3.2 represents the permanent pool volume. The 40 m³/ha represents the extended detention storage.
- For hybrid ponds, 50% to 60% of the permanent pool volume shall be contained in deeper portions of the facility.

PERMANENT POOL VOLUME CALCULATOR

SWMP Type:	WET POND	(IN - infiltration, WET - wetlands, WP - wet pond, HYB - hybrid wet pond/wetland, DP - dry pond)
Protection Level:	1	(1 - 80% TSS, 2 - 70% TSS, 3 - 60% TSS)
Average Imperviousness:	60.0 %	
Volume Level:	161.7 m ³ /ha	Excluding Extended Detention
Area:	10.88 ha	
Total Required Volume:	1,759 m³	

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File: 16119

Date: December 2021

Table E.8-A: Extended Detention Requirements - North SWM Pond

Event	Area (ha)	R.V. (mm)	Required Ext. Det. Volume (m ³)	Provided Ext. Det. Volume (m ³)
25mm 4-hour Chicago Storm	23.89	12.87	3,075	3,113

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File: 16119

Date: December 2021

Table E.8-B: Extended Detention Requirements - South SWM Pond

Event	Area (ha)	R.V. (mm)	Required Ext. Det. Volume (m ³)	Provided Ext. Det. Volume (m ³)
25mm 4-hour Chicago Storm	10.88	12.16	1,323	1,563

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File: 16119

Date: December 2021

Table E.9-A: Extended Detention Drawdown Time - North SWM Pond

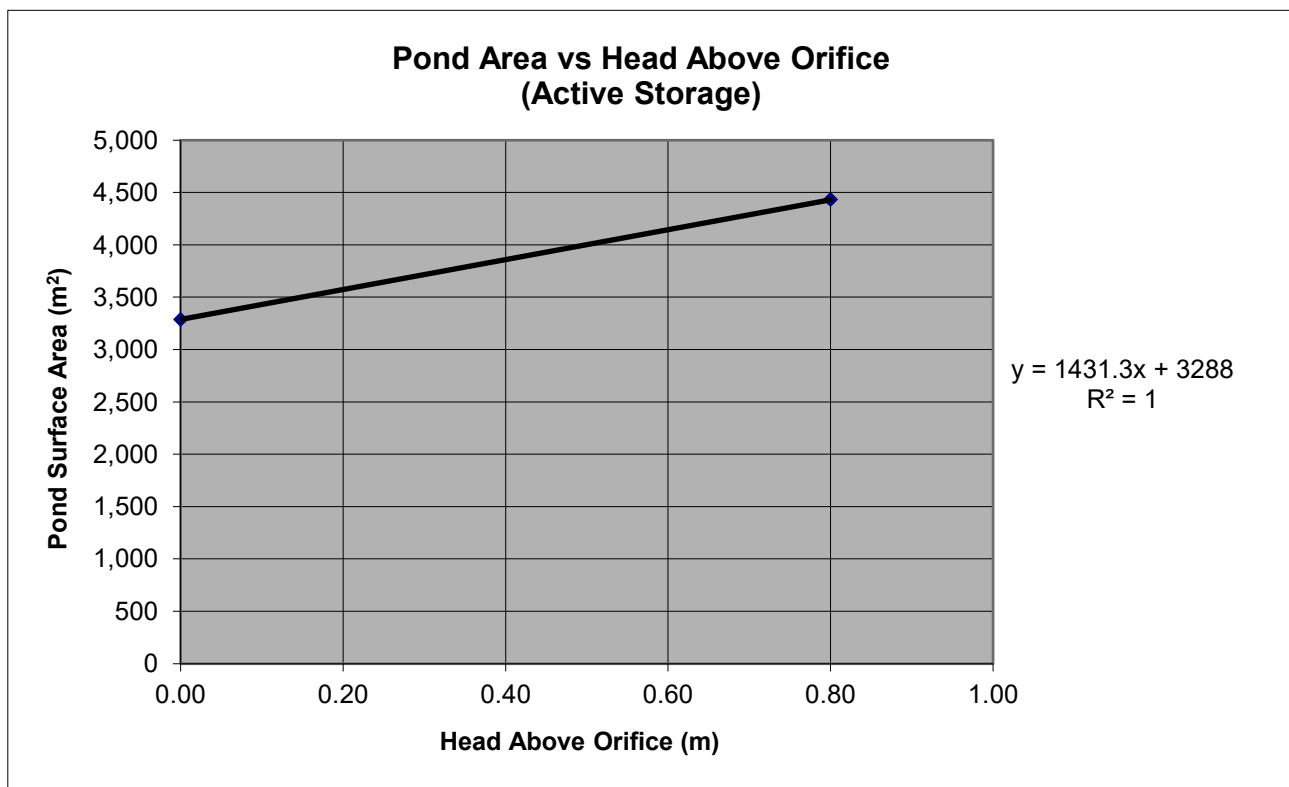
Extended Detention - SWM Pond

Orifice Sizing	
Orifice Size	125 mm
Orifice Inve	247.00 m
Orifice Area	0.012271846 sq. m
¹ EDL _{erosion}	247.80 m
NWL	247.00 m
C ₂	1431.3
C ₃	3288.0
h	0.7375 m
Drawdown τ	51.4 hr

$$y = mx + b$$

$$C_2 = m$$

$$C_3 = b$$



VALDOR ENGINEERING INC.

File: 16119

Date: December 2021

Table E.9-B: Extended Detention Drawdown Time - South SWM Pond

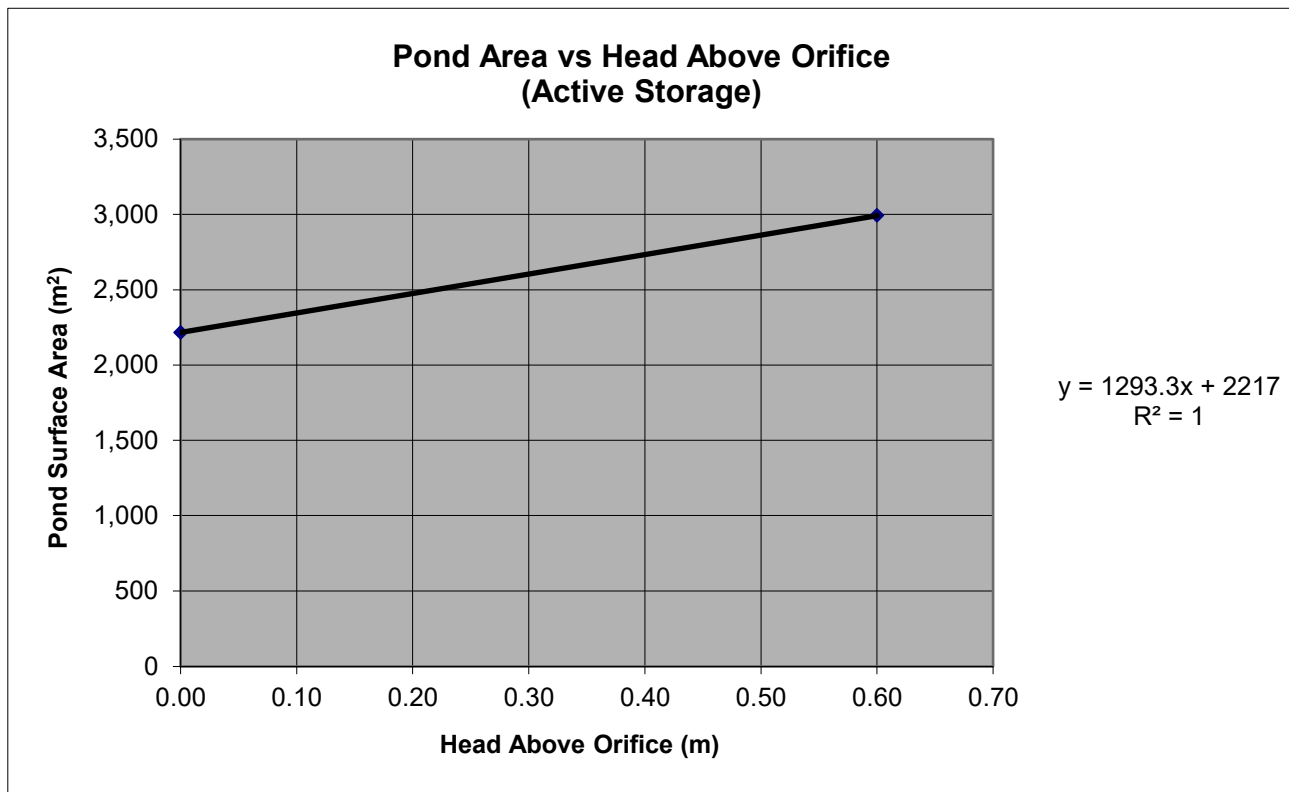
Extended Detention - SWM Pond

Orifice Sizing	
Orifice Size	95 mm
Orifice Inve	245.50 m
Orifice Area	0.007088218 sq. m
¹ EDL _{erosion}	246.10 m
NWL	245.50 m
C ₂	1293.3
C ₃	2217.0
h	0.5525 m
Drawdown τ	52.0 hr

$$y = mx + b$$

$$C_2 = m$$

$$C_3 = b$$



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File: 16119

Date: December 2021

Table E.10-A: Critical Storm Analysis - North SWM Pond

Storm Distribution	Theoretical 100-year Storage Volume Required (m³)	Note
6-hour SCS	5,510	Critical
12-hour SCS	5,078	
24-hour SCS	4,705	
6-hour AES	5,115	
12-hour AES	4,405	
24-hour AES	3,702	
4-hour Chicago	4,902	

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Date: December 2021

Table E.10-B: Critical Storm Analysis - South SWM Pon

Storm Distribution	Theoretical 100-year Storage Volume Required (m³)	Note
6-hour SCS	2,994	Critical
12-hour SCS	2,782	
24-hour SCS	2,575	
6-hour AES	2,624	
12-hour AES	2,013	
24-hour AES	1,515	
4-hour Chicago	2,616	

North SWM Pond: Forebay Spillway

Project Description

Solve For Discharge

Input Data

Headwater Elevation		247.80	m
Crest Elevation		247.00	m
Tailwater Elevation		247.00	m
Crest Surface Type	Gravel		
Crest Breadth		8.00	m
Crest Length		4.00	m

Results

Discharge	4.769	m³/s
Headwater Height Above Crest	0.80	m
Tailwater Height Above Crest	0.00	m
Weir Coefficient	1.67	SI
Submergence Factor	1.00	
Adjusted Weir Coefficient	1.67	SI
Flow Area	3.20	m²
Velocity	1.49	m/s
Wetted Perimeter	5.60	m
Top Width	4.00	m

South SWM Pond: Forebay Spillway

Project Description

Solve For Discharge

Input Data

Headwater Elevation		246.10	m
Crest Elevation		245.50	m
Tailwater Elevation		245.50	m
Crest Surface Type	Gravel		
Crest Breadth		5.60	m
Crest Length		4.00	m

Results

Discharge	3.052	m³/s
Headwater Height Above Crest	0.60	m
Tailwater Height Above Crest	0.00	m
Weir Coefficient	1.64	SI
Submergence Factor	1.00	
Adjusted Weir Coefficient	1.64	SI
Flow Area	2.40	m²
Velocity	1.27	m/s
Wetted Perimeter	5.20	m
Top Width	4.00	m

Culvert Calculator Report

North SWM Pond: Outlet Pipe, 100yr Controlled

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	0.00 m	Headwater Depth/Height	1.06
Computed Headwater Elevation	247.48 m	Discharge	1.4620 m³/s
Inlet Control HW Elev.	247.41 m	Tailwater Elevation	246.60 m
Outlet Control HW Elev.	247.48 m	Control Type	Entrance Control
Grades			
Upstream Invert	246.35 m	Downstream Invert	246.00 m
Length	70.70 m	Constructed Slope	0.004950 m/m
Hydraulic Profile			
Profile	S2	Depth, Downstream	0.68 m
Slope Type	Steep	Normal Depth	0.68 m
Flow Regime	Supercritical	Critical Depth	0.68 m
Velocity Downstream	2.45 m/s	Critical Slope	0.004769 m/m
Section			
Section Shape	Circular	Mannings Coefficient	0.013
Section Material	Concrete	Span	1.07 m
Section Size	1050 mm	Rise	1.07 m
Number Sections	1		
Outlet Control Properties			
Outlet Control HW Elev.	247.48 m	Upstream Velocity Head	0.30 m
Ke	0.50	Entrance Loss	0.15 m
Inlet Control Properties			
Inlet Control HW Elev.	247.41 m	Flow Control	Unsubmerged
Inlet Type	Square edge w/headwall	Area Full	0.9 m²
K	0.00980	HDS 5 Chart	1
M	2.00000	HDS 5 Scale	1
C	0.03980	Equation Form	1
Y	0.67000		

Culvert Calculator Report

South SWM Pond: Outlet Pipe, 100yr Controlled

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	0.00 m	Headwater Depth/Height	1.17
Computed Headwater Elevation	245.82 m	Discharge	0.7500 m³/s
Inlet Control HW Elev.	245.80 m	Tailwater Elevation	242.00 m
Outlet Control HW Elev.	245.82 m	Control Type	Outlet Control
Grades			
Upstream Invert	244.93 m	Downstream Invert	244.50 m
Length	85.60 m	Constructed Slope	0.005023 m/m
Hydraulic Profile			
Profile	M2	Depth, Downstream	0.53 m
Slope Type	Mild	Normal Depth	0.57 m
Flow Regime	Subcritical	Critical Depth	0.53 m
Velocity Downstream	2.19 m/s	Critical Slope	0.005908 m/m
Section			
Section Shape	Circular	Mannings Coefficient	0.013
Section Material	Concrete	Span	0.76 m
Section Size	750 mm	Rise	0.76 m
Number Sections	1		
Outlet Control Properties			
Outlet Control HW Elev.	245.82 m	Upstream Velocity Head	0.21 m
Ke	0.50	Entrance Loss	0.11 m
Inlet Control Properties			
Inlet Control HW Elev.	245.80 m	Flow Control	N/A
Inlet Type	Square edge w/headwall	Area Full	0.5 m²
K	0.00980	HDS 5 Chart	1
M	2.00000	HDS 5 Scale	1
C	0.03980	Equation Form	1
Y	0.67000		

North SWM Pond: Emergency Spillway, 100yr Uncontrolled

Project Description

Solve For Headwater Elevation

Input Data

Discharge		6.127	m³/s
Crest Elevation		249.00	m
Tailwater Elevation		249.00	m
Crest Surface Type	Gravel		
Crest Breadth		7.00	m
Crest Length		20.00	m

Results

Headwater Elevation	249.34	m
Headwater Height Above Crest	0.34	m
Tailwater Height Above Crest	0.00	m
Weir Coefficient	1.57	SI
Submergence Factor	1.00	
Adjusted Weir Coefficient	1.57	SI
Flow Area	6.72	m²
Velocity	0.91	m/s
Wetted Perimeter	20.67	m
Top Width	20.00	m

South SWM Pond: Emergency Spillway, 100yr Uncontrolled

Project Description

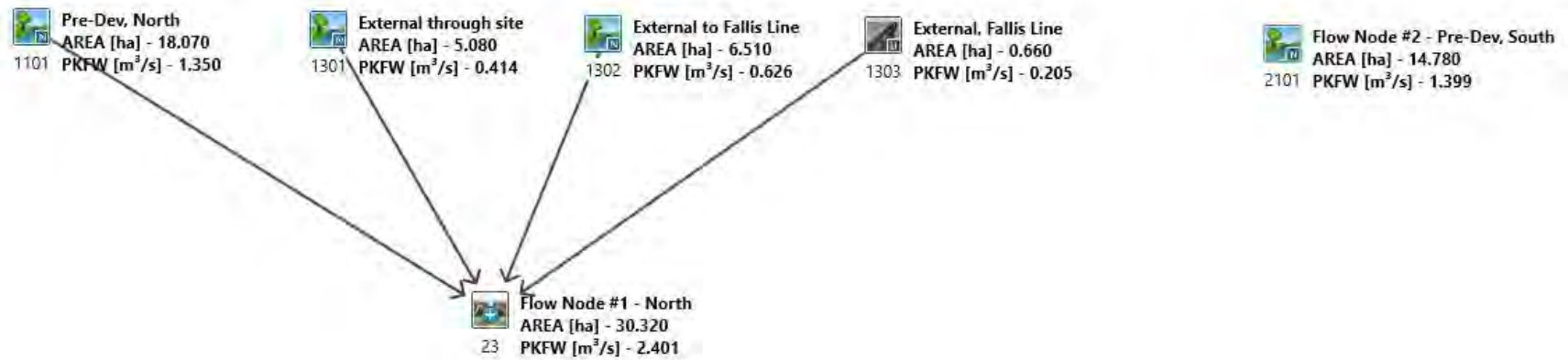
Solve For Headwater Elevation

Input Data

Discharge		3.058	m³/s
Crest Elevation		247.50	m
Tailwater Elevation		247.50	m
Crest Surface Type	Gravel		
Crest Breadth		7.00	m
Crest Length		10.00	m

Results

Headwater Elevation	247.84	m
Headwater Height Above Crest	0.34	m
Tailwater Height Above Crest	0.00	m
Weir Coefficient	1.57	SI
Submergence Factor	1.00	
Adjusted Weir Coefficient	1.57	SI
Flow Area	3.36	m²
Velocity	0.91	m/s
Wetted Perimeter	10.67	m
Top Width	10.00	m



VO5 Model Schematic – Pre-Development

=====

```

V   V   I   SSSSS   U   U   A   L   (v 6.2.2007)
V   V   I   SS      U   U   A   A   L
V   V   I   SS      U   U   AAAAA L
V   V   I   SS      U   U   A   A   L
V   V   I   SSSSS   UUUUU   A   A   LLLLL

```

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000   TTTT   TTTT   H   H   Y   Y   M   M   000   TM
0   0   T   T   H   H   Y   Y   MM   MM   0   0
0   0   T   T   H   H   Y   M   M   0   0
000   T   T   H   H   Y   M   M   000

```

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***** D E T A I L E D O U T P U T *****

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Output filename: C:\Users\Valdor\AppData\Local\Civica\XH5\c7e9b9dc-2878-4b8a-9d26-5e475049aa89\820bdee5-0874-4180-b6fd-493b8247bf23\scena
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DATE: 12-06-2021 TIME: 04:48:35

USER:

COMMENTS: _____

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*****
** SIMULATION : SCS_6H_002Y **
*****

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| READ STORM | File: C:\Users\Valdor\AppData\Local\Temp\2c180882-d1c1-4096-97ef-d5bb234b912f\96d71607
| Ptotal= 38.70 mm | Comments: 2yr/6hr Peterborough A SCS
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TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	0.00	1.75	3.87	3.50	8.51	5.25	1.55
0.25	1.55	2.00	3.87	3.75	3.87	5.50	1.55
0.50	1.55	2.25	4.64	4.00	3.87	5.75	1.55
0.75	2.32	2.50	4.64	4.25	3.10	6.00	1.55
1.00	2.32	2.75	23.22	4.50	3.10		
1.25	2.32	3.00	60.37	4.75	2.32		
1.50	2.32	3.25	8.51	5.00	2.32		

```

-----
| CALIB |
| NASHYD ( 2101) | Area (ha)= 14.78 Curve Number (CN)= 77.0
| ID= 1 DT= 5.0 min | Ia (mm)= 7.40 # of Linear Res.(N)= 3.00
| U.H. Tp(hrs)= 0.39
-----

```

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

```

----- TRANSFORMED HYETOGRAPH -----
TIME RAIN TIME RAIN TIME RAIN TIME RAIN
hrs mm/hr hrs mm/hr hrs mm/hr hrs mm/hr
0.083 0.00 1.667 2.32 3.250 60.37 4.83 2.32
0.167 0.00 1.750 2.32 3.333 8.51 4.92 2.32
0.250 0.00 1.833 3.87 3.417 8.51 5.00 2.32
0.333 1.55 1.917 3.87 3.500 8.51 5.08 2.32
0.417 1.55 2.000 3.87 3.583 8.51 5.17 2.32
0.500 1.55 2.083 3.87 3.667 8.51 5.25 2.32
0.583 1.55 2.167 3.87 3.750 8.51 5.33 1.55
0.667 1.55 2.250 3.87 3.833 3.87 5.42 1.55
0.750 1.55 2.333 4.64 3.917 3.87 5.50 1.55
0.833 2.32 2.417 4.64 4.000 3.87 5.58 1.55
0.917 2.32 2.500 4.64 4.083 3.87 5.67 1.55
1.000 2.32 2.583 4.64 4.167 3.87 5.75 1.55
1.083 2.32 2.667 4.64 4.250 3.87 5.83 1.55
1.167 2.32 2.750 4.64 4.333 3.10 5.92 1.55
1.250 2.32 2.833 23.22 4.417 3.10 6.00 1.55
1.333 2.32 2.917 23.22 4.500 3.10 6.08 1.55
1.417 2.32 3.000 23.22 4.583 3.10 6.17 1.55
1.500 2.32 3.083 60.37 4.667 3.10 6.25 1.55
1.583 2.32 3.167 60.37 4.750 3.10 1.55

```

Unit Hyd Qpeak (cms)= 1.447

PEAK FLOW (cms)= 0.275 (i)
TIME TO PEAK (hrs)= 3.583
RUNOFF VOLUME (mm)= 9.139
TOTAL RAINFALL (mm)= 38.698
RUNOFF COEFFICIENT = 0.236

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| CALIB |
| NASHYD ( 1101) | Area (ha)= 18.07 Curve Number (CN)= 75.0
| ID= 1 DT= 5.0 min | Ia (mm)= 7.30 # of Linear Res.(N)= 3.00
| U.H. Tp(hrs)= 0.50
-----

```

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

```

----- TRANSFORMED HYETOGRAPH -----
TIME RAIN TIME RAIN TIME RAIN TIME RAIN
hrs mm/hr hrs mm/hr hrs mm/hr hrs mm/hr
0.083 0.00 1.667 2.32 3.250 60.37 4.83 2.32
0.167 0.00 1.750 2.32 3.333 8.51 4.92 2.32
0.250 0.00 1.833 3.87 3.417 8.51 5.00 2.32
0.333 1.55 1.917 3.87 3.500 8.51 5.08 2.32
0.417 1.55 2.000 3.87 3.583 8.51 5.17 2.32
0.500 1.55 2.083 3.87 3.667 8.51 5.25 2.32
0.583 1.55 2.167 3.87 3.750 8.51 5.33 1.55
0.667 1.55 2.250 3.87 3.833 3.87 5.42 1.55
0.750 1.55 2.333 4.64 3.917 3.87 5.50 1.55
0.833 2.32 2.417 4.64 4.000 3.87 5.58 1.55
0.917 2.32 2.500 4.64 4.083 3.87 5.67 1.55
1.000 2.32 2.583 4.64 4.167 3.87 5.75 1.55
1.083 2.32 2.667 4.64 4.250 3.87 5.83 1.55
1.167 2.32 2.750 4.64 4.333 3.10 5.92 1.55
1.250 2.32 2.833 23.22 4.417 3.10 6.00 1.55
1.333 2.32 2.917 23.22 4.500 3.10 6.08 1.55
1.417 2.32 3.000 23.22 4.583 3.10 6.17 1.55
1.500 2.32 3.083 60.37 4.667 3.10 6.25 1.55
1.583 2.32 3.167 60.37 4.750 3.10 1.55

```

Unit Hyd Qpeak (cms)= 1.380

PEAK FLOW (cms)= 0.262 (i)

TIME TO PEAK (hrs)= 3.750
 RUNOFF VOLUME (mm)= 8.493
 TOTAL RAINFALL (mm)= 38.698
 RUNOFF COEFFICIENT = 0.219

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 | CALIB |
 | NASHYD (1301) | Area (ha)= 5.08 Curve Number (CN)= 77.0
 | ID= 1 DT= 5.0 min | Ia (mm)= 6.50 # of Linear Res.(N)= 3.00
 |-----| U.H. Tp(hrs)= 0.49

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----							
TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	1.667	2.32	3.250	60.37	4.83	2.32
0.167	0.00	1.750	2.32	3.333	8.51	4.92	2.32
0.250	0.00	1.833	3.87	3.417	8.51	5.00	2.32
0.333	1.55	1.917	3.87	3.500	8.51	5.08	2.32
0.417	1.55	2.000	3.87	3.583	8.51	5.17	2.32
0.500	1.55	2.083	3.87	3.667	8.51	5.25	2.32
0.583	1.55	2.167	3.87	3.750	8.51	5.33	1.55
0.667	1.55	2.250	3.87	3.833	3.87	5.42	1.55
0.750	1.55	2.333	4.64	3.917	3.87	5.50	1.55
0.833	2.32	2.417	4.64	4.000	3.87	5.58	1.55
0.917	2.32	2.500	4.64	4.083	3.87	5.67	1.55
1.000	2.32	2.583	4.64	4.167	3.87	5.75	1.55
1.083	2.32	2.667	4.64	4.250	3.87	5.83	1.55
1.167	2.32	2.750	4.64	4.333	3.10	5.92	1.55
1.250	2.32	2.833	23.22	4.417	3.10	6.00	1.55
1.333	2.32	2.917	23.22	4.500	3.10	6.08	1.55
1.417	2.32	3.000	23.22	4.583	3.10	6.17	1.55
1.500	2.32	3.083	60.37	4.667	3.10	6.25	1.55
1.583	2.32	3.167	60.37	4.750	3.10		

Unit Hyd Qpeak (cms)= 0.396

PEAK FLOW (cms)= 0.085 (i)
 TIME TO PEAK (hrs)= 3.750
 RUNOFF VOLUME (mm)= 9.592
 TOTAL RAINFALL (mm)= 38.698
 RUNOFF COEFFICIENT = 0.248

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 | CALIB |
 | NASHYD (1302) | Area (ha)= 6.51 Curve Number (CN)= 79.0
 | ID= 1 DT= 5.0 min | Ia (mm)= 6.70 # of Linear Res.(N)= 3.00
 |-----| U.H. Tp(hrs)= 0.42

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----							
TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	1.667	2.32	3.250	60.37	4.83	2.32
0.167	0.00	1.750	2.32	3.333	8.51	4.92	2.32
0.250	0.00	1.833	3.87	3.417	8.51	5.00	2.32
0.333	1.55	1.917	3.87	3.500	8.51	5.08	2.32
0.417	1.55	2.000	3.87	3.583	8.51	5.17	2.32
0.500	1.55	2.083	3.87	3.667	8.51	5.25	2.32
0.583	1.55	2.167	3.87	3.750	8.51	5.33	1.55

0.667	1.55	2.250	3.87	3.833	3.87	5.42	1.55
0.750	1.55	2.333	4.64	3.917	3.87	5.50	1.55
0.833	2.32	2.417	4.64	4.000	3.87	5.58	1.55
0.917	2.32	2.500	4.64	4.083	3.87	5.67	1.55
1.000	2.32	2.583	4.64	4.167	3.87	5.75	1.55
1.083	2.32	2.667	4.64	4.250	3.87	5.83	1.55
1.167	2.32	2.750	4.64	4.333	3.10	5.92	1.55
1.250	2.32	2.833	23.22	4.417	3.10	6.00	1.55
1.333	2.32	2.917	23.22	4.500	3.10	6.08	1.55
1.417	2.32	3.000	23.22	4.583	3.10	6.17	1.55
1.500	2.32	3.083	60.37	4.667	3.10	6.25	1.55
1.583	2.32	3.167	60.37	4.750	3.10		

Unit Hyd Qpeak (cms)= 0.592

PEAK FLOW (cms)= 0.131 (i)
 TIME TO PEAK (hrs)= 3.583
 RUNOFF VOLUME (mm)= 18.287
 TOTAL RAINFALL (mm)= 38.698
 RUNOFF COEFFICIENT = 0.266

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 | CALIB |
 | STANDHYD (1303) | Area (ha)= 0.66
 | ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 70.00
 |-----|

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.46	0.20
Dep. Storage (mm)=	1.00	5.00
Average Slope (%)=	1.00	2.00
Length (m)=	66.33	40.00
Mannings n =	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----							
TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	1.667	2.32	3.250	60.37	4.83	2.32
0.167	0.00	1.750	2.32	3.333	8.51	4.92	2.32
0.250	0.00	1.833	3.87	3.417	8.51	5.00	2.32
0.333	1.55	1.917	3.87	3.500	8.51	5.08	2.32
0.417	1.55	2.000	3.87	3.583	8.51	5.17	2.32
0.500	1.55	2.083	3.87	3.667	8.51	5.25	2.32
0.583	1.55	2.167	3.87	3.750	8.51	5.33	1.55
0.667	1.55	2.250	3.87	3.833	3.87	5.42	1.55
0.750	1.55	2.333	4.64	3.917	3.87	5.50	1.55
0.833	2.32	2.417	4.64	4.000	3.87	5.58	1.55
0.917	2.32	2.500	4.64	4.083	3.87	5.67	1.55
1.000	2.32	2.583	4.64	4.167	3.87	5.75	1.55
1.083	2.32	2.667	4.64	4.250	3.87	5.83	1.55
1.167	2.32	2.750	4.64	4.333	3.10	5.92	1.55
1.250	2.32	2.833	23.22	4.417	3.10	6.00	1.55
1.333	2.32	2.917	23.22	4.500	3.10	6.08	1.55
1.417	2.32	3.000	23.22	4.583	3.10	6.17	1.55
1.500	2.32	3.083	60.37	4.667	3.10	6.25	1.55
1.583	2.32	3.167	60.37	4.750	3.10		

Max.Eff.Inten.(mm/hr)= 60.37 8.07
 over (min) 5.00 25.00
 Storage Coeff. (min)= 2.44 (ii) 21.76 (ii)
 Unit Hyd. Tpeak (min)= 5.00 25.00
 Unit Hyd. peak (cms)= 0.30 0.05

TOTALS
 PEAK FLOW (cms)= 0.08 0.00 0.079 (iii)
 TIME TO PEAK (hrs)= 3.25 3.58 3.25

```

RUNOFF VOLUME (mm)= 37.70 5.79 28.10
TOTAL RAINFALL (mm)= 38.70 38.70 38.70
RUNOFF COEFFICIENT = 0.97 0.15 0.73

```

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 61.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| ADD HYD ( 0023)|
| 1 + 2 = 3 |
-----
          AREA   QPEAK   TPEAK   R.V.
          (ha)   (cms)   (hrs)   (mm)
ID1= 1 ( 1101): 18.07 0.262 3.75 8.49
+ ID2= 2 ( 1301): 5.08 0.085 3.75 9.59
=====
ID = 3 ( 0023): 23.15 0.347 3.75 8.73

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| ADD HYD ( 0023)|
| 3 + 2 = 1 |
-----
          AREA   QPEAK   TPEAK   R.V.
          (ha)   (cms)   (hrs)   (mm)
ID1= 3 ( 0023): 23.15 0.347 3.75 8.73
+ ID2= 2 ( 1302): 6.51 0.131 3.58 10.29
=====
ID = 1 ( 0023): 29.66 0.475 3.67 9.08

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| ADD HYD ( 0023)|
| 1 + 2 = 3 |
-----
          AREA   QPEAK   TPEAK   R.V.
          (ha)   (cms)   (hrs)   (mm)
ID1= 1 ( 0023): 29.66 0.475 3.67 9.08
+ ID2= 2 ( 1303): 0.66 0.079 3.25 28.10
=====
ID = 3 ( 0023): 30.32 0.488 3.67 9.49

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

=====
V V I SSSS U U A L (v 6.2.2007)
V V I SS U U A A L
V V I SS U U A A A A L
V V I SS U U A A L
VV I SSSS UUUU A A LLLLL

000 TTTT TTTT H H Y Y M M 000 TM
0 0 T T H H Y Y MM MM 0 0
0 0 T T H H Y M M 0 0
000 T T H H Y M M 000

```

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***** DETAILED OUTPUT *****

```

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
Output filename: C:\Users\Valdor\AppData\Local\Civica\XH5\c7e9b9dc-2878-4b8a-9d26-5e475049aa89\6c580b5f-2b37-4cc7-9310-db5ee20083c1\scena
Summary filename: C:\Users\Valdor\AppData\Local\Civica\XH5\c7e9b9dc-2878-4b8a-9d26-5e475049aa89\6c580b5f-2b37-4cc7-9310-db5ee20083c1\scena

```

DATE: 12-06-2021

TIME: 04:48:35

USER:

COMMENTS:

```

-----
** SIMULATION : SCS_6H_005Y
-----

```

```

-----
| READ STORM |
|          |
| Ptotal= 52.40 mm |
-----
Filename: C:\Users\Valdor\AppData\Local\Temp\2c180882-d1c1-4096-97ef-d5bb234b912f\3c8faa6e
Comments: 5yr/6hr Peterborough A SCS

```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	0.00	1.75	5.24	3.50	11.53	5.25	2.10
0.25	2.10	2.00	5.24	3.75	5.24	5.00	2.10
0.50	2.10	2.25	6.29	4.00	5.24	5.75	2.10
0.75	3.14	2.50	6.29	4.25	4.19	6.00	2.10
1.00	3.14	2.75	31.44	4.50	4.19		
1.25	3.14	3.00	81.74	4.75	3.14		
1.50	3.14	3.25	11.53	5.00	3.14		

```

-----
| CALIB |
| NASHYD ( 2101) |
| ID= 1 DT= 5.0 min |
-----
Area (ha)= 14.78 Curve Number (CN)= 77.0
Ia (mm)= 7.40 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.39

```

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

```

----- TRANSFORMED HYETOGRAPH -----
TIME RAIN TIME RAIN TIME RAIN TIME RAIN
hrs mm/hr hrs mm/hr hrs mm/hr hrs mm/hr
0.083 0.00 1.667 3.14 3.250 81.74 4.83 3.14
0.167 0.00 1.750 3.14 3.333 11.53 4.92 3.14
0.250 0.00 1.833 5.24 3.417 11.53 5.00 3.14
0.333 2.10 1.917 5.24 3.500 11.53 5.08 3.14
0.417 2.10 2.000 5.24 3.583 11.53 5.17 3.14
0.500 2.10 2.083 5.24 3.667 11.53 5.25 3.14
0.583 2.10 2.167 5.24 3.750 11.53 5.33 2.10
0.667 2.10 2.250 5.24 3.833 5.24 5.42 2.10
0.750 2.10 2.333 6.29 3.917 5.24 5.50 2.10
0.833 3.14 2.417 6.29 4.000 5.24 5.58 2.10
0.917 3.14 2.500 6.29 4.083 5.24 5.67 2.10
1.000 3.14 2.583 6.29 4.167 5.24 5.75 2.10
1.083 3.14 2.667 6.29 4.250 5.24 5.83 2.10
1.167 3.14 2.750 6.29 4.333 4.19 5.92 2.10
1.250 3.14 2.833 31.44 4.417 4.19 6.00 2.10
1.333 3.14 2.917 31.44 4.500 4.19 6.08 2.10
1.417 3.14 3.000 31.44 4.583 4.19 6.17 2.10

```

1.500 3.14 | 3.083 81.74 | 4.667 4.19 | 6.25 2.10
 1.583 3.14 | 3.167 81.74 | 4.750 4.19 |

Unit Hyd Qpeak (cms)= 1.447

PEAK FLOW (cms)= 0.523 (i)
 TIME TO PEAK (hrs)= 3.583
 RUNOFF VOLUME (mm)= 16.751
 TOTAL RAINFALL (mm)= 52.400
 RUNOFF COEFFICIENT = 0.320

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 | CALIB |
 | NASHYD (1101) | Area (ha)= 18.07 Curve Number (CN)= 75.0
 | ID= 1 DT= 5.0 min | Ia (mm)= 7.30 # of Linear Res.(N)= 3.00

 U.H. Tp(hrs)= 0.50

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

----- TRANSFORMED HYETOGRAPH -----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	1.667	3.14	3.250	81.74	4.83	3.14
0.167	0.00	1.750	3.14	3.333	11.53	4.92	3.14
0.250	0.00	1.833	5.24	3.417	11.53	5.00	3.14
0.333	2.10	1.917	5.24	3.500	11.53	5.08	3.14
0.417	2.10	2.000	5.24	3.583	11.53	5.17	3.14
0.500	2.10	2.083	5.24	3.667	11.53	5.25	3.14
0.583	2.10	2.167	5.24	3.750	11.53	5.33	2.10
0.667	2.10	2.250	5.24	3.833	5.24	5.42	2.10
0.750	2.10	2.333	6.29	3.917	5.24	5.50	2.10
0.833	3.14	2.417	6.29	4.000	5.24	5.58	2.10
0.917	3.14	2.500	6.29	4.083	5.24	5.67	2.10
1.000	3.14	2.583	6.29	4.167	5.24	5.75	2.10
1.083	3.14	2.667	6.29	4.250	5.24	5.83	2.10
1.167	3.14	2.750	6.29	4.333	4.19	5.92	2.10
1.250	3.14	2.833	31.44	4.417	4.19	6.00	2.10
1.333	3.14	2.917	31.44	4.500	4.19	6.08	2.10
1.417	3.14	3.000	31.44	4.583	4.19	6.17	2.10
1.500	3.14	3.083	81.74	4.667	4.19	6.25	2.10
1.583	3.14	3.167	81.74	4.750	4.19		

Unit Hyd Qpeak (cms)= 1.380

PEAK FLOW (cms)= 0.499 (i)
 TIME TO PEAK (hrs)= 3.667
 RUNOFF VOLUME (mm)= 15.674
 TOTAL RAINFALL (mm)= 52.400
 RUNOFF COEFFICIENT = 0.299

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 | CALIB |
 | NASHYD (1301) | Area (ha)= 5.08 Curve Number (CN)= 77.0
 | ID= 1 DT= 5.0 min | Ia (mm)= 6.50 # of Linear Res.(N)= 3.00

 U.H. Tp(hrs)= 0.49

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

----- TRANSFORMED HYETOGRAPH -----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	1.667	3.14	3.250	81.74	4.83	3.14

0.167	0.00	1.750	3.14	3.333	11.53	4.92	3.14
0.250	0.00	1.833	5.24	3.417	11.53	5.00	3.14
0.333	2.10	1.917	5.24	3.500	11.53	5.08	3.14
0.417	2.10	2.000	5.24	3.583	11.53	5.17	3.14
0.500	2.10	2.083	5.24	3.667	11.53	5.25	3.14
0.583	2.10	2.167	5.24	3.750	11.53	5.33	2.10
0.667	2.10	2.250	5.24	3.833	5.24	5.42	2.10
0.750	2.10	2.333	6.29	3.917	5.24	5.50	2.10
0.833	3.14	2.417	6.29	4.000	5.24	5.58	2.10
0.917	3.14	2.500	6.29	4.083	5.24	5.67	2.10
1.000	3.14	2.583	6.29	4.167	5.24	5.75	2.10
1.083	3.14	2.667	6.29	4.250	5.24	5.83	2.10
1.167	3.14	2.750	6.29	4.333	4.19	5.92	2.10
1.250	3.14	2.833	31.44	4.417	4.19	6.00	2.10
1.333	3.14	2.917	31.44	4.500	4.19	6.08	2.10
1.417	3.14	3.000	31.44	4.583	4.19	6.17	2.10
1.500	3.14	3.083	81.74	4.667	4.19	6.25	2.10
1.583	3.14	3.167	81.74	4.750	4.19		

Unit Hyd Qpeak (cms)= 0.396

PEAK FLOW (cms)= 0.159 (i)
 TIME TO PEAK (hrs)= 3.667
 RUNOFF VOLUME (mm)= 17.300
 TOTAL RAINFALL (mm)= 52.400
 RUNOFF COEFFICIENT = 0.330

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 | CALIB |
 | NASHYD (1302) | Area (ha)= 6.51 Curve Number (CN)= 79.0
 | ID= 1 DT= 5.0 min | Ia (mm)= 6.70 # of Linear Res.(N)= 3.00

 U.H. Tp(hrs)= 0.42

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

----- TRANSFORMED HYETOGRAPH -----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	1.667	3.14	3.250	81.74	4.83	3.14
0.167	0.00	1.750	3.14	3.333	11.53	4.92	3.14
0.250	0.00	1.833	5.24	3.417	11.53	5.00	3.14
0.333	2.10	1.917	5.24	3.500	11.53	5.08	3.14
0.417	2.10	2.000	5.24	3.583	11.53	5.17	3.14
0.500	2.10	2.083	5.24	3.667	11.53	5.25	3.14
0.583	2.10	2.167	5.24	3.750	11.53	5.33	2.10
0.667	2.10	2.250	5.24	3.833	5.24	5.42	2.10
0.750	2.10	2.333	6.29	3.917	5.24	5.50	2.10
0.833	3.14	2.417	6.29	4.000	5.24	5.58	2.10
0.917	3.14	2.500	6.29	4.083	5.24	5.67	2.10
1.000	3.14	2.583	6.29	4.167	5.24	5.75	2.10
1.083	3.14	2.667	6.29	4.250	5.24	5.83	2.10
1.167	3.14	2.750	6.29	4.333	4.19	5.92	2.10
1.250	3.14	2.833	31.44	4.417	4.19	6.00	2.10
1.333	3.14	2.917	31.44	4.500	4.19	6.08	2.10
1.417	3.14	3.000	31.44	4.583	4.19	6.17	2.10
1.500	3.14	3.083	81.74	4.667	4.19	6.25	2.10
1.583	3.14	3.167	81.74	4.750	4.19		

Unit Hyd Qpeak (cms)= 0.592

PEAK FLOW (cms)= 0.244 (i)
 TIME TO PEAK (hrs)= 3.583
 RUNOFF VOLUME (mm)= 18.444
 TOTAL RAINFALL (mm)= 52.400
 RUNOFF COEFFICIENT = 0.352

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| CALIB |
| STANDHYD ( 1303) |
| ID= 1 DT= 5.0 min |
-----
Area (ha)= 0.66
Total Imp(%)= 70.00 Dir. Conn.(%)= 70.00

IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= 0.46 0.20
Dep. Storage (mm)= 1.00 5.00
Average Slope (%)= 1.00 2.00
Length (m)= 66.33 40.00
Mannings n = 0.013 0.250

```

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

```

-----
TIME RAIN TIME RAIN TIME RAIN TIME RAIN
hrs mm/hr hrs mm/hr hrs mm/hr hrs mm/hr
0.083 0.00 1.667 3.14 3.250 81.74 4.83 3.14
0.167 0.00 1.750 3.14 3.333 11.53 4.92 3.14
0.250 0.00 1.833 5.24 3.417 11.53 5.00 3.14
0.333 2.10 1.917 5.24 3.500 11.53 5.08 3.14
0.417 2.10 2.000 5.24 3.583 11.53 5.17 3.14
0.500 2.10 2.083 5.24 3.667 11.53 5.25 3.14
0.583 2.10 2.167 5.24 3.750 11.53 5.33 2.10
0.667 2.10 2.250 5.24 3.833 5.24 5.42 2.10
0.750 2.10 2.333 6.29 3.917 5.24 5.50 2.10
0.833 3.14 2.417 6.29 4.000 5.24 5.58 2.10
0.917 3.14 2.500 6.29 4.083 5.24 5.67 2.10
1.000 3.14 2.583 6.29 4.167 5.24 5.75 2.10
1.083 3.14 2.667 6.29 4.250 5.24 5.83 2.10
1.167 3.14 2.750 6.29 4.333 4.19 5.92 2.10
1.250 3.14 2.833 31.44 4.417 4.19 6.00 2.10
1.333 3.14 2.917 31.44 4.500 4.19 6.08 2.10
1.417 3.14 3.000 31.44 4.583 4.19 6.17 2.10
1.500 3.14 3.083 81.74 4.667 4.19 6.25 2.10
1.583 3.14 3.167 81.74 4.750 4.19 6.33 2.10

Max.Eff.Inten.(mm/hr)= 81.74 18.85
over (min)= 5.00 20.00
Storage Coeff. (min)= 2.16 (ii) 15.92 (ii)
Unit Hyd. Tpeak (min)= 5.00 20.00
Unit Hyd. peak (cms)= 0.31 0.07

*TOTALS*
PEAK FLOW (cms)= 0.10 0.01 0.108 (iii)
TIME TO PEAK (hrs)= 3.25 3.42 3.25
RUNOFF VOLUME (mm)= 51.40 10.71 39.18
TOTAL RAINFALL (mm)= 52.40 52.40 52.40
RUNOFF COEFFICIENT = 0.98 0.20 0.75

```

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
 CN* = 61.0 Ia = Dep. Storage (Above)
 (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
 THAN THE STORAGE COEFFICIENT.
 (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| ADD HYD ( 0023) |
| 1 + 2 = 3 |
-----
AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
ID1= 1 ( 1101): 18.07 0.499 3.67 15.67
+ ID2= 2 ( 1301): 5.08 0.159 3.67 17.30
=====

```

ID = 3 (0023): 23.15 0.658 3.67 16.03

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| ADD HYD ( 0023) |
| 3 + 2 = 1 |
-----
AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
ID1= 3 ( 0023): 23.15 0.658 3.67 16.03
+ ID2= 2 ( 1302): 6.51 0.244 3.58 18.44
=====
ID = 1 ( 0023): 29.66 0.897 3.67 16.56

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| ADD HYD ( 0023) |
| 1 + 2 = 3 |
-----
AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
ID1= 1 ( 0023): 29.66 0.897 3.67 16.56
+ ID2= 2 ( 1303): 0.66 0.108 3.25 39.18
=====
ID = 3 ( 0023): 30.32 0.916 3.67 17.05

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

=====
V V I SSSS U U A L (v 6.2.2007)
V V I SS U U A A L
V V I SS U U A A A A L
V V I SS U U A A L
VV I SSSS UUUU A A LLLLL

000 TTTT TTTT H H Y Y M M 000 TM
0 0 T T H H Y Y MM MM 0 0
0 0 T T H H Y M M 0 0
000 T T H H Y M M 000

```

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***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
 Output filename: C:\Users\Valdor\AppData\Local\Civica\XH5\c7e9b9dc-2878-4b8a-9d26-5e475049aa89\1d125601-d1cd-4f03-8084-036fa7d860ff\scena
 Summary filename: C:\Users\Valdor\AppData\Local\Civica\XH5\c7e9b9dc-2878-4b8a-9d26-5e475049aa89\1d125601-d1cd-4f03-8084-036fa7d860ff\scena

DATE: 12-06-2021

TIME: 04:48:35

USER:

COMMENTS: _____

```

-----
** SIMULATION : SCS_6H_010Y **
=====

```



```

-----
| READ STORM |
| Ptotal= 61.50 mm |
-----

```

Filename: C:\Users\Valdor\AppData\Local\Temp\2c180882-d1c1-4096-97ef-d5bb234b912f\4d7be5e1
 Comments: 10yr/6hr Peterborough A SCS

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	0.00	1.75	6.15	3.50	13.53	5.25	2.46
0.25	2.46	2.00	6.15	3.75	6.15	5.50	2.46
0.50	2.46	2.25	7.38	4.00	6.15	5.75	2.46
0.75	3.69	2.50	7.38	4.25	4.92	6.00	2.46
1.00	3.69	2.75	36.90	4.50	4.92		
1.25	3.69	3.00	95.94	4.75	3.69		
1.50	3.69	3.25	13.53	5.00	3.69		

```

-----
| CALIB |
| NASHYD ( 2101) |
| ID= 1 DT= 5.0 min |
-----

```

Area (ha)= 14.78 Curve Number (CN)= 77.0
 Ia (mm)= 7.40 # of Linear Res.(N)= 3.00
 U.H. Tp(hrs)= 0.39

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

```

-----
| TRANSFORMED HYETOGRAPH |
| TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN |
| hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr |
| 0.083 0.00 | 1.667 3.69 | 3.250 95.94 | 4.83 3.69 |
| 0.167 0.00 | 1.750 3.69 | 3.333 13.53 | 4.92 3.69 |
| 0.250 0.00 | 1.833 6.15 | 3.417 13.53 | 5.00 3.69 |
| 0.333 2.46 | 1.917 6.15 | 3.500 13.53 | 5.08 3.69 |
| 0.417 2.46 | 2.000 6.15 | 3.583 13.53 | 5.17 3.69 |
| 0.500 2.46 | 2.083 6.15 | 3.667 13.53 | 5.25 3.69 |
| 0.583 2.46 | 2.167 6.15 | 3.750 13.53 | 5.33 2.46 |
| 0.667 2.46 | 2.250 6.15 | 3.833 6.15 | 5.42 2.46 |
| 0.750 2.46 | 2.333 7.38 | 3.917 6.15 | 5.50 2.46 |
| 0.833 3.69 | 2.417 7.38 | 4.000 6.15 | 5.58 2.46 |
| 0.917 3.69 | 2.500 7.38 | 4.083 6.15 | 5.67 2.46 |
| 1.000 3.69 | 2.583 7.38 | 4.167 6.15 | 5.75 2.46 |
| 1.083 3.69 | 2.667 7.38 | 4.250 6.15 | 5.83 2.46 |
| 1.167 3.69 | 2.750 7.38 | 4.333 4.92 | 5.92 2.46 |
| 1.250 3.69 | 2.833 36.90 | 4.417 4.92 | 6.00 2.46 |
| 1.333 3.69 | 2.917 36.90 | 4.500 4.92 | 6.08 2.46 |
| 1.417 3.69 | 3.000 36.90 | 4.583 4.92 | 6.17 2.46 |
| 1.500 3.69 | 3.083 95.94 | 4.667 4.92 | 6.25 2.46 |
| 1.583 3.69 | 3.167 95.94 | 4.750 4.92 |
-----

```

Unit Hyd Qpeak (cms)= 1.447

PEAK FLOW (cms)= 0.713 (i)
 TIME TO PEAK (hrs)= 3.500
 RUNOFF VOLUME (mm)= 22.516
 TOTAL RAINFALL (mm)= 61.500
 RUNOFF COEFFICIENT = 0.366

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| CALIB |
| NASHYD ( 1101) |
| ID= 1 DT= 5.0 min |
-----

```

Area (ha)= 18.07 Curve Number (CN)= 75.0
 Ia (mm)= 7.30 # of Linear Res.(N)= 3.00
 U.H. Tp(hrs)= 0.50

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

```

-----
| TRANSFORMED HYETOGRAPH |
| TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN |
| hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr |
| 0.083 0.00 | 1.667 3.69 | 3.250 95.94 | 4.83 3.69 |
| 0.167 0.00 | 1.750 3.69 | 3.333 13.53 | 4.92 3.69 |
| 0.250 0.00 | 1.833 6.15 | 3.417 13.53 | 5.00 3.69 |
| 0.333 2.46 | 1.917 6.15 | 3.500 13.53 | 5.08 3.69 |
| 0.417 2.46 | 2.000 6.15 | 3.583 13.53 | 5.17 3.69 |
| 0.500 2.46 | 2.083 6.15 | 3.667 13.53 | 5.25 3.69 |
| 0.583 2.46 | 2.167 6.15 | 3.750 13.53 | 5.33 2.46 |
| 0.667 2.46 | 2.250 6.15 | 3.833 6.15 | 5.42 2.46 |
| 0.750 2.46 | 2.333 7.38 | 3.917 6.15 | 5.50 2.46 |
| 0.833 3.69 | 2.417 7.38 | 4.000 6.15 | 5.58 2.46 |
| 0.917 3.69 | 2.500 7.38 | 4.083 6.15 | 5.67 2.46 |
| 1.000 3.69 | 2.583 7.38 | 4.167 6.15 | 5.75 2.46 |
| 1.083 3.69 | 2.667 7.38 | 4.250 6.15 | 5.83 2.46 |
| 1.167 3.69 | 2.750 7.38 | 4.333 4.92 | 5.92 2.46 |
| 1.250 3.69 | 2.833 36.90 | 4.417 4.92 | 6.00 2.46 |
| 1.333 3.69 | 2.917 36.90 | 4.500 4.92 | 6.08 2.46 |
| 1.417 3.69 | 3.000 36.90 | 4.583 4.92 | 6.17 2.46 |
| 1.500 3.69 | 3.083 95.94 | 4.667 4.92 | 6.25 2.46 |
| 1.583 3.69 | 3.167 95.94 | 4.750 4.92 |
-----

```

Unit Hyd Qpeak (cms)= 1.380

PEAK FLOW (cms)= 0.684 (i)
 TIME TO PEAK (hrs)= 3.667
 RUNOFF VOLUME (mm)= 21.153
 TOTAL RAINFALL (mm)= 61.500
 RUNOFF COEFFICIENT = 0.344

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| CALIB |
| NASHYD ( 1301) |
| ID= 1 DT= 5.0 min |
-----

```

Area (ha)= 5.08 Curve Number (CN)= 77.0
 Ia (mm)= 6.50 # of Linear Res.(N)= 3.00
 U.H. Tp(hrs)= 0.49

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

```

-----
| TRANSFORMED HYETOGRAPH |
| TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN |
| hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr |
| 0.083 0.00 | 1.667 3.69 | 3.250 95.94 | 4.83 3.69 |
| 0.167 0.00 | 1.750 3.69 | 3.333 13.53 | 4.92 3.69 |
| 0.250 0.00 | 1.833 6.15 | 3.417 13.53 | 5.00 3.69 |
| 0.333 2.46 | 1.917 6.15 | 3.500 13.53 | 5.08 3.69 |
| 0.417 2.46 | 2.000 6.15 | 3.583 13.53 | 5.17 3.69 |
| 0.500 2.46 | 2.083 6.15 | 3.667 13.53 | 5.25 3.69 |
| 0.583 2.46 | 2.167 6.15 | 3.750 13.53 | 5.33 2.46 |
| 0.667 2.46 | 2.250 6.15 | 3.833 6.15 | 5.42 2.46 |
| 0.750 2.46 | 2.333 7.38 | 3.917 6.15 | 5.50 2.46 |
| 0.833 3.69 | 2.417 7.38 | 4.000 6.15 | 5.58 2.46 |
| 0.917 3.69 | 2.500 7.38 | 4.083 6.15 | 5.67 2.46 |
| 1.000 3.69 | 2.583 7.38 | 4.167 6.15 | 5.75 2.46 |
| 1.083 3.69 | 2.667 7.38 | 4.250 6.15 | 5.83 2.46 |
| 1.167 3.69 | 2.750 7.38 | 4.333 4.92 | 5.92 2.46 |
| 1.250 3.69 | 2.833 36.90 | 4.417 4.92 | 6.00 2.46 |
| 1.333 3.69 | 2.917 36.90 | 4.500 4.92 | 6.08 2.46 |
| 1.417 3.69 | 3.000 36.90 | 4.583 4.92 | 6.17 2.46 |
| 1.500 3.69 | 3.083 95.94 | 4.667 4.92 | 6.25 2.46 |
| 1.583 3.69 | 3.167 95.94 | 4.750 4.92 |
-----

```

Unit Hyd Qpeak (cms)= 0.396

PEAK FLOW (cms)= 0.215 (i)
 TIME TO PEAK (hrs)= 3.667
 RUNOFF VOLUME (mm)= 23.113
 TOTAL RAINFALL (mm)= 61.500
 RUNOFF COEFFICIENT = 0.376

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 | CALIB |
 | NASHYD (1302) | Area (ha)= 6.51 Curve Number (CN)= 79.0
 | ID= 1 DT= 5.0 min | Ia (mm)= 6.70 # of Linear Res.(N)= 3.00
 |-----| U.H. Tp(hrs)= 0.42

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

----- TRANSFORMED HYETOGRAPH -----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	1.667	3.69	3.250	95.94	4.83	3.69
0.167	0.00	1.750	3.69	3.333	13.53	4.92	3.69
0.250	0.00	1.833	6.15	3.417	13.53	5.00	3.69
0.333	2.46	1.917	6.15	3.500	13.53	5.08	3.69
0.417	2.46	2.000	6.15	3.583	13.53	5.17	3.69
0.500	2.46	2.083	6.15	3.667	13.53	5.25	3.69
0.583	2.46	2.167	6.15	3.750	13.53	5.33	2.46
0.667	2.46	2.250	6.15	3.833	6.15	5.42	2.46
0.750	2.46	2.333	7.38	3.917	6.15	5.50	2.46
0.833	3.69	2.417	7.38	4.000	6.15	5.58	2.46
0.917	3.69	2.500	7.38	4.083	6.15	5.67	2.46
1.000	3.69	2.583	7.38	4.167	6.15	5.75	2.46
1.083	3.69	2.667	7.38	4.250	6.15	5.83	2.46
1.167	3.69	2.750	7.38	4.333	4.92	5.92	2.46
1.250	3.69	2.833	36.90	4.417	4.92	6.00	2.46
1.333	3.69	2.917	36.90	4.500	4.92	6.08	2.46
1.417	3.69	3.000	36.90	4.583	4.92	6.17	2.46
1.500	3.69	3.083	95.94	4.667	4.92	6.25	2.46
1.583	3.69	3.167	95.94	4.750	4.92		

Unit Hyd Qpeak (cms)= 0.592

PEAK FLOW (cms)= 0.329 (i)
 TIME TO PEAK (hrs)= 3.583
 RUNOFF VOLUME (mm)= 24.548
 TOTAL RAINFALL (mm)= 61.500
 RUNOFF COEFFICIENT = 0.399

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 | CALIB |
 | STANDHYD (1303) | Area (ha)= 0.66
 | ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 70.00
 |-----|

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.46	0.20
Dep. Storage (mm)=	1.00	5.00
Average Slope (%)=	1.00	2.00
Length (m)=	66.33	40.00
Mannings n =	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

----- TRANSFORMED HYETOGRAPH -----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	1.667	3.69	3.250	95.94	4.83	3.69
0.167	0.00	1.750	3.69	3.333	13.53	4.92	3.69
0.250	0.00	1.833	6.15	3.417	13.53	5.00	3.69
0.333	2.46	1.917	6.15	3.500	13.53	5.08	3.69
0.417	2.46	2.000	6.15	3.583	13.53	5.17	3.69
0.500	2.46	2.083	6.15	3.667	13.53	5.25	3.69
0.583	2.46	2.167	6.15	3.750	13.53	5.33	2.46
0.667	2.46	2.250	6.15	3.833	6.15	5.42	2.46
0.750	2.46	2.333	7.38	3.917	6.15	5.50	2.46
0.833	3.69	2.417	7.38	4.000	6.15	5.58	2.46
0.917	3.69	2.500	7.38	4.083	6.15	5.67	2.46
1.000	3.69	2.583	7.38	4.167	6.15	5.75	2.46
1.083	3.69	2.667	7.38	4.250	6.15	5.83	2.46
1.167	3.69	2.750	7.38	4.333	4.92	5.92	2.46
1.250	3.69	2.833	36.90	4.417	4.92	6.00	2.46
1.333	3.69	2.917	36.90	4.500	4.92	6.08	2.46
1.417	3.69	3.000	36.90	4.583	4.92	6.17	2.46
1.500	3.69	3.083	95.94	4.667	4.92	6.25	2.46
1.583	3.69	3.167	95.94	4.750	4.92		

0.083	0.00	1.667	3.69	3.250	95.94	4.83	3.69
0.167	0.00	1.750	3.69	3.333	13.53	4.92	3.69
0.250	0.00	1.833	6.15	3.417	13.53	5.00	3.69
0.333	2.46	1.917	6.15	3.500	13.53	5.08	3.69
0.417	2.46	2.000	6.15	3.583	13.53	5.17	3.69
0.500	2.46	2.083	6.15	3.667	13.53	5.25	3.69
0.583	2.46	2.167	6.15	3.750	13.53	5.33	2.46
0.667	2.46	2.250	6.15	3.833	6.15	5.42	2.46
0.750	2.46	2.333	7.38	3.917	6.15	5.50	2.46
0.833	3.69	2.417	7.38	4.000	6.15	5.58	2.46
0.917	3.69	2.500	7.38	4.083	6.15	5.67	2.46
1.000	3.69	2.583	7.38	4.167	6.15	5.75	2.46
1.083	3.69	2.667	7.38	4.250	6.15	5.83	2.46
1.167	3.69	2.750	7.38	4.333	4.92	5.92	2.46
1.250	3.69	2.833	36.90	4.417	4.92	6.00	2.46
1.333	3.69	2.917	36.90	4.500	4.92	6.08	2.46
1.417	3.69	3.000	36.90	4.583	4.92	6.17	2.46
1.500	3.69	3.083	95.94	4.667	4.92	6.25	2.46
1.583	3.69	3.167	95.94	4.750	4.92		

Max.Eff.Inten.(mm/hr)= 95.94 25.79
 over (min) 5.00 15.00
 Storage Coeff. (min)= 2.03 (ii) 14.17 (ii)
 Unit Hyd. Tpeak (min)= 5.00 15.00
 Unit Hyd. peak (cms)= 0.31 0.08

TOTALS
 PEAK FLOW (cms)= 0.12 0.01 0.130 (iii)
 TIME TO PEAK (hrs)= 3.25 3.42 3.25
 RUNOFF VOLUME (mm)= 60.50 14.58 46.71
 TOTAL RAINFALL (mm)= 61.50 61.50 61.50
 RUNOFF COEFFICIENT = 0.98 0.24 0.76

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
 CN* = 61.0 Ia = Dep. Storage (Above)
 (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
 THAN THE STORAGE COEFFICIENT.
 (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 | ADD HYD (0023) |
 | 1 + 2 = 3 |

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (1101):	18.07	0.684	3.67	21.15
+ ID2= 2 (1301):	5.08	0.215	3.67	23.11
=====				
ID = 3 (0023):	23.15	0.898	3.67	21.58

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 | ADD HYD (0023) |
 | 3 + 2 = 1 |

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 3 (0023):	23.15	0.898	3.67	21.58
+ ID2= 2 (1302):	6.51	0.329	3.58	24.55
=====				
ID = 1 (0023):	29.66	1.219	3.67	22.23

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 | ADD HYD (0023) |
 | 1 + 2 = 3 |

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 3 (0023):	23.15	0.898	3.67	21.58
+ ID2= 2 (1302):	6.51	0.329	3.58	24.55
=====				
ID = 1 (0023):	29.66	1.219	3.67	22.23

```

ID1= 1 ( 0023): 29.66 1.219 3.67 22.23
+ ID2= 2 ( 1303): 0.66 0.130 3.25 46.71
=====
ID = 3 ( 0023): 30.32 1.241 3.67 22.77

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

| CALIB |
| NASHYD ( 2101) | Area (ha)= 14.78 Curve Number (CN)= 77.0
| ID= 1 DT= 5.0 min | Ia (mm)= 7.40 # of Linear Res.(N)= 3.00
|-----| U.H. Tp(hrs)= 0.39

```

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

```

=====
V V I SSSS U U A L (v 6.2.2007)
V V I SS U U A A L
V V I SS U U A A A A L
V V I SS U U A A L
V V I SSSS UUUU A A LLLL
000 TTTT TTTT H H Y Y M M 000 TM
0 0 T T H H Y Y MM MM 0 0
0 0 T T H H Y M M 0 0
000 T H H Y M M 000
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***** D E T A I L E D O U T P U T *****

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DATE: 12-06-2021 TIME: 04:48:35

USER:

COMMENTS: _____

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*****
** SIMULATION : SCS_6H_025Y **
*****

```

```

| READ STORM |
|-----|
| Ptotal= 72.90 mm |
|-----|
| TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN |
| hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr |
| 0.00 0.00 | 1.75 7.29 | 3.50 16.04 | 5.25 2.92 |
| 0.25 2.92 | 2.00 7.29 | 3.75 7.29 | 5.50 2.92 |
| 0.50 2.92 | 2.25 8.75 | 4.00 7.29 | 5.75 2.92 |
| 0.75 4.37 | 2.50 8.75 | 4.25 5.83 | 6.00 2.92 |
| 1.00 4.37 | 2.75 43.74 | 4.50 5.83 |
| 1.25 4.37 | 3.00 113.72 | 4.75 4.37 |
| 1.50 4.37 | 3.25 16.04 | 5.00 4.37 |

```

```

----- TRANSFORMED HYETOGRAPH -----
TIME RAIN TIME RAIN TIME RAIN TIME RAIN
hrs mm/hr hrs mm/hr hrs mm/hr hrs mm/hr
0.083 0.00 1.667 4.37 3.250 113.72 4.83 4.37
0.167 0.00 1.750 4.37 3.333 16.04 4.92 4.37
0.250 0.00 1.833 7.29 3.417 16.04 5.00 4.37
0.333 2.92 1.917 7.29 3.500 16.04 5.08 4.37
0.417 2.92 2.000 7.29 3.583 16.04 5.17 4.37
0.500 2.92 2.083 7.29 3.667 16.04 5.25 4.37
0.583 2.92 2.167 7.29 3.750 16.04 5.33 2.92
0.667 2.92 2.250 7.29 3.833 7.29 5.42 2.92
0.750 2.92 2.333 8.75 3.917 7.29 5.50 2.92
0.833 4.37 2.417 8.75 4.000 7.29 5.58 2.92
0.917 4.37 2.500 8.75 4.083 7.29 5.67 2.92
1.000 4.37 2.583 8.75 4.167 7.29 5.75 2.92
1.083 4.37 2.667 8.75 4.250 7.29 5.83 2.92
1.167 4.37 2.750 8.75 4.333 5.83 5.92 2.92
1.250 4.37 2.833 43.74 4.417 5.83 6.00 2.92
1.333 4.37 2.917 43.74 4.500 5.83 6.08 2.92
1.417 4.37 3.000 43.74 4.583 5.83 6.17 2.92
1.500 4.37 3.083 113.72 4.667 5.83 6.25 2.92
1.583 4.37 3.167 113.72 4.750 5.83

```

Unit Hyd Qpeak (cms)= 1.447

```

PEAK FLOW (cms)= 0.975 (i)
TIME TO PEAK (hrs)= 3.500
RUNOFF VOLUME (mm)= 30.343
TOTAL RAINFALL (mm)= 72.900
RUNOFF COEFFICIENT = 0.416

```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

| CALIB |
| NASHYD ( 1101) | Area (ha)= 18.07 Curve Number (CN)= 75.0
| ID= 1 DT= 5.0 min | Ia (mm)= 7.30 # of Linear Res.(N)= 3.00
|-----| U.H. Tp(hrs)= 0.50

```

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

```

----- TRANSFORMED HYETOGRAPH -----
TIME RAIN TIME RAIN TIME RAIN TIME RAIN
hrs mm/hr hrs mm/hr hrs mm/hr hrs mm/hr
0.083 0.00 1.667 4.37 3.250 113.72 4.83 4.37
0.167 0.00 1.750 4.37 3.333 16.04 4.92 4.37
0.250 0.00 1.833 7.29 3.417 16.04 5.00 4.37
0.333 2.92 1.917 7.29 3.500 16.04 5.08 4.37
0.417 2.92 2.000 7.29 3.583 16.04 5.17 4.37
0.500 2.92 2.083 7.29 3.667 16.04 5.25 4.37
0.583 2.92 2.167 7.29 3.750 16.04 5.33 2.92
0.667 2.92 2.250 7.29 3.833 7.29 5.42 2.92
0.750 2.92 2.333 8.75 3.917 7.29 5.50 2.92
0.833 4.37 2.417 8.75 4.000 7.29 5.58 2.92
0.917 4.37 2.500 8.75 4.083 7.29 5.67 2.92
1.000 4.37 2.583 8.75 4.167 7.29 5.75 2.92
1.083 4.37 2.667 8.75 4.250 7.29 5.83 2.92
1.167 4.37 2.750 8.75 4.333 5.83 5.92 2.92
1.250 4.37 2.833 43.74 4.417 5.83 6.00 2.92
1.333 4.37 2.917 43.74 4.500 5.83 6.08 2.92

```

Max.Eff.Inten.(mm/hr)= 113.72 39.42

```

      over (min)      5.00      10.00
Storage Coeff. (min)= 1.90 (ii) 6.67 (ii)
Unit Hyd. Tpeak (min)= 5.00      10.00
Unit Hyd. peak (cms)= 0.32      0.14

PEAK FLOW (cms)= 0.15      0.02      0.163 (iii)
TIME TO PEAK (hrs)= 3.25      3.25      3.25
RUNOFF VOLUME (mm)= 71.90      20.02      56.33
TOTAL RAINFALL (mm)= 72.90      72.90      72.90
RUNOFF COEFFICIENT = 0.99      0.27      0.77

```

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
 CN* = 61.0 Ia = Dep. Storage (Above)
 (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
 THAN THE STORAGE COEFFICIENT.
 (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

| ADD HYD ( 0023) |
| 1 + 2 = 3 |
|-----|
ID1= 1 ( 1101): 18.07 0.937 3.67 28.64
+ ID2= 2 ( 1301): 5.08 0.291 3.67 30.99
=====
ID = 3 ( 0023): 23.15 1.228 3.67 29.15

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

| ADD HYD ( 0023) |
| 3 + 2 = 1 |
|-----|
ID1= 3 ( 0023): 23.15 1.228 3.67 29.15
+ ID2= 2 ( 1302): 6.51 0.443 3.58 32.77
=====
ID = 1 ( 0023): 29.66 1.658 3.67 29.95

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

| ADD HYD ( 0023) |
| 1 + 2 = 3 |
|-----|
ID1= 1 ( 0023): 29.66 1.658 3.67 29.95
+ ID2= 2 ( 1303): 0.66 0.163 3.25 56.33
=====
ID = 3 ( 0023): 30.32 1.683 3.67 30.52

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

=====
=====
V V I SSSS U U A L (v 6.2.2007)
V V I SS U U A A L
V V I SS U U A A A A L
V V I SS U U A A L
V V I SSSS UUUU A A LLLL

000 TTTT TTTT H H Y Y M M 000 TM
0 0 T T H H Y Y M M 0 0
0 0 T T H H Y M M 0 0
000 T T H H Y M M 000

```

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***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voindat
 Output filename: C:\Users\Valdor\AppData\Local\Civica\WH5\c7e9b9dc-2878-4b8a-9d26-5e475049aa89\bd87c9ab-f3a3-48d2-a78d-93262d2a121d\scena
 Summary filename: C:\Users\Valdor\AppData\Local\Civica\WH5\c7e9b9dc-2878-4b8a-9d26-5e475049aa89\bd87c9ab-f3a3-48d2-a78d-93262d2a121d\scena

DATE: 12-06-2021

TIME: 04:48:35

USER:

COMMENTS:

```

*****
** SIMULATION : SCS_6H_050Y **
*****

```

```

| READ STORM |
|-----|
| Ptotal= 81.40 mm |
|-----|
Filename: C:\Users\Valdor\AppData\Local\Temp\2c180882-d1c1-4096-97ef-d5bb234b912f\d8695a31
Comments: 50yr/6hr Peterborough a SCS

```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	0.00	1.75	8.14	3.50	17.91	5.25	3.26
0.25	3.26	2.00	8.14	3.75	8.14	5.50	3.26
0.50	3.26	2.25	9.77	4.00	8.14	5.75	3.26
0.75	4.88	2.50	9.77	4.25	6.51	6.00	3.26
1.00	4.88	2.75	48.84	4.50	6.51		
1.25	4.88	3.00	126.98	4.75	4.88		
1.50	4.88	3.25	17.91	5.00	4.88		

```

| CALIB |
| NASHYD ( 2101) |
| ID= 1 DT= 5.0 min |
|-----|
Area (ha)= 14.78 Curve Number (CN)= 77.0
Ia (mm)= 7.40 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.39

```

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

```

----- TRANSFORMED HYETOGRAPH -----
TIME RAIN TIME RAIN TIME RAIN TIME RAIN
hrs mm/hr hrs mm/hr hrs mm/hr hrs mm/hr
0.083 0.00 1.667 4.88 3.250 126.98 4.83 4.88
0.167 0.00 1.750 4.88 3.333 17.91 4.92 4.88
0.250 0.00 1.833 8.14 3.417 17.91 5.00 4.88
0.333 3.26 1.917 8.14 3.500 17.91 5.08 4.88
0.417 3.26 2.000 8.14 3.583 17.91 5.17 4.88
0.500 3.26 2.083 8.14 3.667 17.91 5.25 4.88
0.583 3.26 2.167 8.14 3.750 17.91 5.33 3.26
0.667 3.26 2.250 8.14 3.833 8.14 5.42 3.26
0.750 3.26 2.333 9.77 3.917 8.14 5.50 3.26
0.833 4.88 2.417 9.77 4.000 8.14 5.58 3.26

```

0.917	4.88	2.500	9.77	4.083	8.14	5.67	3.26
1.000	4.88	2.583	9.77	4.167	8.14	5.75	3.26
1.083	4.88	2.667	9.77	4.250	8.14	5.83	3.26
1.167	4.88	2.750	9.77	4.333	6.51	5.92	3.26
1.250	4.88	2.833	48.84	4.417	6.51	6.00	3.26
1.333	4.88	2.917	48.84	4.500	6.51	6.08	3.26
1.417	4.88	3.000	48.84	4.583	6.51	6.17	3.26
1.500	4.88	3.083	126.98	4.667	6.51	6.25	3.26
1.583	4.88	3.167	126.98	4.750	6.51		

Unit Hyd Qpeak (cms)= 1.447

PEAK FLOW (cms)= 1.183 (i)
 TIME TO PEAK (hrs)= 3.500
 RUNOFF VOLUME (mm)= 36.533
 TOTAL RAINFALL (mm)= 81.400
 RUNOFF COEFFICIENT = 0.449

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
NASHYD (1101)	Area (ha)= 18.07	Curve Number (CN)= 75.0	
ID= 1 DT= 5.0 min	Ia (mm)= 7.30	# of Linear Res.(N)= 3.00	
U.H. Tp(hrs)= 0.50			

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

--- TRANSFORMED HYETOGRAPH ---							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.667	4.88	3.250	126.98	4.83	4.88
0.167	0.00	1.750	4.88	3.333	17.91	4.92	4.88
0.250	0.00	1.833	8.14	3.417	17.91	5.00	4.88
0.333	3.26	1.917	8.14	3.500	17.91	5.08	4.88
0.417	3.26	2.000	8.14	3.583	17.91	5.17	4.88
0.500	3.26	2.083	8.14	3.667	17.91	5.25	4.88
0.583	3.26	2.167	8.14	3.750	17.91	5.33	3.26
0.667	3.26	2.250	8.14	3.833	8.14	5.42	3.26
0.750	3.26	2.333	9.77	3.917	8.14	5.50	3.26
0.833	4.88	2.417	9.77	4.000	8.14	5.58	3.26
0.917	4.88	2.500	9.77	4.083	8.14	5.67	3.26
1.000	4.88	2.583	9.77	4.167	8.14	5.75	3.26
1.083	4.88	2.667	9.77	4.250	8.14	5.83	3.26
1.167	4.88	2.750	9.77	4.333	6.51	5.92	3.26
1.250	4.88	2.833	48.84	4.417	6.51	6.00	3.26
1.333	4.88	2.917	48.84	4.500	6.51	6.08	3.26
1.417	4.88	3.000	48.84	4.583	6.51	6.17	3.26
1.500	4.88	3.083	126.98	4.667	6.51	6.25	3.26
1.583	4.88	3.167	126.98	4.750	6.51		

Unit Hyd Qpeak (cms)= 1.380

PEAK FLOW (cms)= 1.139 (i)
 TIME TO PEAK (hrs)= 3.667
 RUNOFF VOLUME (mm)= 34.582
 TOTAL RAINFALL (mm)= 81.400
 RUNOFF COEFFICIENT = 0.425

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
NASHYD (1301)	Area (ha)= 5.08	Curve Number (CN)= 77.0	
ID= 1 DT= 5.0 min	Ia (mm)= 6.50	# of Linear Res.(N)= 3.00	
U.H. Tp(hrs)= 0.49			

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

--- TRANSFORMED HYETOGRAPH ---							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.667	4.88	3.250	126.98	4.83	4.88
0.167	0.00	1.750	4.88	3.333	17.91	4.92	4.88
0.250	0.00	1.833	8.14	3.417	17.91	5.00	4.88
0.333	3.26	1.917	8.14	3.500	17.91	5.08	4.88
0.417	3.26	2.000	8.14	3.583	17.91	5.17	4.88
0.500	3.26	2.083	8.14	3.667	17.91	5.25	4.88
0.583	3.26	2.167	8.14	3.750	17.91	5.33	3.26
0.667	3.26	2.250	8.14	3.833	8.14	5.42	3.26
0.750	3.26	2.333	9.77	3.917	8.14	5.50	3.26
0.833	4.88	2.417	9.77	4.000	8.14	5.58	3.26
0.917	4.88	2.500	9.77	4.083	8.14	5.67	3.26
1.000	4.88	2.583	9.77	4.167	8.14	5.75	3.26
1.083	4.88	2.667	9.77	4.250	8.14	5.83	3.26
1.167	4.88	2.750	9.77	4.333	6.51	5.92	3.26
1.250	4.88	2.833	48.84	4.417	6.51	6.00	3.26
1.333	4.88	2.917	48.84	4.500	6.51	6.08	3.26
1.417	4.88	3.000	48.84	4.583	6.51	6.17	3.26
1.500	4.88	3.083	126.98	4.667	6.51	6.25	3.26
1.583	4.88	3.167	126.98	4.750	6.51		

Unit Hyd Qpeak (cms)= 0.396

PEAK FLOW (cms)= 0.351 (i)
 TIME TO PEAK (hrs)= 3.667
 RUNOFF VOLUME (mm)= 37.207
 TOTAL RAINFALL (mm)= 81.400
 RUNOFF COEFFICIENT = 0.457

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
NASHYD (1302)	Area (ha)= 6.51	Curve Number (CN)= 79.0	
ID= 1 DT= 5.0 min	Ia (mm)= 6.70	# of Linear Res.(N)= 3.00	
U.H. Tp(hrs)= 0.42			

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

--- TRANSFORMED HYETOGRAPH ---							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.667	4.88	3.250	126.98	4.83	4.88
0.167	0.00	1.750	4.88	3.333	17.91	4.92	4.88
0.250	0.00	1.833	8.14	3.417	17.91	5.00	4.88
0.333	3.26	1.917	8.14	3.500	17.91	5.08	4.88
0.417	3.26	2.000	8.14	3.583	17.91	5.17	4.88
0.500	3.26	2.083	8.14	3.667	17.91	5.25	4.88
0.583	3.26	2.167	8.14	3.750	17.91	5.33	3.26
0.667	3.26	2.250	8.14	3.833	8.14	5.42	3.26
0.750	3.26	2.333	9.77	3.917	8.14	5.50	3.26
0.833	4.88	2.417	9.77	4.000	8.14	5.58	3.26
0.917	4.88	2.500	9.77	4.083	8.14	5.67	3.26
1.000	4.88	2.583	9.77	4.167	8.14	5.75	3.26
1.083	4.88	2.667	9.77	4.250	8.14	5.83	3.26
1.167	4.88	2.750	9.77	4.333	6.51	5.92	3.26
1.250	4.88	2.833	48.84	4.417	6.51	6.00	3.26
1.333	4.88	2.917	48.84	4.500	6.51	6.08	3.26
1.417	4.88	3.000	48.84	4.583	6.51	6.17	3.26
1.500	4.88	3.083	126.98	4.667	6.51	6.25	3.26
1.583	4.88	3.167	126.98	4.750	6.51		

Unit Hyd Qpeak (cms)= 0.592

PEAK FLOW (cms)= 0.533 (i)
 TIME TO PEAK (hrs)= 3.583
 RUNOFF VOLUME (mm)= 39.232
 TOTAL RAINFALL (mm)= 81.400
 RUNOFF COEFFICIENT = 0.482

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
 STANDHYD (1303)
 ID= 1 DT= 5.0 min

Area (ha)=	0.66	Dir. Conn.(%)=	70.00
Total Imp(%)=	70.00		

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.46	0.20
Dep. Storage (mm)=	1.00	5.00
Average Slope (%)=	1.00	2.00
Length (m)=	66.33	40.00
Mannings n	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

--- TRANSFORMED HYETOGRAPH ---							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.667	4.88	3.250	126.98	4.83	4.88
0.167	0.00	1.750	4.88	3.333	17.91	4.92	4.88
0.250	0.00	1.833	8.14	3.417	17.91	5.00	4.88
0.333	3.26	1.917	8.14	3.500	17.91	5.08	4.88
0.417	3.26	2.000	8.14	3.583	17.91	5.17	4.88
0.500	3.26	2.083	8.14	3.667	17.91	5.25	4.88
0.583	3.26	2.167	8.14	3.750	17.91	5.33	3.26
0.667	3.26	2.250	8.14	3.833	8.14	5.42	3.26
0.750	3.26	2.333	9.77	3.917	8.14	5.50	3.26
0.833	4.88	2.417	9.77	4.000	8.14	5.58	3.26
0.917	4.88	2.500	9.77	4.083	8.14	5.67	3.26
1.000	4.88	2.583	9.77	4.167	8.14	5.75	3.26
1.083	4.88	2.667	9.77	4.250	8.14	5.83	3.26
1.167	4.88	2.750	9.77	4.333	6.51	5.92	3.26
1.250	4.88	2.833	48.84	4.417	6.51	6.00	3.26
1.333	4.88	2.917	48.84	4.500	6.51	6.08	3.26
1.417	4.88	3.000	48.84	4.583	6.51	6.17	3.26
1.500	4.88	3.083	126.98	4.667	6.51	6.25	3.26
1.583	4.88	3.167	126.98	4.750	6.51		

Max.Eff.Inten.(mm/hr)= 126.98 48.04
 over (min) 5.00 10.00
 Storage Coeff. (min)= 1.81 (ii) 6.39 (ii)
 Unit Hyd. Tpeak (min)= 5.00 10.00
 Unit Hyd. peak (cms)= 0.32 0.15

TOTALS
 PEAK FLOW (cms)= 0.16 0.02 0.184 (iii)
 TIME TO PEAK (hrs)= 3.25 3.25 3.25
 RUNOFF VOLUME (mm)= 80.40 24.44 63.61
 TOTAL RAINFALL (mm)= 81.40 81.40 81.40
 RUNOFF COEFFICIENT = 0.99 0.30 0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
 CN* = 61.0 Ia = Dep. Storage (Above)
 (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
 THAN THE STORAGE COEFFICIENT.
 (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0023)				
	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (1101):	18.07	1.139	3.67	34.58
+ ID2= 2 (1301):	5.08	0.351	3.67	37.21
ID = 3 (0023):	23.15	1.490	3.67	35.16

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0023)				
	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 3 (0023):	23.15	1.490	3.67	35.16
+ ID2= 2 (1302):	6.51	0.533	3.58	39.23
ID = 1 (0023):	29.66	2.007	3.67	36.05

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0023)				
	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0023):	29.66	2.007	3.67	36.05
+ ID2= 2 (1303):	0.66	0.184	3.25	63.61
ID = 3 (0023):	30.32	2.035	3.67	36.65

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

V V I SSSSS U U A L (v 6.2.2007)
 V V I SS U U A A L
 V V I SS U U A A A A L
 V V I SS U U A A L
 VV I SSSSS UUUUU A A LLLLL

000 TTTT TTTT H H Y Y M M 000 TM
 0 0 T T H H Y Y MM MM 0 0
 0 0 T T H H Y M M 0 0
 000 T T H H Y M M 000

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***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
 Output filename: C:\Users\Valdor\AppData\Local\Civica\XH5\c7e9b9dc-2878-4b8a-9d26-5e475049aa89\c5631843-708e-4913-8262-12c9734d26c8\scena
 Summary filename: C:\Users\Valdor\AppData\Local\Civica\XH5\c7e9b9dc-2878-4b8a-9d26-5e475049aa89\c5631843-708e-4913-8262-12c9734d26c8\scena

DATE: 12-06-2021

TIME: 04:48:35

USER:

COMMENTS:

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

		--- TRANSFORMED HYPOTHOGRAPH ---					
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.667	5.39	3.250	140.24	4.83	5.39
0.167	0.00	1.750	5.39	3.333	19.78	4.92	5.39
0.250	0.00	1.833	8.99	3.417	19.78	5.00	5.39
0.333	3.60	1.917	8.99	3.500	19.78	5.08	5.39
0.417	3.60	2.000	8.99	3.583	19.78	5.17	5.39
0.500	3.60	2.083	8.99	3.667	19.78	5.25	5.39
0.583	3.60	2.167	8.99	3.750	19.78	5.33	3.60
0.667	3.60	2.250	8.99	3.833	8.99	5.42	3.60
0.750	3.60	2.333	10.79	3.917	8.99	5.50	3.60
0.833	5.39	2.417	10.79	4.000	8.99	5.58	3.60
0.917	5.39	2.500	10.79	4.083	8.99	5.67	3.60
1.000	5.39	2.583	10.79	4.167	8.99	5.75	3.60
1.083	5.39	2.667	10.79	4.250	8.99	5.83	3.60
1.167	5.39	2.750	10.79	4.333	7.19	5.92	3.60
1.250	5.39	2.833	53.94	4.417	7.19	6.00	3.60
1.333	5.39	2.917	53.94	4.500	7.19	6.08	3.60
1.417	5.39	3.000	53.94	4.583	7.19	6.17	3.60
1.500	5.39	3.083	140.24	4.667	7.19	6.25	3.60
1.583	5.39	3.167	140.24	4.750	7.19		

Unit Hyd Opeak (cms)= 1.380

```

PEAK FLOW      (cms)=    1.350 (i)
TIME TO PEAK   (hrs)=    3.667
RUNOFF VOLUME   (mm)=    40.788
TOTAL RAINFALL  (mm)=    89.900
RUNOFF COEFFICIENT =    0.454

```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--- TRANSFORMED HYETOGRAPH ---							
TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	1.667	5.39	3.250	140.24	4.83	5.39
0.167	0.00	1.750	5.39	3.333	19.78	4.92	5.39
0.250	0.00	1.833	8.99	3.417	19.78	5.00	5.39
0.333	3.60	1.917	8.99	3.500	19.78	5.08	5.39
0.417	3.60	2.000	8.99	3.583	19.78	5.17	5.39
0.500	3.60	2.083	8.99	3.667	19.78	5.25	5.39
0.583	3.60	2.167	8.99	3.750	19.78	5.33	3.60
0.667	3.60	2.250	8.99	3.833	8.99	5.42	3.60
0.750	3.60	2.333	10.79	3.917	8.99	5.50	3.60
0.833	5.39	2.417	10.79	4.000	8.99	5.58	3.60
0.917	5.39	2.500	10.79	4.083	8.99	5.67	3.60
1.000	5.39	2.583	10.79	4.167	8.99	5.75	3.60
1.083	5.39	2.667	10.79	4.250	8.99	5.83	3.60
1.167	5.39	2.750	10.79	4.333	7.19	5.92	3.60
1.250	5.39	2.833	53.94	4.417	7.19	6.00	3.60
1.333	5.39	2.917	53.94	4.500	7.19	6.08	3.60
1.417	5.39	3.000	53.94	4.583	7.19	6.17	3.60
1.500	5.39	3.083	140.24	4.667	7.19	6.25	3.60
1.583	5.39	3.167	140.24	4.750	7.19		

Unit Hyd Qpeak (cms)= 1.447

PEAK FLOW (cms)= 1.399 (i)
TIME TO PEAK (hrs)= 3.500
RUNOFF VOLUME (mm)= 42.971
TOTAL RAINFALL (mm)= 89.900
RUNOFF COEFFICIENT = 0.478

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
NASHYD (1301)	Area (ha)=	5.08	Curve Number (CN)= 77.0
ID= 1 DT= 5.0 min	Ia (mm)=	6.50	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	0.49	

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----							
TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	1.667	5.39	3.250	140.24	4.83	5.39
0.167	0.00	1.750	5.39	3.333	19.78	4.92	5.39
0.250	0.00	1.833	8.99	3.417	19.78	5.00	5.39
0.333	3.60	1.917	8.99	3.500	19.78	5.08	5.39
0.417	3.60	2.000	8.99	3.583	19.78	5.17	5.39
0.500	3.60	2.083	8.99	3.667	19.78	5.25	5.39
0.583	3.60	2.167	8.99	3.750	19.78	5.33	3.60
0.667	3.60	2.250	8.99	3.833	8.99	5.42	3.60
0.750	3.60	2.333	10.79	3.917	8.99	5.50	3.60
0.833	5.39	2.417	10.79	4.000	8.99	5.58	3.60
0.917	5.39	2.500	10.79	4.083	8.99	5.67	3.60
1.000	5.39	2.583	10.79	4.167	8.99	5.75	3.60
1.083	5.39	2.667	10.79	4.250	8.99	5.83	3.60
1.167	5.39	2.750	10.79	4.333	7.19	5.92	3.60
1.250	5.39	2.833	53.94	4.417	7.19	6.00	3.60

1.333	5.39	2.917	53.94	4.500	7.19	6.08	3.60
1.417	5.39	3.000	53.94	4.583	7.19	6.17	3.60
1.500	5.39	3.083	140.24	4.667	7.19	6.25	3.60
1.583	5.39	3.167	140.24	4.750	7.19		

Unit Hyd Qpeak (cms)= 0.396

PEAK FLOW (cms)= 0.414 (i)

TIME TO PEAK (hrs)= 3.667

RUNOFF VOLUME (mm)= 43.669

TOTAL RAINFALL (mm)= 89.900

RUNOFF COEFFICIENT = 0.486

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB							
NASHYD (1302)	Area (ha)=	6.51	Curve Number (CN)=	79.0			
ID= 1 DT= 5.0 min	Ia (mm)=	6.70	# of Linear Res.(N)=	3.00			
	U.H. Tp(hrs)=	0.42					

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.667	5.39	3.250	140.24	4.83	5.39
0.167	0.00	1.750	5.39	3.333	19.78	4.92	5.39
0.250	0.00	1.833	8.99	3.417	19.78	5.00	5.39
0.333	3.60	1.917	8.99	3.500	19.78	5.08	5.39
0.417	3.60	2.000	8.99	3.583	19.78	5.17	5.39
0.500	3.60	2.083	8.99	3.667	19.78	5.25	5.39
0.583	3.60	2.167	8.99	3.750	19.78	5.33	3.60
0.667	3.60	2.250	8.99	3.833	8.99	5.42	3.60
0.750	3.60	2.333	10.79	3.917	8.99	5.50	3.60
0.833	5.39	2.417	10.79	4.000	8.99	5.58	3.60
0.917	5.39	2.500	10.79	4.083	8.99	5.67	3.60
1.000	5.39	2.583	10.79	4.167	8.99	5.75	3.60
1.083	5.39	2.667	10.79	4.250	8.99	5.83	3.60
1.167	5.39	2.750	10.79	4.333	7.19	5.92	3.60
1.250	5.39	2.833	53.94	4.417	7.19	6.00	3.60
1.333	5.39	2.917	53.94	4.500	7.19	6.08	3.60
1.417	5.39	3.000	53.94	4.583	7.19	6.17	3.60
1.500	5.39	3.083	140.24	4.667	7.19	6.25	3.60
1.583	5.39	3.167	140.24	4.750	7.19		

Unit Hyd Qpeak (cms)= 0.592

PEAK FLOW (cms)= 0.626 (i)

TIME TO PEAK (hrs)= 3.583

RUNOFF VOLUME (mm)= 45.923

TOTAL RAINFALL (mm)= 89.900

RUNOFF COEFFICIENT = 0.511

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB							
STANDHYD (1303)	Area (ha)=	0.66					
ID= 1 DT= 5.0 min	Total Imp(%)=	70.00	Dir. Conn.(%)=	70.00			

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.46	0.20
Dep. Storage (mm)=	1.00	5.00
Average Slope (%)=	1.00	2.00
Length (m)=	66.33	40.00
Mannings n	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.667	5.39	3.250	140.24	4.83	5.39
0.167	0.00	1.750	5.39	3.333	19.78	4.92	5.39
0.250	0.00	1.833	8.99	3.417	19.78	5.00	5.39
0.333	3.60	1.917	8.99	3.500	19.78	5.08	5.39
0.417	3.60	2.000	8.99	3.583	19.78	5.17	5.39
0.500	3.60	2.083	8.99	3.667	19.78	5.25	5.39
0.583	3.60	2.167	8.99	3.750	19.78	5.33	3.60
0.667	3.60	2.250	8.99	3.833	8.99	5.42	3.60
0.750	3.60	2.333	10.79	3.917	8.99	5.50	3.60
0.833	5.39	2.417	10.79	4.000	8.99	5.58	3.60
0.917	5.39	2.500	10.79	4.083	8.99	5.67	3.60
1.000	5.39	2.583	10.79	4.167	8.99	5.75	3.60
1.083	5.39	2.667	10.79	4.250	8.99	5.83	3.60
1.167	5.39	2.750	10.79	4.333	7.19	5.92	3.60
1.250	5.39	2.833	53.94	4.417	7.19	6.00	3.60
1.333	5.39	2.917	53.94	4.500	7.19	6.08	3.60
1.417	5.39	3.000	53.94	4.583	7.19	6.17	3.60
1.500	5.39	3.083	140.24	4.667	7.19	6.25	3.60
1.583	5.39	3.167	140.24	4.750	7.19		

Max.Eff.Inten.(mm/hr)= 140.24

over (min)= 5.00

Storage Coeff. (min)= 1.74 (ii)

Unit Hyd. Tpeak (min)= 5.00

Unit Hyd. peak (cms)= 0.32

TOTALS

PEAK FLOW (cms)= 0.18

TIME TO PEAK (hrs)= 3.25

RUNOFF VOLUME (mm)= 88.90

TOTAL RAINFALL (mm)= 89.90

RUNOFF COEFFICIENT = 0.99

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN* = 61.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0023)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (1101):	18.07	1.350	3.67	40.79
+ ID2= 2 (1301):	5.08	0.414	3.67	43.67
ID = 3 (0023):	23.15	1.764	3.67	41.42

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0023)				
3 + 2 = 1	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 3 (0023):	23.15	1.764	3.67	41.42
+ ID2= 2 (1302):	6.51	0.626	3.58	45.92
ID = 1 (0023):	29.66	2.370	3.67	42.41

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

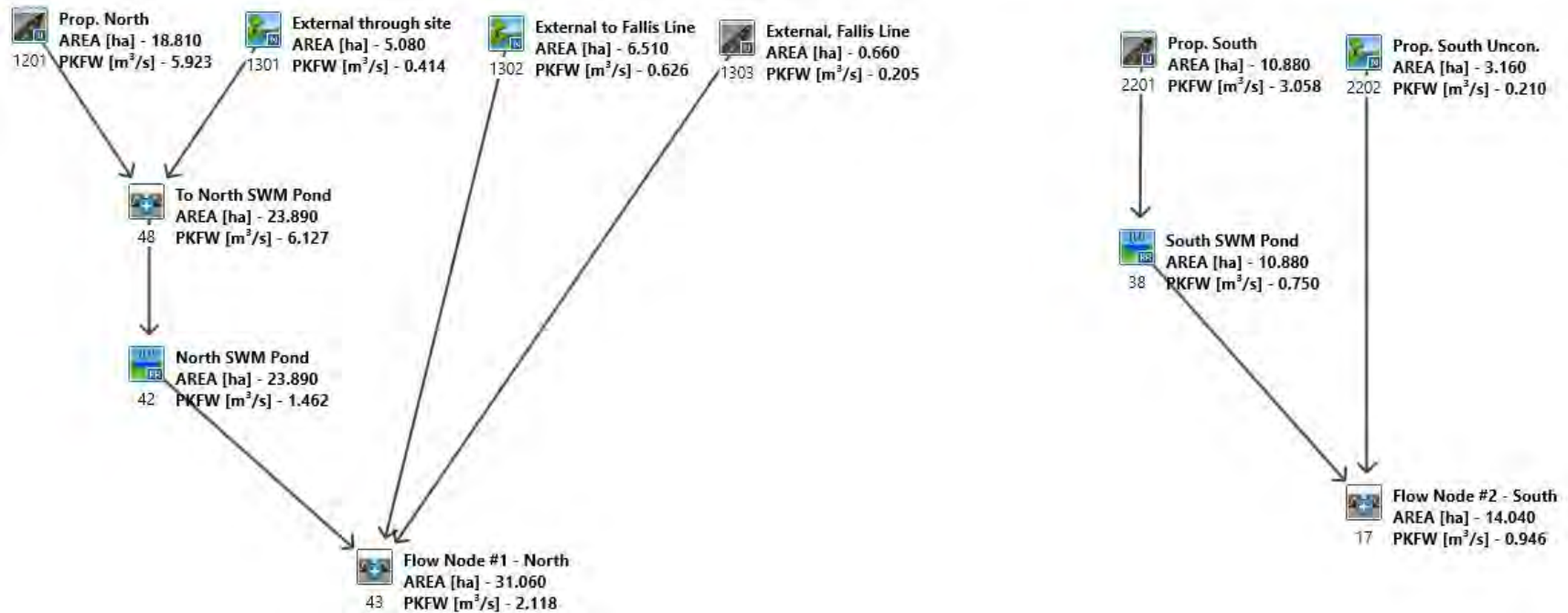
```
-----  
| ADD HYD ( 0023) |  
| 1 + 2 = 3 |  
-----  
          AREA      QPEAK      TPEAK      R.V.  
          (ha)      (cms)      (hrs)      (mm)  
ID1= 1 ( 0023):  29.66  2.370  3.67  42.41  
+ ID2= 2 ( 1303):   0.66  0.205  3.25  70.97  
=====
```

ID = 3 (0023): 30.32 2.401 3.67 43.03

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

FINISH

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VO5 Model Schematic – Post-Development

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V   V   I   SSSSS   U   U   A   L   (v 6.2.2007)
V   V   I   SS     U   U   A   A   L
V   V   I   SS     U   U   AAAAA L
V   V   I   SS     U   U   A   A   L
V   V   I   SSSSS   UUUUU   A   A   LLLLL
000   TTTT   TTTT   H   H   Y   Y   M   M   000   TM
0   0   T   T   H   H   Y   Y   MM   MM   0   0
0   0   T   T   H   H   Y   M   M   0   0
000   T   T   H   H   Y   M   M   000
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***** D E T A I L E D O U T P U T *****

```

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Output filename: C:\Users\Valdor\AppData\Local\Civica\XH5\c7e9b9dc-2878-4b8a-9d26-
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Summary filename: C:\Users\Valdor\AppData\Local\Civica\XH5\c7e9b9dc-2878-4b8a-9d26-
5e475049aa89\9aedd227-c1cc-49dd-a183-d84895375be8\scena

```

DATE: 12-06-2021 TIME: 04:33:18

USER:

COMMENTS: _____

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*****
** SIMULATION : 25mm 4H Chicago **
*****

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-----
| READ STORM | File: C:\Users\Valdor\AppData\Local\Temp\
|            | f4c1afd7-7cd0-48cf-b336-8018d1565688\da349100
| Ptotal= 25.02 mm | Comments: 25mm CHICAGO Storm
-----

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	2.17	1.00	6.20	2.00	5.62	3.00	2.95
0.17	2.38	1.17	12.18	2.17	4.80	3.17	2.76
0.33	2.66	1.33	41.67	2.33	4.21	3.33	2.62
0.50	3.03	1.50	15.28	2.50	3.78	3.50	2.47
0.67	3.58	1.67	9.22	2.67	3.45	3.67	2.35
0.83	4.47	1.83	6.88	2.83	3.18	3.83	2.23

```

-----
| CALIB |
| NASHYD ( 2202) | Area (ha)= 3.16 Curve Number (CN)= 66.0
| ID= 1 DT= 5.0 min | Ia (mm)= 6.20 # of Linear Res.(N)= 3.00
|            | U.H. Tp(hrs)= 0.42
-----

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NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

```

----- TRANSFORMED HYETOGRAPH -----
TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN
hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
0.083 2.17 | 1.083 6.20 | 2.083 5.62 | 3.08 2.95
0.167 2.17 | 1.167 6.20 | 2.167 5.62 | 3.17 2.95
0.250 2.38 | 1.250 12.18 | 2.250 4.80 | 3.25 2.76
0.333 2.38 | 1.333 12.18 | 2.333 4.80 | 3.33 2.76
0.417 2.66 | 1.417 41.67 | 2.417 4.21 | 3.42 2.62
0.500 2.66 | 1.500 41.67 | 2.500 4.21 | 3.50 2.62
0.583 3.03 | 1.583 15.28 | 2.583 3.78 | 3.58 2.47
0.667 3.03 | 1.667 15.28 | 2.667 3.78 | 3.67 2.47
0.750 3.58 | 1.750 9.22 | 2.750 3.45 | 3.75 2.35
0.833 3.58 | 1.833 9.22 | 2.833 3.45 | 3.83 2.35
0.917 4.47 | 1.917 6.88 | 2.917 3.18 | 3.92 2.23
1.000 4.47 | 2.000 6.88 | 3.000 3.18 | 4.00 2.23

```

Unit Hyd Qpeak (cms)= 0.287

PEAK FLOW (cms)= 0.010 (i)
TIME TO PEAK (hrs)= 2.167
RUNOFF VOLUME (mm)= 2.367
TOTAL RAINFALL (mm)= 25.023
RUNOFF COEFFICIENT = 0.095

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| CALIB |
| STANDHYD ( 2201) | Area (ha)= 10.88
| ID= 1 DT= 5.0 min | Total Imp(%)= 60.00 Dir. Conn.(%)= 45.00
-----

```

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	6.53	4.35
Dep. Storage (mm)=	2.00	5.00
Average Slope (%)=	2.00	2.00
Length (m)=	269.32	20.00
Mannings n	0.013	0.035

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

```

----- TRANSFORMED HYETOGRAPH -----
TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN
hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
0.083 2.17 | 1.083 6.20 | 2.083 5.62 | 3.08 2.95
0.167 2.17 | 1.167 6.20 | 2.167 5.62 | 3.17 2.95
0.250 2.38 | 1.250 12.18 | 2.250 4.80 | 3.25 2.76
0.333 2.38 | 1.333 12.18 | 2.333 4.80 | 3.33 2.76
0.417 2.66 | 1.417 41.67 | 2.417 4.21 | 3.42 2.62
0.500 2.66 | 1.500 41.67 | 2.500 4.21 | 3.50 2.62
0.583 3.03 | 1.583 15.28 | 2.583 3.78 | 3.58 2.47
0.667 3.03 | 1.667 15.28 | 2.667 3.78 | 3.67 2.47
0.750 3.58 | 1.750 9.22 | 2.750 3.45 | 3.75 2.35
0.833 3.58 | 1.833 9.22 | 2.833 3.45 | 3.83 2.35
0.917 4.47 | 1.917 6.88 | 2.917 3.18 | 3.92 2.23
1.000 4.47 | 2.000 6.88 | 3.000 3.18 | 4.00 2.23

```

Max.Eff.Inten.(mm/hr)= 41.67 5.32
over (min) 5.00 10.00
Storage Coeff. (min)= 5.34 (ii) 7.27 (ii)
Unit Hyd. Tpeak (min)= 5.00 10.00
Unit Hyd. peak (cms)= 0.21 0.14

TOTALS
PEAK FLOW (cms)= 0.50 0.05 0.540 (iii)
TIME TO PEAK (hrs)= 1.50 1.58 1.50
RUNOFF VOLUME (mm)= 23.02 3.28 12.16
TOTAL RAINFALL (mm)= 25.02 25.02 25.02
RUNOFF COEFFICIENT = 0.92 0.13 0.49

- (i) CN PROCEDURE SELECTED FOR PVIOUS LOSSES:
 CN* = 61.0 Ia = Dep. Storage (Above)
 (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
 THAN THE STORAGE COEFFICIENT.
 (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-----
| RESERVOIR( 0038)| OVERFLOW IS OFF
| IN= 2--> OUT= 1 |
| DT= 5.0 min |
-----
| OUTFLOW | STORAGE | OUTFLOW | STORAGE |
| (cms) | (ha.m.) | (cms) | (ha.m.) |
| 0.0000 | 0.0000 | 0.8454 | 0.4251 |
| 0.0074 | 0.0469 | 0.9743 | 0.4997 |
| 0.0112 | 0.0990 | 1.0880 | 0.5770 |
| 0.0140 | 0.1563 | 1.1909 | 0.6570 |
| 0.1657 | 0.2182 | 5.4831 | 0.7609 |
| 0.4409 | 0.2840 | 13.2243 | 0.8692 |
| 0.6926 | 0.3532 | 0.0000 | 0.0000 |
|
| AREA | QPEAK | TPEAK | R.V. | |
| (ha) | (cms) | (hrs) | (mm) |
| INFLOW : ID= 2 ( 2201) | 10.880 | 0.540 | 1.50 | 12.16 |
| OUTFLOW: ID= 1 ( 0038) | 10.880 | 0.012 | 4.17 | 12.02 |
|
| PEAK FLOW REDUCTION [Qout/Qin](%)= 2.27 |
| TIME SHIFT OF PEAK FLOW (min)=160.00 |
| MAXIMUM STORAGE USED (ha.m.)= 0.1211 |
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| ADD HYD ( 0017)|
| 1 + 2 = 3 |
|
| ID1= 1 ( 2202): | 3.16 | 0.010 | 2.17 | 2.37 |
| + ID2= 2 ( 0038): | 10.88 | 0.012 | 4.17 | 12.02 |
| ===== |
| ID = 3 ( 0017): | 14.04 | 0.021 | 2.33 | 9.84 |
-----

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| CALIB |
| NASHYD ( 1302)| Area (ha)= 6.51 Curve Number (CN)= 79.0
| ID= 1 DT= 5.0 min | Ia (mm)= 6.70 # of Linear Res.(N)= 3.00
| U.H. Tp(hrs)= 0.42 |
-----

```

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

```

-----
| TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN |
| hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr |
| 0.083 2.17 | 1.083 6.20 | 2.083 5.62 | 3.08 2.95 |
| 0.167 2.17 | 1.167 6.20 | 2.167 5.62 | 3.17 2.95 |
| 0.250 2.38 | 1.250 12.18 | 2.250 4.80 | 3.25 2.76 |
| 0.333 2.38 | 1.333 12.18 | 2.333 4.80 | 3.33 2.76 |
| 0.417 2.66 | 1.417 41.67 | 2.417 4.21 | 3.42 2.62 |
| 0.500 2.66 | 1.500 41.67 | 2.500 4.21 | 3.50 2.62 |
| 0.583 3.03 | 1.583 15.28 | 2.583 3.78 | 3.58 2.47 |
| 0.667 3.03 | 1.667 15.28 | 2.667 3.78 | 3.67 2.47 |
| 0.750 3.58 | 1.750 9.22 | 2.750 3.45 | 3.75 2.35 |
| 0.833 3.58 | 1.833 9.22 | 2.833 3.45 | 3.83 2.35 |
| 0.917 4.47 | 1.917 6.88 | 2.917 3.18 | 3.92 2.23 |
| 1.000 4.47 | 2.000 6.88 | 3.000 3.18 | 4.00 2.23 |
-----

```

Unit Hyd Qpeak (cms)= 0.592

```

PEAK FLOW (cms)= 0.034 (i)
TIME TO PEAK (hrs)= 2.167
RUNOFF VOLUME (mm)= 3.911
TOTAL RAINFALL (mm)= 25.023
RUNOFF COEFFICIENT = 0.156

```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| CALIB |
| NASHYD ( 1301)| Area (ha)= 5.08 Curve Number (CN)= 77.0
| ID= 1 DT= 5.0 min | Ia (mm)= 6.50 # of Linear Res.(N)= 3.00
| U.H. Tp(hrs)= 0.49 |
-----

```

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

```

-----
| TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN |
| hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr |
| 0.083 2.17 | 1.083 6.20 | 2.083 5.62 | 3.08 2.95 |
| 0.167 2.17 | 1.167 6.20 | 2.167 5.62 | 3.17 2.95 |
| 0.250 2.38 | 1.250 12.18 | 2.250 4.80 | 3.25 2.76 |
| 0.333 2.38 | 1.333 12.18 | 2.333 4.80 | 3.33 2.76 |
| 0.417 2.66 | 1.417 41.67 | 2.417 4.21 | 3.42 2.62 |
| 0.500 2.66 | 1.500 41.67 | 2.500 4.21 | 3.50 2.62 |
| 0.583 3.03 | 1.583 15.28 | 2.583 3.78 | 3.58 2.47 |
| 0.667 3.03 | 1.667 15.28 | 2.667 3.78 | 3.67 2.47 |
| 0.750 3.58 | 1.750 9.22 | 2.750 3.45 | 3.75 2.35 |
| 0.833 3.58 | 1.833 9.22 | 2.833 3.45 | 3.83 2.35 |
| 0.917 4.47 | 1.917 6.88 | 2.917 3.18 | 3.92 2.23 |
| 1.000 4.47 | 2.000 6.88 | 3.000 3.18 | 4.00 2.23 |
-----

```

Unit Hyd Qpeak (cms)= 0.396

```

PEAK FLOW (cms)= 0.023 (i)
TIME TO PEAK (hrs)= 2.333
RUNOFF VOLUME (mm)= 3.635
TOTAL RAINFALL (mm)= 25.023
RUNOFF COEFFICIENT = 0.145

```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| CALIB |
| STANDHYD ( 1201)| Area (ha)= 18.81
| ID= 1 DT= 5.0 min | Total Imp(%)= 75.00 Dir. Conn.(%)= 60.00
|
-----

```

```

| IMPERVIOUS | PERVIOUS (i) |
| Surface Area (ha)= 14.11 | 4.70 |
| Dep. Storage (mm)= 2.00 | 5.00 |
| Average Slope (%)= 2.00 | 2.00 |
| Length (m)= 354.12 | 20.00 |
| Mannings n = 0.013 | 0.035 |

```

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

```

-----
| TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN |
| hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr |
| 0.083 2.17 | 1.083 6.20 | 2.083 5.62 | 3.08 2.95 |
| 0.167 2.17 | 1.167 6.20 | 2.167 5.62 | 3.17 2.95 |
| 0.250 2.38 | 1.250 12.18 | 2.250 4.80 | 3.25 2.76 |
| 0.333 2.38 | 1.333 12.18 | 2.333 4.80 | 3.33 2.76 |
| 0.417 2.66 | 1.417 41.67 | 2.417 4.21 | 3.42 2.62 |
| 0.500 2.66 | 1.500 41.67 | 2.500 4.21 | 3.50 2.62 |
| 0.583 3.03 | 1.583 15.28 | 2.583 3.78 | 3.58 2.47 |
-----

```

0.667	3.03	1.667	15.28	2.667	3.78	3.67	2.47
0.750	3.58	1.750	9.22	2.750	3.45	3.75	2.35
0.833	3.58	1.833	9.22	2.833	3.45	3.83	2.35
0.917	4.47	1.917	6.88	2.917	3.18	3.92	2.23
1.000	4.47	2.000	6.88	3.000	3.18	4.00	2.23

Max.Eff.Inten.(mm/hr)=	41.67	7.68
over (min)	5.00	10.00
Storage Coeff. (min)=	6.29 (ii)	7.72 (ii)
Unit Hyd. Tpeak (min)=	5.00	10.00
Unit Hyd. peak (cms)=	0.19	0.13
PEAK FLOW (cms)=	1.11	0.08
TIME TO PEAK (hrs)=	1.50	1.58
RUNOFF VOLUME (mm)=	23.02	3.89
TOTAL RAINFALL (mm)=	25.02	25.02
RUNOFF COEFFICIENT =	0.92	0.16

TOTALS

1.166 (iii)

- (i) CN PROCEDURE SELECTED FOR PVIOUS LOSSES:
CN* = 61.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| ADD HYD ( 0048) |
| 1 + 2 = 3 |
-----
ID1= 1 ( 1201): 18.81 1.166 1.50 15.37
+ ID2= 2 ( 1301): 5.08 0.023 2.33 3.63
=====
ID = 3 ( 0048): 23.89 1.168 1.50 12.87

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| RESERVOIR( 0042) |
| IN= 2--> OUT= 1 |
| DT= 5.0 min |
-----
OVERFLOW IS OFF

```

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	1.0462	0.5963
0.0121	0.0688	1.2756	0.6991
0.0189	0.1438	1.4692	0.8059
0.0239	0.2249	1.6400	0.9165
0.0280	0.3113	2.7752	0.9732
0.2556	0.4022	4.7819	1.0308
0.6685	0.4973	13.8126	1.2091

AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
23.890	1.168	1.50	12.87
23.890	0.027	4.25	12.81

PEAK FLOW REDUCTION [Qout/Qin](%)= 2.27
TIME SHIFT OF PEAK FLOW (min)=165.00
MAXIMUM STORAGE USED (ha.m.)= 0.2808

```

-----
| CALIB |
| STANDHYD ( 1303) |
| ID= 1 DT= 5.0 min |
-----
Area (ha)= 0.66
Total Imp(%)= 70.00 Dir. Conn.(%)= 70.00

```

IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.46
Dep. Storage (mm)=	1.00
Average Slope (%)=	1.00

Length (m)= 66.33 40.00
Mannings n = 0.013 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

```

----- TRANSFORMED HYETOGRAPH -----
TIME RAIN TIME RAIN TIME RAIN TIME RAIN
hrs mm/hr hrs mm/hr hrs mm/hr hrs mm/hr
0.083 2.17 1.083 6.20 2.083 5.62 3.08 2.95
0.167 2.17 1.167 6.20 2.167 5.62 3.17 2.95
0.250 2.38 1.250 12.18 2.250 4.80 3.25 2.76
0.333 2.38 1.333 12.18 2.333 4.80 3.33 2.76
0.417 2.66 1.417 41.67 2.417 4.21 3.42 2.62
0.500 2.66 1.500 41.67 2.500 4.21 3.50 2.62
0.583 3.03 1.583 15.28 2.583 3.78 3.58 2.47
0.667 3.03 1.667 15.28 2.667 3.78 3.67 2.47
0.750 3.58 1.750 9.22 2.750 3.45 3.75 2.35
0.833 3.58 1.833 9.22 2.833 3.45 3.83 2.35
0.917 4.47 1.917 6.88 2.917 3.18 3.92 2.23
1.000 4.47 2.000 6.88 3.000 3.18 4.00 2.23

```

Max.Eff.Inten.(mm/hr)=	41.67	1.50
over (min)	5.00	45.00
Storage Coeff. (min)=	2.83 (ii)	40.74 (ii)
Unit Hyd. Tpeak (min)=	5.00	45.00
Unit Hyd. peak (cms)=	0.28	0.03
PEAK FLOW (cms)=	0.05	0.00
TIME TO PEAK (hrs)=	1.50	2.50
RUNOFF VOLUME (mm)=	24.02	2.20
TOTAL RAINFALL (mm)=	25.02	25.02
RUNOFF COEFFICIENT =	0.96	0.09

TOTALS

0.052 (iii)

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PVIOUS LOSSES:
CN* = 61.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| ADD HYD ( 0043) |
| 1 + 2 = 3 |
-----
ID1= 1 ( 1302): 6.51 0.034 2.17 3.91
+ ID2= 2 ( 1303): 0.66 0.052 1.50 17.44
=====
ID = 3 ( 0043): 7.17 0.056 1.50 5.16

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| ADD HYD ( 0043) |
| 3 + 2 = 1 |
-----
ID1= 3 ( 0043): 7.17 0.056 1.50 5.16
+ ID2= 2 ( 0042): 23.89 0.027 4.25 12.81
=====
ID = 1 ( 0043): 31.06 0.069 1.50 11.05

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

V V I SSSS U U A L (v 6.2.2007)

V V I SS U U A A L
V V I SS U U A A A A L
V V I SS U U A A L
V V I SSSS UUUU A A LLLL

000 TTTT TTTT H H Y Y M M 000 TM
O O T T H H Y Y MM MM O O
O O T T H H Y M M O O
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***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voindat
Output filename: C:\Users\Valdor\AppData\Local\Civica\XH5\c7e9b9dc-2878-4b8a-9d26-5e475049aa89\d0616cb9-5003-4901-8698-cfb942d4cf6e\scena
Summary filename: C:\Users\Valdor\AppData\Local\Civica\XH5\c7e9b9dc-2878-4b8a-9d26-5e475049aa89\d0616cb9-5003-4901-8698-cfb942d4cf6e\scena

DATE: 12-06-2021 TIME: 04:33:18

USER:

COMMENTS: _____

** SIMULATION : SCS_6H_002Y **

READ STORM Filename: C:\Users\Valdor\AppData\Local\Temp\ f4c1afd7-7cd0-48cf-b336-8018d1565680\96d71607
Ptotal= 38.70 mm Comments: 2yr/6hr Peterborough A SCS

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	0.00	1.75	3.87	3.50	8.51	5.25	1.55
0.25	1.55	2.00	3.87	3.75	3.87	5.50	1.55
0.50	1.55	2.25	4.64	4.00	3.87	5.75	1.55
0.75	2.32	2.50	4.64	4.25	3.10	6.00	1.55
1.00	2.32	2.75	23.22	4.50	3.10		
1.25	2.32	3.00	60.37	4.75	2.32		
1.50	2.32	3.25	8.51	5.00	2.32		

CALIB
NASHYD (2202) Area (ha)= 3.16 Curve Number (CN)= 66.0
ID= 1 DT= 5.0 min Ia (mm)= 6.20 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.42

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

----- TRANSFORMED HYETOGRAPH -----
TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN

hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.667	2.32	3.250	60.37	4.83	2.32
0.167	0.00	1.750	2.32	3.333	8.51	4.92	2.32
0.250	0.00	1.833	3.87	3.417	8.51	5.00	2.32
0.333	1.55	1.917	3.87	3.500	8.51	5.08	2.32
0.417	1.55	2.000	3.87	3.583	8.51	5.17	2.32
0.500	1.55	2.083	3.87	3.667	8.51	5.25	2.32
0.583	1.55	2.167	3.87	3.750	8.51	5.33	1.55
0.667	1.55	2.250	3.87	3.833	3.87	5.42	1.55
0.750	1.55	2.333	4.64	3.917	3.87	5.50	1.55
0.833	2.32	2.417	4.64	4.000	3.87	5.58	1.55
0.917	2.32	2.500	4.64	4.083	3.87	5.67	1.55
1.000	2.32	2.583	4.64	4.167	3.87	5.75	1.55
1.083	2.32	2.667	4.64	4.250	3.87	5.83	1.55
1.167	2.32	2.750	4.64	4.333	3.10	5.92	1.55
1.250	2.32	2.833	23.22	4.417	3.10	6.00	1.55
1.333	2.32	2.917	23.22	4.500	3.10	6.08	1.55
1.417	2.32	3.000	23.22	4.583	3.10	6.17	1.55
1.500	2.32	3.083	60.37	4.667	3.10	6.25	1.55
1.583	2.32	3.167	60.37	4.750	3.10		

Unit Hyd Qpeak (cms)= 0.287

PEAK FLOW (cms)= 0.039 (i)
TIME TO PEAK (hrs)= 3.583
RUNOFF VOLUME (mm)= 6.464
TOTAL RAINFALL (mm)= 38.698
RUNOFF COEFFICIENT = 0.167

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (2201) Area (ha)= 10.88
ID= 1 DT= 5.0 min Total Imp(%)= 60.00 Dir. Conn.(%)= 45.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	6.53	4.35
Dep. Storage (mm)=	2.00	5.00
Average Slope (%)=	2.00	2.00
Length (m)=	269.32	20.00
Mannings n	0.013	0.035

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

----- TRANSFORMED HYETOGRAPH -----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	1.667	2.32	3.250	60.37	4.83	2.32
0.167	0.00	1.750	2.32	3.333	8.51	4.92	2.32
0.250	0.00	1.833	3.87	3.417	8.51	5.00	2.32
0.333	1.55	1.917	3.87	3.500	8.51	5.08	2.32
0.417	1.55	2.000	3.87	3.583	8.51	5.17	2.32
0.500	1.55	2.083	3.87	3.667	8.51	5.25	2.32
0.583	1.55	2.167	3.87	3.750	8.51	5.33	1.55
0.667	1.55	2.250	3.87	3.833	3.87	5.42	1.55
0.750	1.55	2.333	4.64	3.917	3.87	5.50	1.55
0.833	2.32	2.417	4.64	4.000	3.87	5.58	1.55
0.917	2.32	2.500	4.64	4.083	3.87	5.67	1.55
1.000	2.32	2.583	4.64	4.167	3.87	5.75	1.55
1.083	2.32	2.667	4.64	4.250	3.87	5.83	1.55
1.167	2.32	2.750	4.64	4.333	3.10	5.92	1.55
1.250	2.32	2.833	23.22	4.417	3.10	6.00	1.55
1.333	2.32	2.917	23.22	4.500	3.10	6.08	1.55
1.417	2.32	3.000	23.22	4.583	3.10	6.17	1.55
1.500	2.32	3.083	60.37	4.667	3.10	6.25	1.55
1.583	2.32	3.167	60.37	4.750	3.10		

```

Max.Eff.Inten.(mm/hr)= 60.37      21.85
                    over (min)    5.00      10.00
Storage Coeff. (min)= 4.60 (ii)   6.27 (ii)
Unit Hyd. Tpeak (min)= 5.00      10.00
Unit Hyd. peak (cms)= 0.23      0.15

*TOTALS*
PEAK FLOW (cms)= 0.80      0.21      1.007 (iii)
TIME TO PEAK (hrs)= 3.25      3.25      3.25
RUNOFF VOLUME (mm)= 36.70      8.03      20.93
TOTAL RAINFALL (mm)= 38.70      38.70      38.70
RUNOFF COEFFICIENT = 0.95      0.21      0.54

```

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
 CN* = 61.0 Ia = Dep. Storage (Above)
 (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
 THAN THE STORAGE COEFFICIENT.
 (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| RESERVOIR( 0038) | OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 5.0 min      |
-----
| OUTFLOW | STORAGE | OUTFLOW | STORAGE |
| (cms)   | (ha.m.) | (cms)   | (ha.m.) |
| 0.0000  | 0.0000  | 0.8454  | 0.4251  |
| 0.0074  | 0.0469  | 0.9743  | 0.4997  |
| 0.0112  | 0.0990  | 1.0880  | 0.5770  |
| 0.0140  | 0.1563  | 1.1909  | 0.6570  |
| 0.1657  | 0.2182  | 5.4831  | 0.7609  |
| 0.4409  | 0.2840  | 13.2243 | 0.8692  |
| 0.6926  | 0.3532  | 0.0000  | 0.0000  |

AREA   QPEAK   TPEAK   R.V.
(ha)   (cms)   (hrs)   (mm)
INFLOW : ID= 2 ( 2201) 10.880 1.007 3.25 20.93
OUTFLOW: ID= 1 ( 0038) 10.880 0.065 4.42 20.78

```

```

PEAK FLOW REDUCTION [Qout/Qin](%)= 6.47
TIME SHIFT OF PEAK FLOW (min)= 70.00
MAXIMUM STORAGE USED (ha.m.)= 0.1772

```

```

-----
| ADD HYD ( 0017) |
| 1 + 2 = 3       |
-----
| ID1= 1 ( 2202): | AREA   QPEAK   TPEAK   R.V.
| 1 + 2 = 3       | (ha)   (cms)   (hrs)   (mm)
| + ID2= 2 ( 0038): 3.16 0.039 3.58 6.46
| + ID2= 2 ( 0038): 10.88 0.065 4.42 20.78
| ID = 3 ( 0017): 14.04 0.092 3.92 17.56

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| CALIB |
| NASHYD ( 1302) | Area (ha)= 6.51 Curve Number (CN)= 79.0
| ID= 1 DT= 5.0 min | Ia (mm)= 6.70 # of Linear Res.(N)= 3.00
| U.H. Tp(hrs)= 0.42

```

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

```

----- TRANSFORMED HYETOGRAPH -----
TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN
hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
0.083 0.00 | 1.667 2.32 | 3.250 60.37 | 4.83 2.32
0.167 0.00 | 1.750 2.32 | 3.333 8.51 | 4.92 2.32

```

```

0.250 0.00 | 1.833 3.87 | 3.417 8.51 | 5.00 2.32
0.333 1.55 | 1.917 3.87 | 3.500 8.51 | 5.08 2.32
0.417 1.55 | 2.000 3.87 | 3.583 8.51 | 5.17 2.32
0.500 1.55 | 2.083 3.87 | 3.667 8.51 | 5.25 2.32
0.583 1.55 | 2.167 3.87 | 3.750 8.51 | 5.33 1.55
0.667 1.55 | 2.250 3.87 | 3.833 3.87 | 5.42 1.55
0.750 1.55 | 2.333 4.64 | 3.917 3.87 | 5.50 1.55
0.833 2.32 | 2.417 4.64 | 4.000 3.87 | 5.58 1.55
0.917 2.32 | 2.500 4.64 | 4.083 3.87 | 5.67 1.55
1.000 2.32 | 2.583 4.64 | 4.167 3.87 | 5.75 1.55
1.083 2.32 | 2.667 4.64 | 4.250 3.87 | 5.83 1.55
1.167 2.32 | 2.750 4.64 | 4.333 3.10 | 5.92 1.55
1.250 2.32 | 2.833 23.22 | 4.417 3.10 | 6.00 1.55
1.333 2.32 | 2.917 23.22 | 4.500 3.10 | 6.08 1.55
1.417 2.32 | 3.000 23.22 | 4.583 3.10 | 6.17 1.55
1.500 2.32 | 3.083 60.37 | 4.667 3.10 | 6.25 1.55
1.583 2.32 | 3.167 60.37 | 4.750 3.10 |

```

Unit Hyd Qpeak (cms)= 0.592

```

PEAK FLOW (cms)= 0.131 (i)
TIME TO PEAK (hrs)= 3.583
RUNOFF VOLUME (mm)= 10.287
TOTAL RAINFALL (mm)= 38.698
RUNOFF COEFFICIENT = 0.266

```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| CALIB |
| NASHYD ( 1301) | Area (ha)= 5.08 Curve Number (CN)= 77.0
| ID= 1 DT= 5.0 min | Ia (mm)= 6.50 # of Linear Res.(N)= 3.00
| U.H. Tp(hrs)= 0.49

```

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

```

----- TRANSFORMED HYETOGRAPH -----
TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN
hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
0.083 0.00 | 1.667 2.32 | 3.250 60.37 | 4.83 2.32
0.167 0.00 | 1.750 2.32 | 3.333 8.51 | 4.92 2.32
0.250 0.00 | 1.833 3.87 | 3.417 8.51 | 5.00 2.32
0.333 1.55 | 1.917 3.87 | 3.500 8.51 | 5.08 2.32
0.417 1.55 | 2.000 3.87 | 3.583 8.51 | 5.17 2.32
0.500 1.55 | 2.083 3.87 | 3.667 8.51 | 5.25 2.32
0.583 1.55 | 2.167 3.87 | 3.750 8.51 | 5.33 1.55
0.667 1.55 | 2.250 3.87 | 3.833 3.87 | 5.42 1.55
0.750 1.55 | 2.333 4.64 | 3.917 3.87 | 5.50 1.55
0.833 2.32 | 2.417 4.64 | 4.000 3.87 | 5.58 1.55
0.917 2.32 | 2.500 4.64 | 4.083 3.87 | 5.67 1.55
1.000 2.32 | 2.583 4.64 | 4.167 3.87 | 5.75 1.55
1.083 2.32 | 2.667 4.64 | 4.250 3.87 | 5.83 1.55
1.167 2.32 | 2.750 4.64 | 4.333 3.10 | 5.92 1.55
1.250 2.32 | 2.833 23.22 | 4.417 3.10 | 6.00 1.55
1.333 2.32 | 2.917 23.22 | 4.500 3.10 | 6.08 1.55
1.417 2.32 | 3.000 23.22 | 4.583 3.10 | 6.17 1.55
1.500 2.32 | 3.083 60.37 | 4.667 3.10 | 6.25 1.55
1.583 2.32 | 3.167 60.37 | 4.750 3.10 |

```

Unit Hyd Qpeak (cms)= 0.396

```

PEAK FLOW (cms)= 0.085 (i)
TIME TO PEAK (hrs)= 3.750
RUNOFF VOLUME (mm)= 9.592
TOTAL RAINFALL (mm)= 38.698
RUNOFF COEFFICIENT = 0.248

```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
STANDHYD (1201)		Area (ha)= 18.81			
ID= 1 DT= 5.0 min		Total Imp(%)= 75.00		Dir. Conn.(%)= 60.00	
		IMPERVIOUS		PERVIOUS (i)	
Surface Area	(ha)=	14.11	4.70		
Dep. Storage	(mm)=	2.00	5.00		
Average Slope	(%)=	2.00	2.00		
Length	(m)=	354.12	20.00		
Mannings n	=	0.013	0.035		
NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.					

---- TRANSFORMED HYETOGRAPH ----					
TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.667	2.32	3.250	60.37
0.167	0.00	1.750	2.32	3.333	8.51
0.250	0.00	1.833	3.87	3.417	8.51
0.333	1.55	1.917	3.87	3.500	8.51
0.417	1.55	2.000	3.87	3.583	8.51
0.500	1.55	2.083	3.87	3.667	8.51
0.583	1.55	2.167	3.87	3.750	8.51
0.667	1.55	2.250	3.87	3.833	3.87
0.750	1.55	2.333	4.64	3.917	3.87
0.833	2.32	2.417	4.64	4.000	3.87
0.917	2.32	2.500	4.64	4.083	3.87
1.000	2.32	2.583	4.64	4.167	3.87
1.083	2.32	2.667	4.64	4.250	3.87
1.167	2.32	2.750	4.64	4.333	3.10
1.250	2.32	2.833	23.22	4.417	3.10
1.333	2.32	2.917	23.22	4.500	3.10
1.417	2.32	3.000	23.22	4.583	3.10
1.500	2.32	3.083	60.37	4.667	3.10
1.583	2.32	3.167	60.37	4.750	3.10

Max.Eff.Inten.(mm/hr)=	60.37	29.17			
over (min)	5.00	10.00			
Storage Coeff. (min)=	5.42 (ii)	6.66 (ii)			
Unit Hyd. Tpeak (min)=	5.00	10.00			
Unit Hyd. peak (cms)=	0.20	0.14			

PEAK FLOW (cms)=	1.82	0.29	*TOTALS*		
TIME TO PEAK (hrs)=	3.25	3.25	2.111 (iii)		
RUNOFF VOLUME (mm)=	36.70	9.23	3.25		
TOTAL RAINFALL (mm)=	38.70	38.70	25.71		
RUNOFF COEFFICIENT =	0.95	0.24	38.70		

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:					
CN* = 61.0 Ia = Dep. Storage (Above)					
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL					
THAN THE STORAGE COEFFICIENT.					
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.					

ADD HYD (0048)				
1 + 2 = 3				

ID1= 1 (1201):	18.81	2.111	3.25	25.71
+ ID2= 2 (1301):	5.08	0.085	3.75	9.59
=====				
ID = 3 (0048):	23.89	2.144	3.25	22.28

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR(0042)		OVERFLOW IS OFF			
IN= 2--> OUT= 1					
DT= 5.0 min					

	OUTFLOW	STORAGE	OUTFLOW	STORAGE	
	(cms)	(ha.m.)	(cms)	(ha.m.)	
	0.0000	0.0000	1.0462	0.5963	
	0.0121	0.0688	1.2756	0.6991	
	0.0189	0.1438	1.4692	0.8059	
	0.0239	0.2249	1.6400	0.9165	
	0.0280	0.3113	2.7752	0.9732	
	0.2556	0.4022	4.7819	1.0308	
	0.6685	0.4973	13.8126	1.2091	

	AREA	QPEAK	TPEAK	R.V.	
	(ha)	(cms)	(hrs)	(mm)	
INFLOW : ID= 2 (0048)	23.890	2.144	3.25	22.28	
OUTFLOW: ID= 1 (0042)	23.890	0.209	4.25	22.22	

PEAK FLOW REDUCTION [Qout/Qin](%)=	9.76				
TIME SHIFT OF PEAK FLOW	(min)= 60.00				
MAXIMUM STORAGE USED	(ha.m.)= 0.3838				

CALIB				
STANDHYD (1303)				
ID= 1 DT= 5.0 min				

		Area	(ha)=	0.66
		Total Imp(%)=	70.00	Dir. Conn.(%)= 70.00

		IMPERVIOUS		PERVIOUS (i)
Surface Area	(ha)=	0.46	0.20	
Dep. Storage	(mm)=	1.00	5.00	
Average Slope	(%)=	1.00	2.00	
Length	(m)=	66.33	40.00	
Mannings n	=	0.013	0.250	
NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.				

----- TRANSFORMED HYETOGRAPH -----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.667	2.32	3.250	60.37	4.83	2.32
0.167	0.00	1.750	2.32	3.333	8.51	4.92	2.32
0.250	0.00	1.833	3.87	3.417	8.51	5.00	2.32
0.333	1.55	1.917	3.87	3.500	8.51	5.08	2.32
0.417	1.55	2.000	3.87	3.583	8.51	5.17	2.32
0.500	1.55	2.083	3.87	3.667	8.51	5.25	2.32
0.583	1.55	2.167	3.87	3.750	8.51	5.33	1.55
0.667	1.55	2.250	3.87	3.833	3.87	5.42	1.55
0.750	1.55	2.333	4.64	3.917	3.87	5.50	1.55
0.833	2.32	2.417	4.64	4.000	3.87	5.58	1.55
0.917	2.32	2.500	4.64	4.083	3.87	5.67	1.55
1.000	2.32	2.583	4.64	4.167	3.87	5.75	1.55
1.083	2.32	2.667	4.64	4.250	3.87	5.83	1.55
1.167	2.32	2.750	4.64	4.333	3.10	5.92	1.55
1.250	2.32	2.833	23.22	4.417	3.10	6.00	1.55
1.333	2.32	2.917	23.22	4.500	3.10	6.08	1.55
1.417	2.32	3.000	23.22	4.583	3.10	6.17	1.55
1.500	2.32	3.083	60.37	4.667	3.10	6.25	1.55
1.583	2.32	3.167	60.37	4.750	3.10		
Max. Eff. Inten. (mm/hr)=		60.37	8.07				
over (min)		5.00	25.00				
Storage Coeff. (min)=		2.44	(ii)	21.76	(ii)		
Unit Hyd. Tpeak (min)=		5.00	25.00				
Unit Hyd. peak (cms)=		0.30	0.05				
TOTALS							
PEAK FLOW (cms)=		0.08	0.00		0.079 (iii)		

```

TIME TO PEAK (hrs)=      3.25      3.58      3.25
RUNOFF VOLUME (mm)=     37.70      5.79     28.10
TOTAL RAINFALL (mm)=     38.70     38.70     38.70
RUNOFF COEFFICIENT =      0.97      0.15      0.73

```

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 61.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| ADD HYD ( 0043)|
| 1 + 2 = 3 |
-----
ID1= 1 ( 1302):      6.51  0.131  3.58  10.29
+ ID2= 2 ( 1303):      0.66  0.079  3.25  28.10
-----
ID = 3 ( 0043):      7.17  0.145  3.58  11.93

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| ADD HYD ( 0043)|
| 3 + 2 = 1 |
-----
ID1= 3 ( 0043):      7.17  0.145  3.58  11.93
+ ID2= 2 ( 0042):     23.89  0.209  4.25  22.22
-----
ID = 1 ( 0043):     31.06  0.319  3.83  19.85

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

=====
V V I SSSS U U A L (v 6.2.2007)
V V I SS U U A A L
V V I SS U U A A A A L
V V I SS U U A A L
V V I SSSS UUUU A A LLLL
000 TTTT TTTT H H Y Y M M 000 TM
0 0 T T H H Y Y MM MM 0 0
0 0 T T H H Y M M 0 0
000 T T H H Y M M 000

```

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***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
Output filename: C:\Users\Valdor\AppData\Local\Civica\WH5\c7e9b9dc-2878-4b8a-9d26-5e475049aa89\6f45f1d2-d35a-4a58-a1de-d8c406734d39\scena
Summary filename: C:\Users\Valdor\AppData\Local\Civica\WH5\c7e9b9dc-2878-4b8a-9d26-5e475049aa89\6f45f1d2-d35a-4a58-a1de-d8c406734d39\scena

DATE: 12-06-2021

TIME: 04:33:18

USER:

COMMENTS: _____

```

*****
** SIMULATION : SCS_6H_005Y **
*****

```

```

-----
| READ STORM |
| Ptotal= 52.40 mm |
-----
Filename: C:\Users\Valdor\AppData\Local\Temp\
f4c1afd7-7cd0-48cf-b336-8018d1565688\3c8faa6e
Comments: 5yr/6hr Peterborough A SCS

```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	0.00	1.75	5.24	3.50	11.53	5.25	2.10
0.25	2.10	2.00	5.24	3.75	5.24	5.50	2.10
0.50	2.10	2.25	6.29	4.00	5.24	5.75	2.10
0.75	3.14	2.50	6.29	4.25	4.19	6.00	2.10
1.00	3.14	2.75	31.44	4.50	4.19		
1.25	3.14	3.00	81.74	4.75	3.14		
1.50	3.14	3.25	11.53	5.00	3.14		

```

-----
| CALIB |
| NASHYD ( 2202) |
| ID= 1 DT= 5.0 min |
-----
Area (ha)= 3.16 Curve Number (CN)= 66.0
Ia (mm)= 6.20 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.42

```

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

```

-----
---- TRANSFORMED HYETOGRAPH ----
TIME RAIN TIME RAIN TIME RAIN TIME RAIN
hrs mm/hr hrs mm/hr hrs mm/hr hrs mm/hr
0.083 0.00 1.667 3.14 3.250 81.74 4.83 3.14
0.167 0.00 1.750 3.14 3.333 11.53 4.92 3.14
0.250 0.00 1.833 5.24 3.417 11.53 5.00 3.14
0.333 2.10 1.917 5.24 3.500 11.53 5.08 3.14
0.417 2.10 2.000 5.24 3.583 11.53 5.17 3.14
0.500 2.10 2.083 5.24 3.667 11.53 5.25 3.14
0.583 2.10 2.167 5.24 3.750 11.53 5.33 2.10
0.667 2.10 2.250 5.24 3.833 5.24 5.42 2.10
0.750 2.10 2.333 6.29 3.917 5.24 5.50 2.10
0.833 3.14 2.417 6.29 4.000 5.24 5.58 2.10
0.917 3.14 2.500 6.29 4.083 5.24 5.67 2.10
1.000 3.14 2.583 6.29 4.167 5.24 5.75 2.10
1.083 3.14 2.667 6.29 4.250 5.24 5.83 2.10
1.167 3.14 2.750 6.29 4.333 4.19 5.92 2.10
1.250 3.14 2.833 31.44 4.417 4.19 6.00 2.10
1.333 3.14 2.917 31.44 4.500 4.19 6.08 2.10
1.417 3.14 3.000 31.44 4.583 4.19 6.17 2.10
1.500 3.14 3.083 81.74 4.667 4.19 6.25 2.10
1.583 3.14 3.167 81.74 4.750 4.19

```

Unit Hyd Qpeak (cms)= 0.287

PEAK FLOW (cms)= 0.075 (i)
TIME TO PEAK (hrs)= 3.583
RUNOFF VOLUME (mm)= 12.054
TOTAL RAINFALL (mm)= 52.400
RUNOFF COEFFICIENT = 0.230

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| CALIB |
| STANDHYD ( 2201) |
| ID= 1 DT= 5.0 min |
-----
Area (ha)= 10.88
Total Imp(%)= 60.00 Dir. Conn.(%)= 45.00

IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= 6.53 4.35
Dep. Storage (mm)= 2.00 5.00
Average Slope (%)= 2.00 2.00
Length (m)= 269.32 20.00
Mannings n = 0.013 0.035

```

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

```

-----
| ADD HYD ( 0017) |
| 1 + 2 = 3 |
-----
ID1= 1 ( 2202): 3.16 0.075 3.58 12.05
+ ID2= 2 ( 0038): 10.88 0.201 3.83 30.37
=====
ID = 3 ( 0017): 14.04 0.271 3.75 26.25

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| CALIB |
| NASHYD ( 1302) |
| ID= 1 DT= 5.0 min |
-----
Area (ha)= 6.51 Curve Number (CN)= 79.0
Ia (mm)= 6.70 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.42

```

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

```

-----
| RESERVOIR( 0038) |
| IN= 2--> OUT= 1 |
| DT= 5.0 min |
-----
OVERFLOW IS OFF

OUTFLOW STORAGE | OUTFLOW STORAGE
(cms) (ha.m.) | (cms) (ha.m.)
0.0000 0.0000 | 0.8454 0.4251
0.0074 0.0469 | 0.9743 0.4997
0.0112 0.0990 | 1.0880 0.5770

```

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 61.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

0.0140 0.1563 | 1.1909 0.6570
0.1657 0.2182 | 5.4831 0.7609
0.4409 0.2840 | 13.2243 0.8692
0.6926 0.3532 | 0.0000 0.0000

```

AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)

INFLOW : ID= 2 (2201) 10.880 1.477 3.25 30.52
OUTFLOW: ID= 1 (0038) 10.880 0.201 3.83 30.37

PEAK FLOW REDUCTION [Qout/Qin](%)= 13.60
TIME SHIFT OF PEAK FLOW (min)= 35.00
MAXIMUM STORAGE USED (ha.m.)= 0.2270

```

-----
| ADD HYD ( 0017) |
| 1 + 2 = 3 |
-----
ID1= 1 ( 2202): 3.16 0.075 3.58 12.05
+ ID2= 2 ( 0038): 10.88 0.201 3.83 30.37
=====
ID = 3 ( 0017): 14.04 0.271 3.75 26.25

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| CALIB |
| NASHYD ( 1302) |
| ID= 1 DT= 5.0 min |
-----
Area (ha)= 6.51 Curve Number (CN)= 79.0
Ia (mm)= 6.70 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.42

```

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

```

-----
| RESERVOIR( 0038) |
| IN= 2--> OUT= 1 |
| DT= 5.0 min |
-----
OVERFLOW IS OFF

OUTFLOW STORAGE | OUTFLOW STORAGE
(cms) (ha.m.) | (cms) (ha.m.)
0.0000 0.0000 | 0.8454 0.4251
0.0074 0.0469 | 0.9743 0.4997
0.0112 0.0990 | 1.0880 0.5770

```

Unit Hyd Qpeak (cms)= 0.592

PEAK FLOW (cms)= 0.244 (i)
TIME TO PEAK (hrs)= 3.583
RUNOFF VOLUME (mm)= 18.444
TOTAL RAINFALL (mm)= 52.400
RUNOFF COEFFICIENT = 0.352

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| CALIB |
| NASHYD ( 1301) | Area (ha)= 5.08 Curve Number (CN)= 77.0
| ID= 1 DT= 5.0 min | Ia (mm)= 6.50 # of Linear Res.(N)= 3.00
|-----| U.H. Tp(hrs)= 0.49

```

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

```

----- TRANSFORMED HYETOGRAPH -----
TIME RAIN TIME RAIN TIME RAIN TIME RAIN
hrs mm/hr hrs mm/hr hrs mm/hr hrs mm/hr
0.083 0.00 1.667 3.14 3.250 81.74 4.83 3.14
0.167 0.00 1.750 3.14 3.333 11.53 4.92 3.14
0.250 0.00 1.833 5.24 3.417 11.53 5.00 3.14
0.333 2.10 1.917 5.24 3.500 11.53 5.08 3.14
0.417 2.10 2.000 5.24 3.583 11.53 5.17 3.14
0.500 2.10 2.083 5.24 3.667 11.53 5.25 3.14
0.583 2.10 2.167 5.24 3.750 11.53 5.33 2.10
0.667 2.10 2.250 5.24 3.833 5.24 5.42 2.10
0.750 2.10 2.333 6.29 3.917 5.24 5.50 2.10
0.833 3.14 2.417 6.29 4.000 5.24 5.58 2.10
0.917 3.14 2.500 6.29 4.083 5.24 5.67 2.10
1.000 3.14 2.583 6.29 4.167 5.24 5.75 2.10
1.083 3.14 2.667 6.29 4.250 5.24 5.83 2.10
1.167 3.14 2.750 6.29 4.333 4.19 5.92 2.10
1.250 3.14 2.833 31.44 4.417 4.19 6.00 2.10
1.333 3.14 2.917 31.44 4.500 4.19 6.08 2.10
1.417 3.14 3.000 31.44 4.583 4.19 6.17 2.10
1.500 3.14 3.083 81.74 4.667 4.19 6.25 2.10
1.583 3.14 3.167 81.74 4.750 4.19

```

Unit Hyd Qpeak (cms)= 0.396

```

PEAK FLOW (cms)= 0.159 (i)
TIME TO PEAK (hrs)= 3.667
RUNOFF VOLUME (mm)= 17.300
TOTAL RAINFALL (mm)= 52.400
RUNOFF COEFFICIENT = 0.330

```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| CALIB |
| STANDHYD ( 1201) | Area (ha)= 18.81
| ID= 1 DT= 5.0 min | Total Imp(%)= 75.00 Dir. Conn.(%)= 60.00
|-----|

```

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	14.11	4.70
Dep. Storage (mm)=	2.00	5.00
Average Slope (%)=	2.00	2.00
Length (m)=	354.12	20.00
Mannings n	0.013	0.035

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

```

----- TRANSFORMED HYETOGRAPH -----
TIME RAIN TIME RAIN TIME RAIN TIME RAIN
hrs mm/hr hrs mm/hr hrs mm/hr hrs mm/hr
0.083 0.00 1.667 3.14 3.250 81.74 4.83 3.14
0.167 0.00 1.750 3.14 3.333 11.53 4.92 3.14
0.250 0.00 1.833 5.24 3.417 11.53 5.00 3.14
0.333 2.10 1.917 5.24 3.500 11.53 5.08 3.14
0.417 2.10 2.000 5.24 3.583 11.53 5.17 3.14
0.500 2.10 2.083 5.24 3.667 11.53 5.25 3.14
0.583 2.10 2.167 5.24 3.750 11.53 5.33 2.10
0.667 2.10 2.250 5.24 3.833 5.24 5.42 2.10
0.750 2.10 2.333 6.29 3.917 5.24 5.50 2.10

```

```

0.833 3.14 2.417 6.29 4.000 5.24 5.58 2.10
0.917 3.14 2.500 6.29 4.083 5.24 5.67 2.10
1.000 3.14 2.583 6.29 4.167 5.24 5.75 2.10
1.083 3.14 2.667 6.29 4.250 5.24 5.83 2.10
1.167 3.14 2.750 6.29 4.333 4.19 5.92 2.10
1.250 3.14 2.833 31.44 4.417 4.19 6.00 2.10
1.333 3.14 2.917 31.44 4.500 4.19 6.08 2.10
1.417 3.14 3.000 31.44 4.583 4.19 6.17 2.10
1.500 3.14 3.083 81.74 4.667 4.19 6.25 2.10
1.583 3.14 3.167 81.74 4.750 4.19

```

```

Max.Eff.Inten.(mm/hr)= 81.74 50.61
over (min)= 5.00 10.00
Storage Coeff. (min)= 4.00 (ii) 5.90 (ii)
Unit Hyd. Tpeak (min)= 5.00 10.00
Unit Hyd. peak (cms)= 0.22 0.15

```

```

*TOTALS*
PEAK FLOW (cms)= 2.49 0.54 3.029 (iii)
TIME TO PEAK (hrs)= 3.25 3.25 3.25
RUNOFF VOLUME (mm)= 50.40 16.10 36.68
TOTAL RAINFALL (mm)= 52.40 52.40 52.40
RUNOFF COEFFICIENT = 0.96 0.31 0.70

```

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

```

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
    CN* = 61.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
    THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

```

-----
| ADD HYD ( 0048) |
| 1 + 2 = 3 |
|-----|
ID1= 1 ( 1201): 18.81 3.029 3.25 36.68
+ ID2= 2 ( 1301): 5.08 0.159 3.67 17.30
=====
ID = 3 ( 0048): 23.89 3.097 3.25 32.56

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| RESERVOIR( 0042) | OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 5.0 min |
|-----|

```

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	1.0462	0.5963
0.0121	0.0688	1.2756	0.6991
0.0189	0.1438	1.4692	0.8059
0.0239	0.2249	1.6400	0.9165
0.0280	0.3113	2.7752	0.9732
0.2556	0.4022	4.7819	1.0308
0.6685	0.4973	13.8126	1.2091

```

AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
INFLOW : ID= 2 ( 0048) 23.890 3.097 3.25 32.56
OUTFLOW: ID= 1 ( 0042) 23.890 0.581 3.75 32.50

```

```

PEAK FLOW REDUCTION [Qout/Qin](%)= 18.76
TIME SHIFT OF PEAK FLOW (min)= 30.00
MAXIMUM STORAGE USED (ha.m.)= 0.4781

```

```

-----
| CALIB |
| STANDHYD ( 1303) | Area (ha)= 0.66

```

|ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 70.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.46	0.20
Dep. Storage (mm)=	1.00	5.00
Average Slope (%)=	1.00	2.00
Length (m)=	66.33	40.00
Mannings n	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.667	3.14	3.250	81.74	4.83	3.14
0.167	0.00	1.750	3.14	3.333	11.53	4.92	3.14
0.250	0.00	1.833	5.24	3.417	11.53	5.00	3.14
0.333	2.10	1.917	5.24	3.500	11.53	5.08	3.14
0.417	2.10	2.000	5.24	3.583	11.53	5.17	3.14
0.500	2.10	2.083	5.24	3.667	11.53	5.25	3.14
0.583	2.10	2.167	5.24	3.750	11.53	5.33	2.10
0.667	2.10	2.250	5.24	3.833	5.24	5.42	2.10
0.750	2.10	2.333	6.29	3.917	5.24	5.50	2.10
0.833	3.14	2.417	6.29	4.000	5.24	5.58	2.10
0.917	3.14	2.500	6.29	4.083	5.24	5.67	2.10
1.000	3.14	2.583	6.29	4.167	5.24	5.75	2.10
1.083	3.14	2.667	6.29	4.250	5.24	5.83	2.10
1.167	3.14	2.750	6.29	4.333	4.19	5.92	2.10
1.250	3.14	2.833	31.44	4.417	4.19	6.00	2.10
1.333	3.14	2.917	31.44	4.500	4.19	6.08	2.10
1.417	3.14	3.000	31.44	4.583	4.19	6.17	2.10
1.500	3.14	3.083	81.74	4.667	4.19	6.25	2.10
1.583	3.14	3.167	81.74	4.750	4.19		

Max.Eff.Inten.(mm/hr)=	81.74	18.85
over (min)	5.00	20.00
Storage Coeff. (min)=	2.16 (ii)	15.92 (ii)
Unit Hyd. Tpeak (min)=	5.00	20.00
Unit Hyd. peak (cms)=	0.31	0.07

		TOTALS
PEAK FLOW (cms)=	0.10	0.01
TIME TO PEAK (hrs)=	3.25	3.42
RUNOFF VOLUME (mm)=	51.40	10.71
TOTAL RAINFALL (mm)=	52.40	52.40
RUNOFF COEFFICIENT	0.98	0.20

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 61.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (1302):	6.51	0.244	3.58	18.44
+ ID2= 2 (1303):	0.66	0.108	3.25	39.18
ID = 3 (0043):	7.17	0.263	3.58	20.35

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 3 (0043):	7.17	0.263	3.58	20.35
+ ID2= 2 (0042):	23.89	0.581	3.75	32.50
ID = 1 (0043):	31.06	0.829	3.67	29.70

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

V V I SSSSS U U A L (v 6.2.2007)
V V I SS U U A A L
V V I SS U U A A L
VV I SSSSS UUUUU A A LLLLL

```

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000 TTTT TTTT H H Y Y M M 000 TM
0 0 T T H H Y Y MM MM 0 0
0 0 T T H H Y M M 0 0
000 T T H H Y M M 000

```

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***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
Output filename: C:\Users\Valdor\AppData\Local\Civica\XH5\c7e9b9dc-2878-4b8a-9d26-5e475049aa89\3f6a7d6f-36fd-40bb-8afb-a6df443f47d3\scena
Summary filename: C:\Users\Valdor\AppData\Local\Civica\XH5\c7e9b9dc-2878-4b8a-9d26-5e475049aa89\3f6a7d6f-36fd-40bb-8afb-a6df443f47d3\scena

DATE: 12-06-2021

TIME: 04:33:18

USER:

COMMENTS:

```

*****
** SIMULATION : SCS_6H_010Y **
*****

```

READ STORM	Filename:
	C:\Users\Valdor\AppData\Local\Temp\
	f4c1afd7-7cd0-48cf-b336-8018d1565688\4d7be5e1
Ptotal= 61.50 mm	Comments: 10yr/6hr Peterborough A SCS

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	0.00	1.75	6.15	3.50	13.53	5.25	2.46
0.25	2.46	2.00	6.15	3.75	6.15	5.50	2.46
0.50	2.46	2.25	7.38	4.00	6.15	5.75	2.46
0.75	3.69	2.50	7.38	4.25	4.92	6.00	2.46
1.00	3.69	2.75	36.90	4.50	4.92		
1.25	3.69	3.00	95.94	4.75	3.69		
1.50	3.69	3.25	13.53	5.00	3.69		

CALIB																				
NASHYD (2202)																				
ID= 1 DT= 5.0 min																				

		Area	(ha)=	3.16	Curve Number	(CN)=	66.0													
		Ia	(mm)=	6.20	# of Linear Res.(N)=	3.00														
		U.H. Tp(hrs)=	0.42																	
NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.																				

----- TRANSFORMED HYETOGRAPH -----																				
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN													
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr													
0.083	0.00	1.667	3.69	3.250	95.94	4.83	3.69													
0.167	0.00	1.750	3.69	3.333	13.53	4.92	3.69													
0.250	0.00	1.833	6.15	3.417	13.53	5.00	3.69													
0.333	2.46	1.917	6.15	3.500	13.53	5.08	3.69													
0.417	2.46	2.000	6.15	3.583	13.53	5.17	3.69													
0.500	2.46	2.083	6.15	3.667	13.53	5.25	3.69													
0.583	2.46	2.167	6.15	3.750	13.53	5.33	2.46													
0.667	2.46	2.250	6.15	3.833	6.15	5.42	2.46													
0.750	2.46	2.333	7.38	3.917	6.15	5.50	2.46													
0.833	3.69	2.417	7.38	4.000	6.15	5.58	2.46													
0.917	3.69	2.500	7.38	4.083	6.15	5.67	2.46													
1.000	3.69	2.583	7.38	4.167	6.15	5.75	2.46													
1.083	3.69	2.667	7.38	4.250	6.15	5.83	2.46													
1.167	3.69	2.750	7.38	4.333	4.92	5.92	2.46													
1.250	3.69	2.833	36.90	4.417	4.92	6.00	2.46													
1.333	3.69	2.917	36.90	4.500	4.92	6.08	2.46													
1.417	3.69	3.000	36.90	4.583	4.92	6.17	2.46													
1.500	3.69	3.083	95.94	4.667	4.92	6.25	2.46													
1.583	3.69	3.167	95.94	4.750	4.92															

Unit Hyd Qpeak (cms)= 0.287

PEAK FLOW (cms)= 0.103 (i)
 TIME TO PEAK (hrs)= 3.583
 RUNOFF VOLUME (mm)= 16.426
 TOTAL RAINFALL (mm)= 61.500
 RUNOFF COEFFICIENT = 0.267

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB				
STANDHYD (2201)				
ID= 1 DT= 5.0 min				

		Area	(ha)=	10.88
		Total Imp(%)=	60.00	Dir. Conn.(%)= 45.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	6.53	4.35	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	2.00	2.00	
Length	(m)=	269.32	20.00	
Mannings n	=	0.013	0.035	

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

----- TRANSFORMED HYETOGRAPH -----									
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN		
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr		
0.083	0.00	1.667	3.69	3.250	95.94	4.83	3.69		
0.167	0.00	1.750	3.69	3.333	13.53	4.92	3.69		
0.250	0.00	1.833	6.15	3.417	13.53	5.00	3.69		
0.333	2.46	1.917	6.15	3.500	13.53	5.08	3.69		
0.417	2.46	2.000	6.15	3.583	13.53	5.17	3.69		
0.500	2.46	2.083	6.15	3.667	13.53	5.25	3.69		
0.583	2.46	2.167	6.15	3.750	13.53	5.33	2.46		

0.667	2.46	2.250	6.15	3.833	6.15	5.42	2.46
0.750	2.46	2.333	7.38	3.917	6.15	5.50	2.46
0.833	3.69	2.417	7.38	4.000	6.15	5.58	2.46
0.917	3.69	2.500	7.38	4.083	6.15	5.67	2.46
1.000	3.69	2.583	7.38	4.167	6.15	5.75	2.46
1.083	3.69	2.667	7.38	4.250	6.15	5.83	2.46
1.167	3.69	2.750	7.38	4.333	4.92	5.92	2.46
1.250	3.69	2.833	36.90	4.417	4.92	6.00	2.46
1.333	3.69	2.917	36.90	4.500	4.92	6.08	2.46
1.417	3.69	3.000	36.90	4.583	4.92	6.17	2.46
1.500	3.69	3.083	95.94	4.667	4.92	6.25	2.46
1.583	3.69	3.167	95.94	4.750	4.92		

Max.Eff.Inten.(mm/hr)= 95.94 51.38
 over (min)= 5.00 10.00
 Storage Coeff. (min)= 3.82 (ii) 5.21 (ii)
 Unit Hyd. Tpeak (min)= 5.00 10.00
 Unit Hyd. peak (cms)= 0.25 0.16

TOTALS

PEAK FLOW (cms)= 1.29 0.52 1.810 (iii)
 TIME TO PEAK (hrs)= 3.25 3.25 3.25
 RUNOFF VOLUME (mm)= 59.50 19.03 37.24
 TOTAL RAINFALL (mm)= 61.50 61.50 61.50
 RUNOFF COEFFICIENT = 0.97 0.31 0.61

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
 CN* = 61.0 Ia = Dep. Storage (Above)
 (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
 THAN THE STORAGE COEFFICIENT.
 (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0038)		OVERFLOW IS OFF			
IN= 2----> OUT= 1					
DT= 5.0 min					

		OUTFLOW	STORAGE	OUTFLOW	STORAGE
		(cms)	(ha.m.)	(cms)	(ha.m.)
		0.0000	0.0000	0.8454	0.4251
		0.0074	0.0469	0.9743	0.4997
		0.0112	0.0990	1.0880	0.5770
		0.0140	0.1563	1.1909	0.6570
		0.1657	0.2182	5.4831	0.7609
		0.4409	0.2840	13.2243	0.8692
		0.6926	0.3532	0.0000	0.0000

		AREA	QPEAK	TPEAK	R.V.
		(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (2201)		10.880	1.810	3.25	37.24
OUTFLOW: ID= 1 (0038)		10.880	0.331	3.58	37.09

PEAK FLOW REDUCTION [Qout/Qin](%)= 18.30
 TIME SHIFT OF PEAK FLOW (min)= 20.00
 MAXIMUM STORAGE USED (ha.m.)= 0.2580

ADD HYD (0017)					
1 + 2 = 3					

		AREA	QPEAK	TPEAK	R.V.
		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (2202):	3.16	0.103	3.58	16.43
	+ ID2= 2 (0038):	10.88	0.331	3.58	37.09
=====					
	ID = 3 (0017):	14.04	0.435	3.58	32.44

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

| CALIB
| NASHYD ( 1302) | Area (ha)= 6.51 Curve Number (CN)= 79.0
| ID= 1 DT= 5.0 min | Ia (mm)= 6.70 # of Linear Res.(N)= 3.00
|-----| U.H. Tp(hrs)= 0.42

```

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

```

----- TRANSFORMED HYETOGRAPH -----
TIME RAIN TIME RAIN TIME RAIN TIME RAIN
hrs mm/hr hrs mm/hr hrs mm/hr hrs mm/hr
0.083 0.00 1.667 3.69 3.250 95.94 4.83 3.69
0.167 0.00 1.750 3.69 3.333 13.53 4.92 3.69
0.250 0.00 1.833 6.15 3.417 13.53 5.00 3.69
0.333 2.46 1.917 6.15 3.500 13.53 5.08 3.69
0.417 2.46 2.000 6.15 3.583 13.53 5.17 3.69
0.500 2.46 2.083 6.15 3.667 13.53 5.25 3.69
0.583 2.46 2.167 6.15 3.750 13.53 5.33 2.46
0.667 2.46 2.250 6.15 3.833 6.15 5.42 2.46
0.750 2.46 2.333 7.38 3.917 6.15 5.50 2.46
0.833 3.69 2.417 7.38 4.000 6.15 5.58 2.46
0.917 3.69 2.500 7.38 4.083 6.15 5.67 2.46
1.000 3.69 2.583 7.38 4.167 6.15 5.75 2.46
1.083 3.69 2.667 7.38 4.250 6.15 5.83 2.46
1.167 3.69 2.750 7.38 4.333 4.92 5.92 2.46
1.250 3.69 2.833 36.90 4.417 4.92 6.00 2.46
1.333 3.69 2.917 36.90 4.500 4.92 6.08 2.46
1.417 3.69 3.000 36.90 4.583 4.92 6.17 2.46
1.500 3.69 3.083 95.94 4.667 4.92 6.25 2.46
1.583 3.69 3.167 95.94 4.750 4.92

```

Unit Hyd Qpeak (cms)= 0.592

```

PEAK FLOW (cms)= 0.329 (i)
TIME TO PEAK (hrs)= 3.583
RUNOFF VOLUME (mm)= 24.548
TOTAL RAINFALL (mm)= 61.500
RUNOFF COEFFICIENT = 0.399

```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

| CALIB
| NASHYD ( 1301) | Area (ha)= 5.08 Curve Number (CN)= 77.0
| ID= 1 DT= 5.0 min | Ia (mm)= 6.50 # of Linear Res.(N)= 3.00
|-----| U.H. Tp(hrs)= 0.49

```

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

```

----- TRANSFORMED HYETOGRAPH -----
TIME RAIN TIME RAIN TIME RAIN TIME RAIN
hrs mm/hr hrs mm/hr hrs mm/hr hrs mm/hr
0.083 0.00 1.667 3.69 3.250 95.94 4.83 3.69
0.167 0.00 1.750 3.69 3.333 13.53 4.92 3.69
0.250 0.00 1.833 6.15 3.417 13.53 5.00 3.69
0.333 2.46 1.917 6.15 3.500 13.53 5.08 3.69
0.417 2.46 2.000 6.15 3.583 13.53 5.17 3.69
0.500 2.46 2.083 6.15 3.667 13.53 5.25 3.69
0.583 2.46 2.167 6.15 3.750 13.53 5.33 2.46
0.667 2.46 2.250 6.15 3.833 6.15 5.42 2.46
0.750 2.46 2.333 7.38 3.917 6.15 5.50 2.46
0.833 3.69 2.417 7.38 4.000 6.15 5.58 2.46
0.917 3.69 2.500 7.38 4.083 6.15 5.67 2.46
1.000 3.69 2.583 7.38 4.167 6.15 5.75 2.46
1.083 3.69 2.667 7.38 4.250 6.15 5.83 2.46
1.167 3.69 2.750 7.38 4.333 4.92 5.92 2.46
1.250 3.69 2.833 36.90 4.417 4.92 6.00 2.46
1.333 3.69 2.917 36.90 4.500 4.92 6.08 2.46
1.417 3.69 3.000 36.90 4.583 4.92 6.17 2.46
1.500 3.69 3.083 95.94 4.667 4.92 6.25 2.46
1.583 3.69 3.167 95.94 4.750 4.92

```

```

1.417 3.69 | 3.000 36.90 | 4.583 4.92 | 6.17 2.46
1.500 3.69 | 3.083 95.94 | 4.667 4.92 | 6.25 2.46
1.583 3.69 | 3.167 95.94 | 4.750 4.92

```

Unit Hyd Qpeak (cms)= 0.396

```

PEAK FLOW (cms)= 0.215 (i)
TIME TO PEAK (hrs)= 3.667
RUNOFF VOLUME (mm)= 23.113
TOTAL RAINFALL (mm)= 61.500
RUNOFF COEFFICIENT = 0.376

```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

| CALIB
| STANDHYD ( 1201) | Area (ha)= 18.81
| ID= 1 DT= 5.0 min | Total Imp(%)= 75.00 Dir. Conn.(%)= 60.00

```

```

IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= 14.11 4.70
Dep. Storage (mm)= 2.00 5.00
Average Slope (%)= 2.00 2.00
Length (m)= 354.12 20.00
Mannings n = 0.013 0.035

```

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

```

----- TRANSFORMED HYETOGRAPH -----
TIME RAIN TIME RAIN TIME RAIN TIME RAIN
hrs mm/hr hrs mm/hr hrs mm/hr hrs mm/hr
0.083 0.00 1.667 3.69 3.250 95.94 4.83 3.69
0.167 0.00 1.750 3.69 3.333 13.53 4.92 3.69
0.250 0.00 1.833 6.15 3.417 13.53 5.00 3.69
0.333 2.46 1.917 6.15 3.500 13.53 5.08 3.69
0.417 2.46 2.000 6.15 3.583 13.53 5.17 3.69
0.500 2.46 2.083 6.15 3.667 13.53 5.25 3.69
0.583 2.46 2.167 6.15 3.750 13.53 5.33 2.46
0.667 2.46 2.250 6.15 3.833 6.15 5.42 2.46
0.750 2.46 2.333 7.38 3.917 6.15 5.50 2.46
0.833 3.69 2.417 7.38 4.000 6.15 5.58 2.46
0.917 3.69 2.500 7.38 4.083 6.15 5.67 2.46
1.000 3.69 2.583 7.38 4.167 6.15 5.75 2.46
1.083 3.69 2.667 7.38 4.250 6.15 5.83 2.46
1.167 3.69 2.750 7.38 4.333 4.92 5.92 2.46
1.250 3.69 2.833 36.90 4.417 4.92 6.00 2.46
1.333 3.69 2.917 36.90 4.500 4.92 6.08 2.46
1.417 3.69 3.000 36.90 4.583 4.92 6.17 2.46
1.500 3.69 3.083 95.94 4.667 4.92 6.25 2.46
1.583 3.69 3.167 95.94 4.750 4.92

```

```

Max.Eff.Inten.(mm/hr)= 95.94 66.78
over (min) 5.00 10.00
Storage Coeff. (min)= 4.51 (ii) 5.53 (ii)
Unit Hyd. Tpeak (min)= 5.00 10.00
Unit Hyd. peak (cms)= 0.23 0.16

```

```

*TOTALS*
PEAK FLOW (cms)= 2.94 0.73 3.667 (iii)
TIME TO PEAK (hrs)= 3.25 3.25 3.25
RUNOFF VOLUME (mm)= 59.50 21.31 44.23
TOTAL RAINFALL (mm)= 61.50 61.50 61.50
RUNOFF COEFFICIENT = 0.97 0.35 0.72

```

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

```

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 61.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

```

THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
-----
| ADD HYD ( 0048) |
| 1 + 2 = 3 |
-----
| ID1= 1 ( 1201): 18.81 3.667 3.25 44.23 |
| + ID2= 2 ( 1301): 5.08 0.215 3.67 23.11 |
|=====|
| ID = 3 ( 0048): 23.89 3.764 3.25 39.74 |
|=====|
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| RESERVOIR( 0042) | OVERFLOW IS OFF
| IN= 2--> OUT= 1 |
| DT= 5.0 min |
|=====|
| OUTFLOW (cms) | STORAGE (ha.m.) | OUTFLOW (cms) | STORAGE (ha.m.) |
| 0.0000 | 0.0000 | 1.0462 | 0.5963 |
| 0.0121 | 0.0688 | 1.2756 | 0.6991 |
| 0.0189 | 0.1438 | 1.4692 | 0.8059 |
| 0.0239 | 0.2249 | 1.6400 | 0.9165 |
| 0.0280 | 0.3113 | 2.7752 | 0.9732 |
| 0.2556 | 0.4022 | 4.7819 | 1.0308 |
| 0.6685 | 0.4973 | 13.8126 | 1.2091 |
|=====|
| AREA (ha) | QPEAK (cms) | TPEAK (hrs) | R.V. (mm) | |
| INFLOW : ID= 2 ( 0048) | 23.890 | 3.764 | 3.25 | 39.74 |
| OUTFLOW: ID= 1 ( 0042) | 23.890 | 0.841 | 3.58 | 39.68 |
|=====|
```

PEAK FLOW REDUCTION [Qout/Qin](%)= 22.33
TIME SHIFT OF PEAK FLOW (min)= 20.00
MAXIMUM STORAGE USED (ha.m.)= 0.5425

```
-----
| CALIB |
| STANDHYD ( 1303) |
| ID= 1 DT= 5.0 min |
|=====|
| Area (ha)= 0.66 |
| Total Imp(%)= 70.00 | Dir. Conn.(%)= 70.00 |
|=====|
| IMPERVIOUS | PERVIOUS (i) |
| Surface Area (ha)= 0.46 | 0.20 |
| Dep. Storage (mm)= 1.00 | 5.00 |
| Average Slope (%)= 1.00 | 2.00 |
| Length (m)= 66.33 | 40.00 |
| Mannings n = 0.013 | 0.250 |
|=====|
```

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

```
-----
|----- TRANSFORMED HYETOGRAPH -----|
| TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN |
| hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr |
| 0.083 0.00 | 1.667 3.69 | 3.250 95.94 | 4.83 3.69 |
| 0.167 0.00 | 1.750 3.69 | 3.333 13.53 | 4.92 3.69 |
| 0.250 0.00 | 1.833 6.15 | 3.417 13.53 | 5.00 3.69 |
| 0.333 2.46 | 1.917 6.15 | 3.500 13.53 | 5.08 3.69 |
| 0.417 2.46 | 2.000 6.15 | 3.583 13.53 | 5.17 3.69 |
| 0.500 2.46 | 2.083 6.15 | 3.667 13.53 | 5.25 3.69 |
| 0.583 2.46 | 2.167 6.15 | 3.750 13.53 | 5.33 2.46 |
| 0.667 2.46 | 2.250 6.15 | 3.833 6.15 | 5.42 2.46 |
| 0.750 2.46 | 2.333 7.38 | 3.917 6.15 | 5.50 2.46 |
| 0.833 3.69 | 2.417 7.38 | 4.000 6.15 | 5.58 2.46 |
| 0.917 3.69 | 2.500 7.38 | 4.083 6.15 | 5.67 2.46 |
| 1.000 3.69 | 2.583 7.38 | 4.167 6.15 | 5.75 2.46 |
| 1.083 3.69 | 2.667 7.38 | 4.250 6.15 | 5.83 2.46 |
|=====|
```

```
1.167 3.69 | 2.750 7.38 | 4.333 4.92 | 5.92 2.46
1.250 3.69 | 2.833 36.90 | 4.417 4.92 | 6.00 2.46
1.333 3.69 | 2.917 36.90 | 4.500 4.92 | 6.08 2.46
1.417 3.69 | 3.000 36.90 | 4.583 4.92 | 6.17 2.46
1.500 3.69 | 3.083 95.94 | 4.667 4.92 | 6.25 2.46
1.583 3.69 | 3.167 95.94 | 4.750 4.92 |
```

```
Max.Eff.Inten.(mm/hr)= 95.94 25.79
over (min) 5.00 15.00
Storage Coeff. (min)= 2.03 (ii) 14.17 (ii)
Unit Hyd. Tpeak (min)= 5.00 15.00
Unit Hyd. peak (cms)= 0.31 0.08
*TOTALS*
PEAK FLOW (cms)= 0.12 0.01 0.130 (iii)
TIME TO PEAK (hrs)= 3.25 3.42 3.25
RUNOFF VOLUME (mm)= 60.50 14.58 46.71
TOTAL RAINFALL (mm)= 61.50 61.50 61.50
RUNOFF COEFFICIENT = 0.98 0.24 0.76
```

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 61.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
-----
| ADD HYD ( 0043) |
| 1 + 2 = 3 |
-----
| ID1= 1 ( 1302): 6.51 0.329 3.58 24.55 |
| + ID2= 2 ( 1303): 0.66 0.130 3.25 46.71 |
|=====|
| ID = 3 ( 0043): 7.17 0.352 3.58 26.59 |
|=====|
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| ADD HYD ( 0043) |
| 3 + 2 = 1 |
-----
| AREA (ha) | QPEAK (cms) | TPEAK (hrs) | R.V. (mm) |
| ID1= 3 ( 0043): 7.17 0.352 3.58 26.59 |
| + ID2= 2 ( 0042): 23.89 0.841 3.58 39.68 |
|=====|
| ID = 1 ( 0043): 31.06 1.192 3.58 36.65 |
|=====|
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
=====
V V I SSSS U U A L (v 6.2.2007)
V V I SS U U A A L
V V I SS U U A A A A L
V V I SS U U A A L
VV I SSSS UUUU A A LLLLL

000 TTTT TTTT H H Y Y M M 000 TM
0 0 T T H H Y Y MM MM 0 0
0 0 T T H H Y M M 0 0
000 T T H H Y M M 000

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```


***** DETAILED OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
 Output filename: C:\Users\Valdor\AppData\Local\Civica\XH5\c7e9b9dc-2878-4b8a-9d26-5e475049aa89\86f51cd2-5122-4fa5-9a94-173d448cc0ad\scena
 Summary filename: C:\Users\Valdor\AppData\Local\Civica\XH5\c7e9b9dc-2878-4b8a-9d26-5e475049aa89\86f51cd2-5122-4fa5-9a94-173d448cc0ad\scena

DATE: 12-06-2021

TIME: 04:33:18

USER:

COMMENTS:

 ** SIMULATION : SCS_6H_025Y **

READ STORM	Filename: C:\Users\Valdor\AppData\Local\Temp\
Ptotal= 72.90 mm	f4c1afd7-7cd0-48cf-b336-8018d1565688\fd52cd9
	Comments: 25yr/6hr Peterborough A SCS

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	0.00	1.75	7.29	3.50	16.04	5.25	2.92
0.25	2.92	2.00	7.29	3.75	7.29	5.50	2.92
0.50	2.92	2.25	8.75	4.00	7.29	5.75	2.92
0.75	4.37	2.50	8.75	4.25	5.83	6.00	2.92
1.00	4.37	2.75	43.74	4.50	5.83		
1.25	4.37	3.00	113.72	4.75	4.37		
1.50	4.37	3.25	16.04	5.00	4.37		

CALIB	Area (ha)=	Curve Number (CN)=
NASHYD (2202)	3.16	66.0
ID= 1 DT= 5.0 min	Ia (mm)= 6.20	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= 0.42	

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.667	4.37	3.250	113.72	4.83	4.37
0.167	0.00	1.750	4.37	3.333	16.04	4.92	4.37
0.250	0.00	1.833	7.29	3.417	16.04	5.00	4.37
0.333	2.92	1.917	7.29	3.500	16.04	5.08	4.37
0.417	2.92	2.000	7.29	3.583	16.04	5.17	4.37
0.500	2.92	2.083	7.29	3.667	16.04	5.25	4.37
0.583	2.92	2.167	7.29	3.750	16.04	5.33	2.92
0.667	2.92	2.250	7.29	3.833	7.29	5.42	2.92
0.750	2.92	2.333	8.75	3.917	7.29	5.50	2.92
0.833	4.37	2.417	8.75	4.000	7.29	5.58	2.92
0.917	4.37	2.500	8.75	4.083	7.29	5.67	2.92
1.000	4.37	2.583	8.75	4.167	7.29	5.75	2.92
1.083	4.37	2.667	8.75	4.250	7.29	5.83	2.92
1.167	4.37	2.750	8.75	4.333	5.83	5.92	2.92

1.250	4.37	2.833	43.74	4.417	5.83	6.00	2.92
1.333	4.37	2.917	43.74	4.500	5.83	6.08	2.92
1.417	4.37	3.000	43.74	4.583	5.83	6.17	2.92
1.500	4.37	3.083	113.72	4.667	5.83	6.25	2.92
1.583	4.37	3.167	113.72	4.750	5.83		

Unit Hyd Qpeak (cms)= 0.287

PEAK FLOW (cms)= 0.143 (i)

TIME TO PEAK (hrs)= 3.583

RUNOFF VOLUME (mm)= 22.518

TOTAL RAINFALL (mm)= 72.900

RUNOFF COEFFICIENT = 0.309

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	Area (ha)=	Total Imp(%)=	Dir. Conn.(%)=
STANDHYD (2201)	10.88	60.00	45.00
ID= 1 DT= 5.0 min			

Surface Area	IMPERVIOUS	PERVIOUS (i)
(ha)=		
Dep. Storage	6.53	4.35
Average Slope	2.00	5.00
Length	2.00	2.00
Mannings n	269.32	20.00
	= 0.013	0.035

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.667	4.37	3.250	113.72	4.83	4.37
0.167	0.00	1.750	4.37	3.333	16.04	4.92	4.37
0.250	0.00	1.833	7.29	3.417	16.04	5.00	4.37
0.333	2.92	1.917	7.29	3.500	16.04	5.08	4.37
0.417	2.92	2.000	7.29	3.583	16.04	5.17	4.37
0.500	2.92	2.083	7.29	3.667	16.04	5.25	4.37
0.583	2.92	2.167	7.29	3.750	16.04	5.33	2.92
0.667	2.92	2.250	7.29	3.833	7.29	5.42	2.92
0.750	2.92	2.333	8.75	3.917	7.29	5.50	2.92
0.833	4.37	2.417	8.75	4.000	7.29	5.58	2.92
0.917	4.37	2.500	8.75	4.083	7.29	5.67	2.92
1.000	4.37	2.583	8.75	4.167	7.29	5.75	2.92
1.083	4.37	2.667	8.75	4.250	7.29	5.83	2.92
1.167	4.37	2.750	8.75	4.333	5.83	5.92	2.92
1.250	4.37	2.833	43.74	4.417	5.83	6.00	2.92
1.333	4.37	2.917	43.74	4.500	5.83	6.08	2.92
1.417	4.37	3.000	43.74	4.583	5.83	6.17	2.92
1.500	4.37	3.083	113.72	4.667	5.83	6.25	2.92
1.583	4.37	3.167	113.72	4.750	5.83		

Max.Eff.Inten.(mm/hr)=	113.72	68.91
over (min)	5.00	5.00
Storage Coeff. (min)=	3.57 (ii)	4.87 (ii)
Unit Hyd. Tpeak (min)=	5.00	5.00
Unit Hyd. peak (cms)=	0.26	0.22

PEAK FLOW	(cms)=	1.53	0.81	*TOTALS*
TIME TO PEAK	(hrs)=	3.25	3.25	2.343 (iii)
RUNOFF VOLUME	(mm)=	70.90	25.60	45.99
TOTAL RAINFALL	(mm)=	72.90	72.90	72.90
RUNOFF COEFFICIENT	=	0.97	0.35	0.63

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN* = 61.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0038)
IN= 2--> OUT= 1
DT= 5.0 min

OVERFLOW IS OFF

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.8454	0.4251
0.0074	0.0469	0.9743	0.4997
0.0112	0.0990	1.0880	0.5770
0.0140	0.1563	1.1909	0.6570
0.1657	0.2182	5.4831	0.7609
0.4409	0.2840	13.2243	0.8692
0.6926	0.3532	0.0000	0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (2201)	10.880	2.343	3.25	45.99
OUTFLOW: ID= 1 (0038)	10.880	0.516	3.42	45.84

PEAK FLOW REDUCTION [Qout/Qin](%)= 22.03
TIME SHIFT OF PEAK FLOW
(min)= 10.00
MAXIMUM STORAGE USED (ha.m.)= 0.3048

ADD HYD (0017)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (2202):	3.16	0.143	3.58	22.52
+ ID2= 2 (0038):	10.88	0.516	3.42	45.84
ID = 3 (0017):	14.04	0.651	3.50	40.59

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB
NASHYD (1302)
ID= 1 DT= 5.0 min

Area (ha)= 6.51 Curve Number (CN)= 79.0
Ia (mm)= 6.70 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.42

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	1.667	4.37	3.250	113.72	4.83	4.37
0.167	0.00	1.750	4.37	3.333	16.04	4.92	4.37
0.250	0.00	1.833	7.29	3.417	16.04	5.00	4.37
0.333	2.92	1.917	7.29	3.500	16.04	5.08	4.37
0.417	2.92	2.000	7.29	3.583	16.04	5.17	4.37
0.500	2.92	2.083	7.29	3.667	16.04	5.25	4.37
0.583	2.92	2.167	7.29	3.750	16.04	5.33	2.92
0.667	2.92	2.250	7.29	3.833	7.29	5.42	2.92
0.750	2.92	2.333	8.75	3.917	7.29	5.50	2.92
0.833	4.37	2.417	8.75	4.000	7.29	5.58	2.92
0.917	4.37	2.500	8.75	4.083	7.29	5.67	2.92
1.000	4.37	2.583	8.75	4.167	7.29	5.75	2.92
1.083	4.37	2.667	8.75	4.250	7.29	5.83	2.92
1.167	4.37	2.750	8.75	4.333	5.83	5.92	2.92
1.250	4.37	2.833	43.74	4.417	5.83	6.00	2.92
1.333	4.37	2.917	43.74	4.500	5.83	6.08	2.92
1.417	4.37	3.000	43.74	4.583	5.83	6.17	2.92
1.500	4.37	3.083	113.72	4.667	5.83	6.25	2.92
1.583	4.37	3.167	113.72	4.750	5.83		

1.500	4.37	3.083	113.72	4.667	5.83	6.25	2.92
1.583	4.37	3.167	113.72	4.750	5.83		

Unit Hyd Qpeak (cms)= 0.592

PEAK FLOW (cms)= 0.443 (i)
TIME TO PEAK (hrs)= 3.583
RUNOFF VOLUME (mm)= 32.770
TOTAL RAINFALL (mm)= 72.900
RUNOFF COEFFICIENT = 0.450

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
NASHYD (1301)
ID= 1 DT= 5.0 min

Area (ha)= 5.08 Curve Number (CN)= 77.0
Ia (mm)= 6.50 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.49

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	1.667	4.37	3.250	113.72	4.83	4.37
0.167	0.00	1.750	4.37	3.333	16.04	4.92	4.37
0.250	0.00	1.833	7.29	3.417	16.04	5.00	4.37
0.333	2.92	1.917	7.29	3.500	16.04	5.08	4.37
0.417	2.92	2.000	7.29	3.583	16.04	5.17	4.37
0.500	2.92	2.083	7.29	3.667	16.04	5.25	4.37
0.583	2.92	2.167	7.29	3.750	16.04	5.33	2.92
0.667	2.92	2.250	7.29	3.833	7.29	5.42	2.92
0.750	2.92	2.333	8.75	3.917	7.29	5.50	2.92
0.833	4.37	2.417	8.75	4.000	7.29	5.58	2.92
0.917	4.37	2.500	8.75	4.083	7.29	5.67	2.92
1.000	4.37	2.583	8.75	4.167	7.29	5.75	2.92
1.083	4.37	2.667	8.75	4.250	7.29	5.83	2.92
1.167	4.37	2.750	8.75	4.333	5.83	5.92	2.92
1.250	4.37	2.833	43.74	4.417	5.83	6.00	2.92
1.333	4.37	2.917	43.74	4.500	5.83	6.08	2.92
1.417	4.37	3.000	43.74	4.583	5.83	6.17	2.92
1.500	4.37	3.083	113.72	4.667	5.83	6.25	2.92
1.583	4.37	3.167	113.72	4.750	5.83		

Unit Hyd Qpeak (cms)= 0.396

PEAK FLOW (cms)= 0.291 (i)
TIME TO PEAK (hrs)= 3.667
RUNOFF VOLUME (mm)= 30.988
TOTAL RAINFALL (mm)= 72.900
RUNOFF COEFFICIENT = 0.425

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (1201)
ID= 1 DT= 5.0 min

Area (ha)= 18.81
Total Imp(%)= 75.00 Dir. Conn.(%)= 60.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	14.11	4.70
Dep. Storage (mm)=	2.00	5.00
Average Slope (%)=	2.00	2.00
Length (m)=	354.12	20.00
Mannings n =	0.013	0.035

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----							
TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	1.667	4.37	3.250	113.72	4.83	4.37
0.167	0.00	1.750	4.37	3.333	16.04	4.92	4.37
0.250	0.00	1.833	7.29	3.417	16.04	5.00	4.37
0.333	2.92	1.917	7.29	3.500	16.04	5.08	4.37
0.417	2.92	2.000	7.29	3.583	16.04	5.17	4.37
0.500	2.92	2.083	7.29	3.667	16.04	5.25	4.37
0.583	2.92	2.167	7.29	3.750	16.04	5.33	2.92
0.667	2.92	2.250	7.29	3.833	7.29	5.42	2.92
0.750	2.92	2.333	8.75	3.917	7.29	5.50	2.92
0.833	4.37	2.417	8.75	4.000	7.29	5.58	2.92
0.917	4.37	2.500	8.75	4.083	7.29	5.67	2.92
1.000	4.37	2.583	8.75	4.167	7.29	5.75	2.92
1.083	4.37	2.667	8.75	4.250	7.29	5.83	2.92
1.167	4.37	2.750	8.75	4.333	5.83	5.92	2.92
1.250	4.37	2.833	43.74	4.417	5.83	6.00	2.92
1.333	4.37	2.917	43.74	4.500	5.83	6.08	2.92
1.417	4.37	3.000	43.74	4.583	5.83	6.17	2.92
1.500	4.37	3.083	113.72	4.667	5.83	6.25	2.92
1.583	4.37	3.167	113.72	4.750	5.83		

Max.Eff.Inten.(mm/hr)= 113.72 88.72
over (min) 5.00 10.00
Storage Coeff. (min)= 4.21 (ii) 5.17 (ii)
Unit Hyd. Tpeak (min)= 5.00 10.00
Unit Hyd. peak (cms)= 0.24 0.16

TOTALS
PEAK FLOW (cms)= 3.50 0.99 4.490 (iii)
TIME TO PEAK (hrs)= 3.25 3.25 3.25
RUNOFF VOLUME (mm)= 70.90 28.43 53.91
TOTAL RAINFALL (mm)= 72.90 72.90 72.90
RUNOFF COEFFICIENT = 0.97 0.39 0.74

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 61.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0048)				
1	2	3	AREA (ha)	QPEAK (cms)
ID1= 1 (1201):	18.81	4.490	3.25	53.91
+ ID2= 2 (1301):	5.08	0.291	3.67	30.99
ID = 3 (0048):	23.89	4.628	3.25	49.04

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR(0042)			
IN= 2--> OUT= 1			
DT= 5.0 min			
OVERFLOW IS OFF			
OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	1.0462	0.5963
0.0121	0.0688	1.2756	0.6991
0.0189	0.1438	1.4692	0.8059
0.0239	0.2249	1.6400	0.9165
0.0280	0.3113	2.7752	0.9732
0.2556	0.4022	4.7819	1.0308
0.6685	0.4973	13.8126	1.2091

AREA (ha) QPEAK (cms) TPEAK (hrs) R.V. (mm)
INFLOW : ID= 2 (0048) 23.890 4.628 3.25 49.04
OUTFLOW: ID= 1 (0042) 23.890 1.141 3.50 48.98

PEAK FLOW REDUCTION [Qout/Qin](%)= 24.65
TIME SHIFT OF PEAK FLOW (min)= 15.00
MAXIMUM STORAGE USED (ha.m.)= 0.6388

CALIB
STANDHYD (1303)
ID= 1 DT= 5.0 min
Area (ha)= 0.66
Total Imp(%)= 70.00 Dir. Conn.(%)= 70.00

IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= 0.46 0.20
Dep. Storage (mm)= 1.00 5.00
Average Slope (%)= 1.00 2.00
Length (m)= 66.33 40.00
Mannings n = 0.013 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----							
TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	1.667	4.37	3.250	113.72	4.83	4.37
0.167	0.00	1.750	4.37	3.333	16.04	4.92	4.37
0.250	0.00	1.833	7.29	3.417	16.04	5.00	4.37
0.333	2.92	1.917	7.29	3.500	16.04	5.08	4.37
0.417	2.92	2.000	7.29	3.583	16.04	5.17	4.37
0.500	2.92	2.083	7.29	3.667	16.04	5.25	4.37
0.583	2.92	2.167	7.29	3.750	16.04	5.33	2.92
0.667	2.92	2.250	7.29	3.833	7.29	5.42	2.92
0.750	2.92	2.333	8.75	3.917	7.29	5.50	2.92
0.833	4.37	2.417	8.75	4.000	7.29	5.58	2.92
0.917	4.37	2.500	8.75	4.083	7.29	5.67	2.92
1.000	4.37	2.583	8.75	4.167	7.29	5.75	2.92
1.083	4.37	2.667	8.75	4.250	7.29	5.83	2.92
1.167	4.37	2.750	8.75	4.333	5.83	5.92	2.92
1.250	4.37	2.833	43.74	4.417	5.83	6.00	2.92
1.333	4.37	2.917	43.74	4.500	5.83	6.08	2.92
1.417	4.37	3.000	43.74	4.583	5.83	6.17	2.92
1.500	4.37	3.083	113.72	4.667	5.83	6.25	2.92
1.583	4.37	3.167	113.72	4.750	5.83		

Max.Eff.Inten.(mm/hr)= 113.72 39.42
over (min) 5.00 10.00
Storage Coeff. (min)= 1.90 (ii) 6.67 (ii)
Unit Hyd. Tpeak (min)= 5.00 10.00
Unit Hyd. peak (cms)= 0.32 0.14
TOTALS
PEAK FLOW (cms)= 0.15 0.02 0.163 (iii)
TIME TO PEAK (hrs)= 3.25 3.25 3.25
RUNOFF VOLUME (mm)= 71.90 20.02 56.33
TOTAL RAINFALL (mm)= 72.90 72.90 72.90
RUNOFF COEFFICIENT = 0.99 0.27 0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 61.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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***** D E T A I L E D O U T P U T *****

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Output filename: C:\Users\Valder\AppData\Local\Civica\VH5\c7e9b9dc-2878-4b8a-9d26-5e475094a89a\ad68ddcc-f445-46fd-a5d-4a6e6cbbec4a\scena
Summary filename: C:\Users\Valder\AppData\Local\Civica\VH5\c7e9b9dc-2878-4b8a-9d26-5e475094a89a\ad68ddcc-f445-46fd-a5d-4a6e6cbbec4a\scena

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DATE: 12-06-2021 TIME: 04:33:18

USER:

COMMENTS:

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*****
** SIMULATION : SCS_6H_050Y **
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Ptotal= 81.40 mm	ata\Local\Temp\ f4c1afd7-7cd0-48cf-b336-8018d1565688\d8695a31
Comments:	50yr/6hr Peterborough A SCS

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	0.00	1.75	8.14	3.50	17.91	5.25	3.26
0.25	3.26	2.00	8.14	3.75	8.14	5.50	3.26
0.50	3.26	2.25	9.77	4.00	8.14	5.75	3.26
0.75	4.88	2.50	9.77	4.25	6.51	6.00	3.26
1.00	4.88	2.75	48.84	4.50	6.51		
1.25	4.88	3.00	126.98	4.75	4.88		
1.50	4.88	3.25	17.91	5.00	4.88		

CALIB	Area (ha)=	3.16	Curve Number (CN)=	66.0
NASHVD (2202)	Ia (mm)=	6.20	# of Linear Res.(N)=	3.00
ID= 1 DT= 5.0 min	U.H. Tp(hrs)=	0.42		

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

--- TRANSFORMED HYETOGRAPH ---							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.667	4.88	3.250	126.98	4.83	4.88
0.167	0.00	1.750	4.88	3.333	17.91	4.92	4.88
0.250	0.00	1.833	8.14	3.417	17.91	5.00	4.88
0.333	3.26	1.917	8.14	3.500	17.91	5.08	4.88
0.417	3.26	2.000	8.14	3.583	17.91	5.17	4.88
0.500	3.26	2.083	8.14	3.667	17.91	5.25	4.88
0.583	3.26	2.167	8.14	3.750	17.91	5.33	3.26
0.667	3.26	2.250	8.14	3.833	8.14	5.42	3.26
0.750	3.26	2.333	9.77	3.917	8.14	5.50	3.26
0.833	4.88	2.417	9.77	4.000	8.14	5.58	3.26
0.917	4.88	2.500	9.77	4.083	8.14	5.67	3.26
1.000	4.88	2.583	9.77	4.167	8.14	5.75	3.26
1.083	4.88	2.667	9.77	4.250	8.14	5.83	3.26
1.167	4.88	2.750	9.77	4.333	6.51	5.92	3.26
1.250	4.88	2.833	48.84	4.417	6.51	6.00	3.26
1.333	4.88	2.917	48.84	4.500	6.51	6.08	3.26
1.417	4.88	3.000	48.84	4.583	6.51	6.17	3.26
1.500	4.88	3.083	126.98	4.667	6.51	6.25	3.26
1.583	4.88	3.167	126.98	4.750	6.51		

Unit Hyd Opeak (cms) = 0.287

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PEAK FLOW      (cms)=    0.175 (i)
TIME TO PEAK   (hrs)=    3.583
RUNOFF VOLUME   (mm)=   27.442
TOTAL RAINFALL  (mm)=   81.400
RUNOFF COEFFICIENT =    0.337

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(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (2201)	Area (ha)=	10.88	
ID= 1 DT= 5.0 min	Total Imp(%)=	60.00	Dir. Conn.(%)= 45.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	6.53	4.35
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	2.00	2.00
Length	(m)=	269.32	20.00
Mannings n	=	0.013	0.035

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.667	4.88	3.250	126.98	4.83	4.88
0.167	0.00	1.750	4.88	3.333	17.91	4.92	4.88
0.250	0.00	1.833	8.14	3.417	17.91	5.00	4.88
0.333	3.26	1.917	8.14	3.500	17.91	5.08	4.88
0.417	3.26	2.000	8.14	3.583	17.91	5.17	4.88
0.500	3.26	2.083	8.14	3.667	17.91	5.25	4.88
0.583	3.26	2.167	8.14	3.750	17.91	5.33	3.26
0.667	3.26	2.250	8.14	3.833	8.14	5.42	3.26
0.750	3.26	2.333	9.77	3.917	8.14	5.50	3.26
0.833	4.88	2.417	9.77	4.000	8.14	5.58	3.26
0.917	4.88	2.500	9.77	4.083	8.14	5.67	3.26
1.000	4.88	2.583	9.77	4.167	8.14	5.75	3.26
1.083	4.88	2.667	9.77	4.250	8.14	5.83	3.26
1.167	4.88	2.750	9.77	4.333	6.51	5.92	3.26
1.250	4.88	2.833	48.84	4.417	6.51	6.00	3.26
1.333	4.88	2.917	48.84	4.500	6.51	6.08	3.26
1.417	4.88	3.000	48.84	4.583	6.51	6.17	3.26
1.500	4.88	3.083	126.98	4.667	6.51	6.25	3.26
1.583	4.88	3.167	126.98	4.750	6.51		

Max.Eff.Inten.(mm/hr)= 126.98 82.89
 over (min) 5.00 5.00
 Storage Coeff. (min)= 3.42 (ii) 4.66 (ii)
 Unit Hyd. Tpeak (min)= 5.00 5.00
 Unit Hyd. peak (cms)= 0.26 0.22

TOTALS
 PEAK FLOW (cms)= 1.71 0.98 2.696 (iii)
 TIME TO PEAK (hrs)= 3.25 3.25 3.25
 RUNOFF VOLUME (mm)= 79.40 30.87 52.71
 TOTAL RAINFALL (mm)= 81.40 81.40 81.40
 RUNOFF COEFFICIENT = 0.98 0.38 0.65

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PVIOUS LOSSES:
 CN* = 61.0 Ia = Dep. Storage (Above)
 (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
 THAN THE STORAGE COEFFICIENT.
 (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0038) OVERFLOW IS OFF				
IN= 2---> OUT= 1				
DT= 5.0 min				
OUTFLOW	STORAGE	OUTFLOW	STORAGE	
(cms)	(ha.m.)	(cms)	(ha.m.)	
0.0000	0.0000	0.8454	0.4251	
0.0074	0.0469	0.9743	0.4997	
0.0112	0.0990	1.0880	0.5770	
0.0140	0.1563	1.1909	0.6570	
0.1657	0.2182	5.4831	0.7609	
0.4409	0.2840	13.2243	0.8692	
0.6926	0.3532	0.0000	0.0000	
AREA	QPEAK	TPEAK	R.V.	
(ha)	(cms)	(hrs)	(mm)	
INFLOW : ID= 2 (2201)	10.880	2.696	3.25	52.71
OUTFLOW: ID= 1 (0038)	10.880	0.651	3.42	52.56

PEAK FLOW REDUCTION [Qout/Qin](%)= 24.14
 TIME SHIFT OF PEAK FLOW (min)= 10.00
 MAXIMUM STORAGE USED (ha.m.)= 0.3428

ADD HYD (0017)				
1 + 2 = 3				
	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (2202):	3.16	0.175	3.58	27.44
+ ID2= 2 (0038):	10.88	0.651	3.42	52.56
ID = 3 (0017):	14.04	0.810	3.42	46.91

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB				
NASHYD (1302)				
ID= 1 DT= 5.0 min	Area	(ha)=	Curve Number	(CN)=
	Ia	(mm)=	# of Linear Res.(N)=	
	U.H. Tp(hrs)=	0.42		

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.667	4.88	3.250	126.98	4.83	4.88
0.167	0.00	1.750	4.88	3.333	17.91	4.92	4.88
0.250	0.00	1.833	8.14	3.417	17.91	5.00	4.88
0.333	3.26	1.917	8.14	3.500	17.91	5.08	4.88
0.417	3.26	2.000	8.14	3.583	17.91	5.17	4.88
0.500	3.26	2.083	8.14	3.667	17.91	5.25	4.88
0.583	3.26	2.167	8.14	3.750	17.91	5.33	3.26
0.667	3.26	2.250	8.14	3.833	8.14	5.42	3.26
0.750	3.26	2.333	9.77	3.917	8.14	5.50	3.26
0.833	4.88	2.417	9.77	4.000	8.14	5.58	3.26
0.917	4.88	2.500	9.77	4.083	8.14	5.67	3.26
1.000	4.88	2.583	9.77	4.167	8.14	5.75	3.26
1.083	4.88	2.667	9.77	4.250	8.14	5.83	3.26
1.167	4.88	2.750	9.77	4.333	6.51	5.92	3.26
1.250	4.88	2.833	48.84	4.417	6.51	6.00	3.26
1.333	4.88	2.917	48.84	4.500	6.51	6.08	3.26
1.417	4.88	3.000	48.84	4.583	6.51	6.17	3.26
1.500	4.88	3.083	126.98	4.667	6.51	6.25	3.26
1.583	4.88	3.167	126.98	4.750	6.51		

Unit Hyd Qpeak (cms)= 0.592

PEAK FLOW (cms)= 0.533 (i)
 TIME TO PEAK (hrs)= 3.583
 RUNOFF VOLUME (mm)= 39.232
 TOTAL RAINFALL (mm)= 81.400
 RUNOFF COEFFICIENT = 0.482

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB				
NASHYD (1301)				
ID= 1 DT= 5.0 min	Area	(ha)=	Curve Number	(CN)=
	Ia	(mm)=	# of Linear Res.(N)=	
	U.H. Tp(hrs)=	0.49		

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.667	4.88	3.250	126.98	4.83	4.88
0.167	0.00	1.750	4.88	3.333	17.91	4.92	4.88

0.250	0.00	1.833	8.14	3.417	17.91	5.00	4.88
0.333	3.26	1.917	8.14	3.500	17.91	5.08	4.88
0.417	3.26	2.000	8.14	3.583	17.91	5.17	4.88
0.500	3.26	2.083	8.14	3.667	17.91	5.25	4.88
0.583	3.26	2.167	8.14	3.750	17.91	5.33	3.26
0.667	3.26	2.250	8.14	3.833	8.14	5.42	3.26
0.750	3.26	2.333	9.77	3.917	8.14	5.50	3.26
0.833	4.88	2.417	9.77	4.000	8.14	5.58	3.26
0.917	4.88	2.500	9.77	4.083	8.14	5.67	3.26
1.000	4.88	2.583	9.77	4.167	8.14	5.75	3.26
1.083	4.88	2.667	9.77	4.250	8.14	5.83	3.26
1.167	4.88	2.750	9.77	4.333	6.51	5.92	3.26
1.250	4.88	2.833	48.84	4.417	6.51	6.00	3.26
1.333	4.88	2.917	48.84	4.500	6.51	6.08	3.26
1.417	4.88	3.000	48.84	4.583	6.51	6.17	3.26
1.500	4.88	3.083	126.98	4.667	6.51	6.25	3.26
1.583	4.88	3.167	126.98	4.750	6.51		

Unit Hyd Qpeak (cms)= 0.396

PEAK FLOW (cms)= 0.351 (i)
 TIME TO PEAK (hrs)= 3.667
 RUNOFF VOLUME (mm)= 37.207
 TOTAL RAINFALL (mm)= 81.400
 RUNOFF COEFFICIENT = 0.457

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (1201)			
ID= 1 DT= 5.0 min			
Area (ha)= 18.81			
Total Imp(%)= 75.00 Dir. Conn.(%)= 60.00			
IMPERVIOUS PERVIOUS (i)			
Surface Area (ha)=	14.11	4.70	
Dep. Storage (mm)=	2.00	5.00	
Average Slope (%)=	2.00	2.00	
Length (m)=	354.12	20.00	
Mannings n =	0.013	0.035	

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.667	4.88	3.250	126.98	4.83	4.88
0.167	0.00	1.750	4.88	3.333	17.91	4.92	4.88
0.250	0.00	1.833	8.14	3.417	17.91	5.00	4.88
0.333	3.26	1.917	8.14	3.500	17.91	5.08	4.88
0.417	3.26	2.000	8.14	3.583	17.91	5.17	4.88
0.500	3.26	2.083	8.14	3.667	17.91	5.25	4.88
0.583	3.26	2.167	8.14	3.750	17.91	5.33	3.26
0.667	3.26	2.250	8.14	3.833	8.14	5.42	3.26
0.750	3.26	2.333	9.77	3.917	8.14	5.50	3.26
0.833	4.88	2.417	9.77	4.000	8.14	5.58	3.26
0.917	4.88	2.500	9.77	4.083	8.14	5.67	3.26
1.000	4.88	2.583	9.77	4.167	8.14	5.75	3.26
1.083	4.88	2.667	9.77	4.250	8.14	5.83	3.26
1.167	4.88	2.750	9.77	4.333	6.51	5.92	3.26
1.250	4.88	2.833	48.84	4.417	6.51	6.00	3.26
1.333	4.88	2.917	48.84	4.500	6.51	6.08	3.26
1.417	4.88	3.000	48.84	4.583	6.51	6.17	3.26
1.500	4.88	3.083	126.98	4.667	6.51	6.25	3.26
1.583	4.88	3.167	126.98	4.750	6.51		

Max.Eff.Inten.(mm/hr)= 126.98 106.00
 over (min) 5.00 5.00
 Storage Coeff. (min)= 4.03 (ii) 4.94 (ii)

Unit Hyd. Tpeak (min)= 5.00 5.00
 Unit Hyd. peak (cms)= 0.24 0.22
 TOTALS
 PEAK FLOW (cms)= 3.92 1.34 5.265 (iii)
 TIME TO PEAK (hrs)= 3.25 3.25 3.25
 RUNOFF VOLUME (mm)= 79.40 34.08 61.27
 TOTAL RAINFALL (mm)= 81.40 81.40 81.40
 RUNOFF COEFFICIENT = 0.98 0.42 0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
 CN* = 61.0 Ia = Dep. Storage (Above)
 (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
 THAN THE STORAGE COEFFICIENT.
 (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0048)				
1 + 2 = 3				
AREA QPEAK TPEAK R.V.				
(ha) (cms) (hrs) (mm)				
ID1= 1 (1201):	18.81	5.265	3.25	61.27
+ ID2= 2 (1301):	5.08	0.351	3.67	37.21
=====				
ID = 3 (0048):	23.89	5.435	3.25	56.16

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR(0042)				
IN= 2--> OUT= 1				
DT= 5.0 min				
OVERFLOW IS OFF				
OUTFLOW STORAGE OUTFLOW STORAGE				
(cms) (ha.m.) (cms) (ha.m.)				
0.0000	0.0000	1.0462	0.5963	
0.0121	0.0688	1.2756	0.6991	
0.0189	0.1438	1.4692	0.8059	
0.0239	0.2249	1.6400	0.9165	
0.0280	0.3113	2.7752	0.9732	
0.2556	0.4022	4.7819	1.0308	
0.6685	0.4973	13.8126	1.2091	
AREA QPEAK TPEAK R.V.				
(ha) (cms) (hrs) (mm)				
INFLOW : ID= 2 (0048)	23.890	5.435	3.25	56.16
OUTFLOW: ID= 1 (0042)	23.890	1.309	3.50	56.09

PEAK FLOW REDUCTION [Qout/Qin](%)= 24.08
 TIME SHIFT OF PEAK FLOW (min)= 15.00
 MAXIMUM STORAGE USED (ha.m.)= 0.7183

CALIB			
STANDHYD (1303)			
ID= 1 DT= 5.0 min			
Area (ha)= 0.66			
Total Imp(%)= 70.00 Dir. Conn.(%)= 70.00			
IMPERVIOUS PERVIOUS (i)			
Surface Area (ha)=	0.46	0.20	
Dep. Storage (mm)=	1.00	5.00	
Average Slope (%)=	1.00	2.00	
Length (m)=	66.33	40.00	
Mannings n =	0.013	0.250	

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN

hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.667	4.88	3.250	126.98	4.83	4.88
0.167	0.00	1.750	4.88	3.333	17.91	4.92	4.88
0.250	0.00	1.833	8.14	3.417	17.91	5.00	4.88
0.333	3.26	1.917	8.14	3.500	17.91	5.08	4.88
0.417	3.26	2.000	8.14	3.583	17.91	5.17	4.88
0.500	3.26	2.083	8.14	3.667	17.91	5.25	4.88
0.583	3.26	2.167	8.14	3.750	17.91	5.33	3.26
0.667	3.26	2.250	8.14	3.833	8.14	5.42	3.26
0.750	3.26	2.333	9.77	3.917	8.14	5.50	3.26
0.833	4.88	2.417	9.77	4.000	8.14	5.58	3.26
0.917	4.88	2.500	9.77	4.083	8.14	5.67	3.26
1.000	4.88	2.583	9.77	4.167	8.14	5.75	3.26
1.083	4.88	2.667	9.77	4.250	8.14	5.83	3.26
1.167	4.88	2.750	9.77	4.333	6.51	5.92	3.26
1.250	4.88	2.833	48.84	4.417	6.51	6.00	3.26
1.333	4.88	2.917	48.84	4.500	6.51	6.08	3.26
1.417	4.88	3.000	48.84	4.583	6.51	6.17	3.26
1.500	4.88	3.083	126.98	4.667	6.51	6.25	3.26
1.583	4.88	3.167	126.98	4.750	6.51		

Max.Eff.Inten.(mm/hr)= 126.98 48.84
 over (min) 5.00 10.00
 Storage Coeff. (min)= 1.81 (ii) 6.39 (ii)
 Unit Hyd. Tpeak (min)= 5.00 10.00
 Unit Hyd. peak (cms)= 0.32 0.15

TOTALS
 PEAK FLOW (cms)= 0.16 0.02 0.184 (iii)
 TIME TO PEAK (hrs)= 3.25 3.25 3.25
 RUNOFF VOLUME (mm)= 80.40 24.44 63.61
 TOTAL RAINFALL (mm)= 81.40 81.40 81.40
 RUNOFF COEFFICIENT = 0.99 0.30 0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
 CN* = 61.0 Ia = Dep. Storage (Above)
 (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
 THAN THE STORAGE COEFFICIENT.
 (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0043)	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (1302):	6.51	0.533	3.58	39.23
+ ID2= 2 (1303):	0.66	0.184	3.25	63.61
ID = 3 (0043):	7.17	0.562	3.58	41.48

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0043)	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 3 (0043):	7.17	0.562	3.58	41.48
+ ID2= 2 (0042):	23.89	1.309	3.50	56.09
ID = 1 (0043):	31.06	1.868	3.50	52.72

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

V V I SSSS U U A L (v 6.2.2007)

V V I SS U U A A L
 V V I SS U U A A A A L
 V V I SS U U A A L
 VV I SSSS UUUU A A LLLLL
 000 TTTT TTTT H H Y Y M M 000 TM
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 0 0 T T H H Y M M 0 0
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***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
 Output filename: C:\Users\Valdor\AppData\Local\Civica\XH5\c7e9b9dc-2878-4b8a-9d26-5e475049aa89\6af9f857-66d9-42c2-b2be-20cbdc4d4020\scena
 Summary filename: C:\Users\Valdor\AppData\Local\Civica\XH5\c7e9b9dc-2878-4b8a-9d26-5e475049aa89\6af9f857-66d9-42c2-b2be-20cbdc4d4020\scena

DATE: 12-06-2021 TIME: 04:33:18

USER:

COMMENTS: _____

READ STORM	Filename: C:\Users\Valdor\AppData\Local\Temp\
Ptotal= 89.90 mm	f4c1afd7-7cd0-48cf-b336-8018d1565688\d3ed2ac6
	Comments: 100yr/6hr Peterborough A SCS

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	0.00	1.75	8.99	3.50	19.78	5.25	3.60
0.25	3.60	2.00	8.99	3.75	8.99	5.50	3.60
0.50	3.60	2.25	10.79	4.00	8.99	5.75	3.60
0.75	5.39	2.50	10.79	4.25	7.19	6.00	3.60
1.00	5.39	2.75	53.94	4.50	7.19		
1.25	5.39	3.00	140.24	4.75	5.39		
1.50	5.39	3.25	19.78	5.00	5.39		

CALIB	Area (ha)=	Curve Number (CN)=
NASHYD (2202)	3.16	66.0
ID= 1 DT= 5.0 min	6.20	# of Linear Res.(N)= 3.00
U.H. Tp(hrs)=	0.42	

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----
 TIME hrs RAIN mm/hr TIME hrs RAIN mm/hr TIME hrs RAIN mm/hr

0.083	0.00	1.667	5.39	3.250	140.24	4.83	5.39
0.167	0.00	1.750	5.39	3.333	19.78	4.92	5.39
0.250	0.00	1.833	8.99	3.417	19.78	5.00	5.39
0.333	3.60	1.917	8.99	3.500	19.78	5.08	5.39
0.417	3.60	2.000	8.99	3.583	19.78	5.17	5.39
0.500	3.60	2.083	8.99	3.667	19.78	5.25	5.39
0.583	3.60	2.167	8.99	3.750	19.78	5.33	3.60
0.667	3.60	2.250	8.99	3.833	8.99	5.42	3.60
0.750	3.60	2.333	10.79	3.917	8.99	5.50	3.60
0.833	5.39	2.417	10.79	4.000	8.99	5.58	3.60
0.917	5.39	2.500	10.79	4.083	8.99	5.67	3.60
1.000	5.39	2.583	10.79	4.167	8.99	5.75	3.60
1.083	5.39	2.667	10.79	4.250	8.99	5.83	3.60
1.167	5.39	2.750	10.79	4.333	7.19	5.92	3.60
1.250	5.39	2.833	53.94	4.417	7.19	6.00	3.60
1.333	5.39	2.917	53.94	4.500	7.19	6.08	3.60
1.417	5.39	3.000	53.94	4.583	7.19	6.17	3.60
1.500	5.39	3.083	140.24	4.667	7.19	6.25	3.60
1.583	5.39	3.167	140.24	4.750	7.19	6.25	3.60

Unit Hyd Qpeak (cms)= 0.287

PEAK FLOW (cms)= 0.210 (i)
 TIME TO PEAK (hrs)= 3.583
 RUNOFF VOLUME (mm)= 32.650
 TOTAL RAINFALL (mm)= 89.900
 RUNOFF COEFFICIENT = 0.363

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	Area (ha)= 10.88
STANDHYD (2201)	Total Imp(%)= 60.00 Dir. Conn.(%)= 45.00
ID= 1 DT= 5.0 min	
	IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= 6.53	4.35
Dep. Storage (mm)= 2.00	5.00
Average Slope (%)= 2.00	2.00
Length (m)= 269.32	20.00
Mannings n = 0.013	0.035

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.667	5.39	3.250	140.24	4.83	5.39
0.167	0.00	1.750	5.39	3.333	19.78	4.92	5.39
0.250	0.00	1.833	8.99	3.417	19.78	5.00	5.39
0.333	3.60	1.917	8.99	3.500	19.78	5.08	5.39
0.417	3.60	2.000	8.99	3.583	19.78	5.17	5.39
0.500	3.60	2.083	8.99	3.667	19.78	5.25	5.39
0.583	3.60	2.167	8.99	3.750	19.78	5.33	3.60
0.667	3.60	2.250	8.99	3.833	8.99	5.42	3.60
0.750	3.60	2.333	10.79	3.917	8.99	5.50	3.60
0.833	5.39	2.417	10.79	4.000	8.99	5.58	3.60
0.917	5.39	2.500	10.79	4.083	8.99	5.67	3.60
1.000	5.39	2.583	10.79	4.167	8.99	5.75	3.60
1.083	5.39	2.667	10.79	4.250	8.99	5.83	3.60
1.167	5.39	2.750	10.79	4.333	7.19	5.92	3.60
1.250	5.39	2.833	53.94	4.417	7.19	6.00	3.60
1.333	5.39	2.917	53.94	4.500	7.19	6.08	3.60
1.417	5.39	3.000	53.94	4.583	7.19	6.17	3.60
1.500	5.39	3.083	140.24	4.667	7.19	6.25	3.60
1.583	5.39	3.167	140.24	4.750	7.19	6.25	3.60

Max.Eff.Inten.(mm/hr)= 140.24 97.53

over (min) 5.00 5.00
 Storage Coeff. (min)= 3.28 (ii) 4.48 (iii)
 Unit Hyd. Tpeak (min)= 5.00 5.00
 Unit Hyd. peak (cms)= 0.27 0.23
 TOTALS
 PEAK FLOW (cms)= 1.90 1.16 3.058 (iii)
 TIME TO PEAK (hrs)= 3.25 3.25 3.25
 RUNOFF VOLUME (mm)= 87.90 36.41 59.58
 TOTAL RAINFALL (mm)= 89.90 89.90 89.90
 RUNOFF COEFFICIENT = 0.98 0.41 0.66

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
 CN* = 61.0 Ia = Dep. Storage (Above)
 (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
 THAN THE STORAGE COEFFICIENT.
 (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0038)	OVERFLOW IS OFF
IN= 2---> OUT= 1	
DT= 5.0 min	
	OUTFLOW STORAGE OUTFLOW STORAGE
	(cms) (ha.m.) (cms) (ha.m.)
	0.0000 0.0000 0.8454 0.4251
	0.0074 0.0469 0.9743 0.4997
	0.0112 0.0990 1.0880 0.5770
	0.0140 0.1563 1.1909 0.6570
	0.1657 0.2182 5.4831 0.7609
	0.4409 0.2840 13.2243 0.8692
	0.6926 0.3532 0.0000 0.0000
	AREA QPEAK TPEAK R.V.
	(ha) (cms) (hrs) (mm)
INFLOW : ID= 2 (2201)	10.880 3.058 3.25 59.58
OUTFLOW: ID= 1 (0038)	10.880 0.750 3.42 59.43

PEAK FLOW REDUCTION [Qout/Qin](%)= 24.54
 TIME SHIFT OF PEAK FLOW (min)= 10.00
 MAXIMUM STORAGE USED (ha.m.)= 0.3820

ADD HYD (0017)	AREA QPEAK TPEAK R.V.
1 + 2 = 3	(ha) (cms) (hrs) (mm)
ID1= 1 (2202):	3.16 0.210 3.58 32.65
+ ID2= 2 (0038):	10.88 0.750 3.42 59.43
ID = 3 (0017):	14.04 0.946 3.50 53.41

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB	Area (ha)= 6.51	Curve Number (CN)= 79.0
NASHYD (1302)	Ia (mm)= 6.70	# of Linear Res.(N)= 3.00
ID= 1 DT= 5.0 min	U.H. Tp(hrs)= 0.42	

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.667	5.39	3.250	140.24	4.83	5.39
0.167	0.00	1.750	5.39	3.333	19.78	4.92	5.39
0.250	0.00	1.833	8.99	3.417	19.78	5.00	5.39

0.333	3.60	1.917	8.99	3.500	19.78	5.08	5.39
0.417	3.60	2.000	8.99	3.583	19.78	5.17	5.39
0.500	3.60	2.083	8.99	3.667	19.78	5.25	5.39
0.583	3.60	2.167	8.99	3.750	19.78	5.33	3.60
0.667	3.60	2.250	8.99	3.833	8.99	5.42	3.60
0.750	3.60	2.333	10.79	3.917	8.99	5.50	3.60
0.833	5.39	2.417	10.79	4.000	8.99	5.58	3.60
0.917	5.39	2.500	10.79	4.083	8.99	5.67	3.60
1.000	5.39	2.583	10.79	4.167	8.99	5.75	3.60
1.083	5.39	2.667	10.79	4.250	8.99	5.83	3.60
1.167	5.39	2.750	10.79	4.333	7.19	5.92	3.60
1.250	5.39	2.833	53.94	4.417	7.19	6.00	3.60
1.333	5.39	2.917	53.94	4.500	7.19	6.08	3.60
1.417	5.39	3.000	53.94	4.583	7.19	6.17	3.60
1.500	5.39	3.083	140.24	4.667	7.19	6.25	3.60
1.583	5.39	3.167	140.24	4.750	7.19		

Unit Hyd Qpeak (cms)= 0.592

PEAK FLOW (cms)= 0.626 (i)
 TIME TO PEAK (hrs)= 3.583
 RUNOFF VOLUME (mm)= 45.923
 TOTAL RAINFALL (mm)= 89.900
 RUNOFF COEFFICIENT = 0.511

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
NASHYD (1301)	Area (ha)=	5.08	Curve Number (CN)=	77.0	
ID= 1 DT= 5.0 min	Ia (mm)=	6.50	# of Linear Res.(N)=	3.00	
	U.H. Tp(hrs)=	0.49			

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.667	5.39	3.250	140.24	4.83	5.39
0.167	0.00	1.750	5.39	3.333	19.78	4.92	5.39
0.250	0.00	1.833	8.99	3.417	19.78	5.00	5.39
0.333	3.60	1.917	8.99	3.500	19.78	5.08	5.39
0.417	3.60	2.000	8.99	3.583	19.78	5.17	5.39
0.500	3.60	2.083	8.99	3.667	19.78	5.25	5.39
0.583	3.60	2.167	8.99	3.750	19.78	5.33	3.60
0.667	3.60	2.250	8.99	3.833	8.99	5.42	3.60
0.750	3.60	2.333	10.79	3.917	8.99	5.50	3.60
0.833	5.39	2.417	10.79	4.000	8.99	5.58	3.60
0.917	5.39	2.500	10.79	4.083	8.99	5.67	3.60
1.000	5.39	2.583	10.79	4.167	8.99	5.75	3.60
1.083	5.39	2.667	10.79	4.250	8.99	5.83	3.60
1.167	5.39	2.750	10.79	4.333	7.19	5.92	3.60
1.250	5.39	2.833	53.94	4.417	7.19	6.00	3.60
1.333	5.39	2.917	53.94	4.500	7.19	6.08	3.60
1.417	5.39	3.000	53.94	4.583	7.19	6.17	3.60
1.500	5.39	3.083	140.24	4.667	7.19	6.25	3.60
1.583	5.39	3.167	140.24	4.750	7.19		

Unit Hyd Qpeak (cms)= 0.396

PEAK FLOW (cms)= 0.414 (i)
 TIME TO PEAK (hrs)= 3.667
 RUNOFF VOLUME (mm)= 43.669
 TOTAL RAINFALL (mm)= 89.900
 RUNOFF COEFFICIENT = 0.486

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
STANDHYD (1201)	Area (ha)=	18.81			
ID= 1 DT= 5.0 min	Total Imp(%)=	75.00	Dir. Conn.(%)=	60.00	

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	14.11	4.70
Dep. Storage (mm)=	2.00	5.00
Average Slope (%)=	2.00	2.00
Length (m)=	354.12	20.00
Mannings n =	0.013	0.035

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.667	5.39	3.250	140.24	4.83	5.39
0.167	0.00	1.750	5.39	3.333	19.78	4.92	5.39
0.250	0.00	1.833	8.99	3.417	19.78	5.00	5.39
0.333	3.60	1.917	8.99	3.500	19.78	5.08	5.39
0.417	3.60	2.000	8.99	3.583	19.78	5.17	5.39
0.500	3.60	2.083	8.99	3.667	19.78	5.25	5.39
0.583	3.60	2.167	8.99	3.750	19.78	5.33	3.60
0.667	3.60	2.250	8.99	3.833	8.99	5.42	3.60
0.750	3.60	2.333	10.79	3.917	8.99	5.50	3.60
0.833	5.39	2.417	10.79	4.000	8.99	5.58	3.60
0.917	5.39	2.500	10.79	4.083	8.99	5.67	3.60
1.000	5.39	2.583	10.79	4.167	8.99	5.75	3.60
1.083	5.39	2.667	10.79	4.250	8.99	5.83	3.60
1.167	5.39	2.750	10.79	4.333	7.19	5.92	3.60
1.250	5.39	2.833	53.94	4.417	7.19	6.00	3.60
1.333	5.39	2.917	53.94	4.500	7.19	6.08	3.60
1.417	5.39	3.000	53.94	4.583	7.19	6.17	3.60
1.500	5.39	3.083	140.24	4.667	7.19	6.25	3.60
1.583	5.39	3.167	140.24	4.750	7.19		

Max.Eff.Inten.(mm/hr)= 140.24 124.15
 over (min) 5.00 5.00
 Storage Coeff. (min)= 3.87 (ii) 4.75 (ii)
 Unit Hyd. Tpeak (min)= 5.00 5.00
 Unit Hyd. peak (cms)= 0.25 0.22

TOTALS
 PEAK FLOW (cms)= 4.34 1.58 5.923 (iii)
 TIME TO PEAK (hrs)= 3.25 3.25 3.25
 RUNOFF VOLUME (mm)= 87.90 40.00 68.74
 TOTAL RAINFALL (mm)= 89.90 89.90 89.90
 RUNOFF COEFFICIENT = 0.98 0.44 0.76

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
 CN* = 61.0 Ia = Dep. Storage (Above)
 (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
 THAN THE STORAGE COEFFICIENT.
 (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0048)					
1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.	
	(ha)	(cms)	(hrs)	(mm)	
ID1= 1 (1201):	18.81	5.923	3.25	68.74	
+ ID2= 2 (1301):	5.08	0.414	3.67	43.67	
ID = 3 (0048):	23.89	6.127	3.25	63.41	

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| RESERVOIR( 0042) | OVERFLOW IS OFF
| IN= 2--> OUT= 1 |
| DT= 5.0 min      |
-----
| OUTFLOW | STORAGE | OUTFLOW | STORAGE |
| (cms)   | (ha.m.) | (cms)   | (ha.m.) |
| 0.0000  | 0.0000  | 1.0462  | 0.5963  |
| 0.0121  | 0.0688  | 1.2756  | 0.6991  |
| 0.0189  | 0.1438  | 1.4692  | 0.8059  |
| 0.0239  | 0.2249  | 1.6400  | 0.9165  |
| 0.0280  | 0.3113  | 2.7752  | 0.9732  |
| 0.2556  | 0.4022  | 4.7819  | 1.0308  |
| 0.6685  | 0.4973  | 13.8126 | 1.2091  |
-----
| AREA | QPEAK | TPEAK | R.V. | |
| (ha) | (cms) | (hrs) | (mm) |
| INFLOW : ID= 2 ( 0048) | 23.890 | 6.127 | 3.25 | 63.41 |
| OUTFLOW: ID= 1 ( 0042) | 23.890 | 1.462 | 3.50 | 63.35 |
-----
| PEAK FLOW REDUCTION [Qout/Qin](%)= 23.86 |
| TIME SHIFT OF PEAK FLOW (min)= 15.00 |
| MAXIMUM STORAGE USED (ha.m.)= 0.8027 |
-----

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-----
| CALIB |
| STANDHYD ( 1303) |
| ID= 1 DT= 5.0 min |
-----
| Area (ha)= 0.66 |
| Total Imp(%)= 70.00 | Dir. Conn.(%)= 70.00 |
-----
| IMPERVIOUS | PERVIOUS (i) |
| Surface Area (ha)= 0.46 | 0.20 |
| Dep. Storage (mm)= 1.00 | 5.00 |
| Average Slope (%)= 1.00 | 2.00 |
| Length (m)= 66.33 | 40.00 |
| Mannings n = 0.013 | 0.250 |
-----

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NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

```

-----
| TIME | RAIN | TIME | RAIN | TIME | RAIN | TIME | RAIN |
| hrs  | mm/hr | hrs  | mm/hr | hrs  | mm/hr | hrs  | mm/hr |
| 0.083 | 0.00 | 1.667 | 5.39 | 3.250 | 140.24 | 4.83 | 5.39 |
| 0.167 | 0.00 | 1.750 | 5.39 | 3.333 | 19.78 | 4.92 | 5.39 |
| 0.250 | 0.00 | 1.833 | 8.99 | 3.417 | 19.78 | 5.00 | 5.39 |
| 0.333 | 3.60 | 1.917 | 8.99 | 3.500 | 19.78 | 5.08 | 5.39 |
| 0.417 | 3.60 | 2.000 | 8.99 | 3.583 | 19.78 | 5.17 | 5.39 |
| 0.500 | 3.60 | 2.083 | 8.99 | 3.667 | 19.78 | 5.25 | 5.39 |
| 0.583 | 3.60 | 2.167 | 8.99 | 3.750 | 19.78 | 5.33 | 3.60 |
| 0.667 | 3.60 | 2.250 | 8.99 | 3.833 | 8.99 | 5.42 | 3.60 |
| 0.750 | 3.60 | 2.333 | 10.79 | 3.917 | 8.99 | 5.50 | 3.60 |
| 0.833 | 5.39 | 2.417 | 10.79 | 4.000 | 8.99 | 5.58 | 3.60 |
| 0.917 | 5.39 | 2.500 | 10.79 | 4.083 | 8.99 | 5.67 | 3.60 |
| 1.000 | 5.39 | 2.583 | 10.79 | 4.167 | 8.99 | 5.75 | 3.60 |
| 1.083 | 5.39 | 2.667 | 10.79 | 4.250 | 8.99 | 5.83 | 3.60 |
| 1.167 | 5.39 | 2.750 | 10.79 | 4.333 | 7.19 | 5.92 | 3.60 |
| 1.250 | 5.39 | 2.833 | 53.94 | 4.417 | 7.19 | 6.00 | 3.60 |
| 1.333 | 5.39 | 2.917 | 53.94 | 4.500 | 7.19 | 6.08 | 3.60 |
| 1.417 | 5.39 | 3.000 | 53.94 | 4.583 | 7.19 | 6.17 | 3.60 |
| 1.500 | 5.39 | 3.083 | 140.24 | 4.667 | 7.19 | 6.25 | 3.60 |
| 1.583 | 5.39 | 3.167 | 140.24 | 4.750 | 7.19 | 6.33 | 3.60 |
-----
| Max.Eff.Inten.(mm/hr)= 140.24 | 57.18 |
| over (min)= 5.00 | 10.00 |
| Storage Coeff. (min)= 1.74 (ii) | 6.14 (ii) |
| Unit Hyd. Tpeak (min)= 5.00 | 10.00 |
| Unit Hyd. peak (cms)= 0.32 | 0.15 |
-----
| PEAK FLOW (cms)= 0.18 | 0.03 |
| *TOTALS* | 0.205 (iii) |
-----

```

```

TIME TO PEAK (hrs)= 3.25 3.25 3.25
RUNOFF VOLUME (mm)= 88.90 29.15 70.97
TOTAL RAINFALL (mm)= 89.90 89.90 89.90
RUNOFF COEFFICIENT = 0.99 0.32 0.79

```

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

```

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
    CN* = 61.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
    THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

```

-----
| ADD HYD ( 0043) |
| 1 + 2 = 3 |
-----
| AREA | QPEAK | TPEAK | R.V. | |
| (ha) | (cms) | (hrs) | (mm) |
| ID1= 1 ( 1302): | 6.51 | 0.626 | 3.58 | 45.92 |
| + ID2= 2 ( 1303): | 0.66 | 0.205 | 3.25 | 70.97 |
|=====|
| ID = 3 ( 0043): | 7.17 | 0.659 | 3.58 | 48.23 |

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| ADD HYD ( 0043) |
| 3 + 2 = 1 |
-----
| AREA | QPEAK | TPEAK | R.V. | |
| (ha) | (cms) | (hrs) | (mm) |
| ID1= 3 ( 0043): | 7.17 | 0.659 | 3.58 | 48.23 |
| + ID2= 2 ( 0042): | 23.89 | 1.462 | 3.50 | 63.35 |
|=====|
| ID = 1 ( 0043): | 31.06 | 2.118 | 3.50 | 59.86 |

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| V | V | I | SSSSS | U | U | A | L | (v 6.2.2007) | | | |
| V | V | I | SS | U | U | A | A | L |
| V | V | I | SS | U | U | A | A | L |
| V | V | I | SS | U | U | A | A | L |
| VV | I | SSSSS | UUUUU | A | A | LLLLL |
| 000 | TTTT | TTTT | H | H | Y | Y | M | M | 000 | TM |
| 0 | 0 | T | T | H | H | Y | Y | MM | MM | 0 | 0 |
| 0 | 0 | T | T | H | H | Y | Y | M | M | 0 | 0 |
| 000 | T | T | H | H | Y | Y | M | M | 000 |

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***** D E T A I L E D O U T P U T *****

```

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voind.dat
Output filename: C:\Users\Valdor\AppData\Local\Civica\VH5\c7e9b9dc-2878-4b8a-9d26-5e475049aa89\c73ed2b4-57a0-4a02-97d6-b9299c2649af\scena
Summary filename: C:\Users\Valdor\AppData\Local\Civica\VH5\c7e9b9dc-2878-4b8a-9d26-5e475049aa89\c73ed2b4-57a0-4a02-97d6-b9299c2649af\scena

```

DATE: 12-06-2021 TIME: 04:33:18

USER:

COMMENTS: _____

 ** SIMULATION : Timmins **

 READ STORM Filename: C:\Users\Valdor\AppData
 Local\Temp\
 f4c1afd7-7cd0-48cf-b336-8018d1565688\50758f93
 Ptotal=193.00 mm Comments: * Timmins Storm

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	15.00	3.00	3.00	6.00	43.00	9.00	13.00
0.25	15.00	3.25	3.00	6.25	43.00	9.25	13.00
0.50	15.00	3.50	3.00	6.50	43.00	9.50	13.00
0.75	15.00	3.75	3.00	6.75	43.00	9.75	13.00
1.00	20.00	4.00	5.00	7.00	20.00	10.00	13.00
1.25	20.00	4.25	5.00	7.25	20.00	10.25	13.00
1.50	20.00	4.50	5.00	7.50	20.00	10.50	13.00
1.75	20.00	4.75	5.00	7.75	20.00	10.75	13.00
2.00	10.00	5.00	20.00	8.00	23.00	11.00	8.00
2.25	10.00	5.25	20.00	8.25	23.00	11.25	8.00
2.50	10.00	5.50	20.00	8.50	23.00	11.50	8.00
2.75	10.00	5.75	20.00	8.75	23.00	11.75	8.00

 CALIB
 NASHYD (2202) Area (ha)= 3.16 Curve Number (CN)= 66.0
 ID= 1 DT= 5.0 min Ia (mm)= 6.20 # of Linear Res.(N)= 3.00
 U.H. Tp(hrs)= 0.42

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

----- TRANSFORMED HYETOGRAPH -----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	15.00	3.083	3.00	6.083	43.00	9.08	13.00
0.167	15.00	3.167	3.00	6.167	43.00	9.17	13.00
0.250	15.00	3.250	3.00	6.250	43.00	9.25	13.00
0.333	15.00	3.333	3.00	6.333	43.00	9.33	13.00
0.417	15.00	3.417	3.00	6.417	43.00	9.42	13.00
0.500	15.00	3.500	3.00	6.500	43.00	9.50	13.00
0.583	15.00	3.583	3.00	6.583	43.00	9.58	13.00
0.667	15.00	3.667	3.00	6.667	43.00	9.67	13.00
0.750	15.00	3.750	3.00	6.750	43.00	9.75	13.00
0.833	15.00	3.833	3.00	6.833	43.00	9.83	13.00
0.917	15.00	3.917	3.00	6.917	43.00	9.92	13.00
1.000	15.00	4.000	3.00	7.000	43.00	10.00	13.00
1.083	20.00	4.083	5.00	7.083	20.00	10.08	13.00
1.167	20.00	4.167	5.00	7.167	20.00	10.17	13.00
1.250	20.00	4.250	5.00	7.250	20.00	10.25	13.00
1.333	20.00	4.333	5.00	7.333	20.00	10.33	13.00
1.417	20.00	4.417	5.00	7.417	20.00	10.42	13.00
1.500	20.00	4.500	5.00	7.500	20.00	10.50	13.00
1.583	20.00	4.583	5.00	7.583	20.00	10.58	13.00
1.667	20.00	4.667	5.00	7.667	20.00	10.67	13.00
1.750	20.00	4.750	5.00	7.750	20.00	10.75	13.00
1.833	20.00	4.833	5.00	7.833	20.00	10.83	13.00
1.917	20.00	4.917	5.00	7.917	20.00	10.92	13.00

2.000	20.00	5.000	5.00	8.000	20.00	11.00	13.00
2.083	10.00	5.083	20.00	8.083	23.00	11.08	8.00
2.167	10.00	5.167	20.00	8.167	23.00	11.17	8.00
2.250	10.00	5.250	20.00	8.250	23.00	11.25	8.00
2.333	10.00	5.333	20.00	8.333	23.00	11.33	8.00
2.417	10.00	5.417	20.00	8.417	23.00	11.42	8.00
2.500	10.00	5.500	20.00	8.500	23.00	11.50	8.00
2.583	10.00	5.583	20.00	8.583	23.00	11.58	8.00
2.667	10.00	5.667	20.00	8.667	23.00	11.67	8.00
2.750	10.00	5.750	20.00	8.750	23.00	11.75	8.00
2.833	10.00	5.833	20.00	8.833	23.00	11.83	8.00
2.917	10.00	5.917	20.00	8.917	23.00	11.92	8.00
3.000	10.00	6.000	20.00	9.000	23.00	12.00	8.00

Unit Hyd Qpeak (cms)= 0.287

PEAK FLOW (cms)= 0.228 (i)
 TIME TO PEAK (hrs)= 7.083
 RUNOFF VOLUME (mm)= 109.840
 TOTAL RAINFALL (mm)= 193.000
 RUNOFF COEFFICIENT = 0.569

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 CALIB
 STANDHYD (2201) Area (ha)= 10.88
 ID= 1 DT= 5.0 min Total Imp(%)= 60.00 Dir. Conn.(%)= 45.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	6.53	4.35
Dep. Storage (mm)=	2.00	5.00
Average Slope (%)=	2.00	2.00
Length (m)=	269.32	20.00
Mannings n =	0.013	0.035

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

----- TRANSFORMED HYETOGRAPH -----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	15.00	3.083	3.00	6.083	43.00	9.08	13.00
0.167	15.00	3.167	3.00	6.167	43.00	9.17	13.00
0.250	15.00	3.250	3.00	6.250	43.00	9.25	13.00
0.333	15.00	3.333	3.00	6.333	43.00	9.33	13.00
0.417	15.00	3.417	3.00	6.417	43.00	9.42	13.00
0.500	15.00	3.500	3.00	6.500	43.00	9.50	13.00
0.583	15.00	3.583	3.00	6.583	43.00	9.58	13.00
0.667	15.00	3.667	3.00	6.667	43.00	9.67	13.00
0.750	15.00	3.750	3.00	6.750	43.00	9.75	13.00
0.833	15.00	3.833	3.00	6.833	43.00	9.83	13.00
0.917	15.00	3.917	3.00	6.917	43.00	9.92	13.00
1.000	15.00	4.000	3.00	7.000	43.00	10.00	13.00
1.083	20.00	4.083	5.00	7.083	20.00	10.08	13.00
1.167	20.00	4.167	5.00	7.167	20.00	10.17	13.00
1.250	20.00	4.250	5.00	7.250	20.00	10.25	13.00
1.333	20.00	4.333	5.00	7.333	20.00	10.33	13.00
1.417	20.00	4.417	5.00	7.417	20.00	10.42	13.00
1.500	20.00	4.500	5.00	7.500	20.00	10.50	13.00
1.583	20.00	4.583	5.00	7.583	20.00	10.58	13.00
1.667	20.00	4.667	5.00	7.667	20.00	10.67	13.00
1.750	20.00	4.750	5.00	7.750	20.00	10.75	13.00
1.833	20.00	4.833	5.00	7.833	20.00	10.83	13.00
1.917	20.00	4.917	5.00	7.917	20.00	10.92	13.00
2.000	20.00	5.000	5.00	8.000	20.00	11.00	13.00
2.083	10.00	5.083	20.00	8.083	23.00	11.08	8.00
2.167	10.00	5.167	20.00	8.167	23.00	11.17	8.00
2.250	10.00	5.250	20.00	8.250	23.00	11.25	8.00

2.333	10.00	5.333	20.00	8.333	23.00	11.33	8.00
2.417	10.00	5.417	20.00	8.417	23.00	11.42	8.00
2.500	10.00	5.500	20.00	8.500	23.00	11.50	8.00
2.583	10.00	5.583	20.00	8.583	23.00	11.58	8.00
2.667	10.00	5.667	20.00	8.667	23.00	11.67	8.00
2.750	10.00	5.750	20.00	8.750	23.00	11.75	8.00
2.833	10.00	5.833	20.00	8.833	23.00	11.83	8.00
2.917	10.00	5.917	20.00	8.917	23.00	11.92	8.00
3.000	10.00	6.000	20.00	9.000	23.00	12.00	8.00

Max.Eff.Inten.(mm/hr)= 43.00 43.10
 over (min) 5.00 10.00
 Storage Coeff. (min)= 5.27 (ii) 7.18 (ii)
 Unit Hyd. Tpeak (min)= 5.00 10.00
 Unit Hyd. peak (cms)= 0.21 0.14

TOTALS
 PEAK FLOW (cms)= 0.58 0.51 1.099 (iii)
 TIME TO PEAK (hrs)= 6.92 7.00 7.00
 RUNOFF VOLUME (mm)= 191.00 116.63 150.09
 TOTAL RAINFALL (mm)= 193.00 193.00 193.00
 RUNOFF COEFFICIENT = 0.99 0.60 0.78

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
 CN* = 61.0 Ia = Dep. Storage (Above)
 (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
 THAN THE STORAGE COEFFICIENT.
 (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0038)
 IN= 2--> OUT= 1
 DT= 5.0 min

OVERFLOW IS OFF

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.8454	0.4251
0.0074	0.0469	0.9743	0.4997
0.0112	0.0990	1.0880	0.5770
0.0140	0.1563	1.1909	0.6570
0.1657	0.2182	5.4831	0.7609
0.4409	0.2840	13.2243	0.8692
0.6926	0.3532	0.0000	0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (2201)	10.880	1.099	7.00	150.09
OUTFLOW: ID= 1 (0038)	10.880	0.802	7.08	149.95

PEAK FLOW REDUCTION [Qout/Qin](%)= 73.02
 TIME SHIFT OF PEAK FLOW (min)= 5.00
 MAXIMUM STORAGE USED (ha.m.)= 0.4056

ADD HYD (0017)
 1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (2202):	3.16	0.228	7.08	109.84
+ ID2= 2 (0038):	10.88	0.802	7.08	149.95
ID = 3 (0017):	14.04	1.030	7.08	140.92

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

	Area (ha)	Ia (mm)	U.H. Tp(hrs)
CALIB	6.51	6.70	0.42
NASHYD (1302)	6.51	6.70	0.42
ID= 1 DT= 5.0 min	6.51	6.70	0.42

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	15.00	3.083	3.00	6.083	43.00	9.08	13.00
0.167	15.00	3.167	3.00	6.167	43.00	9.17	13.00
0.250	15.00	3.250	3.00	6.250	43.00	9.25	13.00
0.333	15.00	3.333	3.00	6.333	43.00	9.33	13.00
0.417	15.00	3.417	3.00	6.417	43.00	9.42	13.00
0.500	15.00	3.500	3.00	6.500	43.00	9.50	13.00
0.583	15.00	3.583	3.00	6.583	43.00	9.58	13.00
0.667	15.00	3.667	3.00	6.667	43.00	9.67	13.00
0.750	15.00	3.750	3.00	6.750	43.00	9.75	13.00
0.833	15.00	3.833	3.00	6.833	43.00	9.83	13.00
0.917	15.00	3.917	3.00	6.917	43.00	9.92	13.00
1.000	15.00	4.000	3.00	7.000	43.00	10.00	13.00
1.083	20.00	4.083	5.00	7.083	20.00	10.08	13.00
1.167	20.00	4.167	5.00	7.167	20.00	10.17	13.00
1.250	20.00	4.250	5.00	7.250	20.00	10.25	13.00
1.333	20.00	4.333	5.00	7.333	20.00	10.33	13.00
1.417	20.00	4.417	5.00	7.417	20.00	10.42	13.00
1.500	20.00	4.500	5.00	7.500	20.00	10.50	13.00
1.583	20.00	4.583	5.00	7.583	20.00	10.58	13.00
1.667	20.00	4.667	5.00	7.667	20.00	10.67	13.00
1.750	20.00	4.750	5.00	7.750	20.00	10.75	13.00
1.833	20.00	4.833	5.00	7.833	20.00	10.83	13.00
1.917	20.00	4.917	5.00	7.917	20.00	10.92	13.00
2.000	20.00	5.000	5.00	8.000	20.00	11.00	13.00
2.083	10.00	5.083	20.00	8.083	23.00	11.08	8.00
2.167	10.00	5.167	20.00	8.167	23.00	11.17	8.00
2.250	10.00	5.250	20.00	8.250	23.00	11.25	8.00
2.333	10.00	5.333	20.00	8.333	23.00	11.33	8.00
2.417	10.00	5.417	20.00	8.417	23.00	11.42	8.00
2.500	10.00	5.500	20.00	8.500	23.00	11.50	8.00
2.583	10.00	5.583	20.00	8.583	23.00	11.58	8.00
2.667	10.00	5.667	20.00	8.667	23.00	11.67	8.00
2.750	10.00	5.750	20.00	8.750	23.00	11.75	8.00
2.833	10.00	5.833	20.00	8.833	23.00	11.83	8.00
2.917	10.00	5.917	20.00	8.917	23.00	11.92	8.00
3.000	10.00	6.000	20.00	9.000	23.00	12.00	8.00

Unit Hyd Qpeak (cms)= 0.592

PEAK FLOW (cms)= 0.590 (i)
 TIME TO PEAK (hrs)= 7.083
 RUNOFF VOLUME (mm)= 136.728
 TOTAL RAINFALL (mm)= 193.000
 RUNOFF COEFFICIENT = 0.708

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

	Area (ha)	Ia (mm)	U.H. Tp(hrs)
CALIB	5.08	6.50	0.49
NASHYD (1301)	5.08	6.50	0.49
ID= 1 DT= 5.0 min	5.08	6.50	0.49

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	15.00	3.083	3.00	6.083	43.00	9.08	13.00
0.167	15.00	3.167	3.00	6.167	43.00	9.17	13.00
0.250	15.00	3.250	3.00	6.250	43.00	9.25	13.00

0.333	15.00	3.333	3.00	6.333	43.00	9.33	13.00
0.417	15.00	3.417	3.00	6.417	43.00	9.42	13.00
0.500	15.00	3.500	3.00	6.500	43.00	9.50	13.00
0.583	15.00	3.583	3.00	6.583	43.00	9.58	13.00
0.667	15.00	3.667	3.00	6.667	43.00	9.67	13.00
0.750	15.00	3.750	3.00	6.750	43.00	9.75	13.00
0.833	15.00	3.833	3.00	6.833	43.00	9.83	13.00
0.917	15.00	3.917	3.00	6.917	43.00	9.92	13.00
1.000	15.00	4.000	3.00	7.000	43.00	10.00	13.00
1.083	20.00	4.083	5.00	7.083	20.00	10.08	13.00
1.167	20.00	4.167	5.00	7.167	20.00	10.17	13.00
1.250	20.00	4.250	5.00	7.250	20.00	10.25	13.00
1.333	20.00	4.333	5.00	7.333	20.00	10.33	13.00
1.417	20.00	4.417	5.00	7.417	20.00	10.42	13.00
1.500	20.00	4.500	5.00	7.500	20.00	10.50	13.00
1.583	20.00	4.583	5.00	7.583	20.00	10.58	13.00
1.667	20.00	4.667	5.00	7.667	20.00	10.67	13.00
1.750	20.00	4.750	5.00	7.750	20.00	10.75	13.00
1.833	20.00	4.833	5.00	7.833	20.00	10.83	13.00
1.917	20.00	4.917	5.00	7.917	20.00	10.92	13.00
2.000	20.00	5.000	5.00	8.000	20.00	11.00	13.00
2.083	10.00	5.083	20.00	8.083	23.00	11.08	8.00
2.167	10.00	5.167	20.00	8.167	23.00	11.17	8.00
2.250	10.00	5.250	20.00	8.250	23.00	11.25	8.00
2.333	10.00	5.333	20.00	8.333	23.00	11.33	8.00
2.417	10.00	5.417	20.00	8.417	23.00	11.42	8.00
2.500	10.00	5.500	20.00	8.500	23.00	11.50	8.00
2.583	10.00	5.583	20.00	8.583	23.00	11.58	8.00
2.667	10.00	5.667	20.00	8.667	23.00	11.67	8.00
2.750	10.00	5.750	20.00	8.750	23.00	11.75	8.00
2.833	10.00	5.833	20.00	8.833	23.00	11.83	8.00
2.917	10.00	5.917	20.00	8.917	23.00	11.92	8.00
3.000	10.00	6.000	20.00	9.000	23.00	12.00	8.00

Unit Hyd Qpeak (cms)= 0.396

PEAK FLOW (cms)= 0.428 (i)
 TIME TO PEAK (hrs)= 7.167
 RUNOFF VOLUME (mm)= 132.562
 TOTAL RAINFALL (mm)= 193.000
 RUNOFF COEFFICIENT = 0.687

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (1201)	Area (ha)= 18.81
ID= 1 DT= 5.0 min	Total Imp(%)= 75.00 Dir. Conn.(%)= 60.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	14.11	4.70
Dep. Storage (mm)=	2.00	5.00
Average Slope (%)=	2.00	2.00
Length (m)=	354.12	20.00
Mannings n	0.013	0.035

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	15.00	3.083	3.00	6.083	43.00	9.08	13.00
0.167	15.00	3.167	3.00	6.167	43.00	9.17	13.00
0.250	15.00	3.250	3.00	6.250	43.00	9.25	13.00
0.333	15.00	3.333	3.00	6.333	43.00	9.33	13.00
0.417	15.00	3.417	3.00	6.417	43.00	9.42	13.00
0.500	15.00	3.500	3.00	6.500	43.00	9.50	13.00
0.583	15.00	3.583	3.00	6.583	43.00	9.58	13.00

0.667	15.00	3.667	3.00	6.667	43.00	9.67	13.00
0.750	15.00	3.750	3.00	6.750	43.00	9.75	13.00
0.833	15.00	3.833	3.00	6.833	43.00	9.83	13.00
0.917	15.00	3.917	3.00	6.917	43.00	9.92	13.00
1.000	15.00	4.000	3.00	7.000	43.00	10.00	13.00
1.083	20.00	4.083	5.00	7.083	20.00	10.08	13.00
1.167	20.00	4.167	5.00	7.167	20.00	10.17	13.00
1.250	20.00	4.250	5.00	7.250	20.00	10.25	13.00
1.333	20.00	4.333	5.00	7.333	20.00	10.33	13.00
1.417	20.00	4.417	5.00	7.417	20.00	10.42	13.00
1.500	20.00	4.500	5.00	7.500	20.00	10.50	13.00
1.583	20.00	4.583	5.00	7.583	20.00	10.58	13.00
1.667	20.00	4.667	5.00	7.667	20.00	10.67	13.00
1.750	20.00	4.750	5.00	7.750	20.00	10.75	13.00
1.833	20.00	4.833	5.00	7.833	20.00	10.83	13.00
1.917	20.00	4.917	5.00	7.917	20.00	10.92	13.00
2.000	20.00	5.000	5.00	8.000	20.00	11.00	13.00
2.083	10.00	5.083	20.00	8.083	23.00	11.08	8.00
2.167	10.00	5.167	20.00	8.167	23.00	11.17	8.00
2.250	10.00	5.250	20.00	8.250	23.00	11.25	8.00
2.333	10.00	5.333	20.00	8.333	23.00	11.33	8.00
2.417	10.00	5.417	20.00	8.417	23.00	11.42	8.00
2.500	10.00	5.500	20.00	8.500	23.00	11.50	8.00
2.583	10.00	5.583	20.00	8.583	23.00	11.58	8.00
2.667	10.00	5.667	20.00	8.667	23.00	11.67	8.00
2.750	10.00	5.750	20.00	8.750	23.00	11.75	8.00
2.833	10.00	5.833	20.00	8.833	23.00	11.83	8.00
2.917	10.00	5.917	20.00	8.917	23.00	11.92	8.00
3.000	10.00	6.000	20.00	9.000	23.00	12.00	8.00

Max.Eff.Inten.(mm/hr)= 43.00 52.84
 over (min) 5.00 10.00
 Storage Coeff. (min)= 6.21 (ii) 7.62 (ii)
 Unit Hyd. Tpeak (min)= 5.00 10.00
 Unit Hyd. peak (cms)= 0.19 0.13

TOTALS
 PEAK FLOW (cms)= 1.35 0.68 2.029 (iii)
 TIME TO PEAK (hrs)= 7.00 7.00 7.00
 RUNOFF VOLUME (mm)= 191.00 123.73 164.09
 TOTAL RAINFALL (mm)= 193.00 193.00 193.00
 RUNOFF COEFFICIENT = 0.99 0.64 0.85

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
 CN* = 61.0 Ia = Dep. Storage (Above)
 (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
 THAN THE STORAGE COEFFICIENT.
 (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0048)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (1201):	18.81	2.029	7.00	164.09
+ ID2= 2 (1301):	5.08	0.428	7.17	132.56
=====				
ID = 3 (0048):	23.89	2.444	7.00	157.39

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR(0042)			
IN= 2--> OUT= 1			
DT= 5.0 min			
OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	1.0462	0.5963
0.0121	0.0688	1.2756	0.6991
0.0189	0.1438	1.4692	0.8059

	0.0239	0.2249	1.6400	0.9165
	0.0280	0.3113	2.7752	0.9732
	0.2556	0.4022	4.7819	1.0308
	0.6685	0.4973	13.8126	1.2091

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (0048)	23.890	2.444	7.00	157.39
OUTFLOW: ID= 1 (0042)	23.890	1.589	7.25	157.33

PEAK FLOW REDUCTION [Qout/Qin](%)= 65.02
 TIME SHIFT OF PEAK FLOW (min)= 15.00
 MAXIMUM STORAGE USED (ha.m.)= 0.8846

CALIB			
STANDHYD (1303)	Area (ha)= 0.66		
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 70.00	

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.46	0.20
Dep. Storage (mm)=	1.00	5.00
Average Slope (%)=	1.00	2.00
Length (m)=	66.33	40.00
Mannings n	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

--- TRANSFORMED HYETOGRAPH ---							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	15.00	3.083	3.00	6.083	43.00	9.08	13.00
0.167	15.00	3.167	3.00	6.167	43.00	9.17	13.00
0.250	15.00	3.250	3.00	6.250	43.00	9.25	13.00
0.333	15.00	3.333	3.00	6.333	43.00	9.33	13.00
0.417	15.00	3.417	3.00	6.417	43.00	9.42	13.00
0.500	15.00	3.500	3.00	6.500	43.00	9.50	13.00
0.583	15.00	3.583	3.00	6.583	43.00	9.58	13.00
0.667	15.00	3.667	3.00	6.667	43.00	9.67	13.00
0.750	15.00	3.750	3.00	6.750	43.00	9.75	13.00
0.833	15.00	3.833	3.00	6.833	43.00	9.83	13.00
0.917	15.00	3.917	3.00	6.917	43.00	9.92	13.00
1.000	15.00	4.000	3.00	7.000	43.00	10.00	13.00
1.083	20.00	4.083	5.00	7.083	20.00	10.08	13.00
1.167	20.00	4.167	5.00	7.167	20.00	10.17	13.00
1.250	20.00	4.250	5.00	7.250	20.00	10.25	13.00
1.333	20.00	4.333	5.00	7.333	20.00	10.33	13.00
1.417	20.00	4.417	5.00	7.417	20.00	10.42	13.00
1.500	20.00	4.500	5.00	7.500	20.00	10.50	13.00
1.583	20.00	4.583	5.00	7.583	20.00	10.58	13.00
1.667	20.00	4.667	5.00	7.667	20.00	10.67	13.00
1.750	20.00	4.750	5.00	7.750	20.00	10.75	13.00
1.833	20.00	4.833	5.00	7.833	20.00	10.83	13.00
1.917	20.00	4.917	5.00	7.917	20.00	10.92	13.00
2.000	20.00	5.000	5.00	8.000	20.00	11.00	13.00
2.083	10.00	5.083	20.00	8.083	23.00	11.08	8.00
2.167	10.00	5.167	20.00	8.167	23.00	11.17	8.00
2.250	10.00	5.250	20.00	8.250	23.00	11.25	8.00
2.333	10.00	5.333	20.00	8.333	23.00	11.33	8.00
2.417	10.00	5.417	20.00	8.417	23.00	11.42	8.00
2.500	10.00	5.500	20.00	8.500	23.00	11.50	8.00
2.583	10.00	5.583	20.00	8.583	23.00	11.58	8.00
2.667	10.00	5.667	20.00	8.667	23.00	11.67	8.00
2.750	10.00	5.750	20.00	8.750	23.00	11.75	8.00
2.833	10.00	5.833	20.00	8.833	23.00	11.83	8.00
2.917	10.00	5.917	20.00	8.917	23.00	11.92	8.00
3.000	10.00	6.000	20.00	9.000	23.00	12.00	8.00

Max.Eff.Inten.(mm/hr)=	43.00	27.21
over (min)	5.00	15.00
Storage Coeff. (min)=	2.80 (ii)	14.68 (ii)
Unit Hyd. Tpeak (min)=	5.00	15.00
Unit Hyd. peak (cms)=	0.28	0.08

PEAK FLOW (cms)=	0.06	0.01	0.069 (iii)
TIME TO PEAK (hrs)=	6.75	7.00	7.00
RUNOFF VOLUME (mm)=	192.00	100.87	164.65
TOTAL RAINFALL (mm)=	193.00	193.00	193.00
RUNOFF COEFFICIENT =	0.99	0.52	0.85

TOTALS

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PVIOUS LOSSES:
 CN* = 61.0 Ia = Dep. Storage (Above)
 (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
 THAN THE STORAGE COEFFICIENT.
 (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0043)				
1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (1302):	6.51	0.590	7.08	136.73
+ ID2= 2 (1303):	0.66	0.069	7.00	164.65
ID = 3 (0043):	7.17	0.651	7.00	139.30

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0043)				
3 + 2 = 1	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 3 (0043):	7.17	0.651	7.00	139.30
+ ID2= 2 (0042):	23.89	1.589	7.25	157.33
ID = 1 (0043):	31.06	2.212	7.08	153.17

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

FINISH

APPENDIX “F”

Excerpts from the Hydrogeological Assessment Report



Hydrogeological Assessment Report

Proposed Subdivision Development
787 and 825 Fallis Line
Millbrook, Ontario

Prepared For:
The Bromont Group





6. Conclusions and Recommendations

Supporting data upon which our recommendations are based have been presented in the foregoing sections of this report. Based on the results of our hydrogeologic assessment, it is our professional opinion that the Site is suitable for the proposed house (and garage) and there is low potential for groundwater impact due to the planned construction. It is recommended that good construction and mitigation techniques must be used to minimize the potential for impact. Detailed conclusions and recommendations are presented in the following sections regarding the water balance and impacts.

6.1 Water Balance Evaluation

An evaluation of the water balance was completed to compute the potential impacts that may occur in the recharge/discharge characteristics related to the proposed house construction. The objective of the water balance is to illustrate that post-development infiltration within the developable area can meet or be close to pre-development values. The computations have used detailed parameters such as precipitation (Peterborough A weather station data from 1981 to 2006 was used), regional evapotranspiration, infiltration and runoff. Information from the Peterborough A weather station was selected as it was the closest weather station to the Site (~10 km). The detailed calculations can be reviewed in Appendix F. The calculations are based on a total Site area of 49.22 ha (121.6 acres). A summary of the expected pre-development water balance values for the proposed house construction is described in the following section based on current information.

6.2 Pre-Development Water Balance

The pre-development water balance incorporated the existing soils, slope and agricultural areas. The infiltration factor for the area was calculated from the table of values presented in the “Land Development Guidelines” (MOEE, 1995). It is based on three sub-factors which are:

- Topography sub-factor;
- Soil sub-factor; and
- Cover sub-factor.

The subfactor for topography used a range of representative parameters for the surrounding areas including 0.1 for the forested areas; 0.15 for the agricultural areas and 0.20 for a flatter, naturalized area. The soils are generally comprised of till as per the water balance calculations. The existing vegetation sub-factor was selected to represent both the wooded and agricultural areas of the Site (see Appendix F.2 for breakdown of areas). Table 6.1 summarizes the expected pre-development water balance values for the Site.

Table 6.1 Pre-Development Summary

Total Precipitation (Peterborough A):	- 855 mm/year
Regional Evapotranspiration:	- 556 mm/year
Recharge Available:	- 299 mm/year
Area of Recharge Available (Site):	- 49.22 ha
Total Water Surplus:	- 148,335 m ³ /year
Total Estimated Infiltration:	- 70,356 m ³ /year
Total Estimated Runoff:	- 77,979 m ³ /year



Based upon these values, the overall Sites infiltrate on the order of 70,350 m³ per year or about 145 mm/year.

6.3 Post-Development Water Balance (No Enhancements)

The computation of the water budget was repeated for the proposed house construction assuming no mitigation techniques, that is, runoff from impervious surfaces is unrecoverable and not infiltrated into the ground. The anticipated impact of the proposed construction is related to increased runoff from impervious surfaces such as building roof tops, paved roadways, driveways and parking areas. These are assumed to be impervious surfaces with zero infiltration capacity in this model. A summary of the computations is provided in Table 6.2.

Table 6.2 Post-Development Summary (No Enhancements)

Area of Site:	- 49.22 ha
Impervious Surfaces:	- 20.56 ha
Pervious Surfaces	- 28.66 ha
Total Water Surplus:	- 226,439 m ³ /year
Total Estimated Infiltration:	- 42,674 m ³ /year
Infiltration % Difference (pre- vs. post-):	- (-39%) (decrease)
Total Estimated Runoff:	- 183,765 m ³ /year
Runoff % Difference (pre- vs. post-):	- (136%) (increase)

Information that was provided to GHD in order to compute the post-development water budget in Table 6.2 included evaporation from impervious surfaces (20% of precipitation) and development areas gleaned from the “Draft Concept” prepared by The Biglieri Group Ltd., dated February 20, 2020:

- Single detached lots – 15.86 ha:
 - o Assume rooftops cover 60% of the lots;
 - o Assume paved driveways cover 15% of the lots; and
 - o Assume manicured lawns cover 25% of the lots.
- Townhouse lots – 3.57 ha:
 - o Assume rooftops cover 75% of the lots;
 - o Assume paved driveways cover 5% of the lots; and
 - o Assume manicured lawns cover 20% of the lots.
- Medium density (5-storey building) lot – 0.88 ha:
 - o Assume rooftop covers 60% of the lot;
 - o Assume paved parking area / driveway covers 20 of the lot; and
 - o Assume manicured lawn covers 20% of the lots.
- Parkland and trails – 2.10 ha;
- Right-of-ways – 7.65 ha:
 - o Assume paved asphalt / concrete surfaces cover 50% of the right-of-ways; and
 - o Assume manicured lawn covers 50% of the right-of-ways.
- Natural heritage system – 16.43 ha;
- Easement – 0.01 ha;
- Stormwater facility – 2.57 ha;
 - o Assume pond area – 1.285 ha; and
 - o Grass / open space – 1.285 ha.
- Road widening – 0.16 ha.



Under this scenario, the total infiltration volume decreased by 39% and runoff volume increased by 136%.

Within the areas evaluated, the infiltration has reduced and the runoff increased versus the pre-development values. Groundwater base flow would be expected to decrease over time in this scenario. Based upon this scenario, mitigative strategies are required to minimize infiltration losses and reduce storm water runoff. The following section discusses the water balance after considering the mitigation strategy of conveying rooftop stormwater to the ground for infiltration.

6.4 Post-Development Water Balance (Enhanced Infiltration)

The post-construction water budget computations were repeated considering enhanced infiltration options which are also known as Low Impact Development (LID) technologies. These technologies include and are not restricted to rainwater harvesting, downspout disconnection, infiltration trenches, vegetated filter strips, bioretention, permeable pavement, enhanced grass swales, dry swales and perforated pipe systems. For this Site, downspout disconnection was considered as a LID used to balance the water budget.

Based upon LID documentation, downspout disconnections can reduce rooftop runoff by 25% to 50% (i.e. 25% to 50% of the rooftop runoff can be infiltrated). Our water balance suggests that about 31% of all the available rooftop runoff (after evaporation) is needed to infiltrate the soils to maintain the pre-development infiltration values.

A summary of the post-construction water budget with enhancements for infiltration is presented in Table 6.3.

Table 6.3 Post-Development Summary (With Downspout Disconnection)

Area of Site:	- 49.22 ha
Total Water Surplus:	- 226,439 m ³ /year
% of Rooftop Runoff Required for Infiltration	- 31.8%
Rooftop Runoff Infiltrated	- 27,682 m ³ /year
Total Estimated Infiltration:	- 70,356 m ³ /year
Infiltration % Difference (pre- vs. post-):	- (0%) (meets pre-development)
Total Estimated Runoff:	- 156,083 m ³ /year
Runoff % Difference (pre- vs. post-):	- 100% (increase)

In this scenario and based on the information provided, the post-development infiltration values meet the pre-development values. Runoff has increased as compared with the pre-development conditions and will need to be managed as per a storm water management plan. In general, these water balance calculations indicate development infiltration values can be maintained at pre-development values for the overall development.

Appendix F

Water Balance Calculations

Appendix F.1

Revised Water Budget (Thornthwaite Method) - Average Values*

Weather Station: Peterborough A

Climate Station: 6166418

Elevation: 191 masl

Distance Away: ~ 10.2 km

Month	Mean Temperature (°C)	Heat Index	Unadjusted Potential ET (mm)	Daylight Correction Factor	Adjusted ET (mm)	Total Precipitation (mm)
January	-8.5	0	0	0.78	0	57.4
February	-7.5	0	0	0.88	0	51.5
March	-1.8	0	0	0.99	0	56.1
April	5.9	1.28	28.8	1.12	32.2	68.6
May	12.1	3.81	60.1	1.22	73.3	81.5
June	17	6.38	85.1	1.28	109.0	79.9
July	19.6	7.91	98.5	1.25	123.1	70.6
August	18.3	7.13	91.8	1.15	105.6	77
September	13.9	4.70	69.2	1.04	72.0	85.3
October	7.5	1.85	36.8	0.92	33.8	76.9
November	1.9	0.23	9.0	0.8	7.2	86.4
December	-4.4	0	0	0.76	0	64.2
TOTAL	6.2	33.3	479.3		556.2	855.4
TOTAL WATER SURPLUS: 299.2 mm						

Notes:

*Average values of precipitation were used. Average values of temperature were also used.

Appendix F.2
Water Budget Pre-Development

Catchment Designation	PRE-DEVELOPMENT SITE							TOTAL
	Agricultural Area	Naturalized Areas	Forested Area	787 & 825 Residential Areas				
				Lawn	Rooftops	Pool/Concrete	Gravel Drive	
Area (m ²)	270855	30200	183400	4935	725	185	1900	492200
Pervious Area (m ²)	270855	30200	183400	4935	0	0	1900	491290
% Pervious	55.0%	6.1%	37.3%	1.0%	0%	0%	0.4%	99.8%
Impervious Area (m ²)	0	0	0	0	725	185	0	910
% Impervious	0%	0%	0%	0%	0.1%	0.04%	0%	0.2%
INFILTRATION FACTORS								
Topography Infiltration Factor	0.15	0.2	0.1	0.2	0	0	0.2	
Soil Infiltration Factor	0.2	0.2	0.2	0.2	0	0	0.3	
Land Cover Infiltration Factor	0.1	0.15	0.2	0.15	0	0	0	
MECP Infiltration Factor	0.45	0.55	0.5	0.55	0	0	0.5	
Actual Infiltration Factor	0.45	0.55	0.5	0.55	0	0	0.4	
Runoff Coefficient	0.55	0.45	0.5	0.45	1	1	0.6	
Runoff from Impervious Surfaces*	0	0	0	0	0.8	0.8	0.8	
INPUTS (PER UNIT AREA)								
Precipitation (mm/yr)	855	855	855	855	855	855	855	855
Run On (mm/yr)	0	0	0	0	0	0	0	0
Other Inputs (mm/yr)	0	0	0	0	0	0	0	0
Total Inputs (mm/yr)	855	855	855	855	855	855	855	855
OUTPUTS (PER UNIT AREA)								
Precipitation Surplus (mm/yr)	299	299	299	299	684	684	684	301
Net Surplus (mm/yr)	299	299	299	299	684	684	684	301
Evapotranspiration (mm/yr)	556	556	556	556	171	171	171	554
Infiltration (mm/yr)	135	165	150	165	0	0	274	143
Rooftop Infiltration (mm/yr)	0	0	0	0	171	171	0	0
Total Infiltration (mm/yr)	135	165	150	165	171	171	274	143
Runoff Pervious Areas	165	135	150	135	0	0	411	157
Runoff Impervious Areas	0	0	0	0	513	513	0	1
Total Runoff (mm/yr)	165	135	150	135	513	513	411	158
Total Outputs (mm/yr)	855	855	855	855	855	855	855	855
Difference (Inputs - Outputs)	0	0	0	0	0	0	0	0
INPUTS (VOLUMES)								
Precipitation (m ³ /yr)	231689	25833	156880	4221	620	158	1625	421028
Run On (m ³ /yr)	0	0	0	0	0	0	0	0
Other Inputs (m ³ /yr)	0	0	0	0	0	0	0	0
Total Inputs (m ³ /yr)	231689	25833	156880	4221	620	158	1625	421028
OUTPUTS (VOLUMES)								
Precipitation Surplus (m ³ /yr)	81032	9035	54868	1476	496	127	1300	148335
Net Surplus (m ³ /yr)	81032	9035	54868	1476	496	127	1300	148335
Evapotranspiration (m ³ /yr)	150657	16798	102012	2745	124	32	325	272693
Infiltration (m ³ /yr)	36465	4969	27434	812	0	0	520	70200
Rooftop Infiltration (m ³ /yr)	0	0	0	0	124	32	0	156
Total Infiltration (m ³ /yr)	36465	4969	27434	812	124	32	520	70356
Runoff Pervious Areas (m ³ /yr)	44568	4066	27434	664	0	0	780	77512
Runoff Impervious Areas (m ³ /yr)	0	0	0	0	372	95	0	467
Total Runoff (m ³ /yr)	44568	4066	27434	664	372	95	780	77979
Total Outputs (m ³ /yr)	231689	25833	156880	4221	620	158	1625	421028
Difference (Inputs - Outputs)	0	0	0	0	0	0	0	0

Notes:
Forested areas include hedge rows
Naturalized areas are open, vacant areas that are not used for agriculture and are not forested areas

Table 2: Infiltration Factors	
Description of Area/Development Site	Value of Infiltration Factor
TOPOGRAPHY	
■ Flat land, average slope not exceeding 0.6 m per km	0.30
■ Rolling land, average slope of 2.8 m to 3.8 m per km	0.20
■ Hilly land, average slope of 28 m to 47 m per km	0.10
SOIL	
■ Tight impervious clay	0.10
■ Medium combinations of clay and loam	0.20
■ Open sandy loam	0.4
COVER	
■ Cultivated lands	0.1
■ Woodland	0.2

Table 3: Typical Ground Water Recharge Rates		
Soil Texture	Ground Water Recharge Rate	
	(mm/yr)	(L/Day/Hectare)
■ coarse sand and gravel	250+	7000+
■ fine to medium sand	200 - 250	5600 - 7000
■ silty sand to sandy silt	150 - 200	4200 - 5600
■ silt	125 - 150	3500 - 4200
■ clayey silt	100 - 125	2800 - 3500
■ clay	less than 100	less than 2800

Appendix F.3

Water Budget Post-Development - No Mitigation Strategies

Catchment Designation				POST-DEVELOPMENT SITE														TOTAL
	Low Density - Blocks A,B,C - 329 units			Med. Density - Townhouses			Natural	Road	Road ROWs		Parkland	Medium Density - 5-storey bldg			Easement	SWM Pond		
	Lawns	Rooftops	Driveways	Lawns	Rooftops	Driveways	Heritage	Widening	Asphalt	Grass	& Trails	Landscaping	Rooftops	Asphalt		Grass	Pond	
Area (m ²)	39650	95160	23790	7140	26775	1785	164300	1600	38200	38200	21000	1760	5280	1760	100	12850	12850	492200
Pervious Area (m ²)	39650	0	0	7140	0	0	164300	1600	0	38200	21000	1760	0	0	100	12850	0	286600
% Pervious	8.1%	0%	0%	1%	0%	0%	33.4%	0.3%	0%	7.8%	4.3%	0.4%	0%	0%	0.02%	2.6%	0%	58.2%
Impervious Area (m ²)	0	95160	23790	0	26775	1785	0	0	38200	0	0	0	5280	1760	0	0	12850	205600
% Impervious	0%	19.3%	4.8%	0%	5.4%	0.4%	0%	0%	7.8%	0%	0%	0%	1.1%	0.4%	0%	0%	2.6%	41.8%
	INFILTRATION FACTORS																	
Topography Infiltration Factor	0.15	0	0	0.15	0	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0	0	0.2	0.1	0	
Soil Infiltration Factor	0.2	0	0	0.2	0	0	0.2	0.2	0	0.2	0.2	0.2	0	0	0.2	0.2	0	
Land Cover Infiltration Factor	0.15	0	0	0.15	0	0	0.2	0.15	0	0.15	0	0.15	0	0	0.15	0.15	0	
MECP Infiltration Factor	0.5	0	0	0.5	0	0.2	0.5	0.55	0.2	0.55	0.4	0.55	0	0	0.55	0.45	0	
Actual Infiltration Factor	0.5	0	0	0.5	0	0	0.5	0.55	0	0.55	0.4	0.55	0	0	0.55	0.45	0	
Runoff Coefficient	0.5	1	1	0.5	1	1	0.5	0.45	1	0.45	0.6	0.45	1	1	0.45	0.55	1	
Runoff from Impervious Surfaces*	0	0.8	0.8	0	0.8	0.8	0	0	0.8	0	0.8	0	0.8	0.8	0	0	0.8	
	INPUTS (PER UNIT AREA)																	
Precipitation (mm/yr)	855	855	855	855	855	855	855	855	855	855	855	855	855	855	855	855	855	855
Run On (mm/yr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Inputs (mm/yr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Inputs (mm/yr)	855	855	855	855	855	855	855	855	855	855	855	855	855	855	855	855	855	855
	OUTPUTS (PER UNIT AREA)																	
Precipitation Surplus (mm/yr)	299	684	684	299	684	684	299	299	684	299	299	299	684	684	299	299	684	460
Net Surplus (mm/yr)	299	684	684	299	684	684	299	299	684	299	299	299	684	684	299	299	684	460
Evapotranspiration (mm/yr)	556	171	171	556	171	171	556	556	171	556	556	556	171	171	556	556	171	395
Infiltration (mm/yr)	150	0	0	150	0	0	150	165	0	165	120	165	0	0	165	135	0	87
Rooftop Infiltration (mm/yr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Infiltration (mm/yr)	150	0	0	150	0	0	150	165	0	165	120	165	0	0	165	135	0	87
Runoff Pervious Areas	150	0	0	150	0	0	150	135	0	135	180	135	0	0	135	165	0	88
Runoff Impervious Areas	0	684	684	0	684	684	0	0	684	0	0	0	684	684	0	0	684	286
Total Runoff (mm/yr)	150	684	684	150	684	684	150	135	684	135	180	135	684	684	135	165	684	373
Total Outputs (mm/yr)	855	855	855	855	855	855	855	855	855	855	855	855	855	855	855	855	855	855
Difference (Inputs - Outputs)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	INPUTS (VOLUMES)																	
Precipitation (m ³ /yr)	33917	81400	20350	6108	22903	1527	140542	1369	32676	32676	17963	1506	4517	1506	86	10992	10992	421028
Run On (m ³ /yr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Inputs (m ³ /yr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Inputs (m ³ /yr)	33917	81400	20350	6108	22903	1527	140542	1369	32676	32676	17963	1506	4517	1506	86	10992	10992	421028
	OUTPUTS (VOLUMES)																	
Precipitation Surplus (m ³ /yr)	11862	65120	16280	2136	18323	1222	49154	479	26141	11428	6283	527	3613	1204	30	3844	8794	226439
Net Surplus (m ³ /yr)	11862	65120	16280	2136	18323	1222	49154	479	26141	11428	6283	527	3613	1204	30	3844	8794	226439
Evapotranspiration (m ³ /yr)	22054	16280	4070	3971	4581	305	91388	890	6535	21248	11681	979	903	301	56	7148	2198	194589
Infiltration (m ³ /yr)	5931	0	0	1068	0	0	24577	263	0	6286	2513	290	0	0	16	1730	0	42674
Rooftop Infiltration (m ³ /yr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Infiltration (m ³ /yr)	5931	0	0	1068	0	0	24577	263	0	6286	2513	290	0	0	16	1730	0	42674
Runoff Pervious Areas (m ³ /yr)	5931	0	0	1068	0	0	24577	215	0	5143	3770	237	0	0	13	2114	0	43069
Runoff Impervious Areas (m ³ /yr)	0	65120	16280	0	18323	1222	0	0	26141	0	0	0	3613	1204	0	0	8794	140696
Total Runoff (m ³ /yr)	5931	65120	16280	1068	18323	1222	24577	215	26141	5143	3770	237	3613	1204	13	2114	8794	183765
Total Outputs (m ³ /yr)	33917	81400	20350	6108	22903	1527	140542	1369	32676	32676	17963	1506	4517	1506	86	10992	10992	421028
Difference (Inputs - Outputs)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes:

*Evaporation from impervious areas was assumed to be 20% of precipitation.

Asphalt has 0% infiltration capability

Low Density Single Lots: Assume rooftops cover about 60% of the lot. Driveways cover about 15% of the lot; Grass (lawns) cover about 25% of the lot.

Medium Density 5-storey building lot: Assume rooftops cover about 60% of the lot. Parking areas cover about 20% of the lot; Grass (lawns) cover about 20% of the lot.

Medium Density Townhouse Lots: Assume rooftops cover about 75% of the lot. Driveways cover about 5% of the lot; Grass (lawns) cover about 20% of the lot.

Commercial Lots: Based upon information provided to GHD, assume rooftops covers about 13% of the lot. Asphalt parking covers about 80% of the lot; Landscaping covers about 7% of the lot.

Road ROWs assumed to be 50% asphalt and 50% grass

Appendix F.4

Water Budget Post-Development - With Downspout Disconnection Mitigation Strategies

Catchment Designation				POST-DEVELOPMENT SITE														TOTAL
	Low Density - Blocks A,B,C - 329 units			Med. Density - Townhouses			Natural	Road	Road ROWs		Parkland	Medium Density - 5-storey bldg			Easement	SWM Pond		
	Lawns	Rooftops	Driveways	Lawns	Rooftops	Driveways	Heritage	Widening	Asphalt	Grass	& Trails	Landscaping	Rooftops	Asphalt		Grass	Pond	
Area (m ²)	39650	95160	23790	7140	26775	1785	164300	1600	38200	38200	21000	1760	5280	1760	100	12850	12850	492200
Pervious Area (m ²)	39650	0	0	7140	0	0	164300	1600	0	38200	21000	1760	0	0	100	12850	0	286600
% Pervious	8.1%	0%	0%	1%	0%	0%	33.4%	0.3%	0%	7.8%	4.3%	0.4%	0%	0%	0.02%	2.6%	0%	58.2%
Impervious Area (m ²)	0	95160	23790	0	26775	1785	0	0	38200	0	0	0	5280	1760	0	0	12850	205600
% Impervious	0%	19.3%	4.8%	0%	5.4%	0.4%	0%	0%	7.8%	0%	0%	0%	1.1%	0.4%	0%	0%	2.6%	41.8%
	INFILTRATION FACTORS																	
Topography Infiltration Factor	0.15	0	0	0.15	0	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0	0	0.2	0.1	0	
Soil Infiltration Factor	0.2	0	0	0.2	0	0	0.2	0.2	0	0.2	0.2	0.2	0	0	0.2	0.2	0	
Land Cover Infiltration Factor	0.15	0	0	0.15	0	0	0.2	0.15	0	0.15	0	0.15	0	0	0.15	0.15	0	
MECP Infiltration Factor	0.5	0	0	0.5	0	0.2	0.5	0.55	0.2	0.55	0.4	0.55	0	0	0.55	0.45	0	
Actual Infiltration Factor	0.5	0	0	0.5	0	0	0.5	0.55	0	0.55	0.4	0.55	0	0	0.55	0.45	0	
Runoff Coefficient	0.5	1	1	0.5	1	1	0.5	0.45	1	0.45	0.6	0.45	1	1	0.45	0.55	1	
Runoff from Impervious Surfaces*	0	0.8	0.8	0	0.8	0.8	0	0	0.8	0	0.8	0	0.8	0.8	0	0	0.8	
	INPUTS (PER UNIT AREA)																	
Precipitation (mm/yr)	855	855	855	855	855	855	855	855	855	855	855	855	855	855	855	855	855	855
Run On (mm/yr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Inputs (mm/yr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Inputs (mm/yr)	855	855	855	855	855	855	855	855	855	855	855	855	855	855	855	855	855	855
	OUTPUTS (PER UNIT AREA)																	
Precipitation Surplus (mm/yr)	299	684	684	299	684	684	299	299	684	299	299	299	684	684	299	299	684	460
Net Surplus (mm/yr)	299	684	684	299	684	684	299	299	684	299	299	299	684	684	299	299	684	460
Evapotranspiration (mm/yr)	556	171	171	556	171	171	556	556	171	556	556	556	171	171	556	556	171	395
Infiltration (mm/yr)	150	0	0	150	0	0	150	165	0	165	120	165	0	0	165	135	0	87
%Rooftop Required to Meet Pre-Development	--	32%	--	--	32%	--	--	--	--	--	--	--	32%	--	--	--	--	
Rooftop Infiltration (mm/yr)	0	218	0	0	218	0	0	0	0	0	0	0	218	0	0	0	0	56
Total Infiltration (mm/yr)	150	218	0	150	218	0	150	165	0	165	120	165	218	0	165	135	0	143
Runoff Pervious Areas	150	0	0	150	0	0	150	135	0	135	180	135	0	0	135	165	0	88
Runoff Impervious Areas	0	467	684	0	467	684	0	0	684	0	0	0	467	684	0	0	684	230
Total Runoff (mm/yr)	150	467	684	150	467	684	150	135	684	135	180	135	467	684	135	165	684	317
Total Outputs (mm/yr)	855	855	855	855	855	855	855	855	855	855	855	855	855	855	855	855	855	855
Difference (Inputs - Outputs)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	INPUTS (VOLUMES)																	
Precipitation (m ³ /yr)	33917	81400	20350	6108	22903	1527	140542	1369	32676	32676	17963	1506	4517	1506	86	10992	10992	421028
Run On (m ³ /yr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Inputs (m ³ /yr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Inputs (m ³ /yr)	33917	81400	20350	6108	22903	1527	140542	1369	32676	32676	17963	1506	4517	1506	86	10992	10992	421028
	OUTPUTS (VOLUMES)																	
Precipitation Surplus (m ³ /yr)	11862	65120	16280	2136	18323	1222	49154	479	26141	11428	6283	527	3613	1204	30	3844	8794	226439
Net Surplus (m ³ /yr)	11862	65120	16280	2136	18323	1222	49154	479	26141	11428	6283	527	3613	1204	30	3844	8794	226439
Evapotranspiration (m ³ /yr)	22054	16280	4070	3971	4581	305	91388	890	6535	21248	11681	979	903	301	56	7148	2198	194589
Infiltration (m ³ /yr)	5931	0	0	1068	0	0	24577	263	0	6286	2513	290	0	0	16	1730	0	42674
Rooftop Infiltration (m ³ /yr)	0	20707	0	0	5826	0	0	0	0	0	0	0	1149	0	0	0	0	27682
Total Infiltration (m ³ /yr)	5931	20707	0	1068	5826	0	24577	263	0	6286	2513	290	1149	0	16	1730	0	70356
Runoff Pervious Areas (m ³ /yr)	5931	0	0	1068	0	0	24577	215	0	5143	3770	237	0	0	13	2114	0	43069
Runoff Impervious Areas (m ³ /yr)	0	44413	16280	0	12496	1222	0	0	26141	0	0	0	2464	1204	0	0	8794	113015
Total Runoff (m ³ /yr)	5931	44413	16280	1068	12496	1222	24577	215	26141	5143	3770	237	2464	1204	13	2114	8794	156083
Total Outputs (m ³ /yr)	33917	81400	20350	6108	22903	1527	140542	1369	32676	32676	17963	1506	4517	1506	86	10992	10992	421028
Difference (Inputs - Outputs)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes:

*Evaporation from impervious areas was assumed to be 20% of precipitation.

Asphalt has 0% infiltration capability

Low Density Single Lots: Assume rooftops cover about 60% of the lot. Driveways cover about 15% of the lot; Grass (lawns) cover about 25% of the lot.

Medium Density Townhouse Lots: Assume rooftops cover about 75% of the lot. Driveways cover about 5% of the lot; Grass (lawns) cover about 20% of the lot.

Medium Density 5-storey Residential lot: Assume rooftops cover about 60% of the lot. Asphalt covers about 20% of the lot; Grass (lawn) cover about 20% of the lot.

Road ROWs assumed to be 50% asphalt and 50% grass

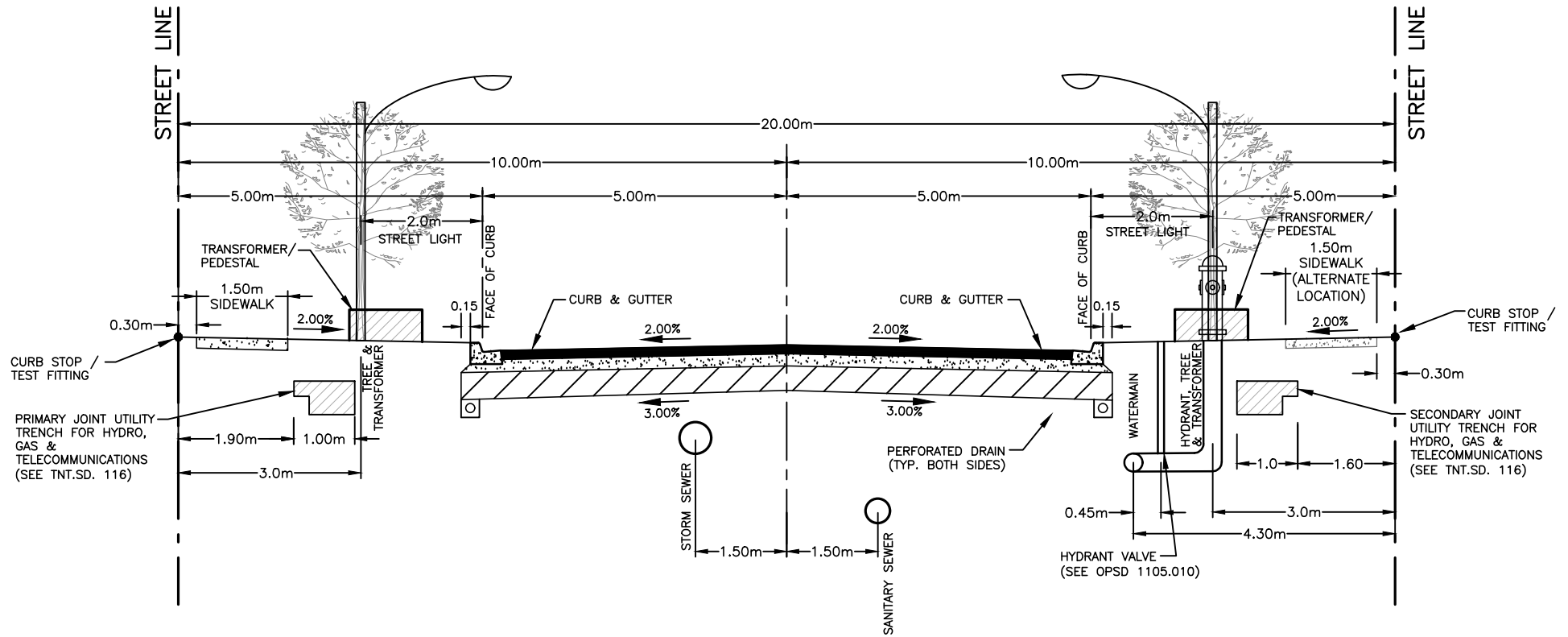
Appendix F.5
Water Budget Summary

PARAMETER	SITE				
	Pre-Development	Post-Development No Mitigation	Difference Pre- vs. Post-	Post-Development With Mitigation	Difference Pre- vs. Post-
INPUTS (VOLUMES)					
Precipitation (m³/yr)	421028	421028	0%	421028	0%
Run On (m³/yr)	0	0	0%	0	0%
Other Inputs (m³/yr)	0	0	0%	0	0%
Total Inputs (m³/yr)	421028	421028	0%	421028	0%
OUTPUTS (VOLUMES)					
Precipitation Surplus (m³/yr)	148335	226439	53%	226439	53%
Net Surplus (m³/yr)	148335	226439	53%	226439	53%
Evapotranspiration (m³/yr)	272693	194589	-29%	194589	-29%
Infiltration (m³/yr)	70200	42674	-39%	42674	-39%
% Rooftop Runoff to balance infiltration	--	--	--	32%	--
Rooftop Infiltration (m³/yr)	156	0	0%	27682	--
Total Infiltration (m³/yr)	70356	42674	-39%	70356	0%
Runoff Pervious Areas (m³/yr)	77512	43069	-44%	43069	-44%
Runoff Impervious Areas (m³/yr)	467	140696	--	113015	--
Total Runoff (m³/yr)	77979	183765	136%	156083	100%
Total Outputs (m³/yr)	421028	421028	0%	421028	0%

To maintain pre-development infiltration values;
32%
of post-development rooftop runoff needs to be infiltrated.

APPENDIX “G”

Standard Road Cross Sections



MILLBROOK SOUTH WEST
SUBDIVISION

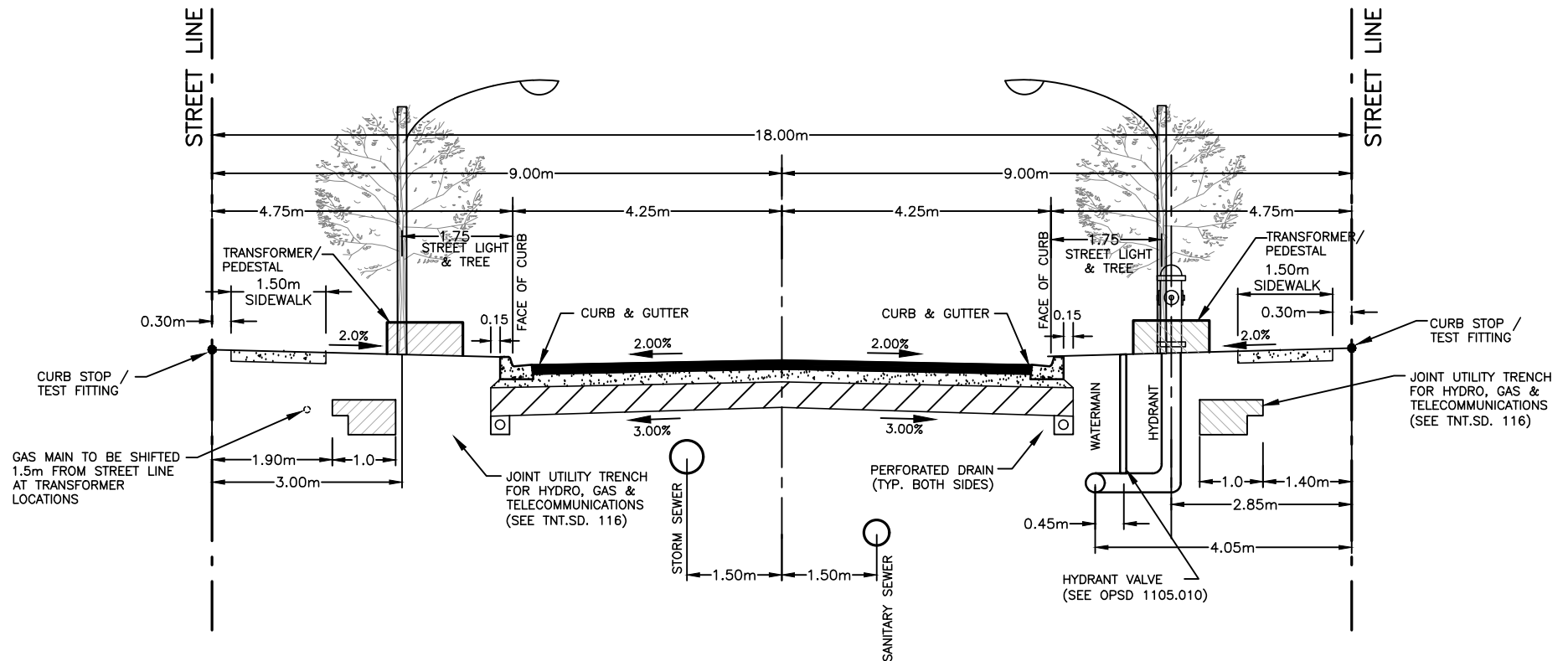
URBAN LOCAL
20.0m RIGHT-OF-WAY (10.0m ROAD)

NO.	REVISIONS	DATE	APR'D

SCALE: N.T.S.

DATE: May 2021

FIGURE G1



**MILLBROOK SOUTH WEST
SUBDIVISION**

**URBAN MINOR LOCAL
18.0m RIGHT-OF-WAY (8.50m ROAD)**

SCALE: N.T.S.

DATE: May 2021

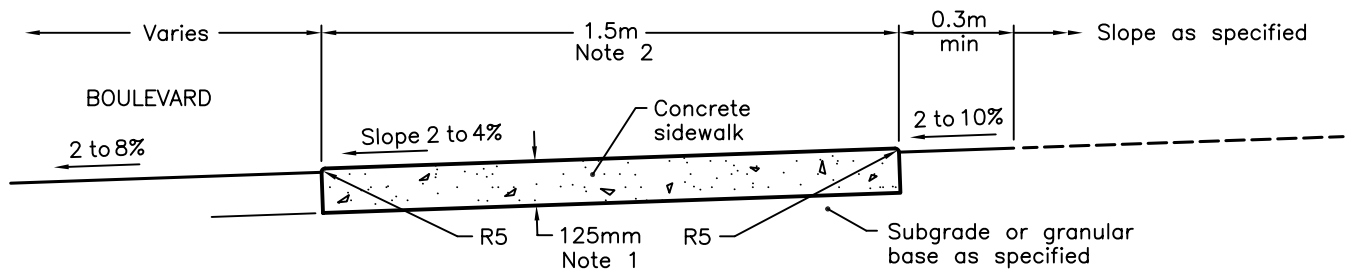
FIGURE G2

NO.

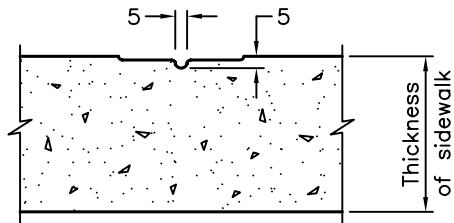
REVISIONS

DATE

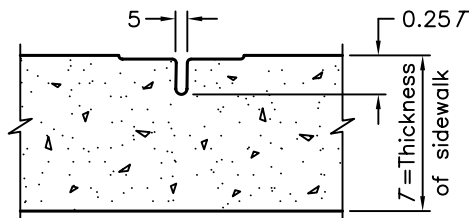
APR'D



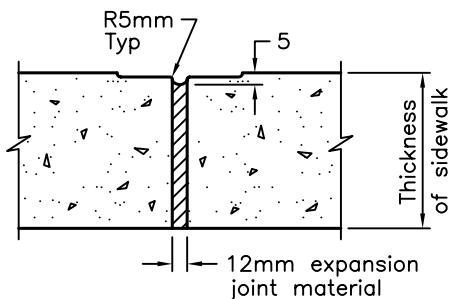
TYPICAL SECTION



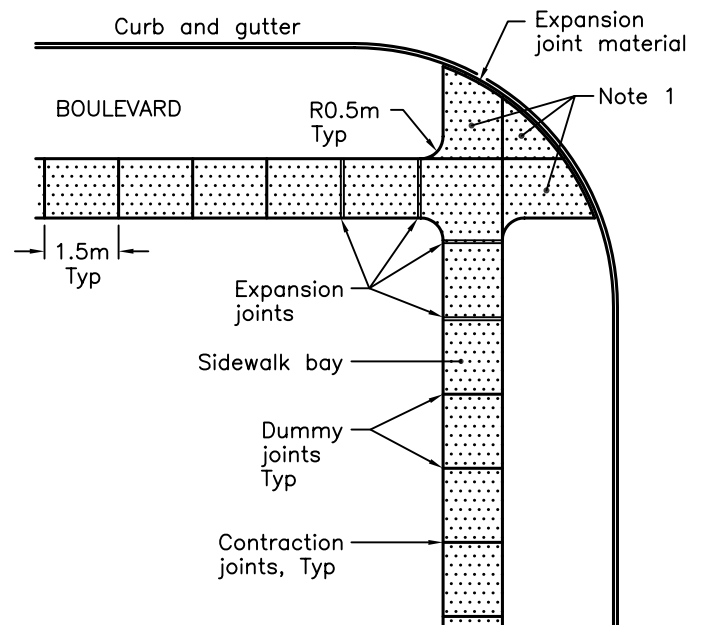
DUMMY JOINT



CONTRACTION JOINT



EXPANSION JOINT



JOINT LAYOUT

NOTES:

- 1 Sidewalk thickness at residential driveways and adjacent to curb shall be 150mm. At commercial and industrial driveways, the thickness shall be 200mm.
- 2 Sidewalk width shall be increased to 2.4m at schools, bus stops, and other high pedestrian areas.

- A This OPSD to be read in conjunction with OPSD-310.030.
- B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

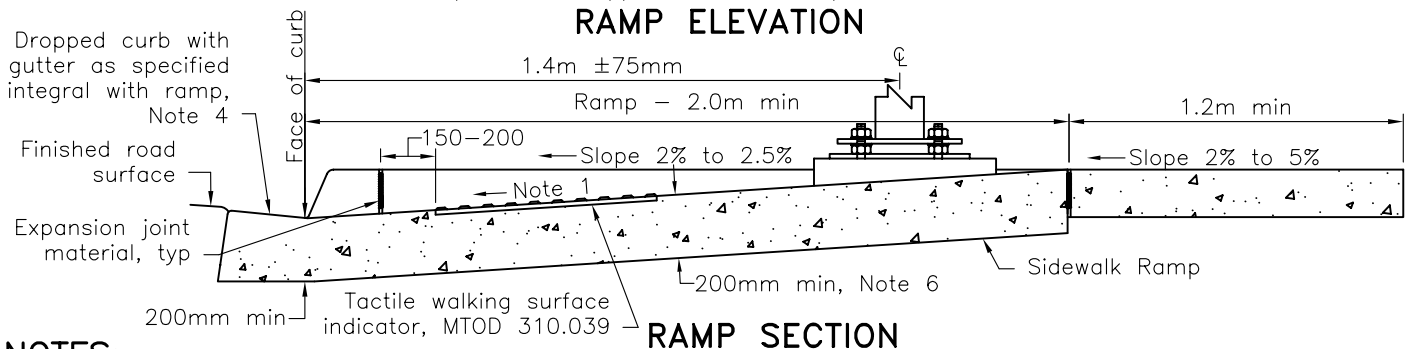
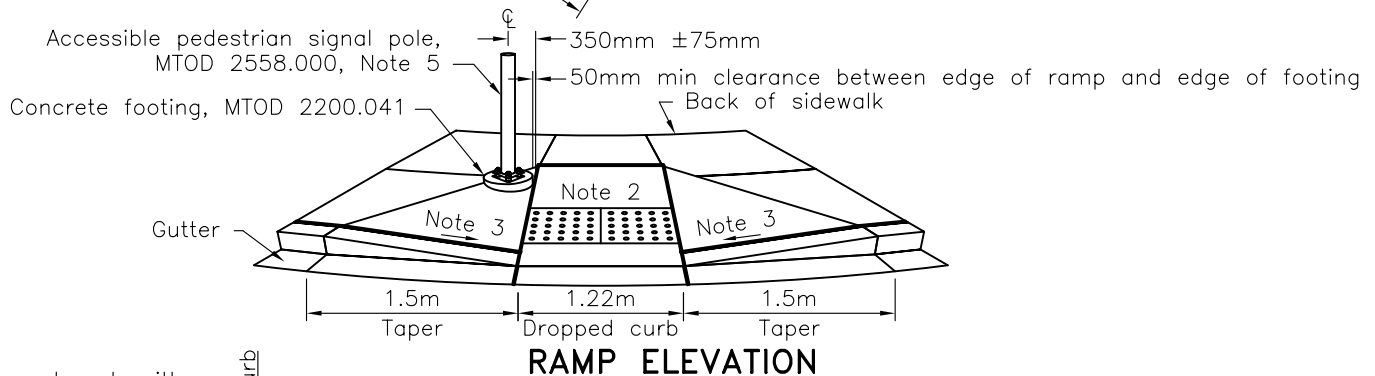
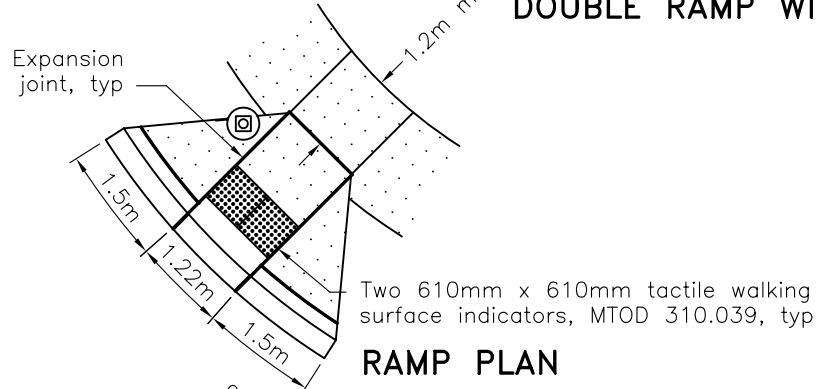
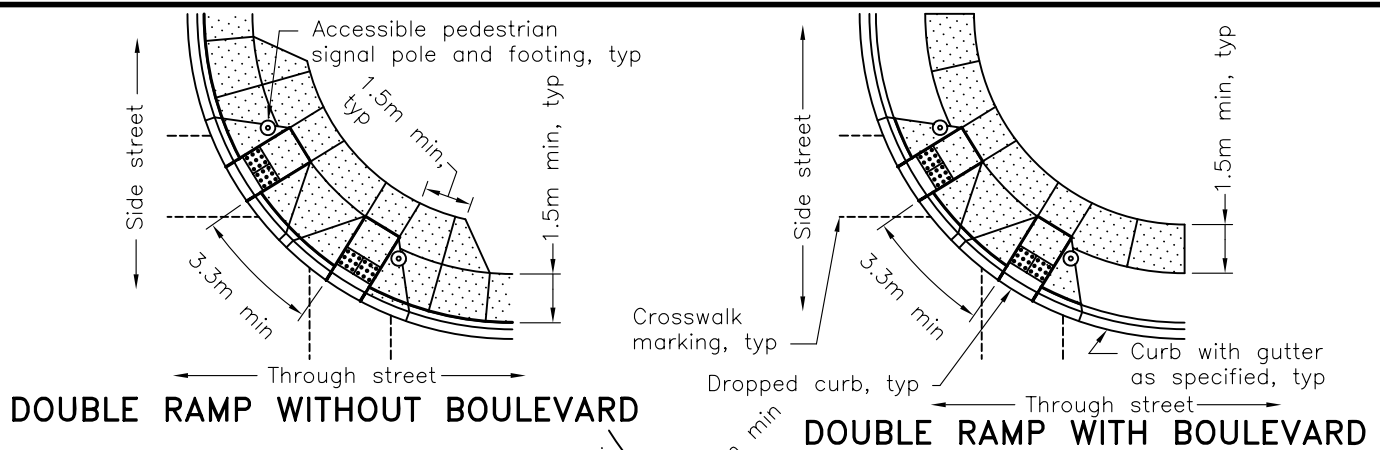
Nov 2005

Rev 1

CONCRETE SIDEWALK

OPSD - 310.010





NOTES:

- 1 Slope of ramp shall not exceed 10%.
 - 2 Cross slope of ramp shall not exceed 2% in either direction.
 - 3 Cross slope of flared side of ramp shall not exceed 10%.
 - 4 Dropped curb at ramp shall be modified to eliminate 30 mm step at gutter.
 - 5 Accessible pedestrian signal to have tactile arrow that aligns with direction of crosswalk.
 - 6 Minimum thickness of ramp is 200mm. Minimum thickness of sidewalk and flared sides adjacent to ramp is 150mm.
- A Where only one crosswalk is present at an intersection, only one curb ramp is required.
- B All dimensions are in millimetres unless otherwise shown.

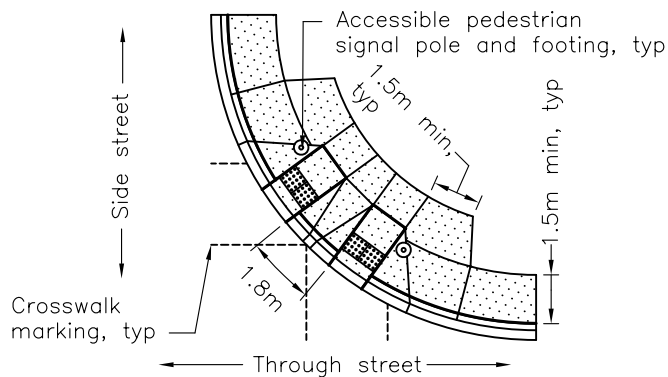
MINISTRY OF TRANSPORTATION ONTARIO DRAWING

Mar 2014

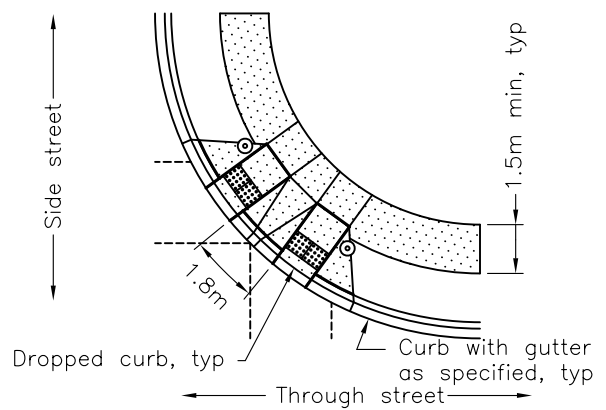
Rev

**CONCRETE SIDEWALK RAMPS AT
SIGNALIZED INTERSECTIONS**

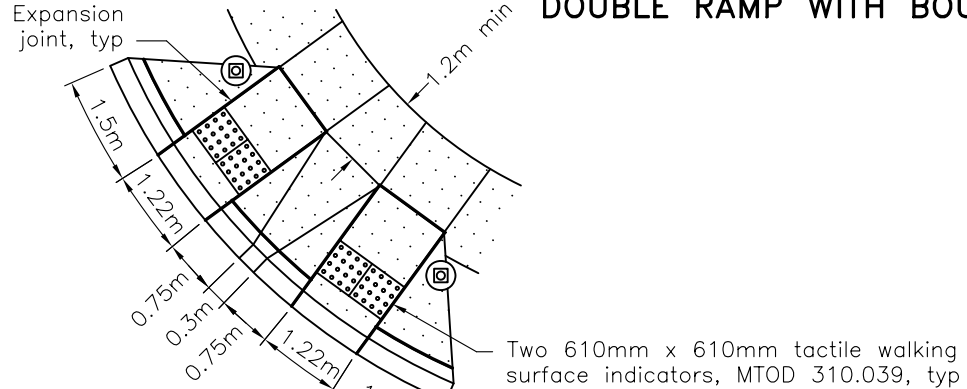
MTOD - 310.030



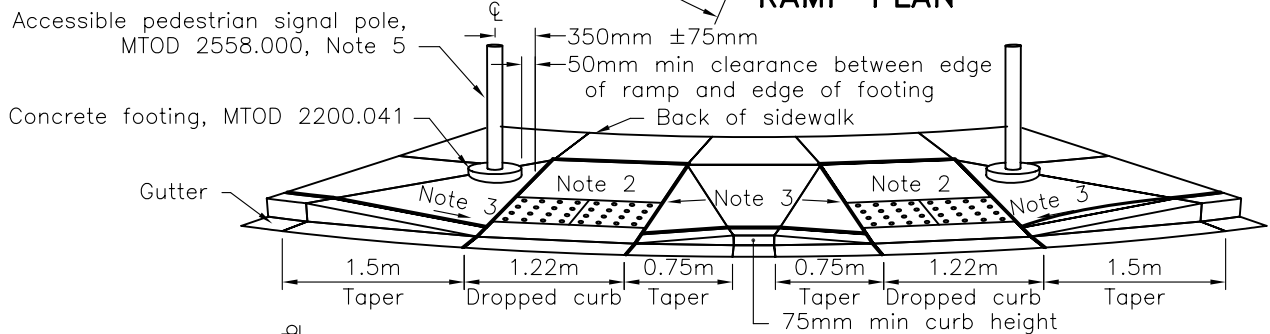
DOUBLE RAMP WITHOUT BOULEVARD



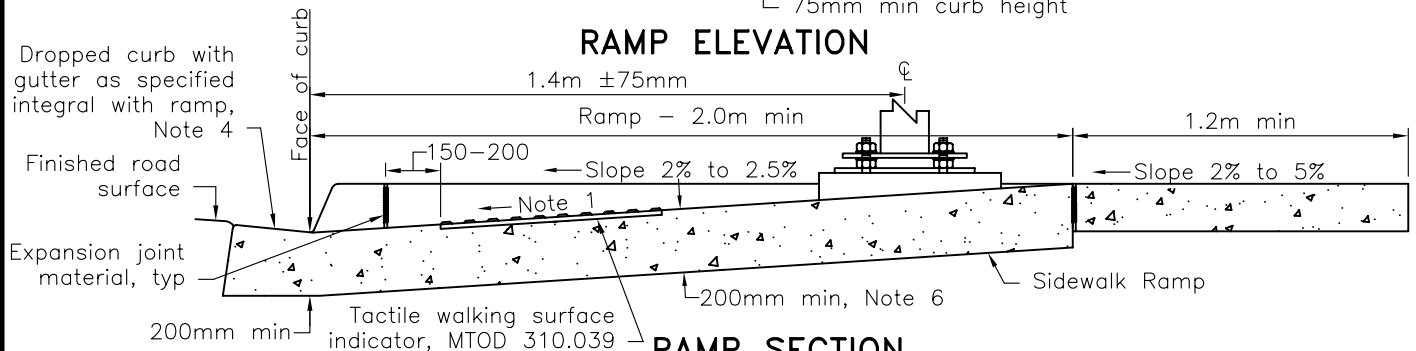
DOUBLE RAMP WITH BOULEVARD



RAMP PLAN



RAMP ELEVATION



RAMP SECTION

NOTES:

- 1 Slope of ramp shall not exceed 10%.
- 2 Cross slope of ramp shall not exceed 2% in either direction.
- 3 Cross slope of flared side of ramp shall not exceed 10%.
- 4 Dropped curb at ramp shall be modified to eliminate 30 mm step at gutter line.
- 5 Accessible pedestrian signal to have tactile arrow that aligns with direction of crosswalk.
- 6 Minimum thickness of ramp is 200mm. Minimum thickness of sidewalk and flared sides adjacent to ramp is 150mm.

A All dimensions are in millimetres unless otherwise shown.

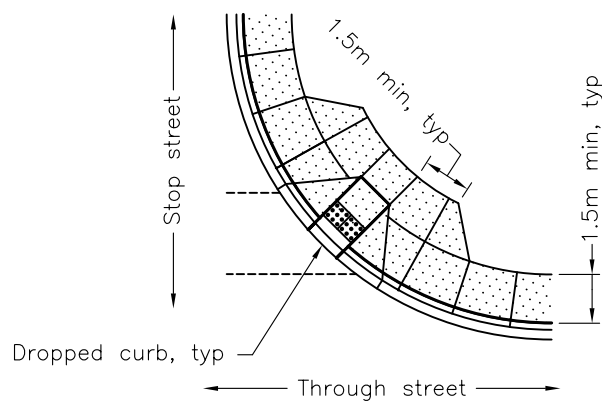
MINISTRY OF TRANSPORTATION ONTARIO DRAWING

Mar 2014

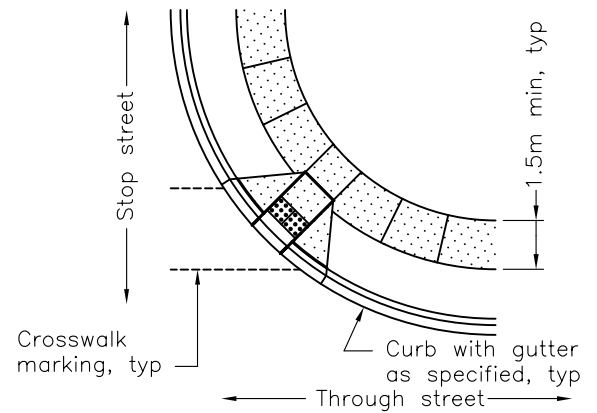
Rev

**CONCRETE SIDEWALK RAMPS AT
SIGNALIZED INTERSECTIONS WITH
INTERSECTING CROSSWALKS**

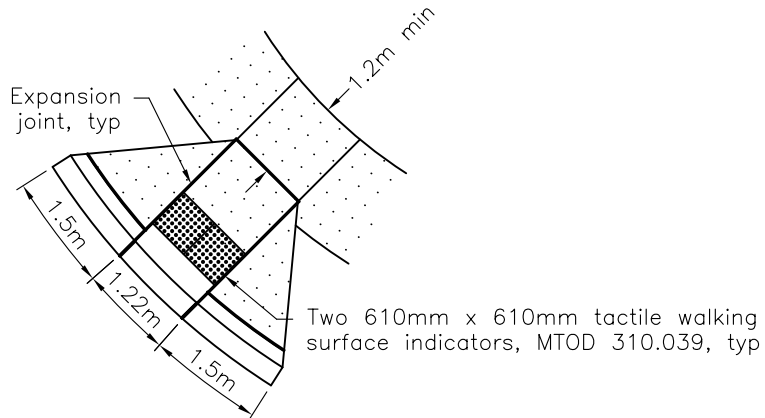
MTOD - 310.031



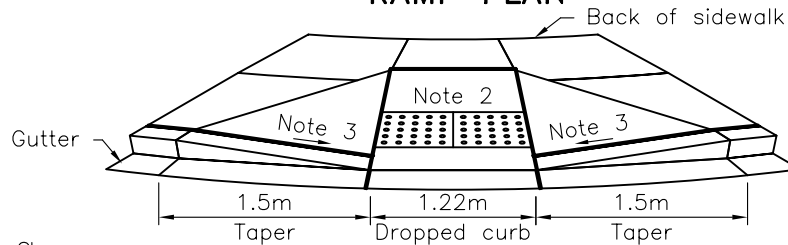
SINGLE RAMP WITHOUT BOULEVARD



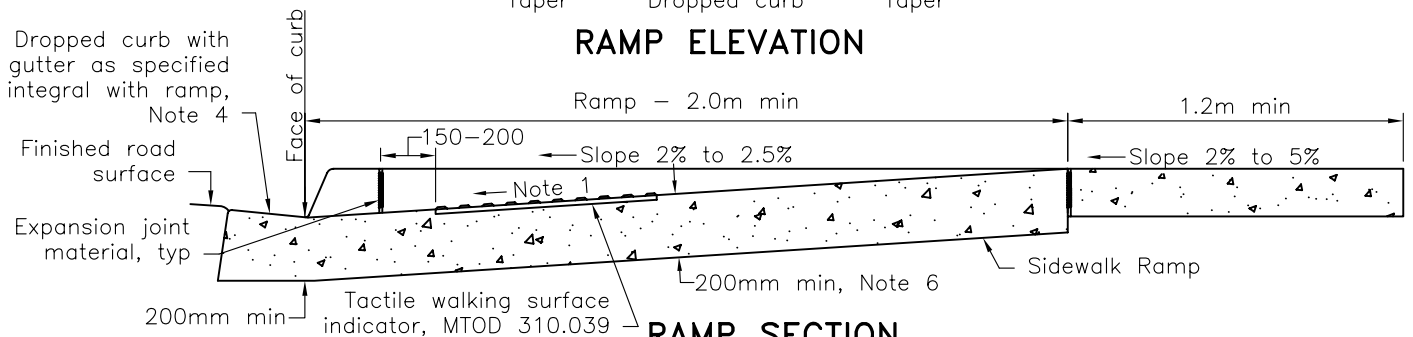
SINGLE RAMP WITH BOULEVARD



RAMP PLAN



RAMP ELEVATION



RAMP SECTION

NOTES:

- 1 Slope of ramp shall not exceed 10%.
- 2 Cross slope of ramp shall not exceed 2% in either direction.
- 3 Cross slope of flared side of ramp shall not exceed 10%.
- 4 Dropped curb at ramp shall be modified to eliminate 30 mm step at gutter line.
- 5 Minimum thickness of ramp is 200mm. Minimum thickness of sidewalk and flared sides adjacent to ramp is 150mm.
- A All dimensions are in millimetres unless otherwise shown.

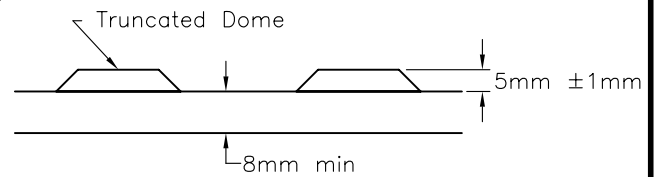
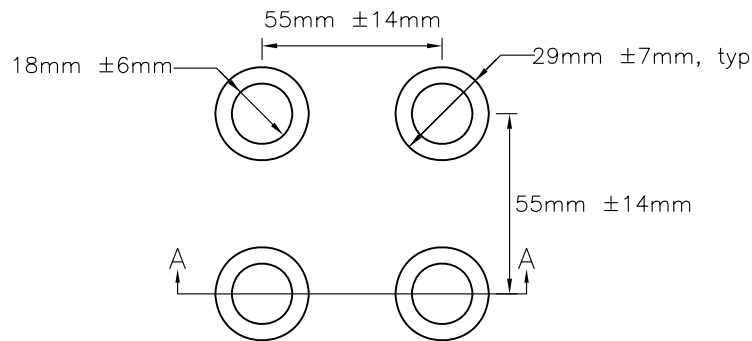
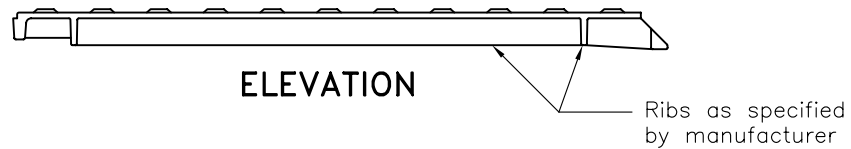
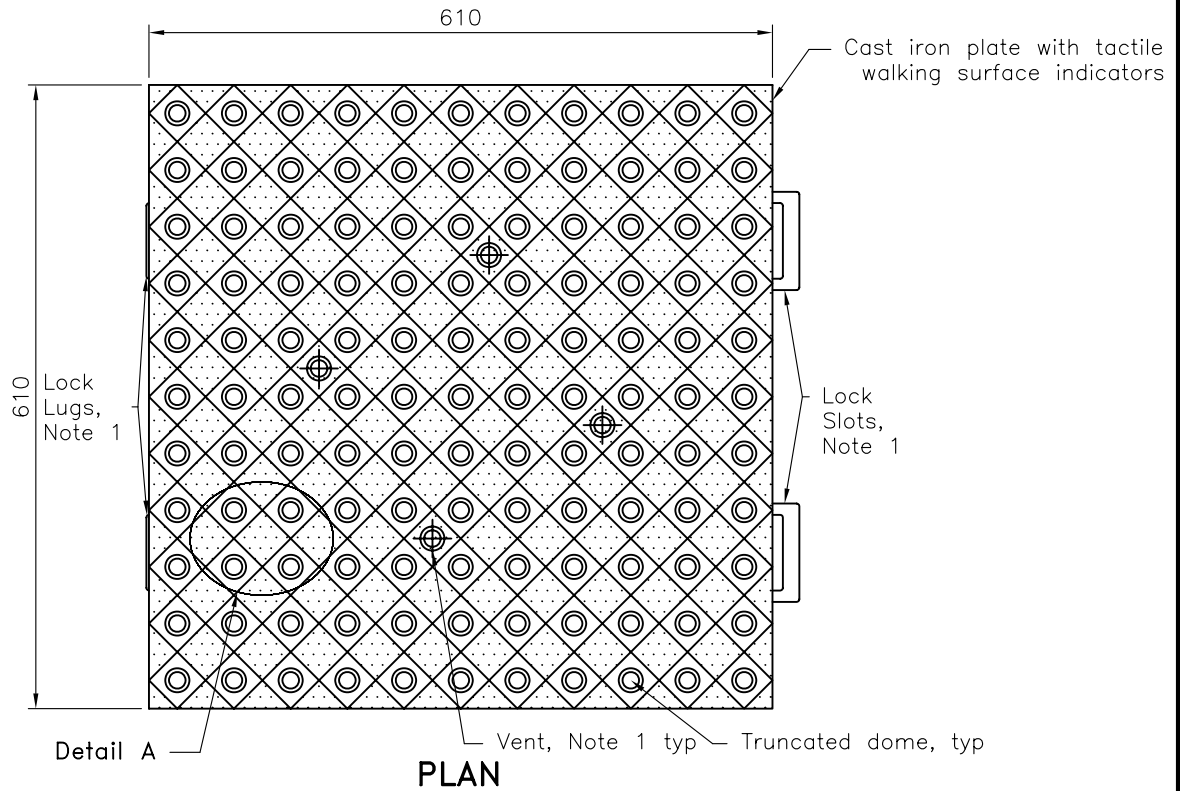
MINISTRY OF TRANSPORTATION ONTARIO DRAWING

Mar 2014

Rev

**CONCRETE SIDEWALK RAMPS AT
UNSIGNALIZED INTERSECTIONS**

MTOD - 310.032



SECTION A-A

**DETAIL A
TRUNCATED DOMES PLAN**

NOTES:

1 Lock lug and slots to interconnect adjacent cast iron plates, and vents, are proprietary to manufacturer

A The coefficient of friction of the cast iron plate shall not be less than 0.8.

B All dimensions are in millimetres unless otherwise shown.

MINISTRY OF TRANSPORTATION ONTARIO DRAWING

Mar 2014

Rev

**CONCRETE SIDEWALK RAMPS
TACTILE WALKING SURFACE
INDICATORS COMPONENT**

MTOD - 310.039

APPENDIX “H”

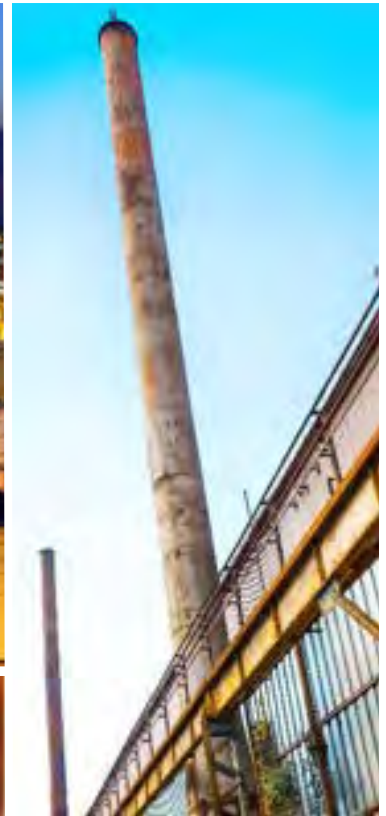
Borehole Logs

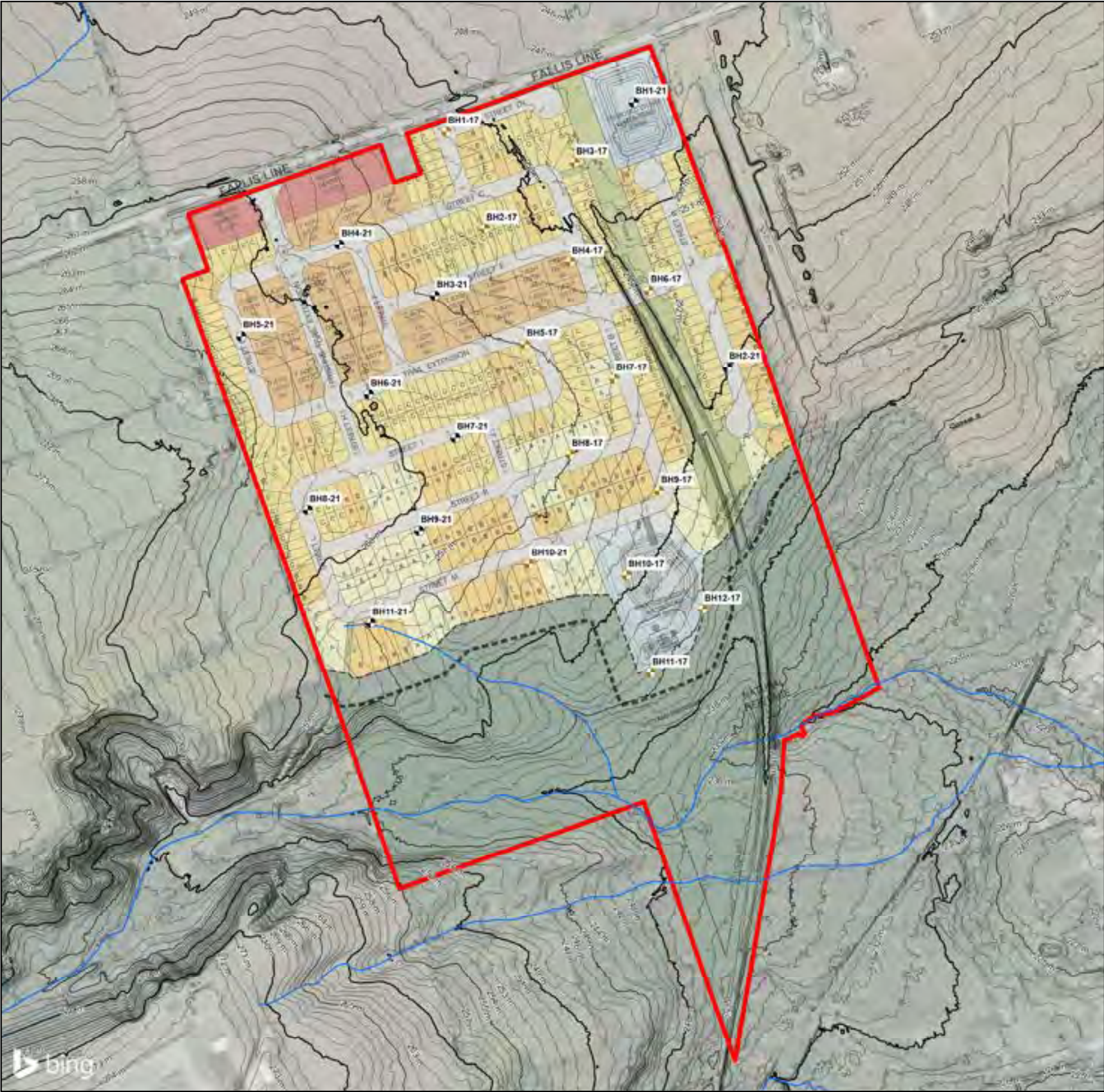


Geotechnical Investigation Report

Proposed Subdivision Development
787 and 825 Fallis Line
Millbrook, Ontario

Report for:
The Bromont Group





TEST HOLES

-  Boreholes Drilled in 2021
-  Boreholes Drilled in 2017

CONTOURS

-  Contour Line, Major
10 m Contour Index
ODTM Lidar Derived
-  Contour Line, Intermediate
5 m Contour Index
ODTM Lidar Derived
-  Contour Line, Minor
1 m Contour Interval
ODTM Lidar Derived

ONTARIO HYDROGRAPHIC NETWORK (OHN)

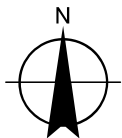
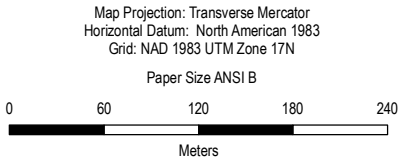
-  Stream

ADMINISTRATIVE BOUNDARIES

-  Property Limit

CITATIONS

Service Layer Credits: © 2021 Microsoft Corporation © 2021 Maxar ©CNES (2021) Distribution Airbus DS © 2021 TomTom
Ontario Digital Terrain Model [Derivative]. OMAFRA. Peterborough, 2016-2017.
Conceptual Draft Plan, Fallis Line West [20697]. The Biglieri Group Ltd. 2021-03-29.



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THE BROMONT GROUP
787 & 825 FALLIS LINE, MILLBROOK, ON
TOWNSHIP OF CAVAN-MONAGHAN
COUNTY OF PETERBOROUGH

GEOTECHNICAL INVESTIGATION
BOREHOLE LOCATION PLAN

Project No. 11224019
Revision No. -
Date Mar 2021

FIGURE 2



BOREHOLE No.: BH1-17

ELEVATION: 251.3 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Bromont Group c/o Valdor Engineering

PROJECT: Proposed Residential Development - Fallis Line, Millbrook, Ontario

LOGGED BY: S. Shepherd

DATE: 22 August 2017

DRILLING COMPANY: Landshark Drilling

METHOD: Solid Stem Augers and Split Spoons

NOTES: Ground surface elevation interpolated from concept plan provided by Valdor Engineering with electronic title "16119_Fallis Line Subdivision_Preliminary Concept.pdf" by email dated July 11, 2017.

LEGEND

- ☒ SS - SPLIT SPOON
☒ AS - AUGER SAMPLE
☒ ST - SHELBY TUBE
☒ CS - CORE SAMPLE
 - WATER LEVEL

UTM: +/- 17T 702910E 4892792N

Depth	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery	Moisture Content	Blows per 6 in. / 15 cm	Penetration Index	Shear test (Cu) Sensitivity (S) ○ Water content (%) H Atterberg limits (%) w _p w _L X "N" Value (blows / 0.3 m)	△ Field □ Lab ◆ RQD ◎ CONE	COMMENTS
ft	m	0.0	GROUND SURFACE		%	%		N	10 20 30 40 50 60 70 80 90		
			TOPSOIL (380 mm)				1				
1	0.4		TILL - Brown Silty Clay, Some Sand, Trace Gravel, Moist, Compact - Occasional Organics to 0.6m	SS-1	79	25	3	8	X	○	Borehole open and dry upon completion of drilling
2							5				
3	1.0			SS-2	100	18	5	17	X		
4							6				
5							11				
6	2.0			SS-3	100	20	4	26	○	X	SS-3: 4% Gravel 10% Sand 86% Silt and Clay 31% between 5-75 µm
7							10				
8	2.3		Occasional Cobbles, Dense	SS-4	89	14	15	35	○	X	
9							13				
10	3.0		Damp to Moist, Very Dense	SS-5	100	7	24	100+	○		
11							38				
12							50=4"				
13	4.0										
14											
15				SS-6	100	9	21	68	○	X	
16	5.0						28				
17							40				
18											
19											
20	6.0		Dense	SS-7	100	13	8	35	○	X	
21							17				
22	6.6		END OF BOREHOLE				18				
23	7.0										
24											

BOREHOLE LOG GEOTECH 11148475-01, 17-08-22, BOREHOLE LOG_LR.GPJ GEOLOGIC.GDT 24/10/17



BOREHOLE No.: BH2-17

ELEVATION: 252.8 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Bromont Group c/o Valdor Engineering

PROJECT: Proposed Residential Development - Fallis Line, Millbrook, Ontario

LOGGED BY: S. Shepherd

DATE: 22 August 2017

DRILLING COMPANY: Landshark Drilling

METHOD: Solid Stem Augers and Split Spoons

NOTES: Ground surface elevation interpolated from concept plan provided by Valdor Engineering with electronic title "16119_Fallis Line Subdivision_Preliminary Concept.pdf" by email dated July 11, 2017.

LEGEND

- ☒ SS - SPLIT SPOON
☒ AS - AUGER SAMPLE
☒ ST - SHELBY TUBE
☒ CS - CORE SAMPLE
 - WATER LEVEL

UTM: +/- 17T 702952E 4892690N

Depth	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery	Moisture Content	Blows per 6 in. / 15 cm	Penetration Index	Shear test (Cu) Sensitivity (S) Water content (%) Atterberg limits (%) "N" Value (blows / 0.3 m)	Field Lab RQD CONE	COMMENTS
ft	m	0.0	GROUND SURFACE		%	%		N	10 20 30 40 50 60 70 80 90		
		0.3	TOPSOIL (300 mm)				2				
1				SS-1	83	13	5	11	×		
2			TILL - Brown Silty Clay, Some Sand, Trace Gravel, Damp, Compact - Occasional Organics to 0.5m				6				
3	1.0			SS-2	100	17	3	11	×	○	
4							3				
5				SS-3	100	24	5	11	×	○	
6	2.0						6				
7											
8		2.3	Brown Silty Sand, Some Clay, Trace Gravel, Damp, Compact	SS-4	100	16	5	11	×	○	
9							6				
10	3.0			SS-5	100	10	6	15	○	×	
11							6				
12							6				
13	4.0										
14											
15				SS-6	100	8	6	14	○	×	
16	5.0						6				
17							8				
18											
19											
20	6.0			SS-7	100	15	7	16	×		
21							7				
22		6.6	END OF BOREHOLE				9				
23	7.0										
24											

BOREHOLE LOG GEOTECH 11148475-01, 17-08-22, BOREHOLE LOG_LR.GPJ GEOLOGIC.GDT 24/10/17



BOREHOLE No.: BH3-17

ELEVATION: 248.3 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Bromont Group c/o Valdor Engineering

PROJECT: Proposed Residential Development - Fallis Line, Millbrook, Ontario

LOGGED BY: S. Shepherd

DATE: 22 August 2017

DRILLING COMPANY: Landshark Drilling

METHOD: Solid Stem Augers and Split Spoons

NOTES: Ground surface elevation interpolated from concept plan provided by Valdor Engineering with electronic title "16119_Fallis Line Subdivision_Preliminary Concept.pdf" by email dated July 11, 2017.

LEGEND

- SS - SPLIT SPOON
 AS - AUGER SAMPLE
 ST - SHELBY TUBE
 CS - CORE SAMPLE
 ▴ - WATER LEVEL

UTM: +/- 17T 703062E 4892759N

Depth	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery	Moisture Content	Blows per 6 in. / 15 cm	Penetration Index	Shear test (Cu) Sensitivity (S) Water content (%) Atterberg limits (%) "N" Value (blows / 0.3 m)	Field Lab RQD CONE	COMMENTS
ft	m				%	%			10 20 30 40 50 60 70 80 90		
	0.0		GROUND SURFACE					N			
	0.3		TOPSOIL (300 mm)				0				
1				SS-1	33	41	0	0	*		
2			TILL - Brown Silty Clay, Some Sand, Trace Gravel, Moist, Compact - Occasional Organics to 0.6m				2				
3	1.0			SS-2	100	25	3	9	*		
4							6				
5							5				
6	2.0			SS-3	100	20	8	18	*		
7							10				
8							7				
9				SS-4	100	12	10	25	*		
10	3.0						15				
11							7				
12				SS-5	100	12	9	20	*		
13							11				
14	4.0										
15	4.6		Grey Sandy Silt, Some Clay, Trace Gravel, Wet, Very Loose	SS-6	100	34	0	4	*		
16	5.0						1				
17							3				
18											
19											
20	6.0		Compact Sand Seam at 6.2m	SS-7	100	10	19	24	*		
21							15				
22	6.6		END OF BOREHOLE				9				
23	7.0										
24											

WL - 0.9 m
9/7/2017

Groundwater seepage encountered at 4.6 m during drilling

33 mm inside diameter piezometer installed to 6.6 m

BOREHOLE LOG GEOTECH 11148475-01, 17-08-22, BOREHOLE LOG, LR.GPJ, GEOLOGIC.GDT 24/10/17



BOREHOLE No.: BH4-17

ELEVATION: 251.6 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Bromont Group c/o Valdor Engineering

PROJECT: Proposed Residential Development - Fallis Line, Millbrook, Ontario

LOGGED BY: S. Shepherd

DATE: 22 August 2017

DRILLING COMPANY: Landshark Drilling

METHOD: Solid Stem Augers and Split Spoons

NOTES: Ground surface elevation interpolated from concept plan provided by Valdor Engineering with electronic title "16119_Fallis Line Subdivision_Preliminary Concept.pdf" by email dated July 11, 2017.

LEGEND

- SS - SPLIT SPOON
 AS - AUGER SAMPLE
 ST - SHELBY TUBE
 CS - CORE SAMPLE
 ▴ - WATER LEVEL

UTM: +/- 17T 703055E 4892637N

Depth		m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery	Moisture Content	Blows per 6 in. / 15 cm	Penetration Index	Shear test (Cu) Sensitivity (S)											COMMENTS
ft	m									w _p w _L Atterberg limits (%) X "N" Value (blows / 0.3 m) △ Field □ Lab RQD CONE											
		0.0		GROUND SURFACE		%	%		N	10	20	30	40	50	60	70	80	90			
				TOPSOIL (300 mm)				1													
1		0.3		TILL - Brown Silty Clay, Trace Sand, Moist, Compact - Occasional Organics to 0.6m	SS-1	83	26	3	8	X		○							Borehole open and dry upon completion of drilling WL - Dry 9/7/2017 WL - Dry 10/17/2017		
2								5													
3	1.0					SS-2	89	30	2	8	X		○								
4								3													
5		1.5		Some Gravel, Damp				4													
6					SS-3	100	12	7	18		○	X									
7	2.0							11													
8								9													
9		2.6		SAND - Brown Sand, Some Silt, Damp, Dense to Very Dense	SS-4	100	9	22	57		○				X						
10	3.0							35													
11					SS-5	94	3	40	51		○				X						
12								25													
13	4.0							26											SS-6: 0% Gravel 74% Sand 26% Silt and Clay 20% between 5-75 µm		
14																					
15				Silt Seam at 4.6m				16													
16					SS-6	100	25	22	43			○		X							
17	5.0							21													
18																					
19																					
20	6.0																				
21					SS-7	100	5	21	75		○						X		51 mm inside diameter monitoring well installed to 6.1 m		
22		6.6		END OF BOREHOLE				35													
23	7.0							40													
24																					

BOREHOLE LOG GEOTECH 11148475-01, 17-08-22, BOREHOLE LOG_LR.GPJ GEOLOGIC.GDT 24/10/17



BOREHOLE No.: BH5-17

ELEVATION: 255.2 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Bromont Group c/o Valdor Engineering

PROJECT: Proposed Residential Development - Fallis Line, Millbrook, Ontario

LOGGED BY: S. Shepherd

DATE: 22 August 2017

DRILLING COMPANY: Landshark Drilling

METHOD: Solid Stem Augers and Split Spoons

NOTES: Ground surface elevation interpolated from concept plan provided by Valdor Engineering with electronic title "16119_Fallis Line Subdivision_Preliminary Concept.pdf" by email dated July 11, 2017.

LEGEND

- ☐ SS - SPLIT SPOON
☐ AS - AUGER SAMPLE
☐ ST - SHELBY TUBE
☐ CS - CORE SAMPLE
☐ - WATER LEVEL

UTM: +/- 17T 703000E 4892563N

Depth	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery	Moisture Content	Blows per 6 in. / 15 cm	Penetration Index	Shear test (Cu) Sensitivity (S) Water content (%) Atterberg limits (%) "N" Value (blows / 0.3 m)	Field Lab RQD CONE	COMMENTS
ft	m	0.0	GROUND SURFACE		%	%		N	10 20 30 40 50 60 70 80 90		
		0.3	TOPSOIL (300 mm)				0				
1			TILL - Brown Sandy Silty Clay, Trace Gravel, Moist, Compact - Occasional Organics to 0.6m	SS-1	79	18	3	7	×	○	Borehole open and dry upon completion of drilling
2							4				
3	1.0			SS-2	89	14	14	35	○	×	
4							21				
5	1.5		SAND - Brown Sand, Some Silt, Trace Gravel, Damp, Very Dense	SS-3	100	3	25	100+	○		×
6							30				
7	2.0						50=4"				
8				SS-4	100	3	38	100+	○		×
9							50=5"				
10	3.0			SS-5	100	3	46	100+	○		×
11							50=4"				
12											
13	4.0										
14											
15				SS-6	100	6	36	38	○	×	
16	5.0						33				
17							35				
18											
19											
20	6.0			SS-7	100	5	28	100+	○		×
21	6.4		END OF BOREHOLE				50=5"				
22											
23	7.0										
24											



BOREHOLE No.: BH6-17

ELEVATION: 252.4 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Bromont Group c/o Valdor Engineering

PROJECT: Proposed Residential Development - Fallis Line, Millbrook, Ontario

LOGGED BY: S. Shepherd

DATE: 23 August 2017

DRILLING COMPANY: Landshark Drilling

METHOD: Solid Stem Augers and Split Spoons

NOTES: Ground surface elevation interpolated from concept plan provided by Valdor Engineering with electronic title "16119_Fallis Line Subdivision_Preliminary Concept.pdf" by email dated July 11, 2017.

LEGEND

- ☒ SS - SPLIT SPOON
☒ AS - AUGER SAMPLE
☒ ST - SHELBY TUBE
☒ CS - CORE SAMPLE
 - WATER LEVEL

UTM: +/- 17T 703151E 4892614N

Depth	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery	Moisture Content	Blows per 6 in. / 15 cm	Penetration Index	Shear test (Cu) Sensitivity (S) Water content (%) Atterberg limits (%) "N" Value (blows / 0.3 m)	Field Lab RQD CONE	COMMENTS
ft	m	0.0	GROUND SURFACE		%	%		N	10 20 30 40 50 60 70 80 90		
		0.3	TOPSOIL (300 mm)				5				
1			TILL - Brown Sandy Silty Clay, Some Gravel, Moist, Compact	SS-1	79	13	8	13			Borehole open and dry upon completion of drilling
2			- Occasional Organics to 0.6m				9				
3	1.0			SS-2	100	23	5	10			
4							5				
5		1.5	Dense				5				
6				SS-3	83	20	10	35			SS-2: 12% Gravel 20% Sand 68% Silt and Clay 33% between 5-75 µm
7	2.0						25				
8		2.3	Brown Silty Sand, Some Clay, Trace Gravel, Moist, Dense	SS-4	94	12	31	38			
9							24				
10	3.0	3.0	Very Dense				14				
11				SS-5	83	14	3	65			
12							24				
13	4.0						41				
14											
15		4.6	SAND - Brown Sand, Some Silt, Trace Gravel, Damp, Very Dense	SS-6	100	4	16	100+			
16	5.0						50=5"				
17											
18											
19											
20	6.0	6.1	Dense				15				
21				SS-7	100	5	15	44			
22		6.6	END OF BOREHOLE				29				
23	7.0										
24											

BOREHOLE LOG GEOTECH 11148475-01, 17-08-22, BOREHOLE LOG, LR.GPJ, GEOLOGIC.GDT 24/10/17



BOREHOLE No.: BH7-17

ELEVATION: 254.5 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Bromont Group c/o Valdor Engineering

PROJECT: Proposed Residential Development - Fallis Line, Millbrook, Ontario

LOGGED BY: S. Shepherd

DATE: 23 August 2017

DRILLING COMPANY: Landshark Drilling

METHOD: Solid Stem Augers and Split Spoons

NOTES: Ground surface elevation interpolated from concept plan provided by Valdor Engineering with electronic title "16119_Fallis Line Subdivision_Preliminary Concept.pdf" by email dated July 11, 2017.

LEGEND

- ☒ SS - SPLIT SPOON
☒ AS - AUGER SAMPLE
☒ ST - SHELBY TUBE
☒ CS - CORE SAMPLE
 - WATER LEVEL

UTM: +/- 17T 703108E 4892501N

Depth	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery	Moisture Content	Blows per 6 in. / 15 cm	Penetration Index	Shear test (Cu) Sensitivity (S) ○ Water content (%) H Atterberg limits (%) X "N" Value (blows / 0.3 m)	△ Field □ Lab ◆ RQD ◎ CONE	COMMENTS
ft	m	0.0	GROUND SURFACE		%	%		N	10 20 30 40 50 60 70 80 90		
		0.3	TOPSOIL (300 mm)				0				
1			TILL - Brown Silty Sand, Some Clay, Trace Gravel, Moist, Compact - Occasional Organics to 1.1m	SS-1	83	18	3	6	X	○	Borehole open and dry upon completion of drilling
2							3				
3	1.0			SS-2	83	15	4	23		○ X	
4							3				
5	1.5		Very Dense	SS-3	100	3	50=5"	100+	○		X
6											
7	2.0			SS-4	100	6	50=5"	100+	○		X
8											
9											
10	3.0			SS-5	100	6	50=4"	100+	○		X
11											
12											
13	4.0										
14											
15				SS-6	100	6	46	100+	○		X
16	5.0						50=4"				
17											
18											
19											
20	6.0			SS-7	100	7	25	75	○		X
21							31				
22	6.6		END OF BOREHOLE				44				
23	7.0										
24											



BOREHOLE No.: BH8-17

ELEVATION: 255.4 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Bromont Group c/o Valdor Engineering

PROJECT: Proposed Residential Development - Fallis Line, Millbrook, Ontario

LOGGED BY: S. Shepherd

DATE: 23 August 2017

DRILLING COMPANY: Landshark Drilling

METHOD: Solid Stem Augers and Split Spoons

NOTES: Ground surface elevation interpolated from concept plan provided by Valdor Engineering with electronic title "16119_Fallis Line Subdivision_Preliminary Concept.pdf" by email dated July 11, 2017.

LEGEND

- SS - SPLIT SPOON
 AS - AUGER SAMPLE
 ST - SHELBY TUBE
 CS - CORE SAMPLE
 ▴ - WATER LEVEL

UTM: +/- 17T 703046E 4892430N

Depth	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery %	Moisture Content %	Blows per 6 in. / 15 cm	Penetration Index	Shear test (Cu) Sensitivity (S) ○ Water content (%) H Atterberg limits (%) X "N" Value (blows / 0.3 m) △ Field □ Lab												COMMENTS
ft	m	0.0	GROUND SURFACE		%	%		N	10	20	30	40	50	60	70	80	90				
		0.3	TOPSOIL (300 mm)				0														
1				SS-1	88	21	2	5	X	○											Borehole open and dry upon completion of drilling
2			TILL - Brown Silty Sand, Some Clay, Trace Gravel, Moist, Compact - Occasional Organics to 1.1m				3														
3	1.0			SS-2	100	19	50=1"	100+		○											WL - Dry 9/7/2017
4																					
5		1.5	Damp, Very Dense	SS-3	100	7	27	100+		○											
6							50=4"														SS-3: 8% Gravel 56% Sand 36% Silt and Clay
7	2.0																				
8				SS-4	100	5	30	74		○					X						
9							34														
10	3.0						40														
11				SS-5	100	6	34	82		○					X						
12							40														
13	4.0						42														
14																					
15				SS-6	100	4	46	100+		○						X					
16	5.0						50=4"														
17																					
18																					
19																					
20	6.0	6.1	END OF BOREHOLE	SS-7	100	6	50=2"	100+		○						X					33 mm inside diameter piezometer installed to 6.1 m
21																					
22																					
23	7.0																				
24																					

BOREHOLE LOG GEOTECH 11148475-01, 17-08-22, BOREHOLE LOG, LR.GPJ, GEOLOGIC.GDT 24/10/17



BOREHOLE No.: BH9-17

ELEVATION: 251.6 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Bromont Group c/o Valdor Engineering

PROJECT: Proposed Residential Development - Fallis Line, Millbrook, Ontario

LOGGED BY: S. Shepherd

DATE: 23 August 2017

DRILLING COMPANY: Landshark Drilling

METHOD: Solid Stem Augers and Split Spoons

NOTES: Ground surface elevation interpolated from concept plan provided by Valdor Engineering with electronic title "16119_Fallis Line Subdivision_Preliminary Concept.pdf" by email dated July 11, 2017.

LEGEND

- SS - SPLIT SPOON
 AS - AUGER SAMPLE
 ST - SHELBY TUBE
 CS - CORE SAMPLE
 ▴ - WATER LEVEL

UTM: +/- 17T 703145E 4892381N

Depth		m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery	Moisture Content	Blows per 6 in. / 15 cm	Penetration Index	Shear test (Cu) Sensitivity (S)										COMMENTS
										○ Water content (%) Atterberg limits (%) "N" Value (blows / 0.3 m)										
ft	m	0.0		GROUND SURFACE		%	%		N	10	20	30	40	50	60	70	80	90		
		0.3		TOPSOIL (300 mm)				0												
1				TILL - Brown Silty Sand, Some Clay, Trace Gravel, Moist, Compact - Occasional Organics to 0.6m	SS-1	83	25	2	5	×		○							Borehole open and dry upon completion of drilling WL - Dry 9/7/2017 WL - Dry 10/17/2017	
2									3											
3	1.0					SS-2	100	7	14	27			○	×						
4								14												
5								13												
6	1.7			Brown Silt, Some Clay, Some Sand, Trace Gravel, Moist, Compact	SS-3	89	17	25	18			○	×							
7	2.0								7											
8								11												
9				Brown Gravelly Silty Sand, Some Clay, Moist, Very Dense	SS-4	100	10	17	54			○		×						
10	3.0								22											
11					SS-5	100	8	32	38			○		×					SS-5: 31% Gravel 42% Sand 27% Silt and Clay 18% between 5-75 µm	
12								24												
13	4.0							33												
14								25												
15																				
16	5.0				SS-6	100	7	35	100+			○								
17								50=5"												
18																				
19																				
20	6.0																			
21		6.1		END OF BOREHOLE	SS-7	100	5	50=2"	100+	○								×	51 mm inside diameter monitoring well installed to 5.6 m	
22																				
23	7.0																			
24																				

BOREHOLE LOG GEOTECH 11148475-01, 17-08-22, BOREHOLE LOG, LR.GPJ, GEOLOGIC.GDT 24/10/17



BOREHOLE No.: BH10-17
ELEVATION: 250.7 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Bromont Group c/o Valdor Engineering

PROJECT: Proposed Residential Development - Fallis Line, Millbrook, Ontario

LOGGED BY: S. Shepherd

DATE: 23 August 2017

DRILLING COMPANY: Landshark Drilling

METHOD: Solid Stem Augers and Split Spoons

NOTES: Ground surface elevation interpolated from concept plan provided by Valdor Engineering with electronic title "16119_Fallis Line Subdivision_Preliminary Concept.pdf" by email dated July 11, 2017.

LEGEND

- SS - SPLIT SPOON
- AS - AUGER SAMPLE
- ST - SHELBY TUBE
- CS - CORE SAMPLE
- WATER LEVEL

UTM: +/- 17T 703105E 4892285N

Depth	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery	Moisture Content	Blows per 6 in. / 15 cm	Penetration Index	Shear test (Cu) Sensitivity (S) Water content (%) Atterberg limits (%) "N" Value (blows / 0.3 m)	Field Lab RQD CONE	COMMENTS
ft	m	0.0	GROUND SURFACE		%	%		N	10 20 30 40 50 60 70 80 90		
		0.3	TOPSOIL (300 mm)				0				
1			TILL - Brown Silty Sand, Some Clay, Trace Gravel, Moist, Compact - Occasional Organics to 0.9m	SS-1	92	15	2	7	X		Borehole open upon completion of drilling
2							5				
3	1.0			SS-2	100	19	3	10	X		
4							4				
5							6				
6	2.0			SS-3	100	19	6	14	X		
7							8				
8		2.3	Brown Silty Sand, Some Clay, Trace Gravel, Wet, Loose	SS-4	100	14	2	9	X		Slight groundwater seepage encountered at 2.3 m during drilling
9							3				
10	3.0	3.0	SAND - Brown Sand, Some Silt, Trace Gravel, Damp, Very Dense	SS-5	94	6	39	66			
11							42				
12							24				
13	4.0						32				
14							38				
15		4.6	Moist	SS-6	100	7	24	70			
16	5.0						32				
17							38				
18											
19											
20	6.0										
21		6.2	END OF BOREHOLE	SS-7	100	6	50=5"	100+			
22											
23	7.0										
24											



BOREHOLE No.: BH11-17
ELEVATION: 246.5 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Bromont Group c/o Valdor Engineering

PROJECT: Proposed Residential Development - Fallis Line, Millbrook, Ontario

LOGGED BY: S. Shepherd

DATE: 23 August 2017

DRILLING COMPANY: Landshark Drilling

METHOD: Solid Stem Augers and Split Spoons

NOTES: Ground surface elevation interpolated from concept plan provided by Valdor Engineering with electronic title "16119_Fallis Line Subdivision_Preliminary Concept.pdf" by email dated July 11, 2017.

LEGEND

- ☒ SS - SPLIT SPOON
- ▨ AS - AUGER SAMPLE
- ▨ ST - SHELBY TUBE
- ▨ CS - CORE SAMPLE
- ▼ - WATER LEVEL

UTM: +/- 17T 703134E 4892182N

Depth		m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery	Moisture Content	Blows per 6 in. / 15 cm	Penetration Index	Shear test (Cu) Sensitivity (S) ○ Water content (%) H Atterberg limits (%) X "N" Value (blows / 0.3 m)										Field Lab		COMMENTS
ft	m									10	20	30	40	50	60	70	80	90	RQD	CONE		
		0.0		GROUND SURFACE		%	%		N													
				TOPSOIL (300 mm)				0											Borehole open upon completion of drilling			
1		0.3		TILL - Brown Silty Sand, Some Clay, Trace Gravel, Moist, Compact - Occasional Organics to 0.8m	SS-1	83	22	3	5	X	○											
2																						
3	1.0				SS-2	78	9	11	13		○	X										
4																						
5								7														
6	2.0				SS-3	100	14	6	13		⊗											
7																						
8								9														
9					SS-4	100	12	10	19		○	X										
10	3.0	3.0		Dense				14														
11					SS-5	72	10	17	35		○		X									
12																						
13	4.0																		Slight groundwater seepage encountered at 4.6 m during drilling WL - 4.8 m 10/17/2017			
14																						
15	4.6	4.6		Wet, Compact				6														
16	5.0				SS-6	100	10	8	15		○	X							WL - 4.7 m 9/7/2017			
17																						
18																			SS-7: 21% Gravel 48% Sand 31% Silt and Clay 20% between 5-75 µm			
19																						
20	6.0	6.1		Dense, With Gravel				9														
21					SS-7	100	6	20	47		○		X						51 mm inside diameter monitoring well installed to 6.1 m			
22	6.6	6.6		END OF BOREHOLE				27														
23	7.0																					
24																						

BOREHOLE LOG GEOTECH 11148475-01, 17-08-22, BOREHOLE LOG, LR.GPJ, GEOLOGIC.GDT 24/10/17



BOREHOLE No.: BH12-17
ELEVATION: 246.1 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Bromont Group c/o Valdor Engineering

PROJECT: Proposed Residential Development - Fallis Line, Millbrook, Ontario

LOGGED BY: S. Shepherd

DATE: 23 August 2017

DRILLING COMPANY: Landshark Drilling

METHOD: Solid Stem Augers and Split Spoons

NOTES: Ground surface elevation interpolated from concept plan provided by Valdor Engineering with electronic title "16119_Fallis Line Subdivision_Preliminary Concept.pdf" by email dated July 11, 2017.

LEGEND

- ☒ SS - SPLIT SPOON
- ▨ AS - AUGER SAMPLE
- ▨ ST - SHELBY TUBE
- ▨ CS - CORE SAMPLE
- ▼ - WATER LEVEL

UTM: +/- 17T 703196E 4892253N

Depth	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery	Moisture Content	Blows per 6 in. / 15 cm	Penetration Index	Shear test (Cu) Sensitivity (S) ○ Water content (%) H Atterberg limits (%) X "N" Value (blows / 0.3 m)	△ Field □ Lab	COMMENTS
ft	m	0.0	GROUND SURFACE		%	%		N	10 20 30 40 50 60 70 80 90		
			TOPSOIL (460 mm)				0				
1		0.5	TILL - Brown Silty Sand, Some Clay, Trace Gravel, Moist, Compact - Occasional Organics to 0.9m	SS-1	75	17	2	4	X	○	
2							1				
3	1.0			SS-2	94	11	4	17		○	X
4							7				
5		1.5	Dense				12				
6		1.8	SAND - Brown Sand, Some Silt, Trace Gravel, Damp, Very Dense	SS-3	100	6	20	44		○	X
7	2.0						24				
8				SS-4	100	4	21	100+		○	X
9							50=5"				
10	3.0						30				
11				SS-5	100	7	40	90		○	X
12							50				
13	4.0										
14											
15				SS-6	100	6	50=5"	100+		○	X
16	5.0										
17		5.2	Wet								
18											
19											
20	6.0	6.1	Damp	SS-7	100	9	50=4"	100+		○	X
21		6.2	END OF BOREHOLE								
22											
23	7.0										
24											

Groundwater seepage encountered at 5.2 m during drilling



WL - 5.2 m
8/23/2017



BOREHOLE No.: BH1D-21

ELEVATION: 248.0 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Bromont Group

PROJECT: Geotechnical Investigation - 787 & 825 Fallis Line, Millbrook

LOGGED BY: J. Scott

DATE: 3 March 2021

DRILLING COMPANY: Landshark Group

METHOD: Solid Stem Augers and SplitSpoons

NOTES: Ground surface elevation interpolated from ODTM Lidar Derived data.

LEGEND

- SS - SPLIT SPOON
 AS - AUGER SAMPLE
 ST - SHELBY TUBE
 CS - CORE SAMPLE
 ▴ - WATER LEVEL

UTM: +/- 17T 703105.4E 4892846.0N

Depth		m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery	Moisture Content	Blows per 6 in. / 15 cm	Penetration Index	Shear test (Cu) Sensitivity (S)										COMMENTS		
										Water content (%)	Atterberg limits (%)	"N" Value (blows / 0.3 m)	Field	Lab	RQD	CONE						
ft	m	0.0		GROUND SURFACE		%	%		N	10	20	30	40	50	60	70	80	90				
				TOPSOIL (460mm)	SS-1	0		0	0										WL - 0.2 m 3/17/2021			
1		0.5		TILL - Clayey Silt, Few Sand, Trace Gravel, Very Soft, Brown, Moist Very Stiff	SS-2	100	17	0											- Borehole open upon completion with water level at approximately 3.7m			
2		0.8						9														
3	1.0							10														
4								11	21													
5								9														
6	2.0				SS-3	100	15	9	24													
7								15														
8								12														
9					SS-4	100	22	7	16													
10	3.0	3.0		Stiff				8														
11					SS-5	100	19	8	11										- SS5: 1% Gravel 5% Sand 54% Silt 40% Clay (<0.002mm) LL - 30% PI - 16%			
12								8														
13	4.0							6														
14								6														
15	4.6	4.6		Wet				0											- Groundwater seepage first observed at approximately 4.6 m			
16	5.0				SS-6	100	31	0	1													
17								1														
18								2														
19																						
20	6.0	6.1		Hard															- 50 mm diameter monitoring well installed to 6.1m			
21					SS-7	83	11	13	32													
22	6.7	6.7		END OF BOREHOLE				16														
23	7.0							16														
24								17														

BOREHOLE LOG GEOTECH 11224019-DSG-21-03-19, GINT BOREHOLE LOGS, JS.GPJ GEOLOGIC.GDT 22/3/21



BOREHOLE No.: BH1S-21

ELEVATION: 248.0 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Bromont Group

PROJECT: Geotechnical Investigation - 787 & 825 Fallis Line, Millbrook

LOGGED BY: J. Scott

DATE: 3 March 2021

DRILLING COMPANY: Landshark Group

METHOD: Solid Stem Augers and Split Spoons

NOTES: Ground surface elevation interpolated from ODTM Lidar Derived data.

LEGEND

- ☒ SS - SPLIT SPOON
☒ AS - AUGER SAMPLE
☒ ST - SHELBY TUBE
☒ CS - CORE SAMPLE
 - WATER LEVEL

UTM: +/- 17T 703105.4E 4892846.0N

Depth		m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery	Moisture Content	Blows per 6 in. / 15 cm	Penetration Index	Shear test (Cu) △ Field Sensitivity (S) □ Lab ○ Water content (%) w _p w _L Atterberg limits (%) × "N" Value ◆ RQD (blows / 0.3 m) ◎ CONE										COMMENTS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
ft	m									10	20	30	40	50	60	70	80	90																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
		0.0		GROUND SURFACE			%	%		N																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																



BOREHOLE No.: BH2-21

ELEVATION: 249.0 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Bromont Group

PROJECT: Geotechnical Investigation - 787 & 825 Fallis Line, Millbrook

LOGGED BY: J. Scott

DATE: 3 March 2021

DRILLING COMPANY: Landshark Group

METHOD: Solid Stem Augers and SplitSpoons

NOTES: Ground surface elevation interpolated from ODTM Lidar Derived data.

LEGEND

- ☒ SS - SPLIT SPOON
☒ AS - AUGER SAMPLE
☒ ST - SHELBY TUBE
☒ CS - CORE SAMPLE
 - WATER LEVEL

UTM: +/- 17T 703243.9E 4892529.9N

Depth		m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery	Moisture Content	Blows per 6 in. / 15 cm	Penetration Index	Shear test (Cu) Sensitivity (S) ○ Water content (%) Atterberg limits (%) X "N" Value (blows / 0.3 m)										COMMENTS
ft	m									10	20	30	40	50	60	70	80	90		
		0.0		GROUND SURFACE		%	%		N											
		0.2		TOPSOIL (200mm)	SS-1A	67	26	3	6	X	○							- Borehole open and free of groundwater accumulation upon completion.		
1				TILL - Sandy Silt, With Clay, Few Gravel, Loose, Dark Brown to Brown, Moist - Occasional Organics to 0.70m.	SS-1B		25	3			○									
2		0.7			SS-2A	50	21	3				○	X							
3	1.0			Dense, Brown	SS-2B		9	10			○									
4								22												
5		1.5		Very Dense				12												
6	2.0				SS-3	79	7	22	100+	○						X				
7								50=5"												
8		2.3		Dense	SS-4	67	11	13	33		○		X							
9								15												
10	3.0							18												
11					SS-5	100	8	14	32		○		X							
12								18												
13	4.0							16												
14																				
15		4.6		Very Dense	SS-6	13	6	50=3"	100+	○						X				
16	5.0																			
17																				
18																				
19																				
20	6.0				SS-7A	46	9	32	100+		○					X				
21		6.2		SAND - Sand, With Silt and Clay, Very Dense, Brown, Moist	SS-7B		4	50=5"			○									
22		6.7		END OF BOREHOLE																
23	7.0																			
24																				



BOREHOLE No.: BH3-21

ELEVATION: 255.1 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Bromont Group

PROJECT: Geotechnical Investigation - 787 & 825 Fallis Line, Millbrook

LOGGED BY: J. Scott

DATE: 4 March 2021

DRILLING COMPANY: Landshark Group

METHOD: Solid Stem Augers and SplitSpoons

NOTES: Ground surface elevation interpolated from ODTM Lidar Derived data.

LEGEND

- SS - SPLIT SPOON
 AS - AUGER SAMPLE
 ST - SHELBY TUBE
 CS - CORE SAMPLE
 ▼ - WATER LEVEL

UTM: +/- 17T 702896.8E 4892621.1N

Depth	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery	Moisture Content	Blows per 6 in. / 15 cm	Penetration Index	Shear test (Cu) Sensitivity (S)	Water content (%)	Atterberg limits (%)	"N" Value (blows / 0.3 m)	Field	Lab	COMMENTS
ft	m				%	%		N							
	0.0		GROUND SURFACE												
	0.2		TOPSOIL (230mm)	SS-1A	54	34	2	5	X						
1			TILL - Clayey Silt, Few Sand, Trace Gravel, Firm, Dark Brown to Brown, Moist - Occasional Organics to 0.85m.	SS-1B		35	3								
2							2								
3	1.0			SS-2A	33	36	2	5	X						
4				SS-2B		33	2								
5							3								
6			Very Stiff				5								
7	2.0		Sand Seam at 1.8m	SS-3	100	19	10	16		X					
8							13								
9			Hard				12								
10				SS-4	100	10	20	36			X				
11	3.0		Very Stiff				16								
12			Sand Seam at 3.2m	SS-5	100	10	10	25			X				
13							15								
14			Hard				12								
15							50=5"	100+							
16	5.0			SS-6	46	10	12								
17															
18															
19															
20	6.0						18								
21				SS-7	100	21	16	37			X				
22	6.7		END OF BOREHOLE				21								
23	7.0						24								
24															

BOREHOLE LOG GEOTECH 11224019-DSG-21-03-19, GINT BOREHOLE LOGS, JS.GPJ GEOLOGIC.GDT 22/3/21

- Borehole open upon completion with water level at approximately 6.4m

- SS3:
1% Gravel
11% Sand
45% Silt
43% Clay
($<0.002\text{mm}$)



BOREHOLE No.: BH4-21

ELEVATION: 257.0 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Bromont Group

PROJECT: Geotechnical Investigation - 787 & 825 Fallis Line, Millbrook

LOGGED BY: J.Scott

DATE: 3 March 2021

DRILLING COMPANY: Landshark Group

METHOD: Solid Stem Augers and Split Spoons

NOTES: Ground surface elevation interpolated from ODTM Lidar Derived data.

LEGEND

- ☒ SS - SPLIT SPOON
 ☒ AS - AUGER SAMPLE
 ☒ ST - SHELBY TUBE
 ☒ CS - CORE SAMPLE
 ▼ - WATER LEVEL

UTM: +/- 17T 702801.4E 4892676.0N

Depth	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery	Moisture Content	Blows per 6 in. / 15 cm	Penetration Index	Shear test (Cu) Sensitivity (S)	Water content (%)	Atterberg limits (%)	"N" Value (blows / 0.3 m)	Field	Lab	COMMENTS
ft	m				%	%		N							
	0.0		GROUND SURFACE												
	0.2		TOPSOIL (205mm)	SS-1A	83	33	2	5	X						
1			TILL - Clayey Silt, Few Sand, Trace Gravel, Firm, Dark Brown to Brown, Moist - Occasional Organics to 0.60m.	SS-1B		25	2								
2	0.6						3								
3			Stiff, Brown	SS-2	50	18	4								
4	1.0						5		X						
5							4								
6	2.0			SS-3	88	19	5		X						
7							5								
8	2.3		Very Stiff Sand Seam at 2.4m	SS-4	100	15	12								
9							10								
10	3.0		Hard, Occasional Cobbles	SS-5	46	9	14								
11							12								
12							17								
13	4.0						23								
14							50=4"	100+							
15															
16	5.0			SS-6	21	7	50=5"	100+							
17															
18															
19															
20	6.0														
21	6.1		SAND - Sand, With Silt and Clay, Very Dense, Brown, Moist	SS-7	46	8	39	100+							
22	6.4		END OF BOREHOLE				50=5"								
23	7.0														
24															

BOREHOLE LOG GEOTECH 11224019-DSG-21-03-19, GINT BOREHOLE LOGS, JS.GPJ GEOLOGIC.GDT 22/3/21

- Borehole open and free of groundwater accumulation upon completion.



BOREHOLE No.: BH5D-21

ELEVATION: 262.4 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Bromont Group

PROJECT: Geotechnical Investigation - 787 & 825 Fallis Line, Millbrook

LOGGED BY: J.Scott

DATE: 5 March 2021

DRILLING COMPANY: Landshark Group

METHOD: Solid Stem Augers and Split Spoons

NOTES: Ground surface elevation interpolated from ODTM Lidar Derived data. Well Tag Number A301561.

LEGEND

- ☒ SS - SPLIT SPOON
 ▨ AS - AUGER SAMPLE
 ▩ ST - SHELBY TUBE
 ▬ CS - CORE SAMPLE
 ▼ - WATER LEVEL

UTM: +/- 17T 702694.7E 4892571.5N

Depth		m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery	Moisture Content	Blows per 6 in. / 15 cm	Penetration Index	Shear test (Cu) Sensitivity (S)										COMMENTS
ft	m									△ Field	□ Lab	○ Water content (%)	⊖ Atterberg limits (%)	⊗ "N" Value (blows / 0.3 m)	◆ RQD	⊙ CONE				
		0.0		GROUND SURFACE		%	%		N	10	20	30	40	50	60	70	80	90		
1				TOPSOIL (915mm)	SS-1	45	19	9	11	×	○								- Borehole open and free of groundwater accumulation upon completion.	
2								8												
3	1.0	0.9		FILL - Sand, With Silt and Clay, Very Loose, Brown, Moist	SS-2A	71	29	3	4	×		○							WL - Dry 3/17/2021	
4					SS-2B		7	2		○										
5		1.5		ORGANIC SILT	SS-3A	79	26	4	9	×		○								
6		1.7		SAND - Sand, With Silt and Clay, Loose, Brown, Moist	SS-3B		5	4		○										
7	2.0							5												
8		2.3		Very Loose	SS-4	42	7	2	2	×	○								- SS4: 0% Gravel 82% Sand 11% Silt 7% Clay ($<0.002\text{mm}$)	
9								1												
10	3.0	3.0		Dense	SS-5	67	7	14	31	○		×								
11								14												
12								17												
13	4.0							18												
14																				
15		4.6		Very Dense	SS-6	54	9	24	100+	○									- 50 mm diameter monitoring well installed to 5.8m	
16	5.0							50=5"												
17																				
18																				
19																				
20	6.0																			
21		6.2		END OF BOREHOLE	SS-7	29	4	50=5"	100+	○										
22																				
23	7.0																			
24																				



BOREHOLE No.: BH5S-21

ELEVATION: 262.4 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Bromont Group

PROJECT: Geotechnical Investigation - 787 & 825 Fallis Line, Millbrook

LOGGED BY: J.Scott

DATE: 5 March 2021

DRILLING COMPANY: Landshark Group

METHOD: Solid Stem Augers and Split Spoons

NOTES: Ground surface elevation interpolated from ODTM Lidar Derived data.

LEGEND

- ☐ SS - SPLIT SPOON
☐ AS - AUGER SAMPLE
☐ ST - SHELBY TUBE
☐ CS - CORE SAMPLE
 - WATER LEVEL

UTM: +/- 17T 702694.7E 4892571.5N

Depth		m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery	Moisture Content	Blows per 6 in. / 15 cm	Penetration Index	Shear test (Cu) △ Field Sensitivity (S) □ Lab ○ Water content (%) w _p w _L Atterberg limits (%) × "N" Value ◆ RQD (blows / 0.3 m) ◎ CONE										COMMENTS
ft	m									10	20	30	40	50	60	70	80	90		
		0.0		GROUND SURFACE			%	%		N										
1				TOPSOIL (915mm)																
2																				
3	1.0	0.9		FILL - Sand, With Silt and Clay, Very Loose, Brown, Moist																
4																				
5		1.5		ORGANIC SILT																
6		1.7		SAND - Sand, With Silt and Clay, Loose, Brown, Moist																
7	2.0																			
8		2.2		END OF BOREHOLE																
9																				
10	3.0																			
11																				
12																				
13	4.0																			
14																				
15																				
16	5.0																			
17																				
18																				
19																				
20	6.0																			
21																				
22																				
23	7.0																			
24																				



BOREHOLE No.: BH6-21

ELEVATION: 259.1 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Bromont Group

PROJECT: Geotechnical Investigation - 787 & 825 Fallis Line, Millbrook

LOGGED BY: J.Scott

DATE: 5 March 2021

DRILLING COMPANY: Landshark Group

METHOD: Solid Stem Augers and SplitSpoons

NOTES: Ground surface elevation interpolated from ODTM Lidar Derived data.

LEGEND

- ☒ SS - SPLIT SPOON
☒ AS - AUGER SAMPLE
☒ ST - SHELBY TUBE
☒ CS - CORE SAMPLE
 - WATER LEVEL

UTM: +/- 17T 702833.9E 4892513.0N

Depth		m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery	Moisture Content	Blows per 6 in. / 15 cm	Penetration Index	Shear test (Cu) Sensitivity (S) △ Field Water content (%) □ Lab Atterberg limits (%) ◇ RQD "N" Value (blows / 0.3 m) ⊙ CONE										COMMENTS
ft	m									10	20	30	40	50	60	70	80	90		
		0.0		GROUND SURFACE		%	%		N											
				TOPSOIL (915mm)	SS-1	71	38	3 2 4 4	6	×			○						- Borehole open and free of groundwater accumulation upon completion.	
1																				
2																				
3	1.0	0.9		FILL - Sand, With Silt and Clay, Dense, Brown, Moist	SS-2A	67	19	2 5 29 20	34			○	×							
4					SS-2B		10					○								
5																				
6		1.6		ORGANIC SILT	SS-3A	63	11	16	29			○		×						
7		1.8		TILL - Sandy Silt, With Clay, Few Gravel, Compact, Brown, Moist	SS-3B		22	14				○								
8	2.0				SS-3C		7	15												
9								50=5"												
10		2.3		Dense, Occasional Cobbles				14 14 18 22												
11					SS-4	100	7		32	○			×							
12																				
13	3.0	3.0		Very Dense				22 25 36 32												
14					SS-5	67	8		61	○				×						
15																				
16																				
17																				
18																				
19																				
20	5.0																			
21																				
22																				
23	6.0																			
24		6.2		END OF BOREHOLE	SS-7	21	6	50=5"	100+	○							×			
25																				
26																				
27																				
28	7.0																			
29																				
30																				
31																				
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BOREHOLE LOG GEOTECH 11224019-DSG-21-03-19, GINT BOREHOLE LOGS, JS.GPJ GEOLOGIC.GDT 22/3/21

- Borehole open and free of groundwater accumulation upon completion.



BOREHOLE No.: BH7-21

ELEVATION: 259.3 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Bromont Group

PROJECT: Geotechnical Investigation - 787 & 825 Fallis Line, Millbrook

LOGGED BY: J.Scott

DATE: 4 March 2021

DRILLING COMPANY: Landshark Group

METHOD: Solid Stem Augers and Split Spoons

NOTES: Ground surface elevation interpolated from ODTM Lidar Derived data.

LEGEND

- ☒ SS - SPLIT SPOON
 ▨ AS - AUGER SAMPLE
 ▩ ST - SHELBY TUBE
 ▬ CS - CORE SAMPLE
 ▼ - WATER LEVEL

UTM: +/- 17T 702936.2E 4892456.8N

Depth		m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery	Moisture Content	Blows per 6 in. / 15 cm	Penetration Index	Shear test (Cu) Sensitivity (S) △ Field ○ Water content (%) □ Lab ⊞ Atterberg limits (%) × "N" Value (blows / 0.3 m) ◆ RQD ⊙ CONE										COMMENTS
ft	m									10	20	30	40	50	60	70	80	90		
		0.0		GROUND SURFACE		%	%		N											
				TOPSOIL (300mm)	SS-1A	63	27	4												- Borehole open and free of groundwater accumulation upon completion.
1		0.3		TILL - Sandy Silt, With Clay, Few Gravel, Loose to Compact, Dark Brown to Brown, Moist - Occasional Organics to 0.75m. ----- Compact, Brown	SS-1B		16	5	10											
2									4											
3	1.0					SS-2A	58	24	3	7										
4		1.1			SS-2B		9	4												
5																				
6	2.0				SS-3	67	11	9	14											
7								7												
8								8												
9					SS-4	71	16	13	21											
10	3.0																			
11								16												
12		3.7			SS-5	100	11	12	25											- SS5: 6% Gravel 34% Sand 46% Silt 14% Clay ($<0.002\text{mm}$)
13				Very Dense, Occasional Cobbles -----				8												
14																				
15																				
16	5.0				SS-6	17	6	50=4"	100+											
17																				
18																				
19																				
20	6.0																			
21		6.2			SS-7	21	5	50=5"	100+											
22				END OF BOREHOLE																
23	7.0																			
24																				

BOREHOLE LOG GEOTECH 11224019-DSG-21-03-19, GINT BOREHOLE LOGS, JS.GPJ GEOLOGIC.GDT 22/3/21

- Borehole open and free of groundwater accumulation upon completion.

- SS5:
6% Gravel
34% Sand
46% Silt
14% Clay (<0.002mm)



BOREHOLE No.: BH8-21

ELEVATION: 261.8 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Bromont Group

PROJECT: Geotechnical Investigation - 787 & 825 Fallis Line, Millbrook

LOGGED BY: J. Scott

DATE: 5 March 2021

DRILLING COMPANY: Landshark Group

METHOD: Solid Stem Augers and Split Spoons

NOTES: Ground surface elevation interpolated from ODTM Lidar Derived data.

LEGEND

- ☒ SS - SPLIT SPOON
☒ AS - AUGER SAMPLE
☒ ST - SHELBY TUBE
☒ CS - CORE SAMPLE
 - WATER LEVEL

UTM: +/- 17T 702771.1E 4892372.6N

Depth		m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery	Moisture Content	Blows per 6 in. / 15 cm	Penetration Index	Shear test (Cu) △ Field Sensitivity (S) □ Lab ○ Water content (%) ┌─┐ Atterberg limits (%) w _p w _L × "N" Value ◆ RQD (blows / 0.3 m) ◎ CONE													COMMENTS		
ft	m									10	20	30	40	50	60	70	80	90							
		0.0		GROUND SURFACE		%	%		N																
				TOPSOIL (255mm)	⊗ SS-1		27	1	5	×		○													
1		0.3		TILL - Sandy Silt, With Clay, Few Gravel, Loose, Brown, Moist				2																	
									3																
2								2																	
				Very Dense	⊗ SS-2		13	5	100+			○													
3	1.0	0.8						11																	
								50=1"																	
4																									
5					⊗ SS-3		5	22	74			○													
6								37																	
				Occasional Cobbles				37																	
7	2.0	2.0						30																	
					⊗ SS-4		5	27	100+			○													
8								44																	
								50=5"																	
9																									
10	3.0				⊗ SS-5		6	35	91			○													
11								42																	
								49																	
12								44																	
13	4.0																								
14																									
15					⊗ SS-6		7	48	100+			○													
16								50=5"																	
17	5.0																								
18																									
19																									
20	6.0				⊗ SS-7		7	37	100+			○													
21		6.4		END OF BOREHOLE				50=5"																	
22																									
23	7.0																								
24																									

- Borehole open and free of groundwater accumulation upon completion.



BOREHOLE No.: BH9-21

ELEVATION: 259.0 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Bromont Group

PROJECT: Geotechnical Investigation - 787 & 825 Fallis Line, Millbrook

LOGGED BY: J. Scott

DATE: 4 March 2021

DRILLING COMPANY: Landshark Group

METHOD: Solid Stem Augers and SplitSpoons

NOTES: Ground surface elevation interpolated from ODTM Lidar Derived data.

LEGEND

- ☒ SS - SPLIT SPOON
 ☒ AS - AUGER SAMPLE
 ☒ ST - SHELBY TUBE
 ☒ CS - CORE SAMPLE
 ▼ - WATER LEVEL

UTM: +/- 17T 702887.4E 4892348.3N

Depth	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery	Moisture Content	Blows per 6 in. / 15 cm	Penetration Index	Shear test (Cu) Sensitivity (S) Water content (%) Atterberg limits (%) "N" Value (blows / 0.3 m)	Field Lab RQD CONE	COMMENTS
ft	m	0.0	GROUND SURFACE		%	%		N	10 20 30 40 50 60 70 80 90		
		0.3	TOPSOIL (255mm)	SS-1A	12	28	5	12	×	○	
1			TILL - Sandy Silt, With Clay, Few Gravel, Compact, Dark Brown to Brown, Moist - Occasional Organics to 0.75m. Brown	SS-1B		27	5				
2							7				
3		0.8					4				
4	1.0			SS-2	24	19	6	14	×	○	
5							8				
6							7				
7	2.0			SS-3	19	19	4	14	×	○	
8							6				
9							8				
10							9				
11	3.0			SS-4	24	15	6	14	×		
12							8				
13							11				
14											
15	4.0						12				
16							12				
17							13	25	○	×	
18							10				
19											
20											
21	5.0	4.6	Dense	SS-6	24	17	19	41	○	×	
22							17				
23							24				
24							24				
25	6.0	6.1	Very Dense, Occasional Cobbles	SS-7	22	10	10	100+	○		×
26							18				
27		6.5	END OF BOREHOLE				50=4"				
28											
29	7.0										
30											
31											
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BOREHOLE No.: BH10-21

ELEVATION: 253.0 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Bromont Group

PROJECT: Geotechnical Investigation - 787 & 825 Fallis Line, Millbrook

LOGGED BY: J. Scott

DATE: 4 March 2021

DRILLING COMPANY: Landshark Group

METHOD: Solid Stem Augers and Split Spoons

NOTES: Ground surface elevation interpolated from ODTM Lidar Derived data.

LEGEND

- ☒ SS - SPLIT SPOON
☒ AS - AUGER SAMPLE
☒ ST - SHELBY TUBE
☒ CS - CORE SAMPLE
 - WATER LEVEL

UTM: +/- 17T 703013.4E 4892304.0N

Depth		m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery	Moisture Content	Blows per 6 in. / 15 cm	Penetration Index	Shear test (Cu) Sensitivity (S) Water content (%) Atterberg limits (%)										COMMENTS
ft	m									w_p	w_L	"N" Value (blows / 0.3 m)	Field	Lab	RQD	CONE				
		0.0		GROUND SURFACE		%	%		N	10	20	30	40	50	60	70	80	90		
		0.2		TOPSOIL (230mm)	SS-1A	71	24	3	6	X		O							- Borehole open and free of groundwater accumulation upon completion.	
1				TILL - Sandy Silt, With Clay Few Gravel, Loose, Dark Brown to Brown, Moist - Occasional Organics to 0.30m	SS-1B		23	3				O								
					SS-1C		23	5				O								
2		0.8						3												
3	1.0			Compact	SS-2	92	22	4	10	X		O								
4								6												
5								12												
6	2.0				SS-3	83	24	8	20			X	O							
7								10												
8								32												
9		2.6		Dense, Occasional Cobbles	SS-4	88		6	28			X								
10	3.0							22												
11					SS-5	100	15	16	46			O		X						
12								20												
13	4.0							26												
14								26												
15		4.6		Very Dense, Occasional Cobbles	SS-6	42	16	25	100+			O						X		
16	5.0							50=3"												
17																				
18																				
19																				
20	6.0	6.2		END OF BOREHOLE	SS-7	16	6	50=4"	100+	O								X		
21																				
22																				
23	7.0																			
24																				



BOREHOLE No.: BH11D-21

ELEVATION: 254.9 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Bromont Group

PROJECT: Geotechnical Investigation - 787 & 825 Fallis Line, Millbrook

LOGGED BY: J. Scott

DATE: 4 March 2021

DRILLING COMPANY: Landshark Group

METHOD: Solid Stem Augers and Split Spoons

NOTES: Ground surface elevation interpolated from ODTM Lidar Derived data.

LEGEND

- ☒ SS - SPLIT SPOON
 ▨ AS - AUGER SAMPLE
 ▩ ST - SHELBY TUBE
 ▬ CS - CORE SAMPLE
 ▼ - WATER LEVEL

UTM: +/- 17T 702829.8E 4892241.8N

Depth		m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery	Moisture Content	Blows per 6 in. / 15 cm	Penetration Index	Shear test (Cu) Sensitivity (S)										COMMENTS
ft	m									W _p	W _L	Atterberg limits (%)	△ Field	□ Lab						
		0.0		GROUND SURFACE		%	%		N	10	20	30	40	50	60	70	80	90		
		0.0		TOPSOIL (275mm)	SS-1A	75	33	5	5	×		○							- Borehole open upon completion with water level at approximately 6.5m	
1		0.3		TILL - Clayey Silt, Few Sand, Trace Gravel, Firm, Dark Brown to Brown, Moist - Occasional Organics to 0.90m Soft, Brown	SS-1B		29	3				○								
2									3											
3		0.9				SS-2A	67	21	3	4	×		○							- SS2B: 0% Gravel 6% Sand 54% Silt 40% Clay ($<0.002\text{mm}$)
4	1.0					SS-2B		25	2				○							
5		1.5		Stiff				3												
6					SS-3	100	10	6	13			○	×							
7	2.0							7												
8		2.3		Very Stiff				5												
9					SS-4	71	9	8	16	○	×								WL - 2.5 m 3/17/2021	
10								8												
11	3.0	3.0		Wet				6											- Groundwater seepage first observed at approximately 3.0 m	
12					SS-5	100	16	8	20			○	×							
13								12												
14	4.0							10												
15								7												
16					SS-6	100	18	8	19			○	×							
17	5.0							11												
18																				
19																				
20	6.0																		- 50 mm diameter monitoring well installed to 6.0m	
21					SS-7	100	17	10	25			○	×							
22		6.7		END OF BOREHOLE				12												
23	7.0							13												
24								14												

BOREHOLE LOG GEOTECH 11224019-DSG-21-03-19, GINT BOREHOLE LOGS, JS.GPJ GEOLOGIC.GDT 22/3/21



BOREHOLE No.: BH11S-21

ELEVATION: 254.9 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Bromont Group

PROJECT: Geotechnical Investigation - 787 & 825 Fallis Line, Millbrook

LOGGED BY: J. Scott

DATE: 4 March 2021

DRILLING COMPANY: Landshark Group

METHOD: Solid Stem Augers and Split Spoons

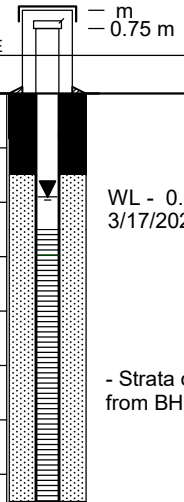
NOTES: Ground surface elevation interpolated from ODTM Lidar Derived data.

LEGEND

- ☒ SS - SPLIT SPOON
☒ AS - AUGER SAMPLE
☒ ST - SHELBY TUBE
☒ CS - CORE SAMPLE
 - WATER LEVEL

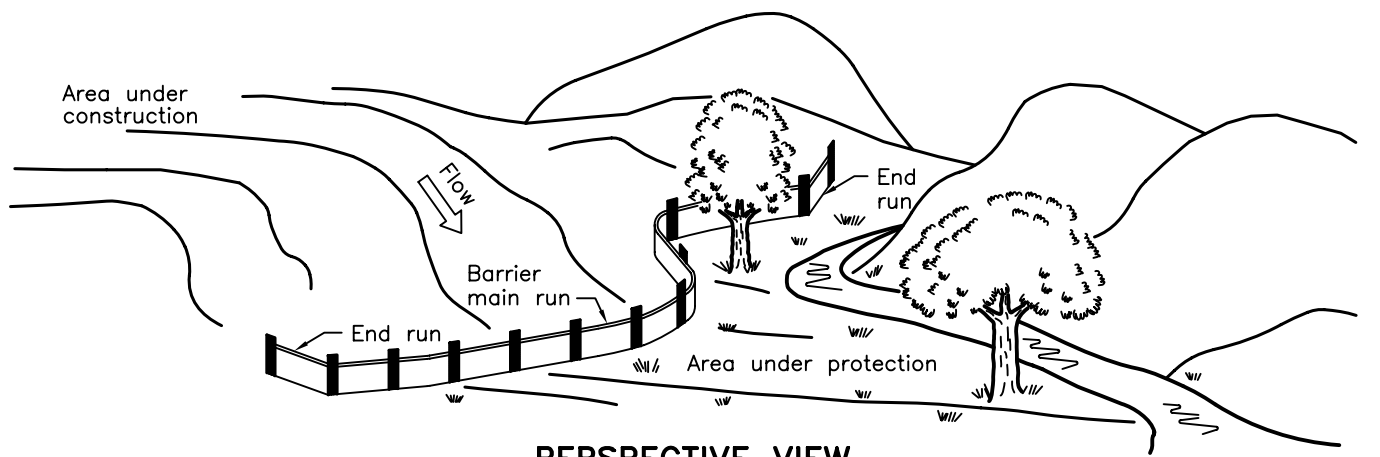
UTM: +/- 17T 702829.8E 4892241.8N

Depth		m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery	Moisture Content	Blows per 6 in. / 15 cm	Penetration Index	Shear test (Cu) Sensitivity (S) △ Field ○ Water content (%) □ Lab Atterberg limits (%) X "N" Value (blows / 0.3 m) ◆ RQD ⊙ CONE										COMMENTS		
ft	m									10	20	30	40	50	60	70	80	90				
		0.0		GROUND SURFACE			%	%		N												
				TOPSOIL (275mm)																		
1		0.3		TILL - Clayey Silt, Few Sand, Trace Gravel, Firm, Dark Brown to Brown, Moist - Occasional Organics to 0.90m Soft, Brown																	WL - 0.6 m 3/17/2021	
2																						
3	1.0	0.9																				
4																						
5		1.5		Stiff																		
6																						
7	2.0																					
8		2.3		END OF BOREHOLE																		
9																						
10	3.0																					
11																						
12																						
13	4.0																					
14																						
15																						
16	5.0																					
17																						
18																						
19																						
20	6.0																					
21																						
22																						
23	7.0																					
24																						

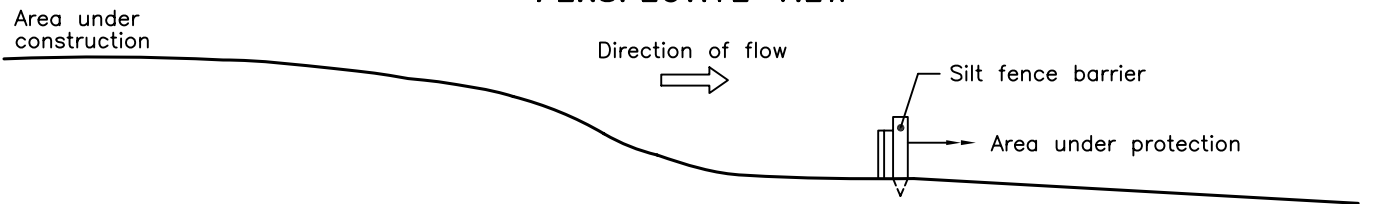
WL - 0.6 m
3/17/2021- Strata obtained
from BH11D-21- 50 mm diameter
monitoring well
installed to 2.3m

APPENDIX “I”

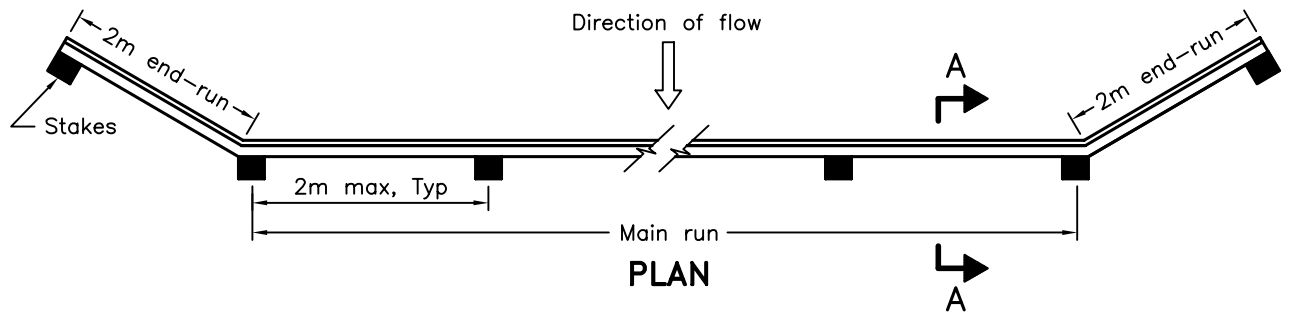
Erosion & Sediment Control Details



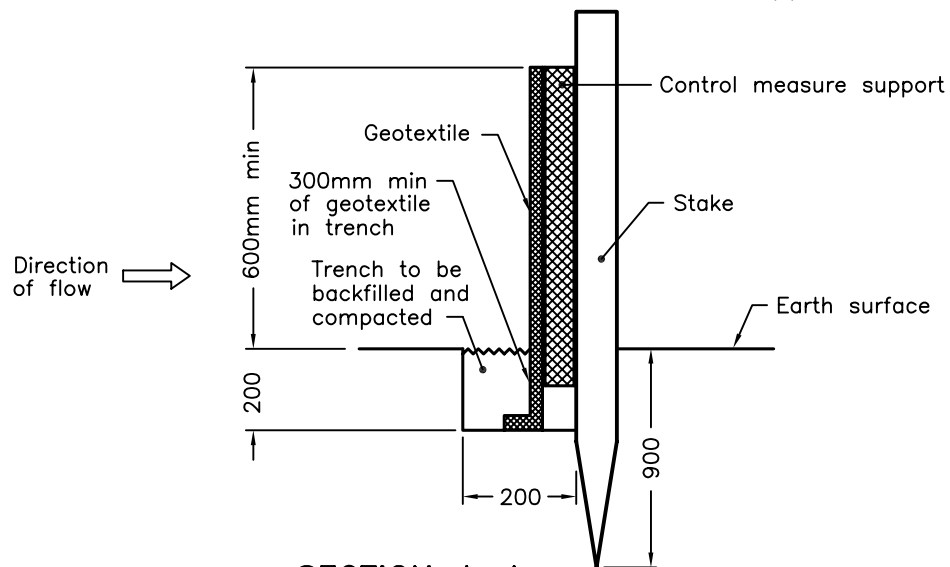
PERSPECTIVE VIEW



SECTION



PLAN



SECTION A-A

NOTE:

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

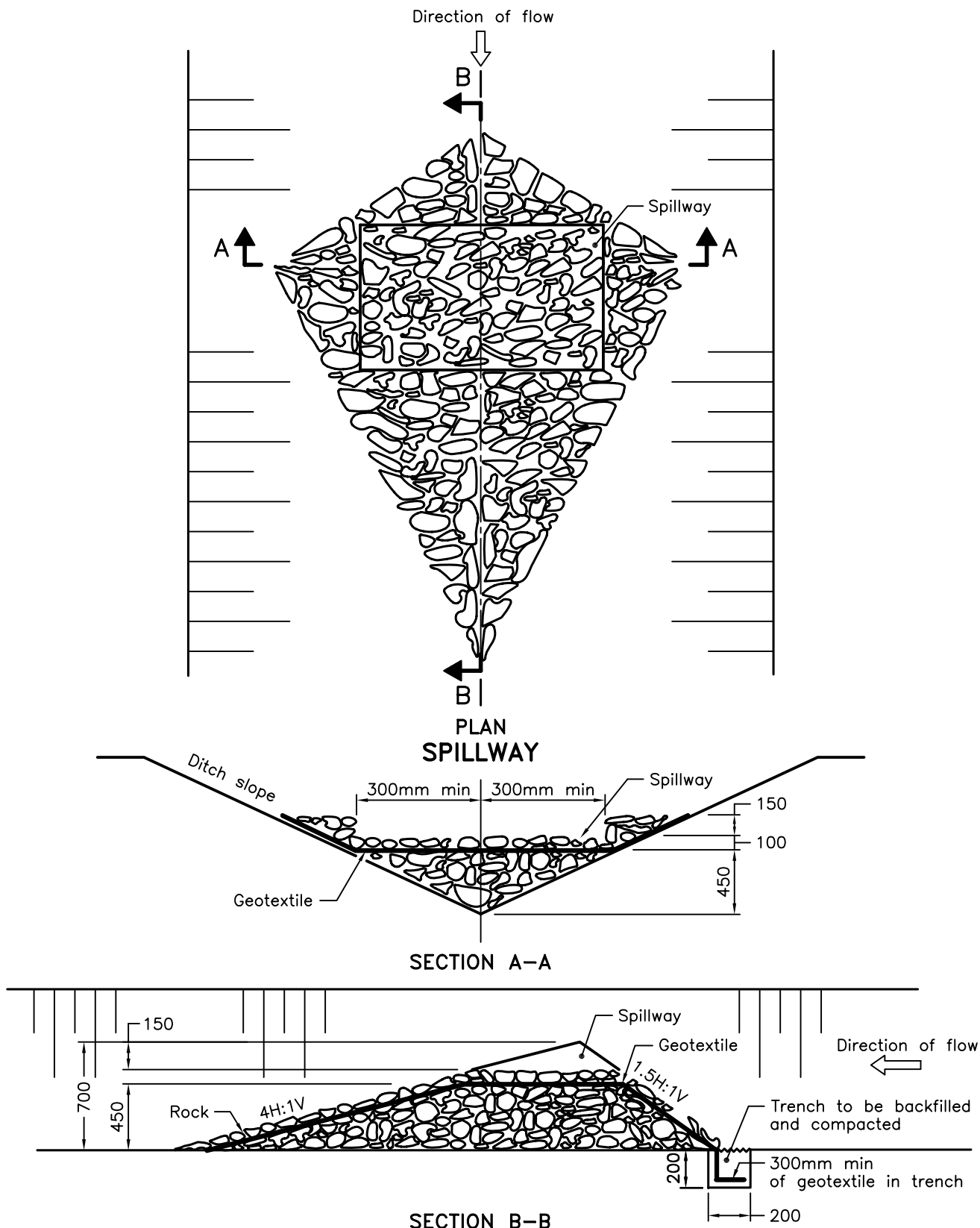
Nov 2006

Rev 1

**HEAVY-DUTY
SILT FENCE BARRIER**



OPSD 219.130



NOTE:

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2006

Rev 1

ROCK FLOW CHECK DAM

V-DITCH



OPSD 219.210

APPENDIX “J”

Typical Joint Utility Trench Detail

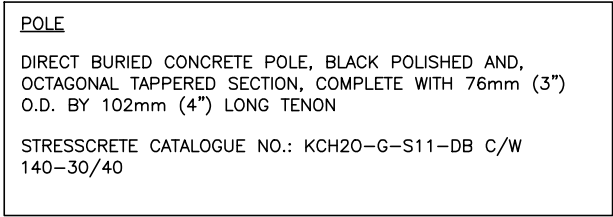


FIGURE J1

APPENDIX “K”

Growth Management Strategy & Master Servicing Study Update

Council Presentation

Township of Cavan Monaghan

October 18, 2021



Growth Management Strategy & Master Servicing Study Update



R.V. Anderson Associates Limited
engineering • environment • infrastructure



PURPOSE OF GROWTH MANAGEMENT STRATEGY (G.M.S.) UPDATE



- The Growth Plan (2019) now requires upper-tier municipalities to plan for long-term population and employment growth to the year 2051.
- To conform with the Growth Plan, upper-tier municipalities must have new Official Plans approved by July 2022.
- In addition to the above, Council have also requested that the scope of the G.M.S. be expanded to specially review Special Study Area No. 1 (SSA-1) as a potential location for future development in the Township over the long-term.
- As a part of this process, the Township of Cavan Monaghan is updating its population, housing and employment forecasts to include the 2041 to 2051 timeframe.

PETERBOROUGH COUNTY GROWTH FORECAST



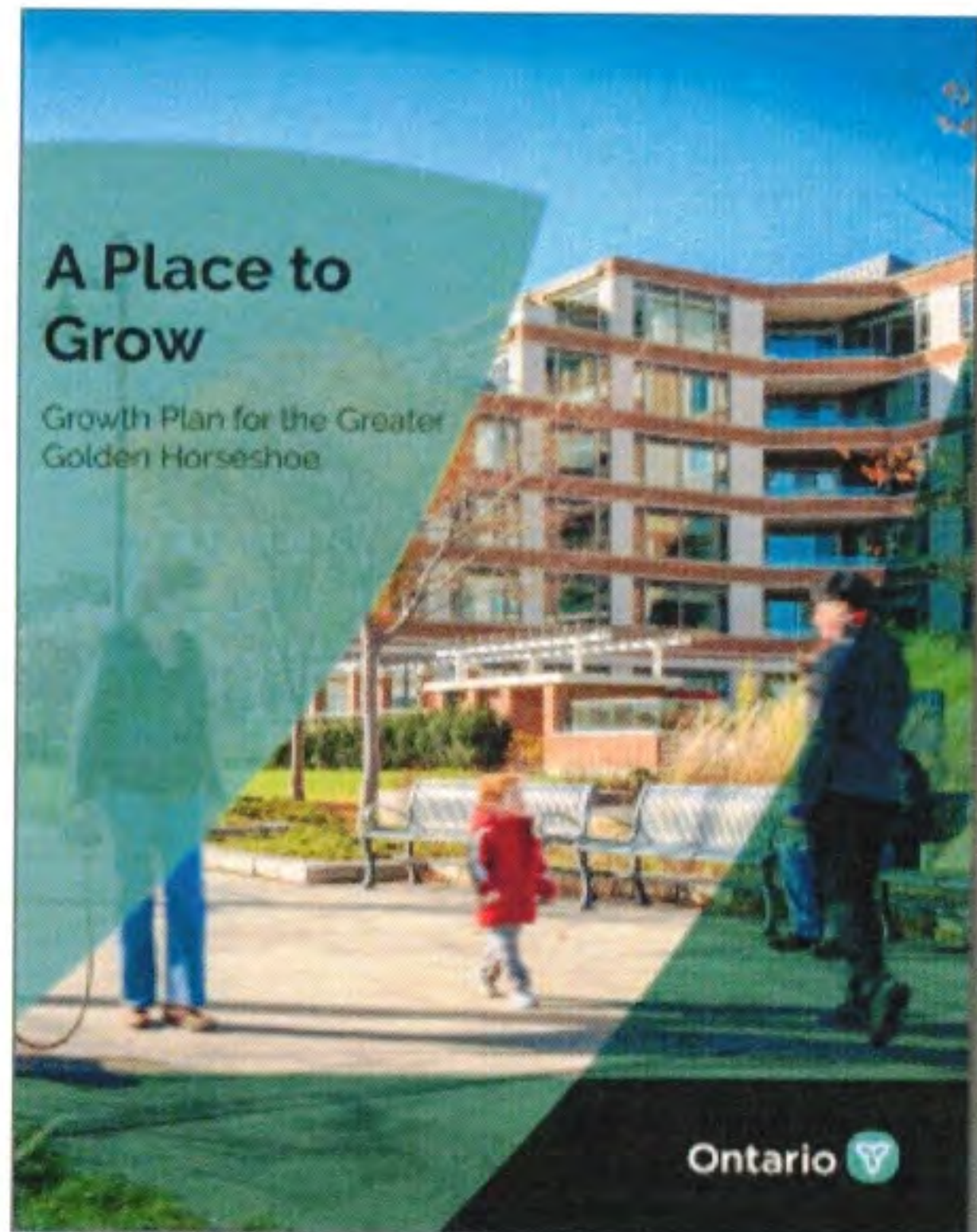
Growth Plan Schedule 3 Growth Forecast for Peterborough County, 2016 to 2051

25,000
population

10,000
jobs

Annual
population
growth rate
of **1%** and
employment
growth rate
of **1.4%**

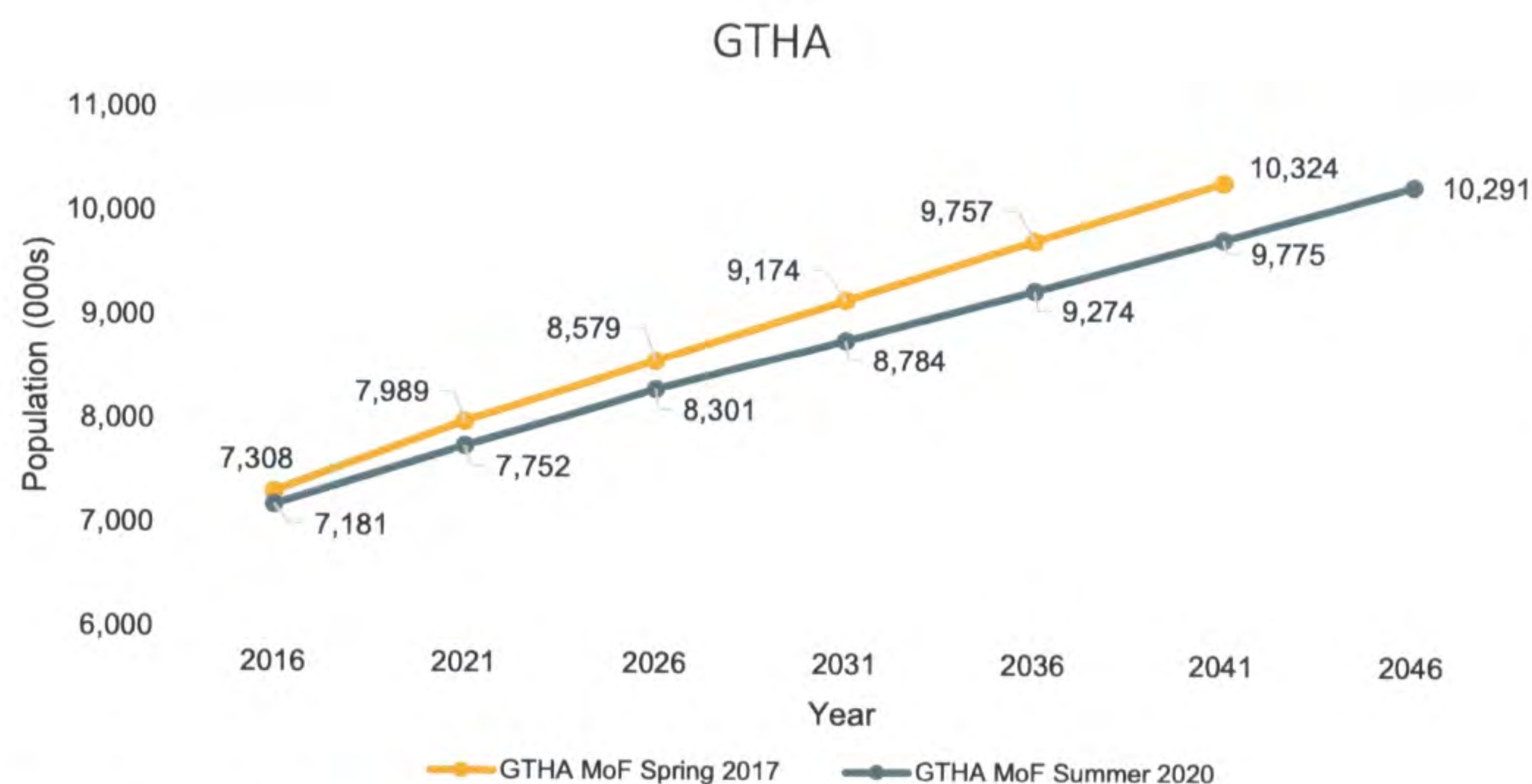
- Schedule 3 Growth Forecasts are to be treated as minimums.
- Higher growth forecast alternatives are permitted, providing that the Municipal Comprehensive Review (M.C.R.) demonstrate that the higher growth scenario meets the Growth Plan, 2020 policy objectives regarding housing choice and labour force supply.



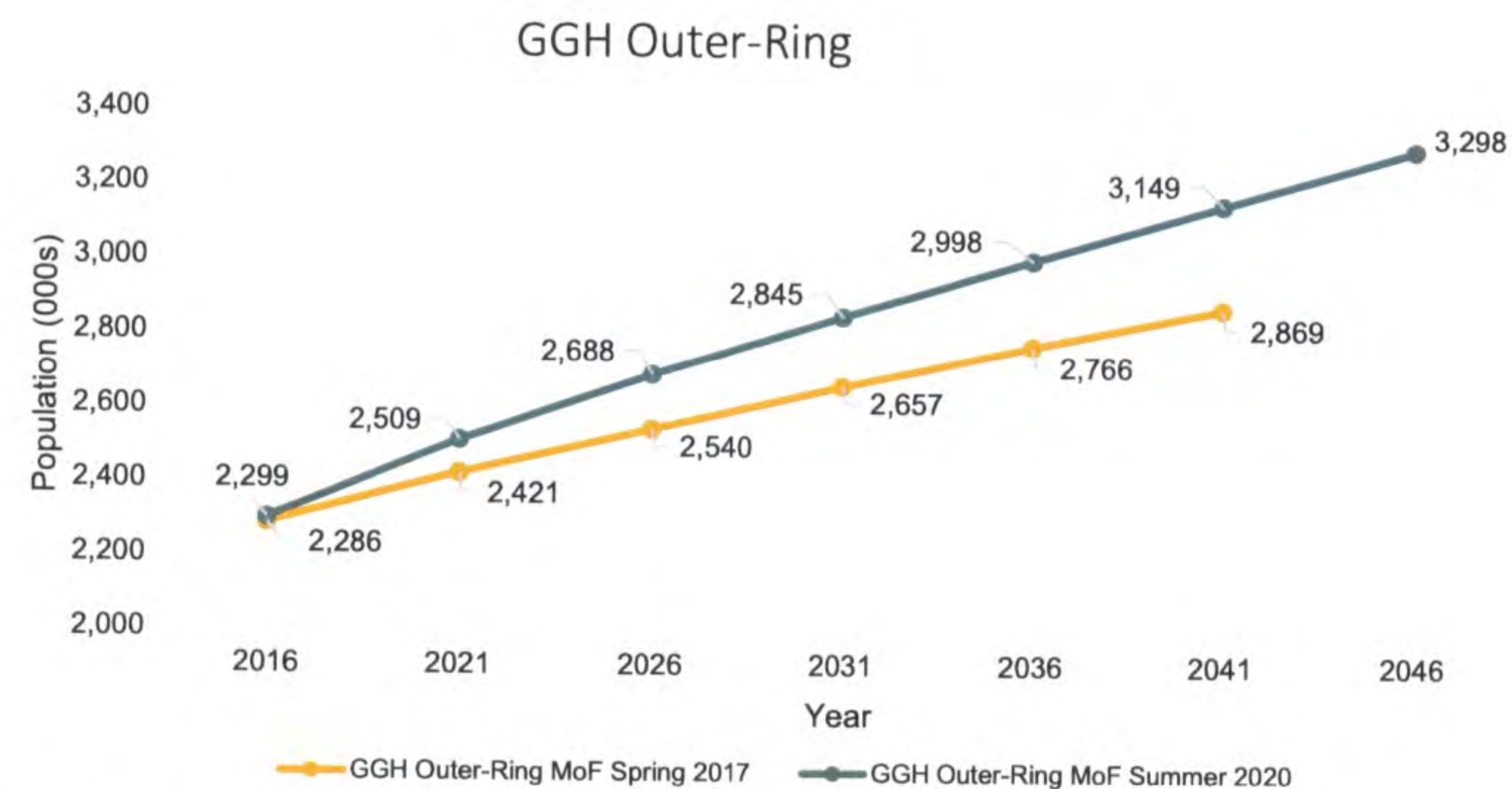
PETERBOROUGH COUNTY GROWTH DRIVERS AND DISRUPTORS



GTHA and GGH Outer Ring Ministry of Finance Population Forecasts

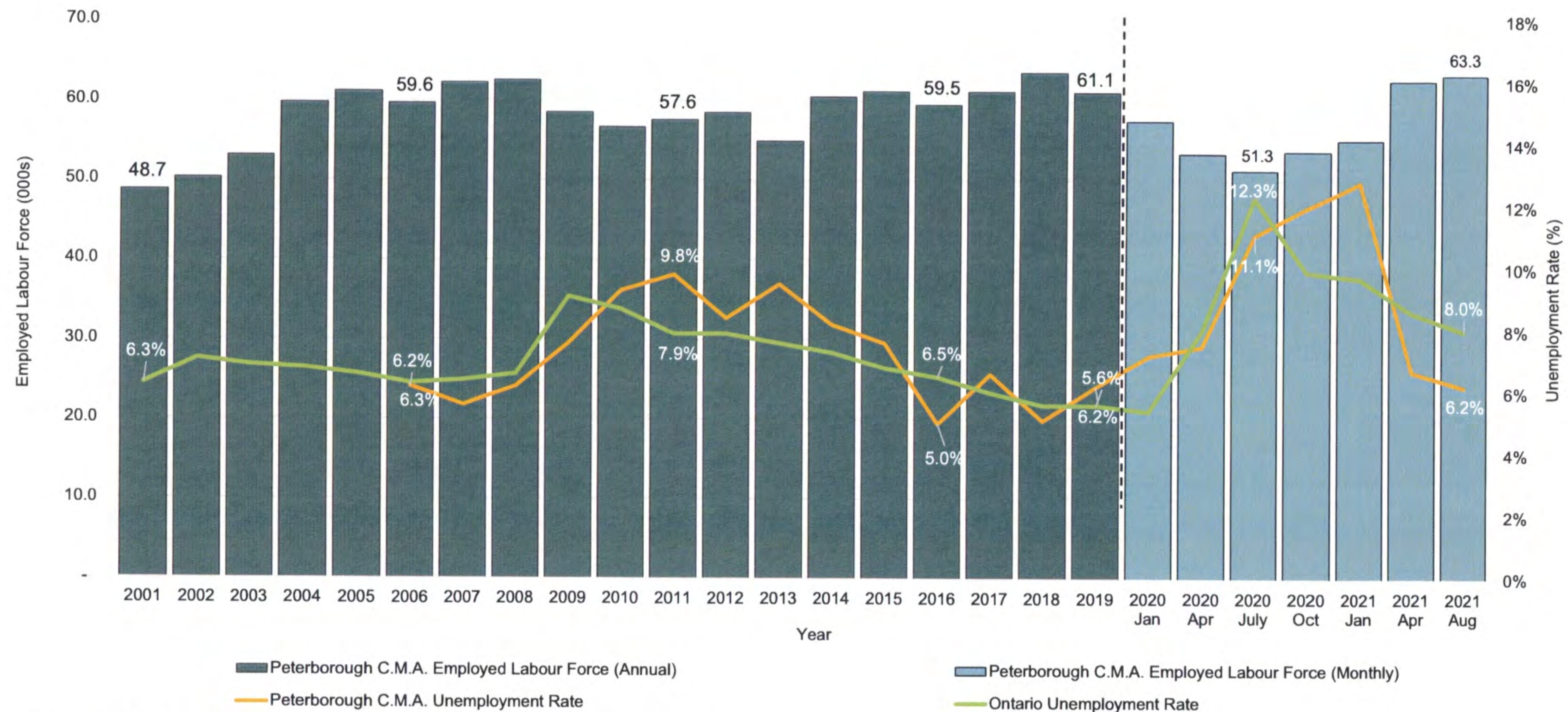


Source: Derived from Ministry of Finance Ontario Population Projections Spring 2017 and Summer 2020 releases, by Watson & Associates Economists Ltd., 2020.



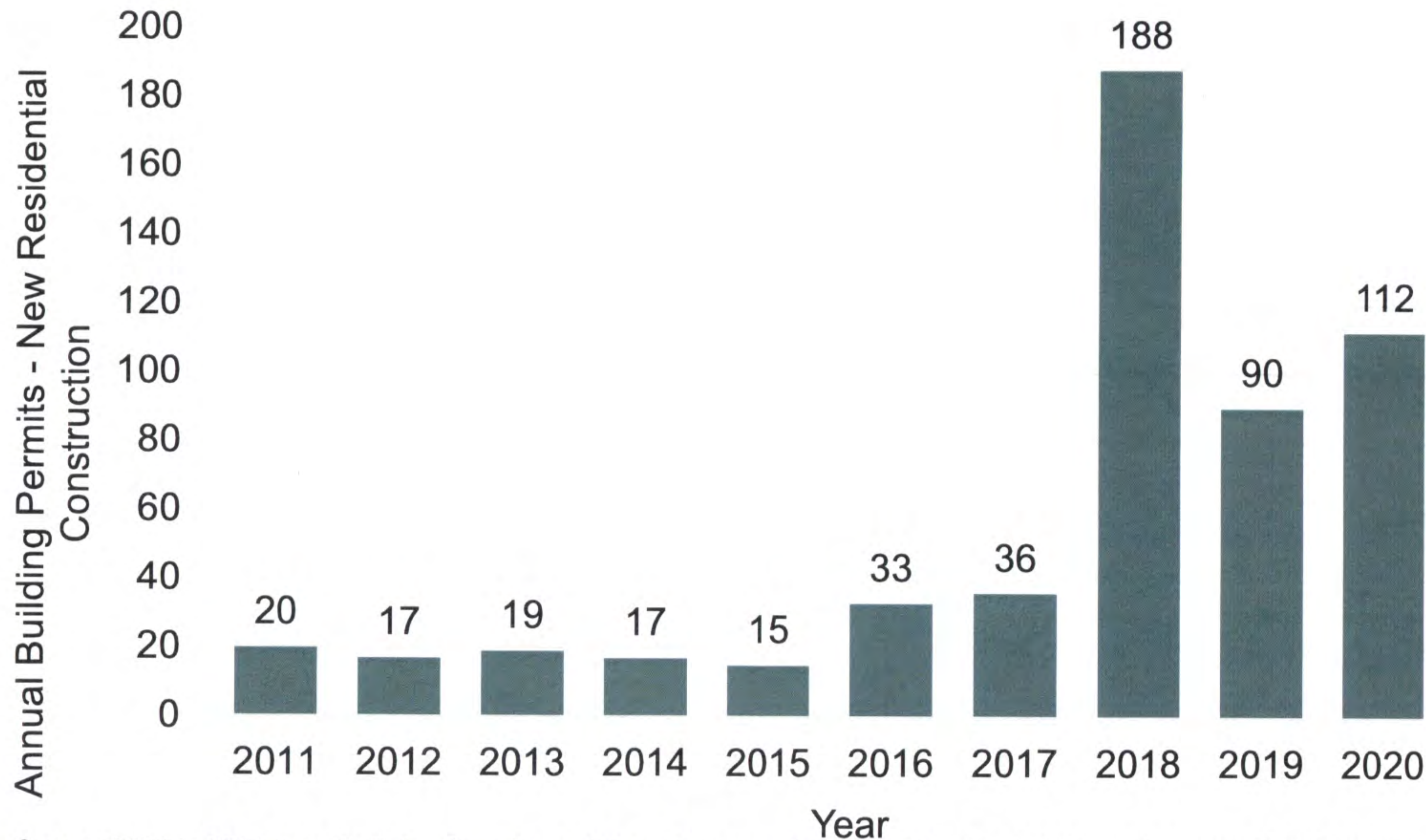
Source: Derived from Ministry of Finance Ontario Population Projections Spring 2017 and Summer 2020 releases, by Watson & Associates Economists Ltd., 2020.

PETERBOROUGH C.M.A. LABOUR FORCE TRENDS, 2006 TO 2021 YTD



Note: Statistics Canada Labour Force Survey and Census labour force statistics may differ.
 Source: Statistics Canada Data Tables 14-10-0098-01 and 14-10-0380-01. By Watson & Associates Economists Ltd., 2021.

CAVAN MONAGHAN HISTORICAL BUILDING PERMIT ACTIVITY, 2011 TO 2020

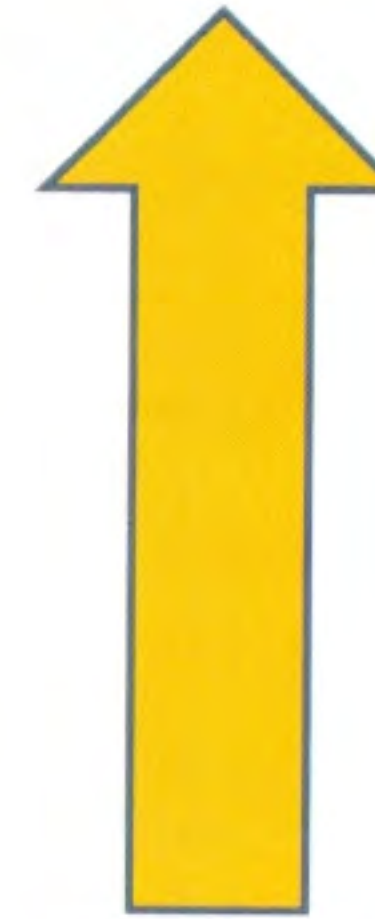
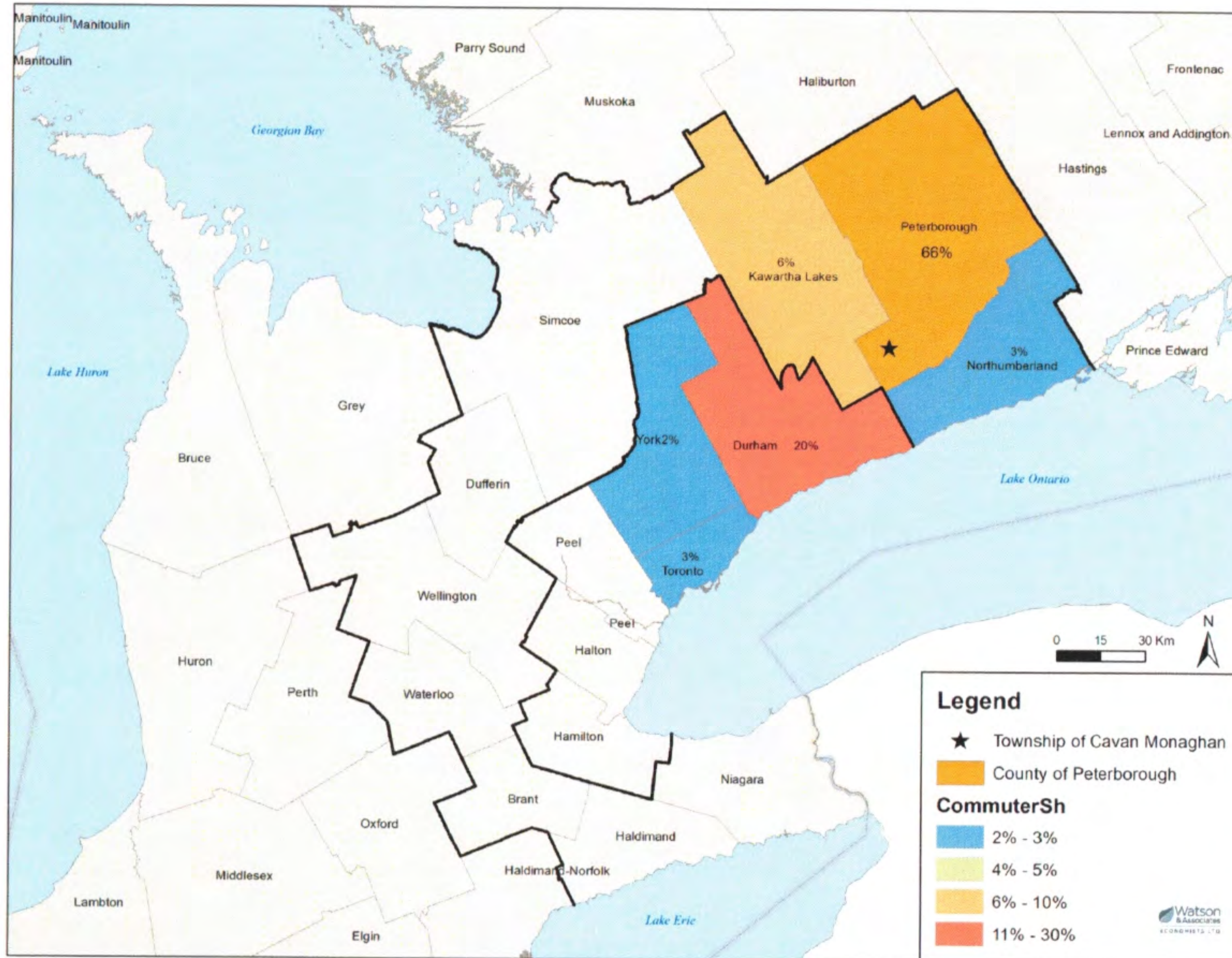


Source: 2011 to 2014 from Statistics Canada monthly building permit data and 2015 to 2020 from the Township of Cavan Monaghan. Figure by Watson & Associates Economists Ltd., 2021.

Note: Building permit activity does not account for demolitions.

REGIONAL CONTEXT

• Township of Cavan Monaghan Commuter-Shed



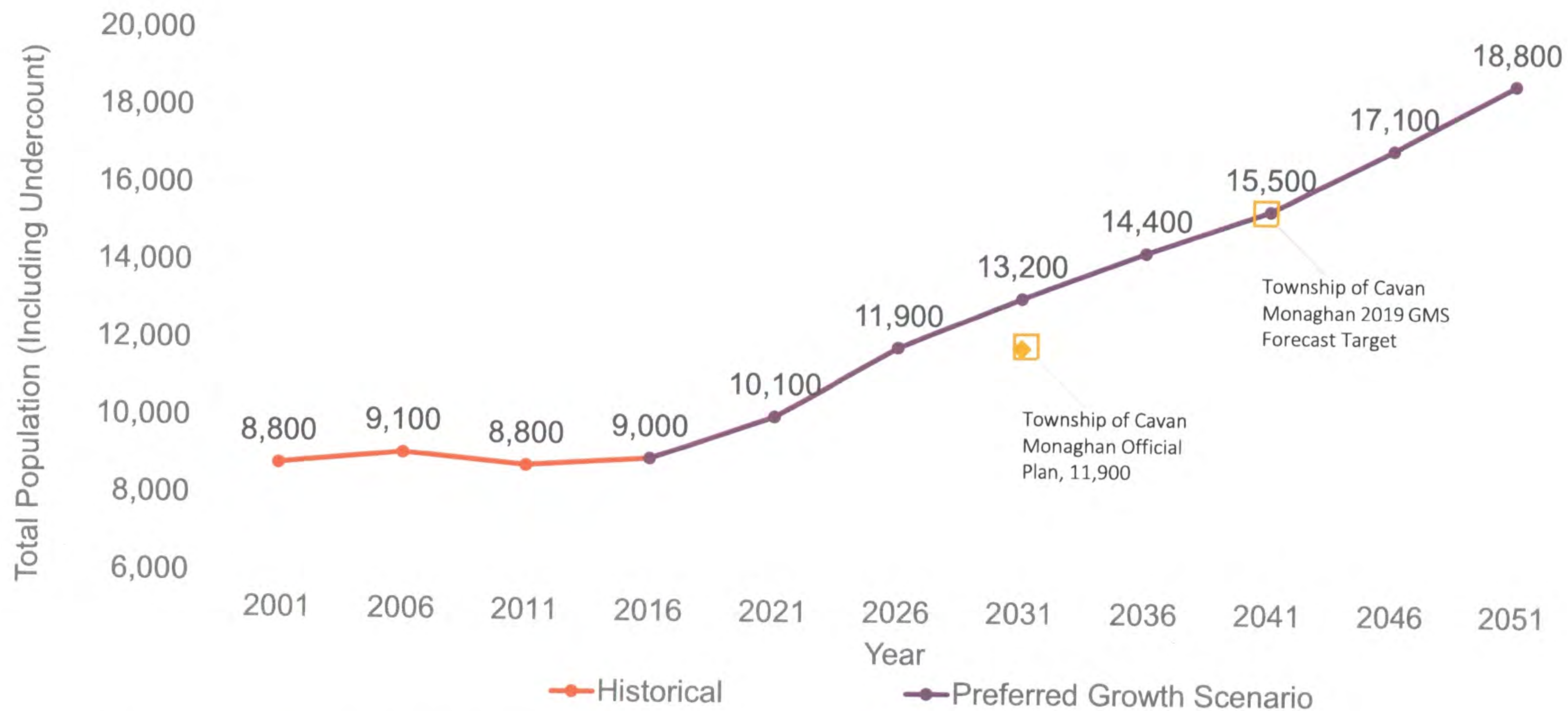
- 1,078,000 increase in Primary Commuter Shed jobs from 2016-2051.
- 1.1% Annual employment growth rate 2016-2051.
- Primary commuter shed is 95% of the Townships' total commuter shed.

Township of Cavan Monaghan Primary Commuter Shed Employment Forecast

2016	2051	2016-2051
2,435,000	3,513,000	1,078,000

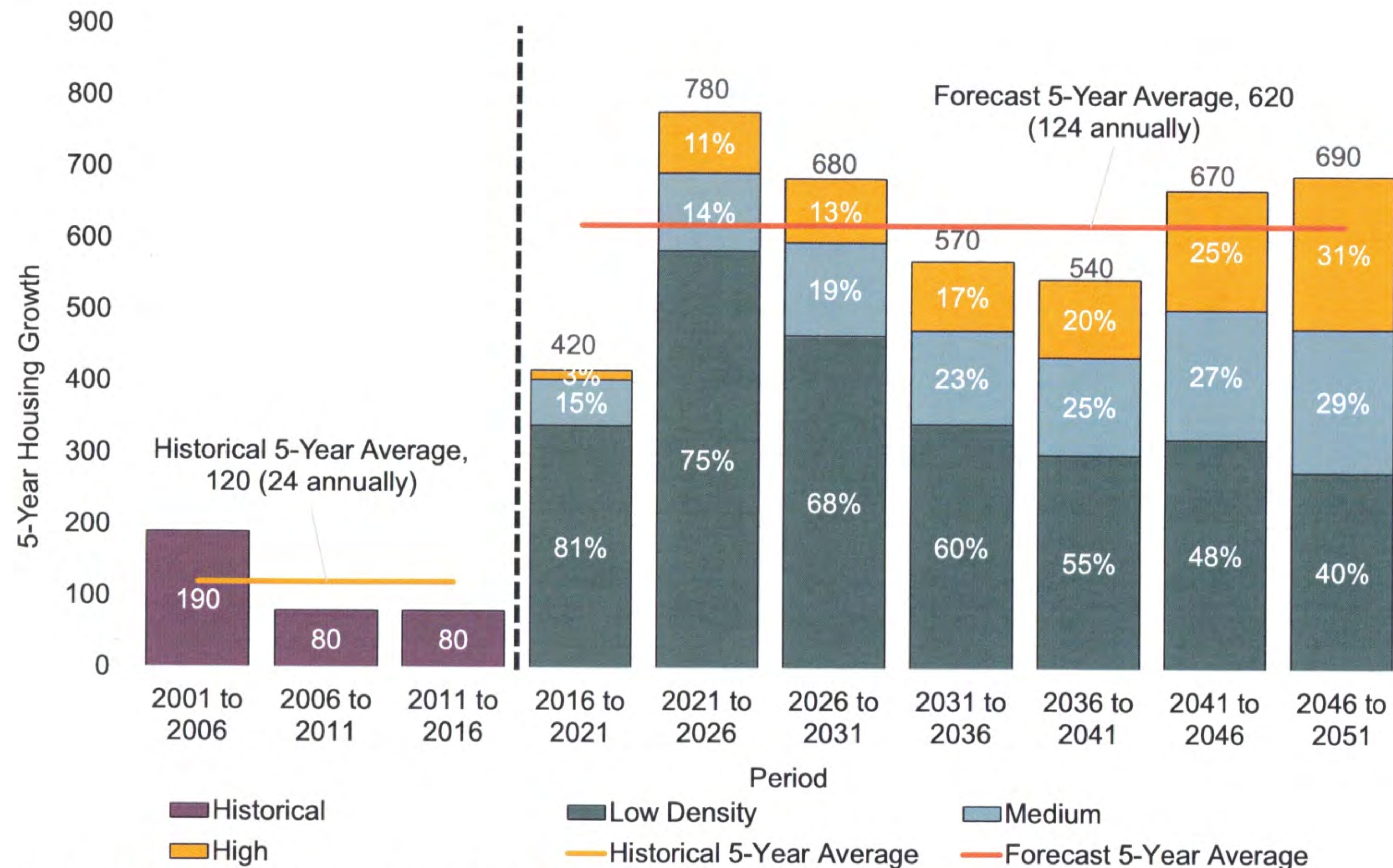
Preliminary Population, Housing, and Employment Forecasts

TOWNSHIP OF CAVAN MONAGHAN POPULATION GROWTH SCENARIOS, 2016 TO 2051



Source: 2001 to 2016 from Statistics Canada Census. Forecast by Watson & Associates Economists Ltd., 2021.
Note: Population includes the net Census undercount estimated at 2.5%.

CAVAN MONAGHAN HOUSING FORECAST BY TYPE, 2016 TO 2051



Source: Statistics Canada Census, 2001 to 2016. Forecast by Watson & Associates Economists Ltd., 2021.

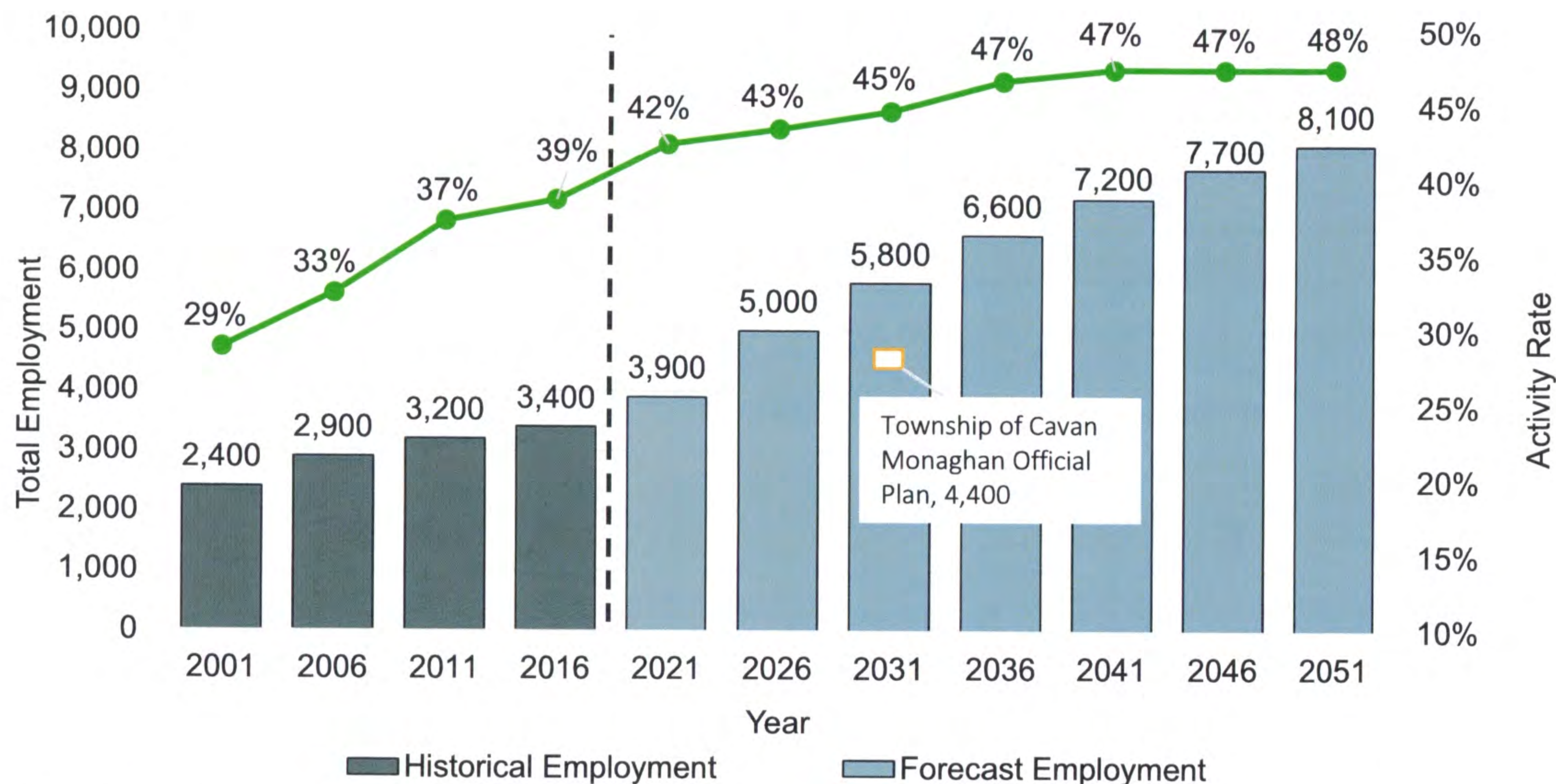
TOWNSHIP OF CAVAN MONAGHAN INTENSIFICATION OUTLOOK



Current Local
Official Plan
Intensification
Target:
20%

Current
Minimum
Growth Plan
Intensification
Target:
40%

TOWNSHIP OF CAVAN MONAGHAN EMPLOYMENT FORECAST, 2016 TO 2051



Source: 2001 to 2016 from Statistics Canada place of work data including work at home and no fixed place of work. Forecast by Watson & Associates Economists Ltd., 2021.

Note: Numbers have been rounded.

TOWNSHIP OF CAVAN MONAGHAN GROWTH FORECAST, 2016 TO 2051



Total Population (Including Undercount) ¹	Historical		Incremental Growth	Forecast			Incremental Growth	Annual Growth Rate	
	2001	2016	2001-2016	2031	2041	2051	2016-2051	2001-2016	2016-2051
Peterborough County	56,600	57,200	600			82,000	24,800	0.1%	1.0%
Township of Cavan Monaghan	8,800	9,000	200	13,200	15,500	18,800	9,800	0.2%	2.1%
Cavan Monaghan Growth Share of Peterborough County			33%				40%		

¹ Includes the net Census undercount estimated at 2.5%.

Total Employment ¹	Historical		Incremental Growth	Forecast			Incremental Growth	Annual Growth Rate	
	2001	2016	2001-2016	2031	2041	2051	2016-2051	2001-2016	2016-2051
Peterborough County	15,000	15,900	900			26,000	10,100	0.4%	1.4%
Township of Cavan Monaghan	2,400	3,400	1,000	5,800	7,200	8,700	5,300	2.3%	2.7%
Cavan Monaghan Growth Share of Peterborough County			111%				52%		

¹ Includes 'no fixed place of work' employment.

Millbrook Master Servicing to 2041

OUTLINE

- Existing Conditions of Facilities (2019)
- Servicing of Short-Term Growth (~2026)
- Servicing of Long-Term Growth (2041)
- Growth Beyond 2041
- Questions and Comments

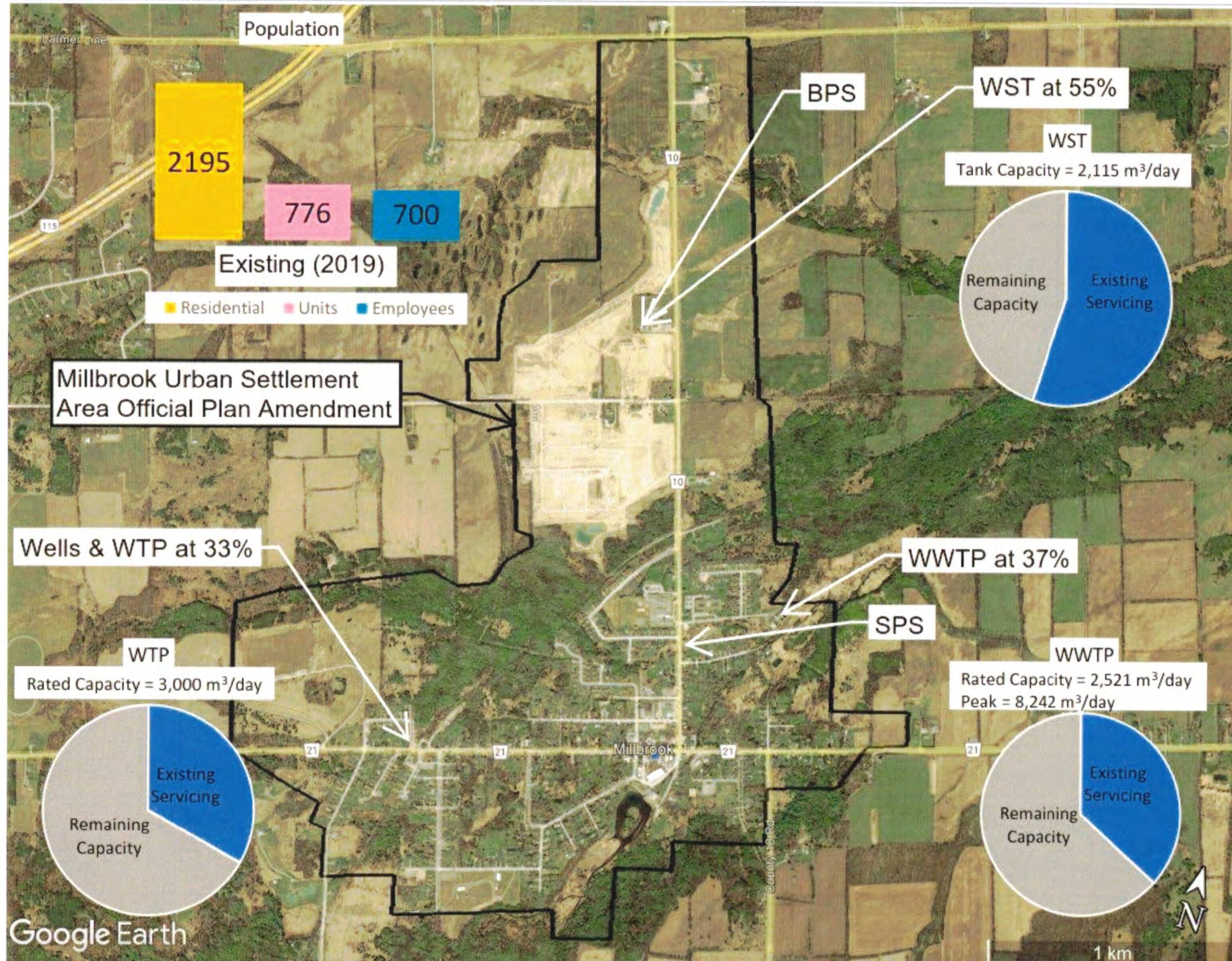
ACRONYMS

- TCM: Township of Cavan Monaghan
- WWTP: Wastewater Treatment Plant
- WTP: Water Treatment Plant
- WST: Water Storage Tank
- SPS: Sewage Pumping Station
- BPS: Booster Pumping Station
- ICI: Institutional, Commercial and Industrial

EXISTING CONDITIONS OF FACILITIES (2019)

- Servicing for:
 - 776 residential units
 - 2,195 residential population
 - 700 employees
- Servicing usage:
 - WWTP operating at 31% of rated capacity 2,521 m³/day and 37% of peak capacity of 8,242 m³/day
 - WTP operating at 33% of 3,000 m³/day rated capacity
 - WST operating at 55% of 2,115 m³ storage volume

EXISTING CONDITIONS OF FACILITIES (2019)



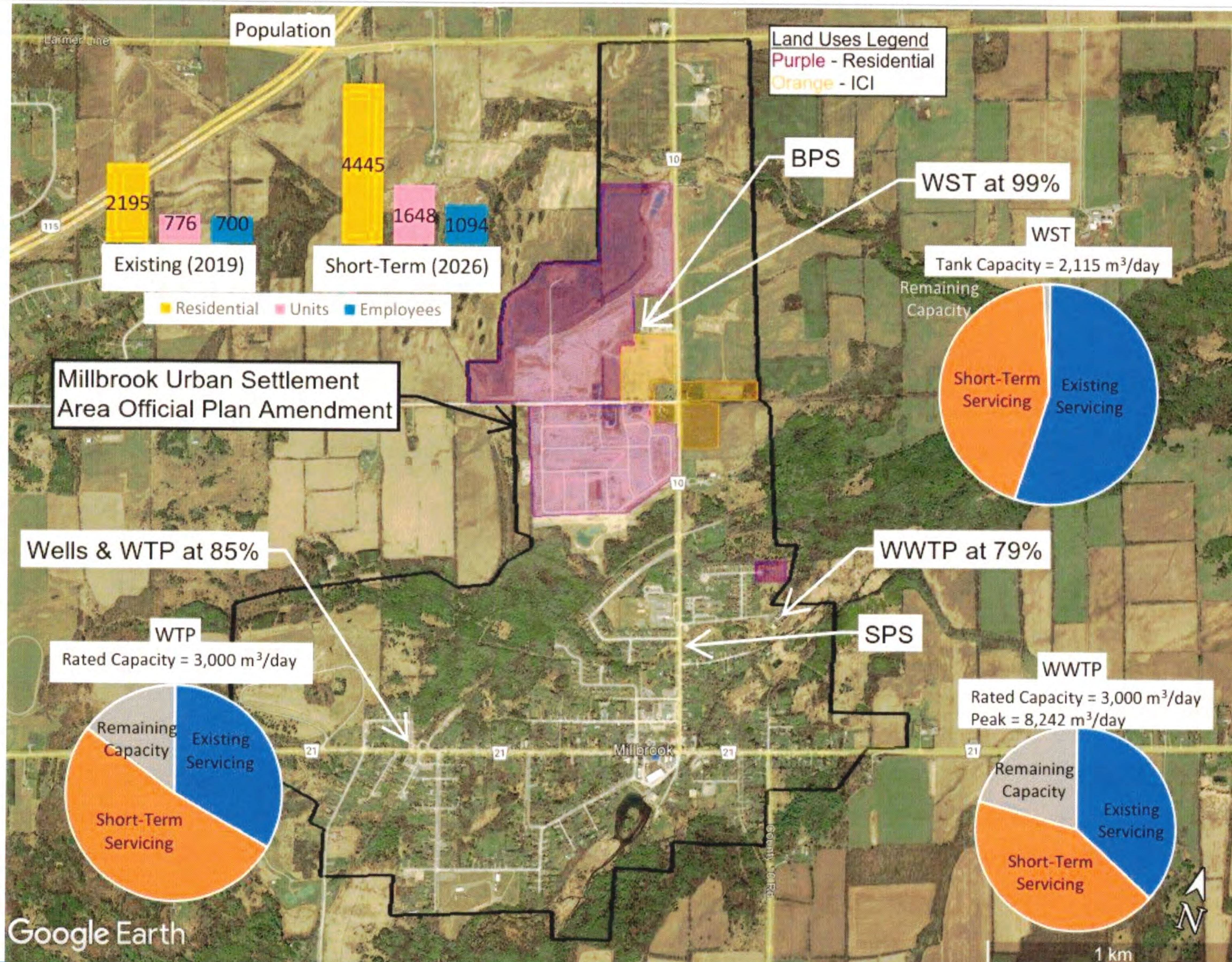
SERVICING OF SHORT-TERM GROWTH (~2026)

- Planned and in progress growth includes:
 - Towerhill South (345 units)
 - Towerhill North (718 units)
 - Coldbrook Drive (former Nina Court) (32 units)
 - Various ICI properties
- Servicing for:
 - 1,648 residential units (872 additional from existing)
 - 4,445 residential population (2,250 additional from existing)
 - 1,094 employees (394 additional from existing)

SERVICING OF SHORT-TERM GROWTH (~2026)

- Required facility upgrades:
 - Stress testing and re-rating the WWTP to 3,000 m³/day (with associated upgrades)
 - Possible upgrades to Tupper St. SPS
 - Booster Pumping Station capacity expansion
 - No further Class EA is required prior to design and construction, unless land acquisition or bldg. expansions are required
 - Total preliminary cost estimate (engineering + capital) of ~\$1.4M (Anticipated to be funded by Development Charges)
- Servicing usage:
 - WWTP operating at 37% of 3,000 m³/day rated capacity and 79% of 8,242 m³/day peak capacity
 - WTP operating at 85% of 3,000 m³/day rated capacity
 - WST operating at 99% of 2,115 m³ storage volume

SERVICING OF SHORT-TERM GROWTH (~2026)



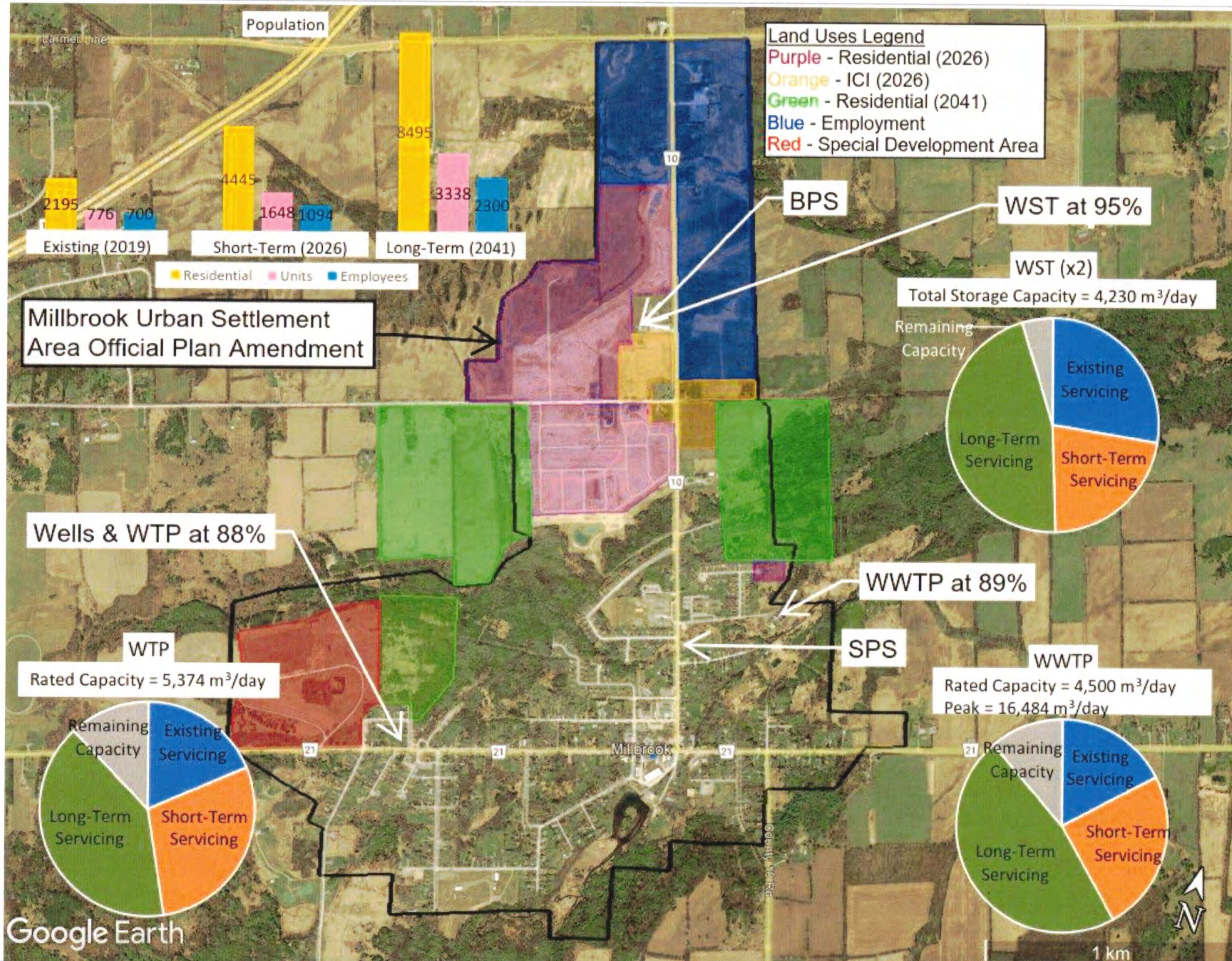
SERVICING OF LONG-TERM GROWTH (2041)

- Active and anticipated applications:
 - Fallis Line East (244 units) - active
 - Fallis Line West (696 units) - active
 - Turner Street (85 units) - active
 - Duke Street (192 units) - anticipated
 - Downtown intensification - ongoing
 - Northern employment areas – anticipated
- Servicing for:
 - 3,338 residential units (1,690 additional from 2026; 2,562 additional from existing)
 - 8,495 residential population (4,050 additional from 2026; 6,300 additional from existing)
 - 2,300 employees (1,206 additional from 2026; 1,600 additional from existing)

SERVICING OF LONG-TERM GROWTH (2041)

- Required facility upgrades:
 - WWTP expansion (addition of 3rd train)
 - Potential new SPS for North employment lands
 - Groundwater exploration, WTP expansion (well supply and treatment)
 - New BPS (depending where growth occurs)
 - Construction of new 2,115 m³ WST (location dependent on where growth occurs)
 - These upgrades will require another Class EA prior to design and construction
 - Total project (engineering + capital) cost estimate of ~\$38M (Anticipated to be funded by Development Charges)
- Servicing usage:
 - WWTP operating at 89% of expanded rated capacity of 4,500 m³/day
 - WTP operating at 88% of expanded rated capacity of 5,374 m³/day
 - WSTs operating at 95% of both tanks, with a total storage volume of 4,230 m³

SERVICING OF LONG-TERM GROWTH (2041)



GROWTH BEYOND 2041

- Baxter creek assimilative capacity cannot support additional wastewater effluent beyond 2041 based on the current regulation requirements and limit of technology
 - Therefore, it will prevent any additional growth in Millbrook
 - However, the design criteria and technology may change over time and can be reassessed in future
- Millbrook groundwater supply source (well field) near its capacity
- Forecasted Township of Cavan Monaghan growth will need to occur outside of Millbrook
- Further investigation and discussions are needed to consider growth beyond 2041 and where that might be located

NEXT STEPS

- Public Works to provide an updated report to Council on next steps.
- Peterborough County will be providing an update on local municipal growth projections on October 29th.
- Watson and Township Staff will work with Peterborough County to discuss the growth and land needs to 2051 in the Township of Cavan Monaghan.
- After these discussions, Watson will finalize the updated GMS that Staff will bring back to Council at a later date.
- Upcoming Water and Wastewater Master Servicing Study Public Information Centre at a later date.
- Public works to provide final Master Servicing recommendations to Council at a later date.



NOTE:
Distances Shown On This Plan Are In Metres And Can Be Converted To Feet By Dividing By 0.3048.
The Position of Pole Lines, Conduits, Watermain, Sewers and Other Underground and Overground Utilities and Structures is Not Necessarily Shown On The Contract Drawing, And Where Shown, The Accuracy Of The Position of Such Utilities and Structures is Not Guaranteed. Before Starting Work, The Contractor Shall Inform Himself Of The Exact Location of All Such Utilities and Structures, and Shall Assume All Liability For Damage To Them.

- LEGEND**
- SUBDIVISION BOUNDARY
 - PROPOSED ELEVATION
 - EXISTING ELEVATION
 - EXISTING CONTOUR ELEVATION
 - PROPOSED OVERLAND FLOW DIRECTION
 - PEDESTRIAN NETWORK
 - PROPOSED SANITARY MAINTENANCE HOLE
 - PROPOSED STORM MAINTENANCE HOLE
 - PROPOSED FDC MAINTENANCE HOLE
 - PROPOSED SANITARY SEWER
 - PROPOSED STORM SEWER
 - PROPOSED WATERMAIN
 - PROPOSED FDC SEWER

NOTE
THIS PLAN HAS BEEN PREPARED TO DEMONSTRATE FEASIBILITY OF THE PROPOSED DEVELOPMENT WITH RESPECT TO DRAINAGE. IN CONNECTION WITH THE LIMIT FROM APPLICATION, DETAILED DRAINAGE DESIGN WILL BE PREPARED AT THE SUBDIVISION ENGINEERING STAGE.

AS PER CITY COMMENTS				
1.	Revision	Date	By	Appr.

CONSULTANT:

PRELIMINARY

MILLBROOK SOUTH WEST SUBDIVISION
BROMONT HOMES INC.

VALDOR ENGINEERING INC.
Consulting Engineers - Project Managers
141 ROUTE 100, EAST BRIDGEVILLE, ONTARIO, L4L 1T5
TEL: (905) 884-4444 FAX: (905) 884-4444 E-MAIL: info@valdor-engineering.com
www.valdor-engineering.com

CavanMungham
COUNTY OF PETERBOROUGH

PRELIMINARY SITE SERVING AND GRADING PLAN

Drawn by: V.L.	Checked by: P.S.Z.	Project No: 16119
Designed by: V.L.	Approved by: D.S.	Drawn by: V.L.
Date: May 21, 2022	Sheet No: 1/1	Project No: 16119
Scale: 1/8"=1'-0"	Sheet No: 1/1	Project No: 16119