VALDOR ENGINEERING INC.
Municipal • Land Development • Water Resources
Site Development • Project Management • Contract Administration
Consulting Engineers – est. 1992

571 Chrislea Rd, Unit4, 2nd Floor
Woodbridge, Ontario L4L 8A2
TEL (905) 264-0054
FAX (905) 264-0069
info@valdor-engineering.com
www.valdor-engineering.com

FUNCTIONAL SERVICING REPORT

Millbrook North East Subdivision

East Side of County Road 10, Nouth of Fallis Line
Community of Millbrook
Township of Cavan Monaghan
County of Peterborough

Rev. June 2025
Rev. March 2026

Prepared For: **Vargas P Inc.**

File: **21101**

N:\Projects\2021\21101\Report\FSR - Subdivision\Revision 1 - March 2026\21101 - FSR March 2026

VALDOR WATER RESOURCES

Professional Engineers Ontario

Authorized by the Association of Professional Engineers of Ontario to offer professional engineering services.

TABLE OF CONTENTS

1.0 INTRODUCTION..... 4
1.1 Existing Conditions..... 4
1.1.1 Geotechnical / Hydrogeological..... 4
1.1.2 Topography..... 4
1.2 Proposed Development..... 4
1.3 Purpose of Report..... 5
1.4 Approving Authorities..... 5
2.0 WATER SERVICING..... 6
2.1 Domestic Demand..... 6
2.2 External Watermains..... 7
2.3 Local Watermains & Service Connections..... 7
2.4 Fire Protection..... 7
3.0 WASTEWATER SERVICING..... 9
3.1 Wastewater Loading..... 9
3.2 External Sanitary Sewers..... 10
3.3 Local Sanitary Sewers & Service Connections..... 10
4.0 STORM CONVEYANCE SYSTEM..... 11
4.1 Minor System Design..... 11
4.2 Major System Design..... 11
4.3 Foundation Drainage..... 12
4.4 Roof Drainage..... 12
5.0 STORMWATER MANAGEMENT..... 13
5.1 Drainage areas..... 13
5.1.1 Pre-Development..... 13
5.1.2 Post-Development..... 13
5.1.3 External Area..... 13
5.2 SWM Design Criteria..... 14
5.3 Stormwater Management Pond Design..... 14
5.3.1 Quality Control..... 14
5.3.2 Erosion Control..... 16
5.3.3 Quantity Control..... 17
5.3.4 Thermal Mitigation Measures..... 18
5.3.5 SWM Pond Inspection & Maintenance..... 19
5.4 Site Water Balance..... 21

TABLE OF CONTENTS (Continued)

6.0 FLOOD PLAIN ANALYSIS..... 24
6.1 Pre-Development Flood Plain Conditions.....24
6.2 Post-Development Flood Plain Conditions.....25
7.0 VEHICULAR & PEDESTRIAN ACCESS..... 26
7.1 Municipal Roads..... 26
7.2 Driveways..... 26
7.3 Sidewalks, Walkways & Trails..... 27
8.0 GRADING..... 28
8.1 Grading Criteria..... 28
8.2 Preliminary Design..... 28
8.3 Permitting..... 28
9.0 EROSION AND SEDIMENT CONTROL DURING CONSTRUCTION..... 29
9.1 Control Measures..... 29
9.2 Construction Sequencing..... 30
9.3 ESC Inspection and Maintenance..... 31
10.0 UTILITIES..... 32
11.0 SUMMARY..... 33
12.0 REFERENCES & BIBLIOGRAPHY..... 35

LIST OF TABLES

Table 1 Development Statistics – Proposed Draft Plan..... 5
Table 2 Domestic Water & Fire Flow Demand..... 7
Table 3 Wastewater Loading Summary..... 10
Table 4 Summary of Storm Drainage Peak Flows 18
Table 5 SWM Facility Performance Summary 20

TABLE OF CONTENTS (Continued)

LIST OF FIGURES

Figure 1	Location Plan	Follows Text
Figure 2	Water Servicing Plan - External	Follows Text
Figure 3	Wastewater Servicing Plan - External	Follows Text
Figure 4	SWM Drainage Plan: Pre-Development	Follows Text
Figure 5	SWM Drainage Plan: Post-Development	Follows Text
Figure 6	Preliminary SWM Pond	Follows Text
Figure 7	Floodplain Mapping: Existing	Follows Text
Figure 8	Floodplain Mapping: Pre-Development	Follows Text
Figure 9	Floodplain Mapping: Post-Development	Follows Text

LIST OF DRAWINGS

Dwg FGP-1	Functional Grading Plan	Appendix “K”

LIST OF APPENDICES

Appendix “A” Draft Plan, Conceptual Master Plan & Equivalent Population Calculation
Appendix “B” Water Demand Calculations & Details
Appendix “C” Wastewater Servicing Details & Calculations
Appendix “D” Storm Drainage Details
Appendix “E” Stormwater Management Calculations
Appendix “F” Flood Plain Analysis
Appendix “G” Standard Road & Sidewalk Cross Sections
Appendix “H” Water Balance and Excerpts from the Geotechnical Investigation Report
Appendix “I” Erosion & Sediment Control Details
Appendix “J” Typical Joint Utility Trench & Street Light Detail
Appendix “K” Functional Servicing Plans

1.0 INTRODUCTION

Valdor Engineering Inc. has been retained by Vargas P Inc. to provide consulting engineering services for the proposed Millbrook North East Subdivision located on 33.62 hectare parcel on the east side of County Road 10, north of Fallis Line, in the Community of Millbrook, Township of Cavan Monaghan, County of Peterborough as illustrated in **Figure 1**.

1.1 Existing Conditions

The subject site is bounded to the west by County Road 10, bounded to the north by agricultural lands and existing Larmer Line, to the east by agricultural lands, and to the south by the future Fallis Line extension. There is a proposed Fallis Southeast Residential Development south of future Fallis Line extension.

The subject site is traversed by Baxter Creek running west-east through a culvert crossing County Road 10. The site topography is generally rolling to hilly terrain, gentle to steep slopes with relatively flat ridges. North of the creek the terrain generally drains southerly towards the creek. South of the creek the terrain generally drains northerly towards the creek. Refer to the geotechnical report which discusses soils conditions in more detail.

1.1.1 Geotechnical / Hydrogeological

A Hydrogeological & Geotechnical Assessment prepared by GHD Inc. (February, 2025) for the subject site included eight boreholes, seven test pits and 6 monitoring wells. Based on the investigation it was determined that the site is covered by a topsoil layer having a depth of approximately 150-300mm underlain by silty sand and then glacial till and/or silty clay. The boreholes are included in **Appendix "H"**.

1.1.2 Topography

The surface condition of the subject site can be generally described as rolling to hilly terrain, gentle to steep slopes with relatively flat ridges based on a recent topographical survey. North of the creek the terrain generally drains southerly towards the creek. South of the creek the terrain generally drains to the north towards the creek. There is an elevation difference of approximately 21m from Fallis Line to Baxter Creek over a distance of approximately 930m for an average slope of 2.25%. An elevation difference of approximately 11m over a distance of approximately 480m for an average slope of 2.29% from Larmer Line to Baxter Creek.

1.2 Proposed Development

The proposed development consists of a mix of lots for detached dwellings and street townhomes as well as 2 blocks for medium density housing and a commercial block. The lot frontages for the detached dwellings will range from 10.7 m to 15.9 m while the townhomes will consist of 7.6 m frontages. Access for the subdivision will consist of 2 full moves access locations to County Road 10, a connection to Larmer Line and to future Fallis Line to the south. Separate access locations will also be provided to the Commercial

Block and reviewed under a separate Site Plan Application. The development also proposes Park land, a stormwater management block and Natural Heritage Lands.

Table 1. Development Statistics

Land Use	**Area** (Ha)	**Residential Units** (No.)	**Equivalent Population** (persons)
Detached Dwellings	7.11	159	557
Street Townhomes	3.91	148	518
Medium Density	1.69	176	616
Commercial	9.06		
Park	1.93		
Stormwater Management Pond	1.54		
Natural Heritage Systems	1.95		
Future Residential	0.07		
Roads, Reservices & Road Widenings	6.36		
TOTAL	**33.62**	**483**	**1,691**

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 for the proposed development 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. A **Functional Servicing and Grading Plan** are included in **Appendix "K"** of the report.

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 25 L/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 1,410m^3 with a top water level at an elevation of 278.0m.

The Township of Cavan Monaghan completed a Class Environmental Assessment (Class EA) in June 2014 to investigate on the alternatives to address concerns associated with the water storage and water servicing needs. In this regard, the expansion of the existing urban boundary of Millbrook required additional water storage and expansion of the existing water servicing network to the new development area.

As a result, a new, larger water storage tank was constructed on the Township Office site, a new watermain was constructed to connect to the tank to the existing water supply main and the original water storage tank in Millbrook as decommissioned. A booster station was also constructed within the Township Office site to ensure proper minimum fire pressures are maintained during maximum day demand throughout the higher elevations within the development.

The Township has recently initiated a Water and Wastewater Master Servicing 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 should consider the proposed draft plan as well as the ultimate development for the subject lands.

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
Commercial Flow:	0.32 L/s/Ha (MECP 28m^3/Ha/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 domestic demands for the proposed draft plan and the ultimate development are summarized in **Table 2.**

Table 2. Domestic Water & Fire Flow Demand

Land Use	Equivalent Population (Persons)	Area (Ha)	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	557		174.1	348.1	522.2	7,000	
Street Townhomes	518		161.9	323.8	485.6	10,000	
Medium Density	616		192.5	385.0	577.5		
Commercial		9.06	2.9	5.8	8.7		
TOTAL	**1,691**		**531.3**	**1,062.7**	**1,594.0**	**10,000**	**11,063**

2.2 External Watermains

The location of the existing Water Treatment Plant, existing water storage tank and the existing water booster station are indicated in **Figure 2**. The subject site will be serviced by a 250 mm diameter watermain on Fallis Line which has been stubbed immediately east of County Road 10 and a 250 mm watermain on Highlands Boulevard which is connected to the Towerhill North Residential Subdivision.

2.3 Local Watermains & Service Connections

The local water distribution system within the subdivision will consist of watermains ranging in diameter from 150 mm to 250 mm. This water system will connect to the 2 trunk watermains mentioned above.

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 20 mm x 25 mm water meters will be installed.

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

2.4 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*, 2020, 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 are the largest detached dwelling and the largest interior townhouse unit. Based on the calculations, the minimum fire suppression flow required for the detached dwellings and the townhouse units is 7,000 L/min and 10,000 L/min respectively. The detailed fire flow calculation is shown in **Table B2-1** to **Table B2-2** of **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 principal 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.

In May 2013 the Township of Cavan Monaghan completed a Class Environmental Assessment (Class EA) which investigated the alternatives to address concerns associated with the existing WWTP, in particular, the fact that it did not have sufficient capacity to sustain the projected growth. In addition, the existing plant is at the end of its useful life and requires substantial upgrade and rehabilitation. Based on the recommendations of the EA, the expansion and upgrade of the existing Millbrook WWTP was completed in 2015 to include a high-level tertiary treatment facility that is able to provide improved effluent quality to meet the current effluent discharge criteria, as well as the increased capacity to accommodate future flows.

The Township has recently initiated a Water and Wastewater Master Servicing 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 should consider the proposed draft plan as well as the ultimate development for the subject lands.

The location of the existing sanitary sewers and the WWTP is indicated in **Figure 3**. 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
Commercial Flow:	0.32 L/s/Ha (MECP 28 m^3 / Ha)
Commercial Peaking Factor:	2.50
Extraneous Flow, *I*:	0.28 L/s/Ha (Infiltration)
Design Flow, Q =	Q x K_H + *I*

Based on the above criteria the sewage flow calculations are provided in **Table C1** contained in **Appendix "C"** and the wastewater flow for the proposed draft plan and the ultimate development are summarized in **Table 3.**

Table 3. Wastewater Loading Summary

Land Use	Area (Ha)	Equivalent Population (Persons)	Average Daily Flow (L/s)	Peaking Factor	Peak Daily Flow (L/s)	Infiltration Rate (L/s)	Total Flow (L/s)
Detached Dwellings	7.11	557	2.90	3.95	11.46	1.99	13.45
Street Townhomes	3.91	518	2.70	3.97	10.70	1.09	11.80
Medium Density	1.69	616	3.21	3.93	12.60	0.47	13.07
Commercial	9.06		2.90	2.50	7.25	2.54	9.78
Roads	6.36					1.78	1.78
Total	**28.13**	**1,691**	**11.71**		**42.00**	**7.88**	**49.88**

3.2 External Sanitary Sewers

A 450mm diameter trunk sanitary sewer will be constructed within the Vargus SE Subdivision to the South to Fallis Line. As part of this development the trunk sewer will be extended northerly through the subject development to service the entire development. Due to the drop in elevation towards Baxter Creek a gravity system will not be feasible to service the entire development. As part of a future phase a sanitary pumping station is being proposed within the vicinity of the stormwater management pond to capture the remaining lands then pumped back to where the gravity system ends. We note that the development from Street D to Fallis Line, including the entire Commercial Block will be serviced by gravity without the need for the pumping station. The rest of the development to the north will require the pumping station for servicing which at this time is shown within the stormwater management block. In addition, it is proposed to construct the sanitary sewer to the westerly limit of Street G at County Road 10 to potentially service lands to the west of County Road 10 in the future. The alignment of the trunk sanitary sewer is indicated in **Figure 3**. We note that flows from the Commercial Block only will be diverted to the existing 375mm sanitary sewer on Highlands Boulevard on the west side of County Road 10 to the Towerhill North Phase 2 Development. Capacity requirements for that sanitary sewer have been confirmed with the Township.

The Vargas South Development, south of Fallis Line has considered the ultimate flows from this development and has sized the sewers to convey the flows from the subject lands.

3.3 Local Sanitary Sewers & Service Connections

The subject site will be serviced by a local sanitary system consisting of 200 mm diameter sewers. The local sewer 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 120 m.

Each dwelling unit will be provided with a 100 mm diameter single connection in accordance with Township standards.

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

As per the Township engineering design criteria, the proposed development is to be serviced with a minor storm sewer system that is designed to convey runoff from the 5-year storm event. The rainfall intensity values, *I*, are calculated in accordance with the 2014 rainfall intensity duration frequency (IDF) data for the Peterborough Airport weather station, obtained from Environment Canada. Based on this data the rainfall intensity for the 5- and 100-year rainfall events is calculated as follows:

$$I_5 = \frac{844}{(t+7.5)^{0.78}} \qquad I_{100} = \frac{1697}{(t+10.5)^{0.81}}$$

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 proposed storm sewer will run south under Street "A" to discharge to the proposed stormwater management facility (SWM pond) located just to the south of Baxter Creek. At There is sufficient depth for the storm sewers over the proposed culvert crossing for the tributary to Baxter Creek. Further details will be provided at detailed design.

The IDF curve data is included in **Appendix "D"**. A schematic design of the minor system is illustrated in on the **Functional Servicing 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. The major system flow route is illustrated in on the **Functional Servicing Plan**. **Figure 5** illustrates the drainage catchments for the post-development condition.

Overland flow from Catchment 201 will be conveyed to the low point on Street “G”, south of the proposed SWM pond. FlowMaster calculations have been completed to confirm that the road allowance has adequate capacity to convey the 100- minus 5-year flow, flows can be found from the VO model (7.226 – 3.847 = 3.379 cms).

Overland flow from Catchment 202 will be conveyed to the low point on Street “A”, east of the proposed SWM pond. FlowMaster calculations have been completed to confirm that the road allowance has adequate capacity to convey the 100- minus 5-year flow, flows can be found from the VO model (3.152 – 1.511 = 1.641 cms).

Based on these calculations, the major storm flows are conveyed along Street “G” and Street “A” with a flow depth of 0.22 m and 0.14 m, respectively, which is does not exceed the maximum allowable depth of 0.30 m. The detailed *FlowMaster* calculations are included in **Appendix “E”.**

4.3 Foundation Drainage

It is anticipated that the dwellings will have basements and therefore a foundation weeping tile system will be required. In accordance with Township standards, storm service connections are to be provided to each dwelling unit. A hydraulic grade line analysis of the storm sewer system will be completed at the detailed design stage to ensure that basements are protected during the 100-year storm event.

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.

5.1.1 Pre-Development

Under pre-development conditions, The portion of the site located to the south of the tributary (*Catchment* 101, 24.37 ha) generally drains in a north-easterly direction to the tributary. The subject site north of the Baxter Creek tributary (*Catchment 102*, 13.27 ha) drains in a south-easterly direction to the tributary.

For the purpose of the pre-development modelling, drainage boundaries were determined based on the post-development limits.

The existing land uses comprise of mainly row crops, with some meadows, lawn and forests. **Figure 4** illustrates the drainage patterns for the pre-development condition.

5.1.2 Post-Development

The proposed development consists of commercial and residential land uses (single detached, townhomes and medium density), a park block, a SWM block, and open space blocks to remain undeveloped.

The subject site (*Catchment 201*, 21.49 ha, and *Catchment 202* 13.27 ha) will drain to the SWM pond. Drainage will be conveyed to the SWM pond via the storm sewer system, or overland via the road network to the low point on Street “A” adjacent to the SWM pond maintenance access road.

Discharge from the SWM pond will be released to the Baxter Creek tributary via an outlet pipe within Block 193 (Natural heritage system). **Figure 5** illustrates the drainage patterns for the post-development condition.

A portion of the subject site (Catchment 203 2.88 ha) will drain south towards the *Vargas East Subdivision*. Further details of the drainage to Vargas East Subdivision are provided in the Stormwater Management Report prepared by Valdor (August 2025).

5.1.3 External Area

An external flow of 0.236 m^3/s from the Cavan Monaghan Community Center west of County Road 10 will be directed to the existing 600 mm culvert under County Road 10 to be captured and conveyed to the storm sewer and into the SWM pond. Further details on this external area are provided in the *Storm Management Report – Proposed Community Centre, Millbrook, Township of Cavan Monaghan* prepared by Valdor (November 2017). Excerpts from the report can be found in **Appendix E**.

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 (48 hours preferred).
- **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, the 6, 12 & 24-hour AES, and the 4-hour Chicago storm distributions, for the 2-yr through 100-yr design storm events.

5.3 Stormwater Management Pond Design

A wet detention pond SWM facility is proposed to serve the subject site. The total service area for the SWM pond is approximately 34.91 ha. The proposed SWM pond is located at the south of Baxter Creek of the proposed development, as illustrated in **Figure 6**.

Per the Township standards, MOE SWM pond criteria and recommendations in the geotechnical report, the SWM pond design includes 5H:1V side slopes for 3.0 to either side of the normal water level with 4H:1V slopes above, and 3H:1V slopes below, the permanent pool. A 4.0 m wide maintenance access road is provided along the top of the pond with a maximum 10% slope.

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 and will be detailed further at detailed design stage:

- 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.

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. Based on a total average imperviousness of 70.0%, the required permanent pool volume is provided below.

SWM Pond Permanent Pool Volume Calculation

Volume required for catchment with 70.0% imperviousness:	225.0 m^3/ha
Less 40 m^3/ha of extended detention storage zone:	- 40.0 m^3/ha
Permanent Pool Volume Required:	185.0 m^3/ha

The permanent pool storage volume required for the pond is 185.0 m^3/ha × 34.91 ha = 6,458 m^3.

A review of the Geotechnical Investigation Report for the site indicates that the native, undisturbed stiff silty clay till soils would have a sufficiently low permeability and could substitute for a liner.

The normal water level of the permanent pool for the pond is set at an elevation of 235.50 m. The bottom of the pond is set at an elevation of 233.50 m in the forebay and the main cell, providing a permanent pool depth of 2.00 m. The actual permanent pool storage volume provided is approximately 6,950 m^3 which is greater than the minimum required volume (6,458 m^3). The required and provided quality control volume together with the elevation of the normal water level are summarized in **Table 5**.

The forebay has been sized based on MOE design criteria and supporting calculations are provided below.

Forebay Sizing Calculations

The proposed forebay is approximately 60 m in length and 30 m in width, on average. The resultant length-to-width ratio is therefore 2:1. Using the methodology provided in the *Stormwater Management Planning and Design Manual*, the recommended forebay length based on particulate settling is calculated using the following expression:

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

where: $Dist$ is the forebay length (m)
r is the length-to-width ratio of the forebay (2.0:1 or r = 2.0)
Q_p is the pond's peak discharge (0.053 m^3/s, VO modelling of 25 mm storm)
V_s is the settling velocity (0.0003 m/s for 150 µm particles)

Solving [1] gives:

$$Dist = \sqrt{\frac{2.0 \times 0.053}{0.0003}} = 18.8\ m$$

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

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

where: *Dist* is the forebay length (m)
Q is the peak inlet flow (7.024 m^3/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:

$$Dist = \frac{8 \times 7.024}{2.00 \times 0.50} = 56.19\ m$$

The distance from the headwall to the forebay berm is 60 m. The proposed design therefore 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:

$$Width = \frac{Dist}{8} = \frac{56.19}{8} = 7.02\ m$$

The design proposes an average forebay bottom width of approximately 15 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 and to release the runoff over a period of at least 24 hours. Based on the VO modelling of this storm condition (i.e. the 25 mm 4-hour Chicago storm distribution), the estimated runoff volume is 15.66 mm distributed over the 34.91 ha catchment area draining to the SWM pond, for a required erosion control volume of 5,467 m^3.

Based on the design for the SWM pond, the extended detention volume provided is 5,780 m^3 at an elevation of 236.50 m. The proposed extended detention depth is 1.00 m.

The extended detention function of the pond will be controlled with a 165 mm diameter orifice plate (*Orifice #1*) located in the box manhole control structure to achieve the minimum required drawdown time of 24 hours (48 hours is considered preferable).

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

$$t_d = \frac{0.66 \cdot C_2 \cdot h_1^{1.5} + 2 \cdot C_3 \cdot h_1^{0.5}}{2.75 \cdot A_o} \quad [3]$$

where: t_d is the drawdown time (s)
h is the maximum water elevation above the orifice (0.915 m)
A_o is the cross-sectional area of the orifice (0.022698007 m^2)
C_2 is the slope coefficient from area-depth linear regression (2094.4)
C_3 is the intercept from area-depth linear regression (5359.2)

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):

$$h_1 = HWL_{25mm} - \left[NWL + \frac{D}{2}\right] = 236.50 - \left[235.50 + \frac{0.165}{2}\right] = 0.9175\ m$$

where: HWL_{25mm} is the high water level for the 25 mm rainfall (236.50 m)
NWL is the normal water level (235.50 m)
D is the diameter of the orifice (0.165 m)

Solving [3] yields:

$$t_d = \frac{0.66 \times (1886.7) \times (0.917)^{1.5} + 2 \times (4833.1) \times (0.917)^{0.5}}{2.75 \times (0.021382465)} = 176{,}071s = 48.9\ hrs$$

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

5.3.3 Quantity Control

As per the ORCA and the Township's standards, the SWM facility 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 greater of the uncontrolled 100-year or Regional flow.

A critical storm analysis was completed to determined which storm distribution (based on the latest Peterborough Airport IDF data for 1971-2006 obtained from Environment Canada) requires the largest storage volume to achieve pre-development target flow rates. Based on the results provided in **Table F.9** (provided in **Appendix "F"**), the 6-hour SCS storm was identified as the critical storm requiring the largest storage volume to achieve the 100-year flow control.

The preliminary rating curve is provided in **Table F.5** (provided in **Appendix "F"**), and consists of a box manhole control structure with a 1.70 m wide by 0.40 m height weir (*Weir #1*) cut into the wall of the box manhole.

Table 4 shows the VO modelling results based on the 6-hour SCS storm distribution, and **Table 5** shows the SWM pond performance characteristics for each return period event.

As per request by Otonabee Conservation, climate change adjustments have been applied for the 2-yr through 100-yr flows using the IDF_CC Tool to the 2073 date range with SSP of 8.5 using the Canadian ensembles.

The SWM pond has been designed with a total active storage volume of 19,411 m^3 at an elevation of 238.20 m. The expected maximum storage required during 100-year storm conditions is approximately 19,309 m^3. The provided active storage is therefore sufficient.

As shown in **Table 4**, the peak discharge rates are equal to or less than the target release rates. Supporting documentation (**Tables F.1-9**) and output from the VO modelling is provided in **Appendix "F"**.

Table 4. Summary of Storm Drainage Peak Flows

Return Period	Existing Peak Flows (m^3/s)	Proposed Peak Flow (m^3/s)
25mm Chicago	-	0.053
2-year	0.742	0.673
5-year	1.418	1.279
10-year	1.871	1.625
25-year	2.549	1.963
50-year	3.015	2.223
100-year	3.482	2.493
Regional	3.762	3.558

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 (25 mm 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 stormwater management facility 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 48.9 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 5: SWM Facility Performance Summary

Quality Control		
	Protection Level	Level 1 (Enhanced)
	Permanent Pool Required (m^3)	6.458
	Permanent Pool Provided (m^3)	6,950
	Normal Water Level, NWL (m)	**235.50**

Erosion Control		
25mm Chicago	Orifice Size (mm)	165
	Draw Down Time (hrs)	48.9
	Flow In (m^3/s)	2.029
	Flow Out (m^3/s)	0.053
	Storage Used (m^3)	5,502
	Pond W.S. Elevation (m)	**236.46**

Quantity Control (6-hour SCS)		
2-year	Flow in (m^3/s)	4.725
	Flow Out (m^3/s)	0.673
	Storage Used (m^3)	8,232
	Pond W.S. Elevation (m)	**236.84**
5-year	Flow in (m^3/s)	7.024
	Flow Out (m^3/s)	1.279
	Storage Used (m^3)	11,073
	Pond W.S. Elevation (m)	**237.20**
10-year	Flow in (m^3/s)	8.279
	Flow Out (m^3/s)	1.625
	Storage Used (m^3)	12,828
	Pond W.S. Elevation (m)	**237.42**
25-year	Flow in (m^3/s)	10.291
	Flow Out (m^3/s)	1.963
	Storage Used (m^3)	15,562
	Pond W.S. Elevation (m)	**237.77**
50-year	Flow in (m^3/s)	11.547
	Flow Out (m^3/s)	2.140
	Storage Used (m^3)	17,419
	Pond W.S. Elevation (m)	**237.99**
100-year	Flow in (m^3/s)	12.792
	Flow Out (m^3/s)	2.297
	Storage Used (m^3)	19,309
	Pond W.S. Elevation (m)	**238.19**
Regional Storm (Timmins)	Flow in (m^3/s)	4.963
	Flow Out (m^3/s)	3.558
	Storage Used (m^3)	20,718
	Pond W.S. Elevation (m)	**238.33**

5.4 Site Water Balance

In accordance with the requirements of the ORCA, an annual site water balance assessment was completed by GHD for the subject development area to determine the overall infiltration deficit under proposed conditions and to design LID measures as part of an overall mitigation strategy to maintain pre-development infiltration volumes (*Hydrogeological and Geotechnical Assessment; Proposed Residential and Commercial Development; Fallis Line, Millbrook, Ontario; GHD*, June 2025). Excerpts from the *Geotechnical Assessment Report* regarding the water balance analysis (*Section 5.1.1 – Water Balance*) are included in **Appendix H**. The findings of the *Hydrogeological Assessment* water balance analysis are summarized below.

Pre-Development Infiltration Volume

For the pre-development condition, a total estimated infiltration volume of 47,206 m³/year was determined. Refer to **Appendix H** for the detailed water balance calculations.

Post-Development Infiltration Volume (Unmitigated)

For the post-development condition, without infiltration enhancements, a total estimated infiltration of 15,614 m³/year was determined. This corresponds to a total infiltration deficit of 27,132 m³/year (47,192 m³/year – 20,060 m³/year = 27,132 m³/year), a 57.5% decrease in annual infiltration compared to the pre-development condition. Refer to **Appendix H** for the detailed water balance calculations.

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 are presented below.

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 catchbasin. For runoff draining the back yard

of the lot (split-drainage lots), a minimum flow length of 5 m will be achieved. For runoff draining to the front, roof downspouts will be installed as required in order to ensure a minimum flow length of 5 m. Where required, roof downspouts shall discharge to the side of the house into a side swale in order to meet the flow length requirement.

According to the hydrologic modelling completed for this site, the soils generally fall 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.*

  In order to meet this design criteria, lots will generally be graded between 2 and 5%. 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 1x10-6 cm/s), as determined from measurements (see Appendix C for acceptable methods), 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 per *Section 5.1.3 – Preliminary Infiltration Rates* (*Hydrogeological and Geotechnical Assessment; GHD*, June 2025) the infiltration rate varies between 12 and 75 mm/hr.

  Assuming the lowest measured infiltration rate of 12 mm/hr to be conservative, the soils 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. 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 is to 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.

  Although most roof areas will exceed 100 m^2 (excluding townhouse lots), the roof drainage area to any single roof downspout will be less than 100 m^2 (split-draining, peaked roofs). However, when performing the infiltration

calculations, it is assumed that no more than 100 m^2 of roof area per lot contributes to infiltration, to be conservative.

It is assumed that roof area for single detached residential lots is 45% of the total lot, and that all lots have an average minimum depth of 30 m. The average maximum roof area for each lot is therefore 144 m^2, 184 m^2, and 214 m^2, for the proposed 10.70 m, 13.7 m, and 15.90 m frontage single detached residential lots, respectively. Based on the design criteria, it is assumed that only 100 m^2 of roof area per lot can be applied towards infiltration mitigation. As per the draft plan, there are a total of 159 single detached residential lots, each with an applicable roof area of 100 m^2, for a total applicable roof area of 15,900 m^2 (1.59 ha).

It is assumed that the roof area for townhouse lots is 30% of the total lot. All townhouse lots will have 7.62 m of frontage and a depth of 30 m. The maximum roof area is therefore 68 m^2. It is assumed that the townhouse roofs will be split draining, and that roof drainage to the front will meet the minimum 5 m flow path criteria. Because of this, only half of the roof area, or 34 m^2, is applicable towards infiltration mitigation. As per the draft plan, there are 148 townhouse lots, each with an applicable roof area of 34 m^2, for a total applicable roof area of 5,032 m^2 (0.50 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 the *Geotechnical Investigation Report*, the total annual site precipitation is 282,341 m^3/yr for a total site area of 33.62 ha. This corresponds to a per hectare precipitation rate of 8,398 m^3/yr/ha. The total roof area applicable to roof downspout disconnection infiltration is 2.09 ha (1.59 ha + 0.50 ha = 2.09 ha). The precipitation to applicable roof areas is therefore 17,551 m^3/yr (2.09 ha x 8,398 m^3/yr/ha). Based on an evaporation rate of 20% of incident precipitation for impervious areas, as per the *Geotechnical Investigation Report*, the surplus for the applicable roof area is therefore 14,040 m^3/yr (17,551 m^3/yr x (1 – 0.2)).

Assuming an infiltration rate of 50%, the infiltration volume due to roof downspout disconnections is therefore 7,020m^3/yr (14,040 m^3/yr x 0.50).

Proposed Infiltration BMP – Infiltration Facilities

Roof downspout disconnection will account for an annual infiltration volume of 7,020 m^3/yr. The post-development infiltration deficit without infiltration measures is 11,914 m^3/yr. The remaining deficit of 20,112 m^3/yr (27,132 m^3/yr – 7,020 m^3/yr) will be infiltrated through the installation of infiltration trenches.

Three different types of infiltration trenches are proposed:

- Parking lot infiltration trenches will be located beneath the parking lots commercial blocks, and will capture clean runoff from the roof areas, which will be piped directly to the infiltration trenches.

- Soakaway pits will be located in the rear of residential lots and will capture and infiltrate clean water discharging from the rear roof leaders are to be connected to the soakaway pits.

- Infiltration trenches will be located in the rear of residential lots 16-30, 114-120, and block 162, and will capture and infiltration surface runoff from the rear yard.

Tables H.1-H.3 provide the preliminary infiltration trench sizing calculations. With the implementation of the proposed infiltration facilities, an additional infiltration capacity of 20,368 m^3/yr is achieved.

Post-Development Infiltration Volume (Mitigated)

With the inclusion of the roof downspout disconnection and infiltration facility LID measures, the total post-development infiltration volume will be 47,448 m^3/yr (20,060 m^3/yr + 7020 m^3/yr + 20,368 m^3/yr), which is 100.5% of the annual pre-development infiltration volume (47,192 m^3/yr). The pre-development infiltration volumes will therefore be maintained under post-development conditions. Typical details of infiltration trench and soak-away pits are provided in **Figure H.1** in **Appendix H**.

6.0 Floodplain Analysis

An analysis has been undertaken to determine the extent of the floodplain associated with Tributary C under pre-development and post-development conditions. Previous existing floodplain mapping of the subject site adjacent was completed by Valdor Engineering in *the Millbrook Subdivision, Phase 2* (Project No. 15T-18002, April 2021) and has been reviewed and approved by the Township of Cavan Monaghan and Otonabee Conservation. Further details on the existing floodplain and associated modelling are provided in the Functional Servicing Report prepared by Valdor (April 2021).

6.1 Pre-Development Flood Plain Conditions

In addition to the existing floodplain assessment from the Millbrook Subdivision, Phase 2 development, Valdor has completed a floodplain assessment for a modified existing condition to include cross sections as per post-development conditions to accurately compare the post-development and pre-development conditions for the subject site.

Hydraulic modelling of pre-development (existing) conditions was completed by Valdor using the HEC-RAS 4.1.0 hydraulic model (Hydrologic Engineering Center, U.S. Army Corps of Engineers, January 2010). Cross-section data was entered into the model based on topographic data collected by IBW Surveyors (February 19, 2021). Refer to **Figure 8** for the locations of the cross-sections.

Appropriate model Manning's roughness "n" coefficients were chosen for each land cover type, following a site visit and review of satellite imagery, based on the standard values as per *Table 3-1* of the HEC-RAS *Hydraulic Reference Manual, Version 4.1* (Hydrologic Engineering Center, U.S. Army Corps of Engineers, January 2010). For the main channel between bank stations, a value of n = 0.035 was chosen, appropriate for "clean, straight, full, with stones and weeds but no rifts or deep pools" For the cultivated areas, a value of n = 0.040 was chosen, appropriate for mature field crops. For the meadow and treed areas, a composite value of n = 0.080 was chosen, appropriate for "light brush and trees, in summer".

The total upstream drainage area of Tributary C is 1,194.70 Ha (*Catchments 101-110*), as shown on **Figure 4**. In order to determine the extent of the Regulatory floodplain at this location, a HEC-RAS model was prepared and the Regulatory floodplain is delineated in **Figure 8**.

6.2 Post-Development Flood Plain Conditions

A new crossing Street "A" is proposed for the subject site. Therefore an 8.30 m wide by 2.40 m high concrete box culverts under Street "A" are proposed to provide enough capacity to convey the Regional flow without overtopping the road.

As indicated in **Figure 9**, the flood plain associated with Tributary C will be entirely contained within open space blocks and therefore the proposed lots are protected from flooding.

Based on the hydraulic modelling of the proposed conditions, there are no adverse flooding impacts upstream or downstream of the subject site. The hydraulic analysis of the Street "A" culvert and the associated floodplain modifications are summarized in **Table F.6** of **Appendix "F"**. There will therefore be no tailwater impacts on the subject site.

Supporting documentation, VO and HEC-RAS modelling output, and hydraulic calculations are provided in **Appendix "F"**.

7.0 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.

7.1 Municipal Roads

The subject site has a frontage on both Fallis Line and on County Road 10. Fallis Line, east of County Road 10 is a 20.0m wide Township road allowance which is currently unopened and untravelled. County Road 10 is an arterial road which is under the jurisdiction of the County of Peterborough. This road consists of a rural cross section having two lanes with partially paved shoulders and road side ditches.

The vehicular access to the subdivision will be facilitated a connection to Fallis Line to the north, two connections to County Road 10, one opposite Highlands Boulevard to the west and a connection to Larmar Line on the north side all with pedestrian accessibility. Additional access locations are proposed for the Commercial Block but will be reviewed under a separate Site Plan Application.

The streets in the subdivision will be in the form of either 20.0m road allowances or 18m road allowances. The 20m road allowances having 10.0m wide pavement and the rest of the streets will have 8.5m pavement width. The proposed roads will have urban sections having pavement crowned with a 2.0% 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 maximum 5.0% slope. The standard road cross section for 20m 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

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

7.2 Driveways

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

Driveways

Material	Compacted Depth
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.

7.3 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 commercial block and the existing community centre. Sidewalks will be generally constructed on one side of each road. The sidewalks will have tactile warning plates at all curb ramps in accordance with Provincial accessibility standards.

Details of the standard sidewalk, curb ramp and tactile warning plate are included in **Appendix "G"**.

8.0 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.

8.1 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 8.0% 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. Given the relatively steep site, a road grade of 6.5% will be utilized for a length of Street "A".

8.2 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.

A detailed analysis of the earthworks will be conducted using digital terrain modelling software at the detailed design stage to optimize the cut and fill volumes. We anticipate that there will be sufficient material generated from the site to closely balance the site. Any shortage of material can be obtained from the Vargus SE Development to the south.

8.3 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 41/24 prior to commencing topsoil stripping and earthworks. The permit application should be submitted in conjunction with the detailed design at the subdivision engineering stage. A copy of the regulation mapping is contained in **Appendix "D"**.

9.0 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. 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:

9.1 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 pond will be utilized as temporary sediment control basins during construction. The basin is to be sized in accordance with the ESC Guideline based on a required storage volume of 250 m^3 per hectare of disturbed area (125 m^3/ha of permanent pool and 125 m^3/ha of active storage). The basin's outlet is to have a Hickenbottom riser and a minimum 75mm 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"**.

9.2 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.

9.3 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.

10.0 UTILITIES

While some external upgrades may be necessary by the utility providers, it is anticipated that utilities such as electrical (Hydro One Networks Inc.), natural gas (Enbridge Gas Distribution Inc.) and telecommunications (Nexicom Inc.) will be available to service the subject development. As per standard practice in subdivisions, utilities will be installed underground. Co-ordination with the Hydro One and the various utility companies 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 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. Joint trenching maximizes the efficiency of the available area in the utility corridor and provides for a safe installation.

In accordance with the Township requirements, street lights will be LED. The street lights will have black octagonal poles with black post top luminaires similar to those installed in the Phase 1 subdivision.

A copy of a typical joint trench detail is included in **Appendix "J"** together with a detail of the street light.

11.0 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 300mm diameter trunk watermain was constructed northerly along County Road 10 with a water tower and booster station located on the site of the municipal offices. A 250mm diameter watermain was constructed on Fallis Line to the east side of County Road 10 which will service the subject development. A 250mm watermain connection is also available at County Road 10 and Highlands Blvd.

- A local water distribution system will be constructed along the roads to provide domestic supply and fire protection for the proposed dwellings. This local system will have pipe diameters ranging in size from 150mm to 250mm. Based on the Ontario Building Code (OBC 2012) requirements, the water service connections for the individual townhouse units are to be 25mm diameter.

Waste Water

- A 450mm diameter trunk sanitary will be constructed within the future Vargus SE Subdivision to the south. The trunk sewer will be picked up from there and extend northerly through the subject site to service the entire development and possibly lands west of County Road 10 in the future. Due to grading restrictions a portion of the development will require service from a sanitary pumping station to be located within the storm water management facility and pumped back up to the trunk sewer via a future forcemain. The development from Street D to Fallis Line, including the entire Commercial Block will be serviced by gravity without the need for the pumping station.
- A local sanitary sewer system will be constructed along the proposed roads to provide service to the dwellings. In accordance with Township standards, the dwellings will be serviced with individual sanitary connections.

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. This storm sewer will outlet to the proposed SWM facility.
- 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 the SWM facility.
- The Regulatory floodplain of the Baxter Creek tributary is contained entirely within the valley lands and therefore the proposed residential lots and the stormwater management pond are outside the Regulatory floodplain.

Stormwater Management

- A stormwater management facility will be constructed to service the subject property. This facility has been designed as a wet pond 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 wet pond consists of a sediment forebay and a main cell separated by a forebay berm.
- A portion of the subject site will drain into the Vargas East Subdivision south of Fallis Line.
- Thermal mitigation measures are to be incorporated in the design of the pond 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 mitigation measures are required in the form of infiltration trenches and roof top disconnections.

Vehicular & Pedestrian Access

- Vehicular access to the subject site will be provided by road connections to the proposed Fallis Line extension as well as 2 access locations on County Road 10 and one at Larmar Line.
- The proposed local roads will be constructed to urban standards having 20.0m wide and 18m 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.

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.
- 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 (2019). The ESC plans are to be prepared at the detailed engineering design stage and are to reflect the various construction stages.

Utilities

- Similar to the Phase 1 subdivision, utility servicing will include an underground joint utility trench for electrical, natural gas and telecommunications. Street lighting will be LED and will be comprised of black octagonal poles with black post top luminaires.

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.

12.0 REFERENCES & BIBLIOGRAPHY

- Township of Cavan Monaghan, **Municipal Servicing Standards**, April 2017.
- Ontario Ministry of Environment, **Stormwater Management Planning & Design Manual,** Mar 2003.
- Ontario Ministry of Transportation, **Drainage Management Manual**, 1997.
- Greater Golden Horseshoe Area Conservation Authorities, **Erosion & Sediment Control Guidelines for Urban Construction**, 2019.
- Fire Underwriters Survey, Water Supply for Public Fire Protection, 2020.
- Ministry of Municipal Affairs & Housing, **Ontario Building Code**, 2024.
- GHD Inc., **Hydrogeological & Geotechnical Assessment**, June 12, 2025.

Respectfully Submitted,

VALDOR ENGINEERING INC.

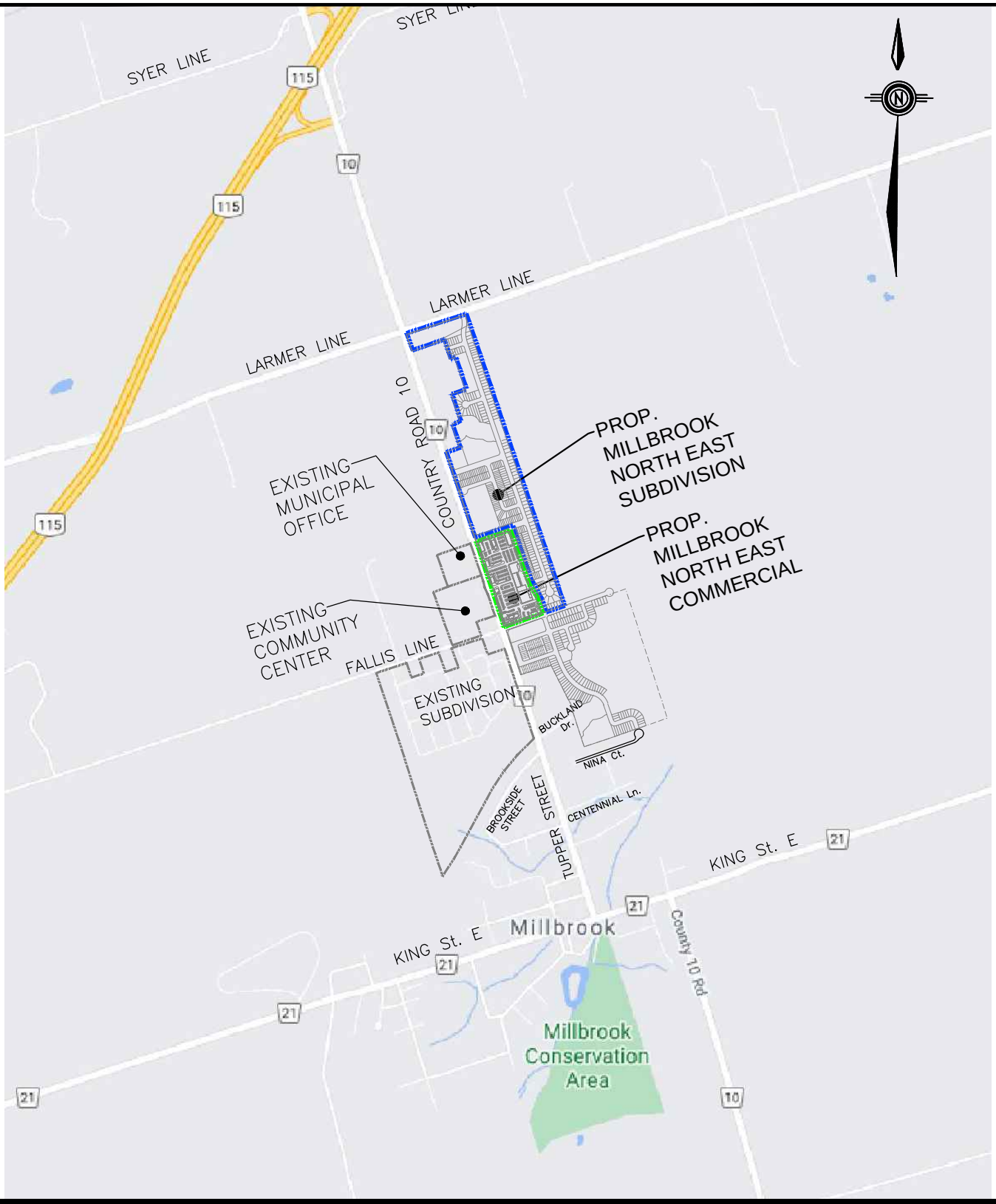
Peter S. Zourntos, P.Eng., C.Eng.
Senior Project Manager

905-264-0054 ext. 223
pzourntos@valdor-engineering.com

Phoebe Yung, B. Eng.
Water Resources Analyst

905-264-0054 ext. 227
pyung@valdor-engineering.com

This report was prepared by Valdor Engineering Inc. for the account of the Vargas P Inc. The comments, recommendations and material in this report reflect Valdor Engineering Inc.'s best judgment in light of the information available to it at the time of preparation. Any use of which a third party makes of this report, or any reliance on, or decisions made based on it, are the responsibility of such third parties. Valdor Engineering Inc. accepts no responsibility whatsoever for any damages, if any, suffered by any third party as a result of decisions made or actions based on this report.



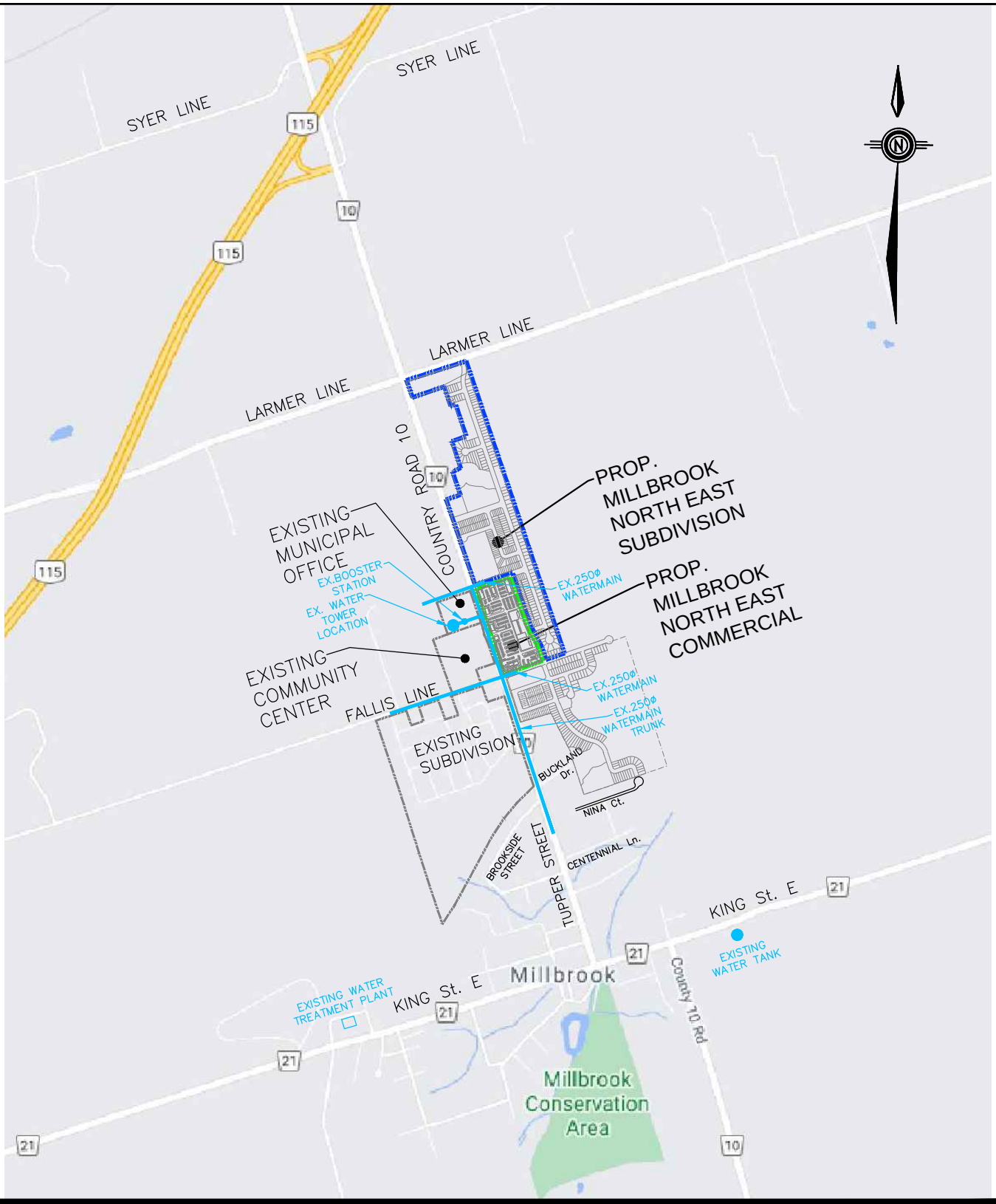
MILLBROOK NORTH EAST COMMERCIAL / SUBDIVISION

LOCATION MAP

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

SCALE	N.TS.	PROJECT	21101
DATE	June, 2025	DRAWN BY	V.L.

FIGURE 1



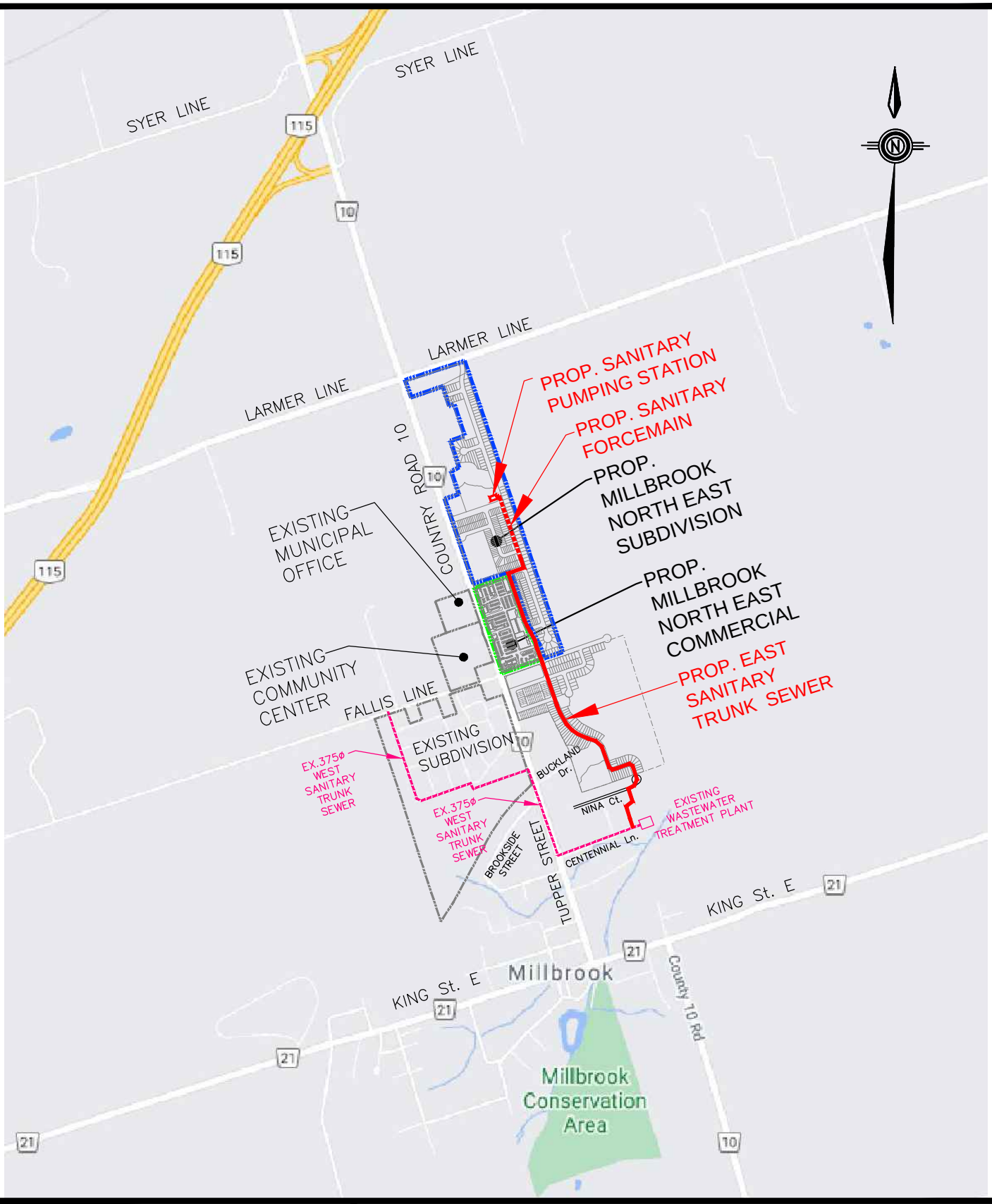
MILLBROOK NORTH EAST COMMERCIAL / SUBDIVISION

WATER SERVICING EXTERNAL

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

SCALE	N.TS.	PROJECT	21101
DATE	June, 2025	DRAWN BY	V.L.

FIGURE 2



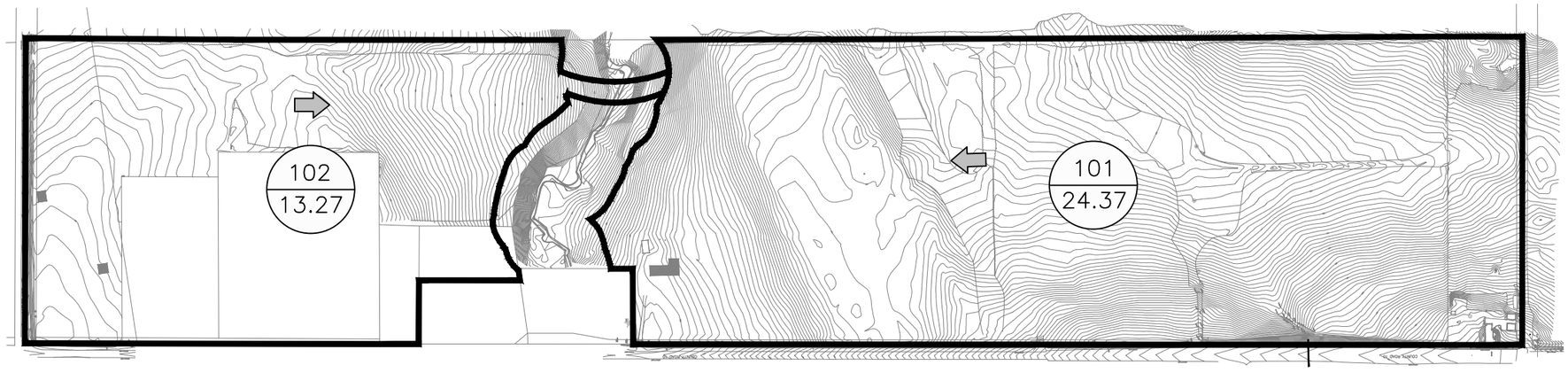
MILLBROOK NORTH EAST COMMERCIAL / SUBDIVISION

WASTEWATER SERVICING EXTERNAL

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

SCALE	N.TS.	PROJECT	21101
DATE	June, 2025	DRAWN BY	V.L.

FIGURE 3



LEGEND

101 — CATCHMENT ID
10.00 — AREA (HA)

DRAINAGE BOUNDARY

OVERLAND FLOW

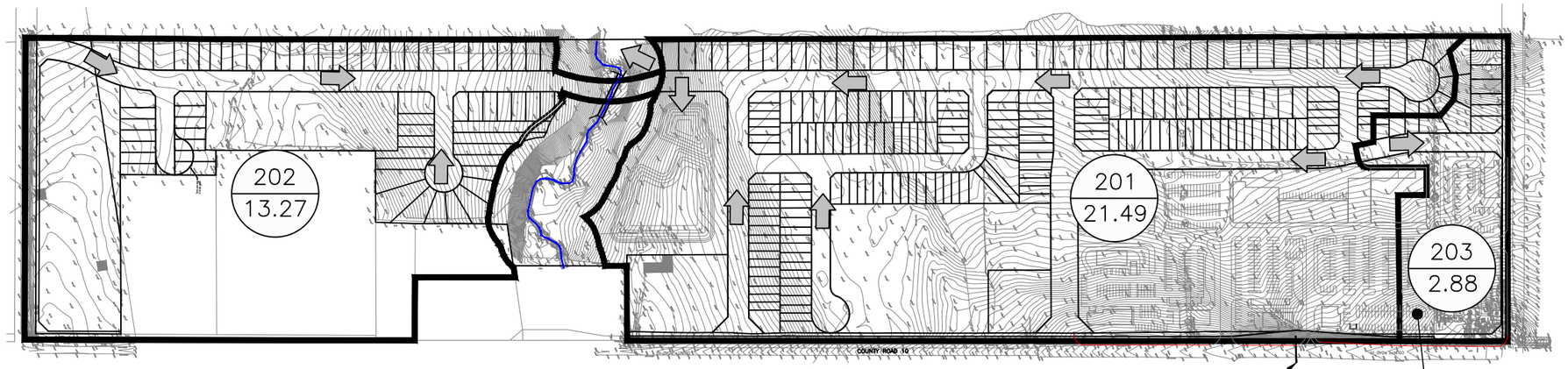
PROJECT
FALLIS LINE NORTH SUBDIVISION
TOWNSHIP OF CAVAN MONAGHAN

TITLE
SWM DRAINAGE PLAN
PRE-DEVELOPMENT

VALDOR ENGINEERING INC.
Consulting Engineers - Project Managers
571 Chrislea Road, Unit 4, 2nd Floor, WOODBRIDGE, ONTARIO, L4L 8A2
TEL (905)264-0054, FAX (905)264-0069
E-MAIL: info@valdor-engineering.com
www.valdor-engineering.com

PREPARED BY	CHECKED BY
O.B.	P.Z.
SCALE	DATE
1:5000	FEB 2026
PROJECT	
21101	**FIGURE 4**

ACAD File: N:\Projects\2021\21101\Hydrotechnical\0-Working\Figures\21101_SWM Drainage Plan_Ultimate.dwg Layout: Existing Printed: Mar. 04, 2026



EXTERNAL FLOW TO BE CAPTURED AND CONVEYED TO THE STORM SEWER AND INTO SWM POND VIA. EX. 600mm CULVERT
CONTROLLED FLOW: 0.236 m^3/s

MINOR SYSTEM TO NORTH SWM POND, MAJOR SYSTEM TO SOUTH SWM POND (VARGAS EAST SUBDIVISION)

LEGEND

101 — CATCHMENT ID
10.00 — AREA (HA)

DRAINAGE BOUNDARY

OVERLAND FLOW

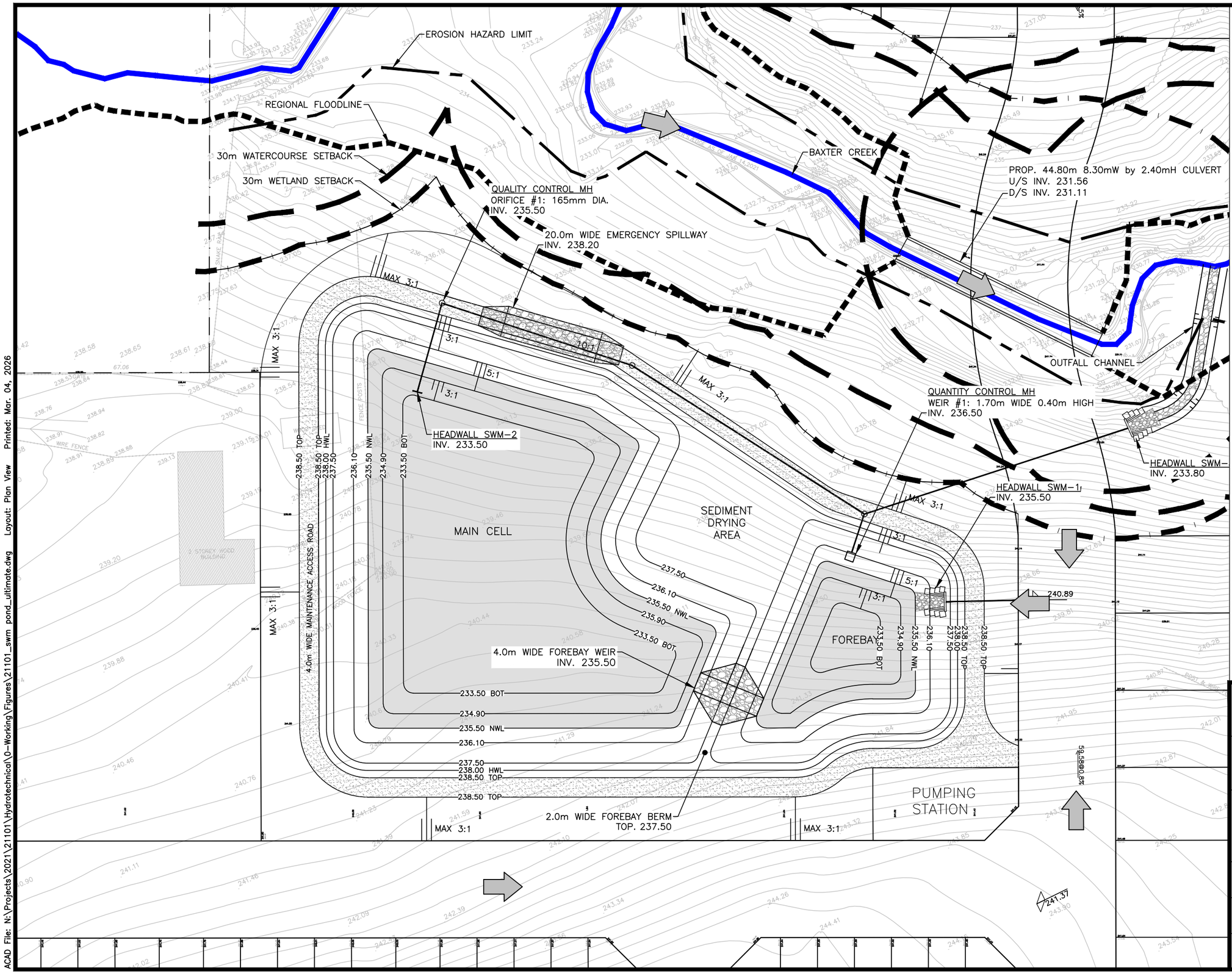
PROJECT
FALLIS LINE NORTH SUBDIVISION
TOWNSHIP OF CAVAN MONAGHAN

TITLE
SWM DRAINAGE PLAN
POST-DEVELOPMENT

VALDOR ENGINEERING INC.
Consulting Engineers - Project Managers
571 Chrislea Road, Unit 4, 2nd Floor, WOODBRIDGE, ONTARIO, L4L 8A2
TEL (905)264-0054, FAX (905)264-0069
E-MAIL: info@valdor-engineering.com
www.valdor-engineering.com

PREPARED BY	CHECKED BY
P.Y.	P.Z.
SCALE: 1:5000	DATE: FEB 2026
PROJECT: 21101	**FIGURE 5**

ACAD File: N:\Projects\2021\21101\Hydrotechnical\0-Working\Figures\21101_SWM Drainage Plan_Ultimate.dwg Layout: Proposed Printed: Mar. 04, 2026



LEGEND

- PERMANENT POOL
- RIP-RAP
- MAINTENANCE ACCESS ROAD
- OVERLAND FLOW

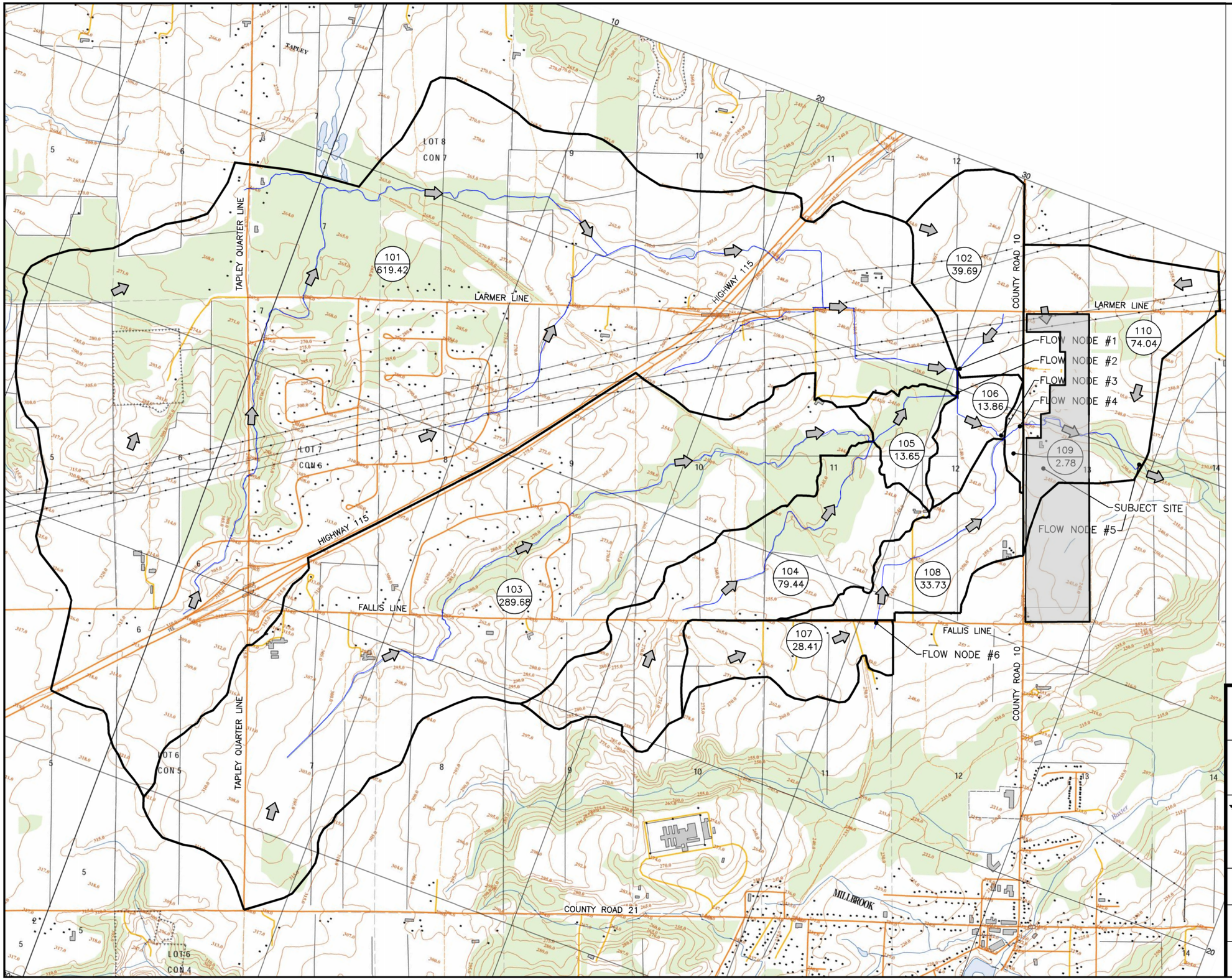
PROJECT
FALLIS LINE NORTH SUBDIVISION
TOWNSHIP OF CAVAN MONAGHAN

TITLE
PRELIMINARY SWM POND

VALDOR ENGINEERING INC.
Consulting Engineers - Project Managers
571 Chrislea Road, Unit 4, 2nd Floor, WOODBRIDGE, ONTARIO, L4L 8A2
TEL (905)264-0054, FAX (905)264-0069
E-MAIL: info@valdor-engineering.com
www.valdor-engineering.com

PREPARED BY	CHECKED BY
P.Y.	P.Z.
SCALE: 1:750	DATE: FEB 2026
PROJECT: 21101	**FIGURE 6**

ACAD File: N:\Projects\2021\21101\Hydrotechnical\0-Working\Figures\21101_swm pond_ultimate.dwg Layout: Plan View Printed: Mar. 04, 2026 By: pyew



LEGEND

- 101 / 619.42 — CATCHMENT ID / AREA (HA)
- DRAINAGE BOUNDARY
- WATERCOURSE
- OVERLAND FLOW

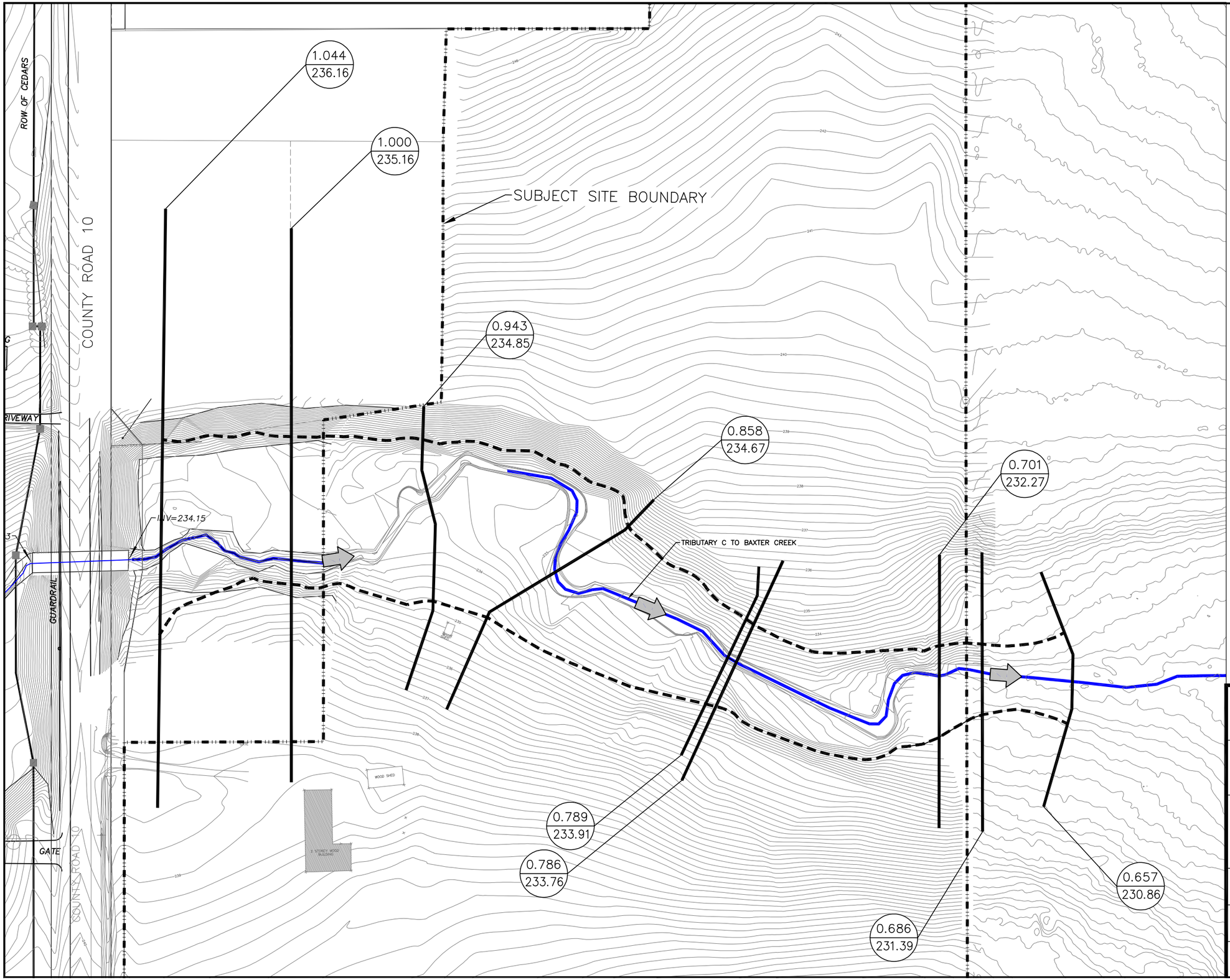
FLOW NODE #	REGIONAL FLOW (cms)
1	4.131
2	29.637
3	49.855
4	53.519
5	57.571
6	2.228

PROJECT
MILLBROOK EAST SUBDIVISION, TOWNSHIP OF CAVAN MONAGHAN

TITLE
FLOODPLAIN MAPPING EXISTING DRAINAGE PLAN

VALDOR ENGINEERING INC.
Consulting Engineers - Project Managers
571 CRISLEA ROAD, UNIT 4, 2nd FLOOR, WOODBRIDGE, ONTARIO, L4L 8A2
TEL (905)264-0054, FAX (905)264-0069
E-MAIL: info@valdor-engineering.com
www.valdor-engineering.com

PREPARED BY: P.Y.	CKD. BY: P.Z.
SCALE: NTS	DATE: JUNE. 2025
PROJECT: 21101	FIGURE 7



LEGEND

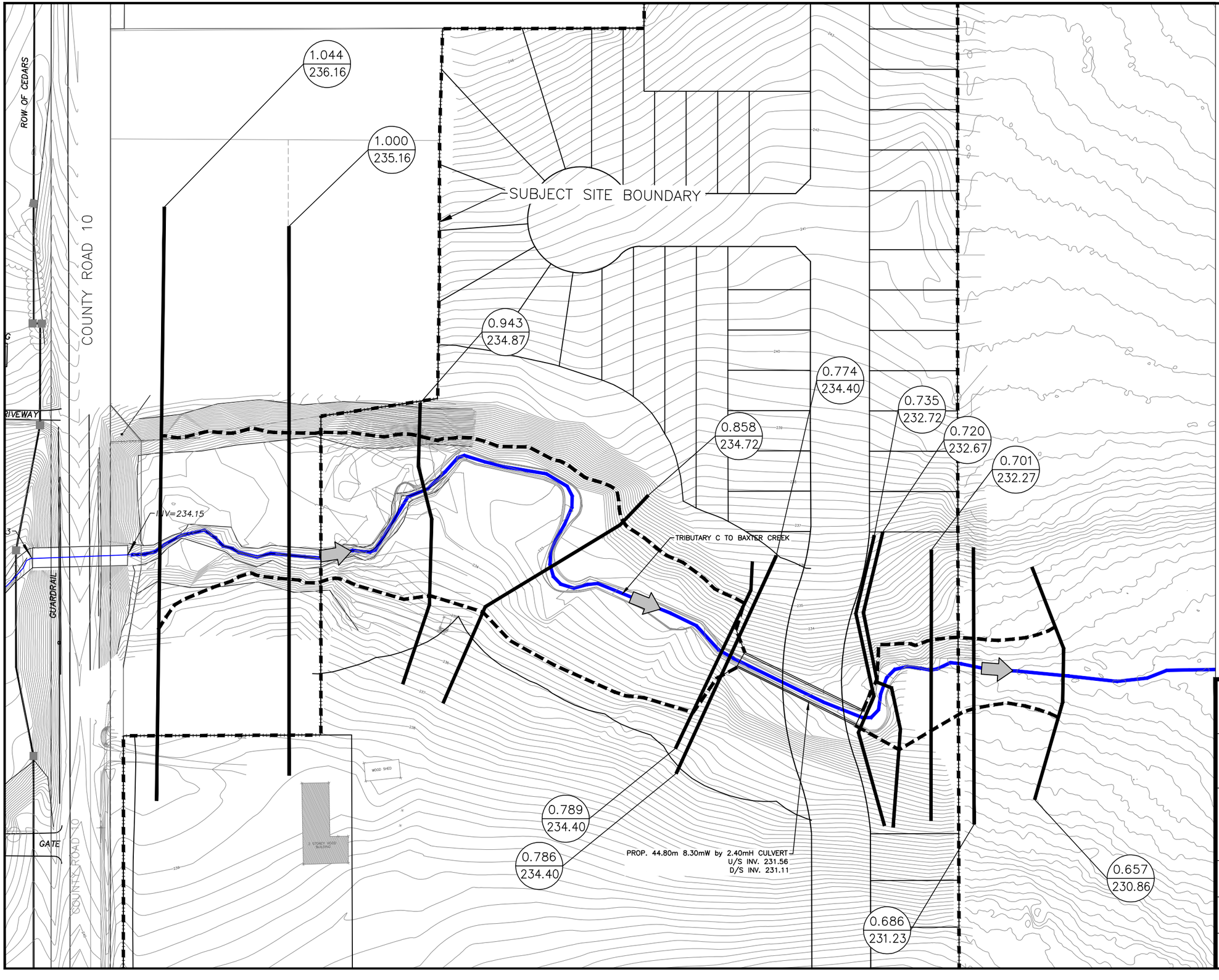
- 0.858 / 234.67 — HEC–RAS SECTION ID / REGIONAL WSE (m)
- REGIONAL FLOODPLAIN
- WATERCOURSE CENTERLINE
- FLOW DIRECTION
- PROPERTY BOUNDARY

PROJECT
MILLBROOK EAST SUBDIVISION, TOWNSHIP OF CAVAN MONAGHAN

TITLE
FLOODPLAIN MAPPING REGULATORY FLOODPLAIN PRE-DEVELOPMENT

VALDOR ENGINEERING INC.
Consulting Engineers - Project Managers
571 CRISLEA ROAD, UNIT 4, 2nd FLOOR, WOODBRIDGE, ONTARIO, L4L 8A2
TEL (905)264-0054, FAX (905)264-0069
E-MAIL: info@valdor-engineering.com
www.valdor-engineering.com

PREPARED BY	CKD. BY
P.Y.	P.Z.
SCALE 1:1250	DATE MAR 2026
PROJECT 21101	FIGURE 8



LEGEND

- 0.858 / 234.67 — HEC–RAS SECTION ID / REGIONAL WSE (m)
- REGIONAL FLOODPLAIN
- WATERCOURSE CENTERLINE
- FLOW DIRECTION
- PROPERTY BOUNDARY

PROJECT
MILLBROOK EAST SUBDIVISION, TOWNSHIP OF CAVAN MONAGHAN

TITLE
FLOODPLAIN MAPPING
REGULATORY FLOODPLAIN
POST DEVELOPMENT

VALDOR ENGINEERING INC.
Consulting Engineers - Project Managers
571 CRISLEA ROAD, UNIT 4, 2nd FLOOR, WOODBRIDGE, ONTARIO, L4L 8A2
TEL (905)264-0054, FAX (905)264-0069
E-MAIL: info@valdor-engineering.com
www.valdor-engineering.com

PREPARED BY: P.Y..	CKD. BY: P.Z.
SCALE: 1:1250	DATE: MAR 2026
PROJECT: 21101	FIGURE 9

APPENDIX “A”

Draft Plan & Equivalent Population Calculation

VALDOR ENGINEERING INC.
571 Chrislea Road, Unit 4, 2nd Floor, Woodbridge, ON L4L 8A2
Tel: 905-264-0054 Fax: 905-264-0069 info@valdor-engineering.com
www.valdor-engineering.com

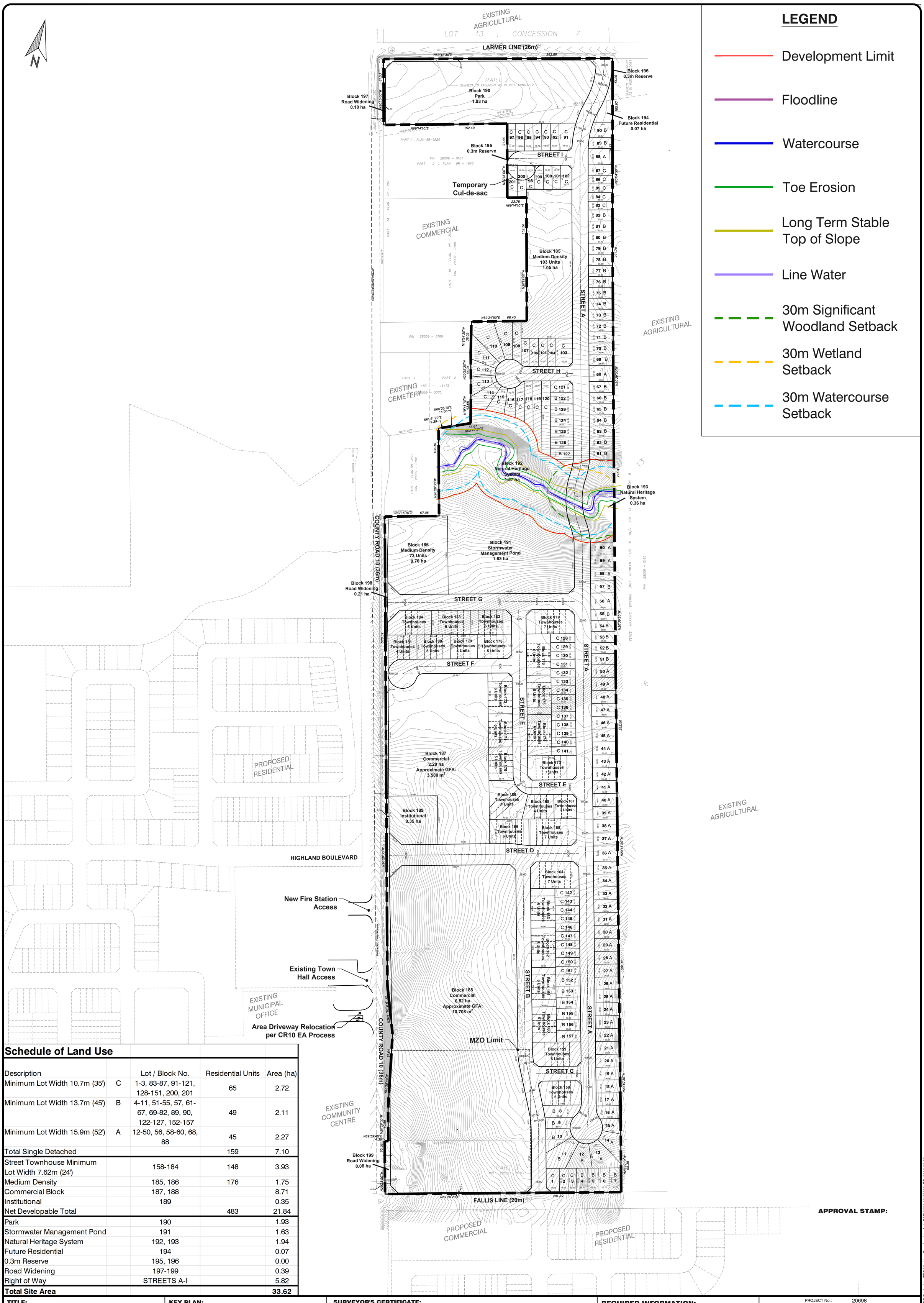
TABLE: A

EQUIVALENT POPULATION

Project Name: **Millbrook North East Subdivision**
File: 21101
Date: June 2025

PROPOSED DRAFT PLAN

Land Use	Area (Hectares)	Criteria	No. of Units	Equivalent Population
Detached Dwellings	7.11	3.50 persons per unit	159	557
Street Townhomes	3.91	3.50 persons per unit	148	518
Medium Density	1.69	3.50 persons per unit	176	616
Commerical	9.06			
Park	1.93			
Stormwater Management Pond	1.54			
Natural Heritage Systems	1.95			
Future Residential	0.07			
Roads, Reserves & Widenings	6.36			
Total:	**33.62**		**483**	**1,691**



LEGEND

- Development Limit
- Floodline
- Watercourse
- Toe Erosion
- Long Term Stable Top of Slope
- Line Water
- 30m Significant Woodland Setback
- 30m Wetland Setback
- 30m Watercourse Setback

Schedule of Land Use

Description		Lot / Block No.	Residential Units	Area (ha)
Minimum Lot Width 10.7m (35')	C	1-3, 83-87, 91-121, 128-151, 200, 201	65	2.72
Minimum Lot Width 13.7m (45')	B	4-11, 51-55, 57, 61-67, 69-82, 89, 90, 122-127, 152-157	49	2.11
Minimum Lot Width 15.9m (52')	A	12-50, 56, 58-60, 68, 88	45	2.27
Total Single Detached			159	7.10
Street Townhouse Minimum Lot Width 7.62m (24')		158-184	148	3.93
Medium Density		185, 186	176	1.75
Commercial Block		187, 188		8.71
Institutional		189		0.35
Net Developable Total			483	21.84
Park		190		1.93
Stormwater Management Pond		191		1.63
Natural Heritage System		192, 193		1.94
Future Residential		194		0.07
0.3m Reserve		195, 196		0.00
Road Widening		197-199		0.39
Right of Way		STREETS A-I		5.82
Total Site Area				**33.62**

APPROVAL STAMP:

TITLE:

DRAFT PLAN OF SUBDIVISION

LEGAL DESCRIPTION:

DRAFT PLAN OF SUBDIVISION
PART OF LOT 13
CONCESSION 6
GEOGRAPHIC TOWNSHIP OF CAVAN
TOWNSHIP OF CAVAN
COUNTY OF PETERBOROUGH

KEY PLAN:

PROJECT NAME

FALLIS NORTH

ADDRESS

963 COUNTY ROAD 10

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 IBW SURVEYORS

IBW SURVEYORS
DAVID COMERY, O.L.S.

July 2, 2025
DATE

OWNER'S CERTIFICATE:

I HEREBY AUTHORIZE **THE BIGLIERI GROUP LTD.** TO PREPARE AND SUBMIT THIS DRAFT PLAN OF SUBDIVISION TO THE COUNTY OF PETERBOROUGH

SAVERIO MONTEMARANO
VARGAS P INC.

July 2, 2025
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
(f.1) N/A
(g) SEE PLAN
(h) MUNICIPAL SERVICES AVAILABLE
(i) SANDY SILT, CLAYEY SILT, SILTY CLAY
(j) SEE PLAN
(k) MUNICIPAL SERVICES AVAILABLE
(l) SEE PLAN

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

REVISIONS

No.	Description	Date	Int.
3	2nd SUBMISSION	26/02/27	EC
2	ADDED MUNICIPAL INFRASTRUCTURE BLOCK	25/09/24	EC
1	1st DPS/OPA/ZBA SUBMISSION	25/07/02	EC

PROJECT No.:	20698
DATE:	July 2, 2025
SCALE:	1:2000
DRAFTED BY:	EC
CHECKED BY:	
DRAWING No.:	**DP-01**

Biglieri
2472 Kingston Road, Toronto
21 King Street W, Suite 1502, Hamilton
(416) 693-9155
thebiglierigroup.com

C:\Users\TBG-DT\The Biglieri Group\TBG_Project - 2020-2024\2020\20698\2 - TBG Design\1 - TBG Working Drawings\1 - AutoCAD\2026-02\20698_DP_2026.02.27

APPENDIX “B”

Water Demand Calculations & Details

VALDOR ENGINEERING INC.
571 Chrislea Road, Unit 4, 2nd Floor, Woodbridge, ON L4L 8A2
Tel: 905-264-0054 Fax: 905-264-0069 info@valdor-engineering.com
www.valdor-engineering.com

TABLE: B1

DOMESTIC WATER DEMAND CALCULATION

Project Name: **Millbrook North East Subdivision, Township of Cavan Monaghan**
File: 21101
Date: June 2025

Conditions:			
Residential Average Day Demand	450	L/person/day	
Maximum Day Factor	2.0		
Peak Hour Factor	3.0		
Commerial	0.32	L/s/Ha	MECP 28m3/Ha/day

PROPOSED DRAFT PLAN

Land Use	**Equivalent Population** (persons)	**Area** (Ha)	**Domestic Demand** (L/min)	**Maximum Day Demand** (L/min)	**Peak Hour Demand** (L/min)
Detached Dwellings	557		174.1	348.1	522.2
Street Townhomes	518		161.9	323.8	485.6
Medium Density	616		192.5	385.0	577.5
Commerical		9.06	2.9	5.8	8.7
Total	**1,691**	**9.06**	**531.3**	**1,062.7**	**1,594.0**

VALDOR ENGINEERING INC.
571 Chrislea Road, Unit 4, Woodbridge, ON L4L 8A2
Tel: 905-264-0054 Fax: 905-264-0069 info@valdor-engineering.com
www.valdor-engineering.com

TABLE: B2-1

CALCULATION OF REQUIRED FIRE FLOW

In accordance to Water Supply for Public Fire Protection, Fire Underwriters Survey 2020

Project Name: **Millbrook North East Subdivision**
File: 21101
Date: June 2025

Notes: **DETACHED DWELLING**
Assume:
- 3,000 sq ft (366 sq m) two storey
- Basement > 50% underground

Type of Construction - Wood Frame

$C =$ 1.5

Total Floor Area:	279	sq.m
$A =$	279	sq.m

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

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

$F =$ 5,512 L/min

$F =$ 6,000 (to nearest 1,000 Lmin)

Occupancy Factor

		Charge
Type:	Limited Combustible	-15%
	$f_1 =$	-15%

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

$F' =$ 5,100 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	15%
Side 2 - Distance to Building (m):	0 to 3m	11%
Side 3 - Distance to Building (m):	10.1 to 20m	0%
Side 4 - Distance to Building (m):	20.1 to 30m	8%
	$f_3 =$	34% (maximum of 75%)

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

$F'' =$ 6,834 L/min

REQUIRED FIRE FLOW

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

VALDOR ENGINEERING INC.
571 Chrislea Road, Unit 4, Woodbridge, ON L4L 8A2
Tel: 905-264-0054 Fax: 905-264-0069 info@valdor-engineering.com
www.valdor-engineering.com

TABLE: B2-2

CALCULATION OF REQUIRED FIRE FLOW

In accordance to Water Supply for Public Fire Protection, Fire Underwriters Survey 2020

Project Name: **Millbrook North East Subdivision**
File: 21101
Date: June 2025

Notes: **STREET TOWNHOMES DWELLING**
Assume:
- 2,000 sq ft (186 sq.m) 2 storey unit
-4 consecutive units maximum
-7 Unit Townhouse block with
fire resistant separation
- Basement >50% below grade

Type of Construction - Wood Frame

$C =$ 1.5

Total Floor Area:	744	sq.m
$A =$	744	sq.m

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

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

$F =$ 9,001 L/min
$F =$ 9,000 (to nearest 1,000 Lmin)

Occupancy Factor

		Charge
Type:	Limited Combustible	-15%
	$f_1 =$	-15%

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

$F' =$ 7,650 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%

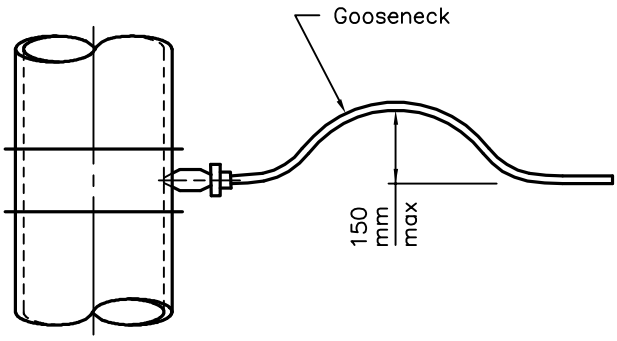
Exposure Factor

		Charge
Side 1 - Distance to Building (m):	0 to 3m	15%
Side 2 - Distance to Building (m):	0 to 3m	11%
Side 3 - Distance to Building (m):	10.1 to 20m	0%
Side 4 - Distance to Building (m):	30.1 to 45m	0%
	$f_3 =$	26% (maximum of 75%)

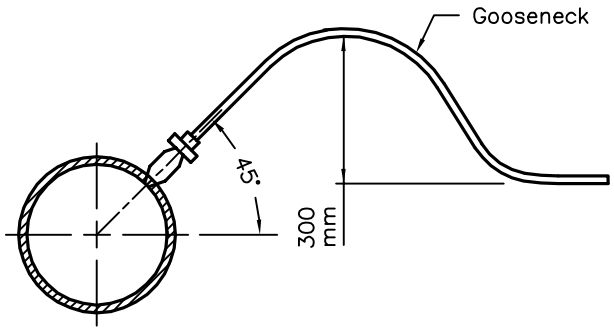
$$F'' = F' + F' \times f_2 + F' \times f_3$$

$F'' =$ 9,639 L/min

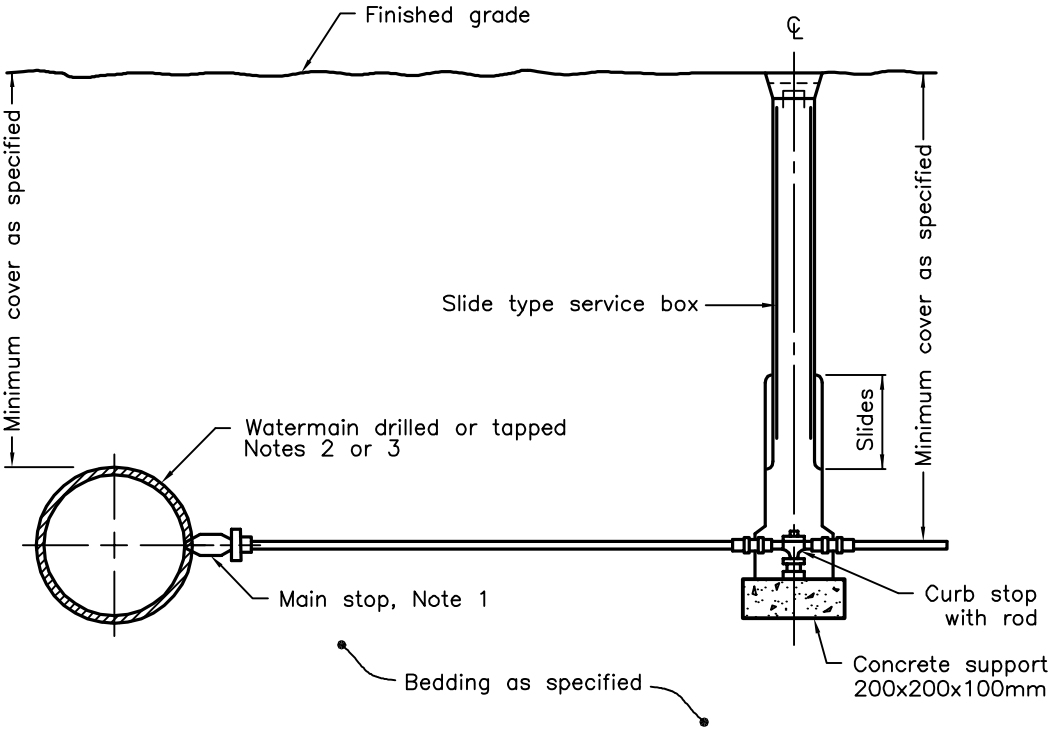
REQUIRED FIRE FLOW
$F'' =$ **10,000** **L/min** (to nearest 1,000 L/min)



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.

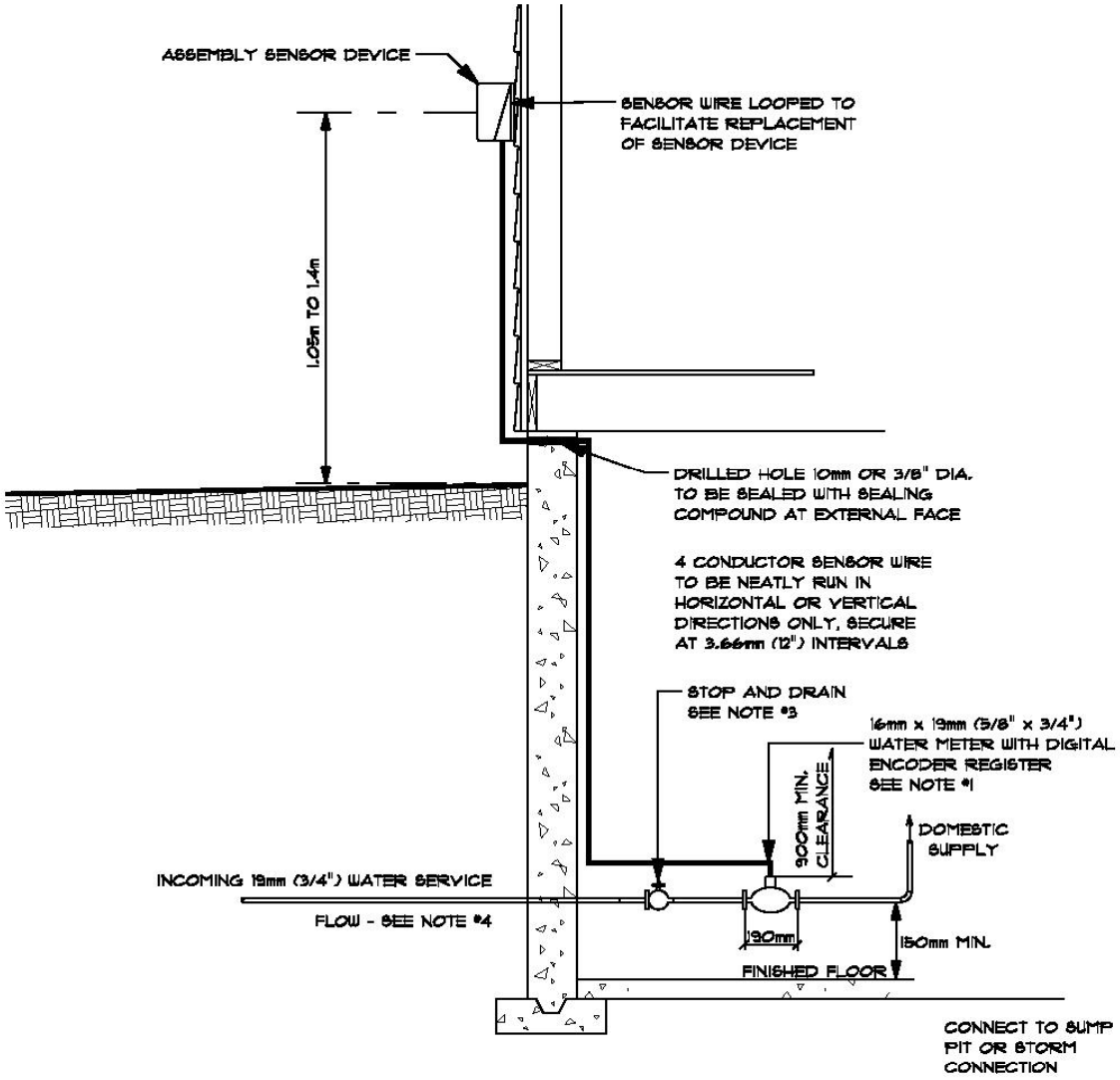
B Couplings shall not be permitted unless the service length exceeds 20m between the main stop and curb stop.

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 METERES. 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

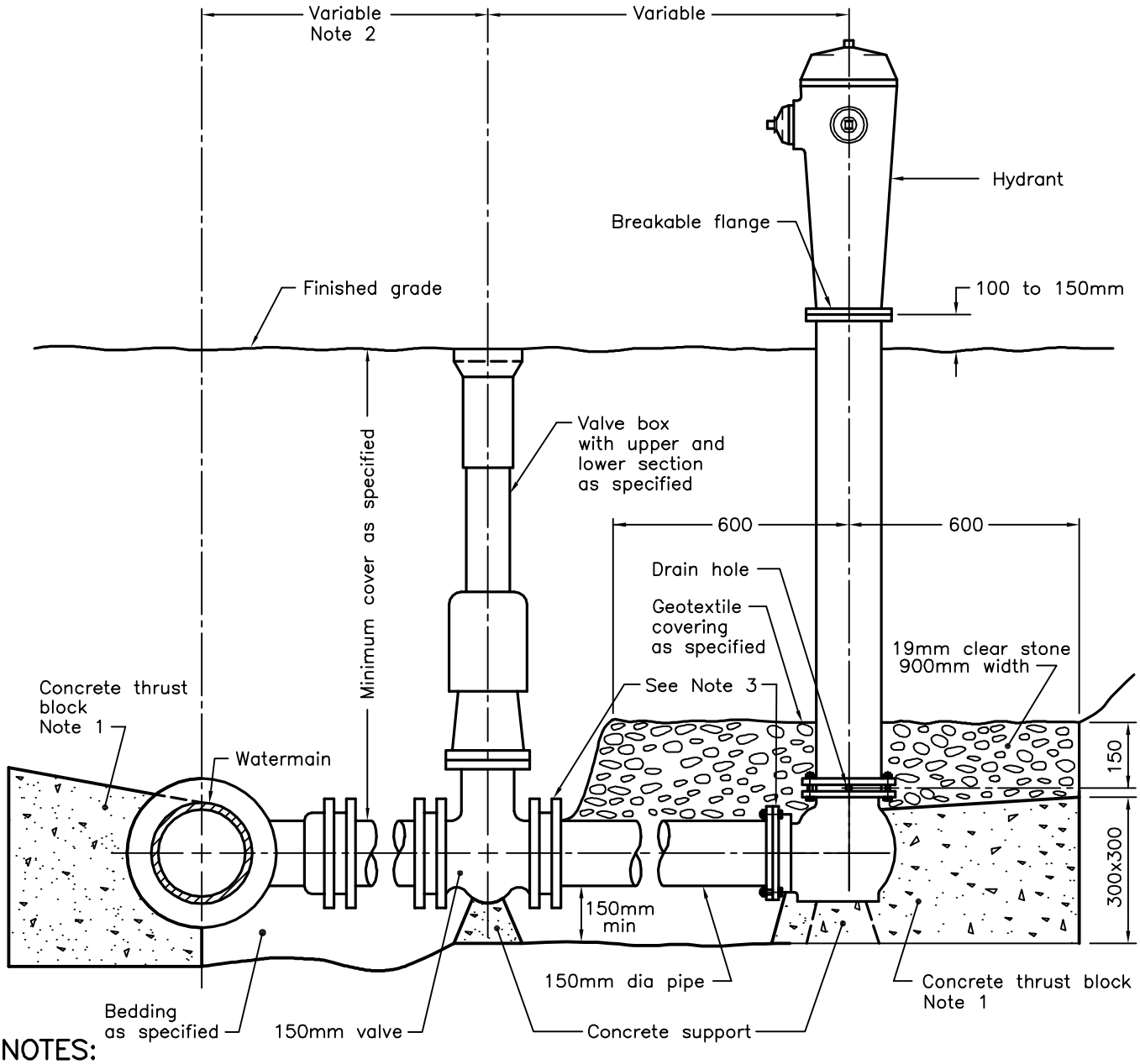
TOWNSHIP OF CAVAN MONAGHAN

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 watermains 400mm and less, locate valve within 1.0m of centreline of watermain. Retaining and restraining devices shall be utilized. For watermains 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 Details & Calculations

VALDOR ENGINEERING INC.
571 Chrislea Road, Unit 3, 2nd Floor, Woodbridge, ON L4L 8A2
Tel: 905-264-0054 Fax: 905-264-0069 info@valdor-engineering.com
www.valdor-engineering.com

TABLE: C1

WASTEWATER FLOW CALCULATIONS

Project Name: **Millbrook North East Subdivision, Township of Cavan Monaghan**
File: 21101
Date: June 2025

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 x $K_H + I$	

Commercial/institutional Average Daily Flow:	0.32	L/s/ha	MECP 28 m3/Ha/day
Commercial/Institutional Peaking Factor:	2.5		

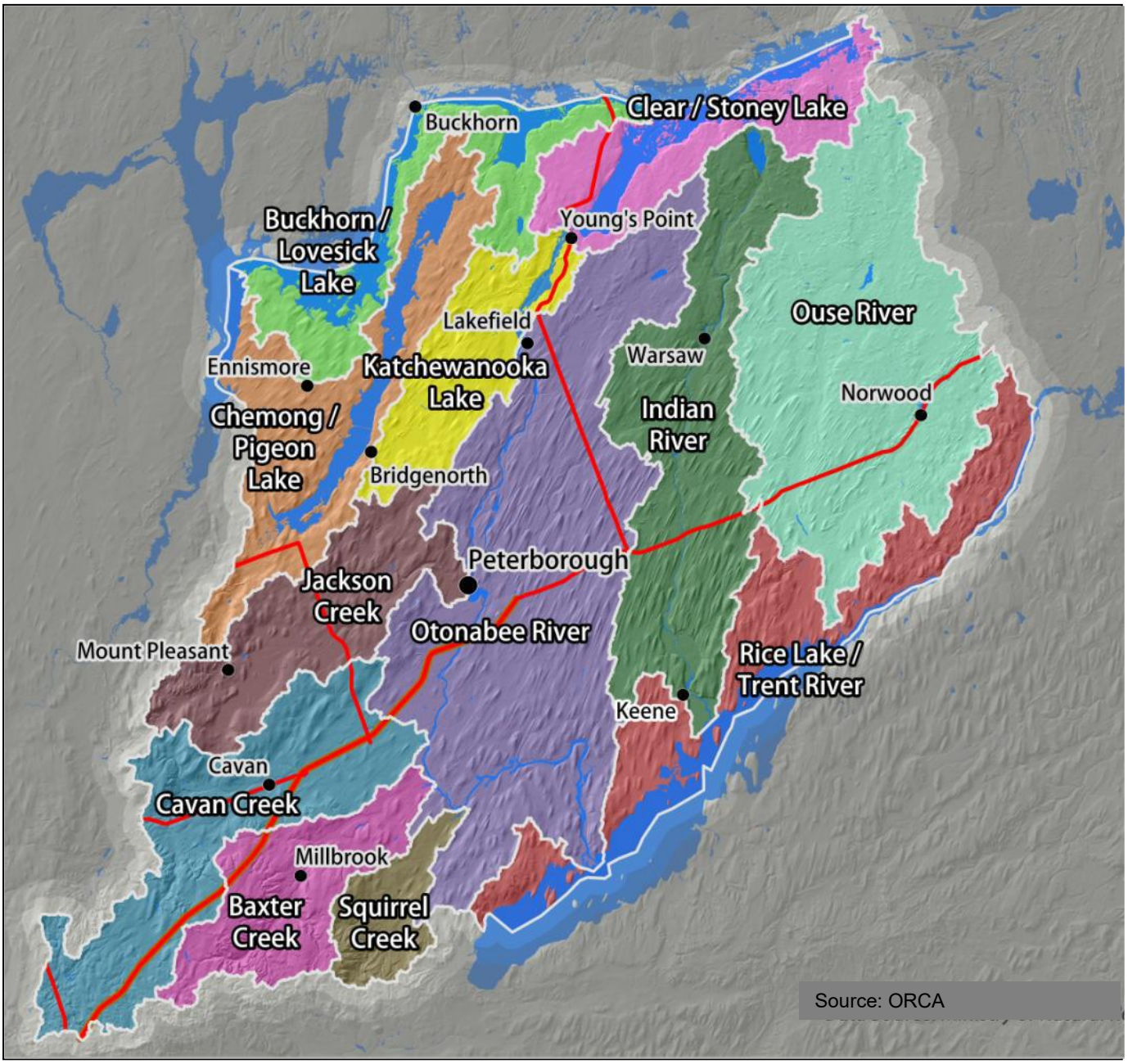
PROPOSED DRAFT PLAN

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 Homes	7.11	557	2.90	3.95	11.46	1.99	13.45
Street Townhomes	3.91	518	2.70	3.97	10.70	1.09	11.80
Medium Density	1.69	616	3.21	3.93	12.60	0.47	13.07
Commercial	9.06		2.90	2.50	7.25	2.54	9.78
Roads	6.36					1.78	1.78
Total	**28.13**	**1,691**	**11.71**		**42.00**	**7.88**	**49.88**

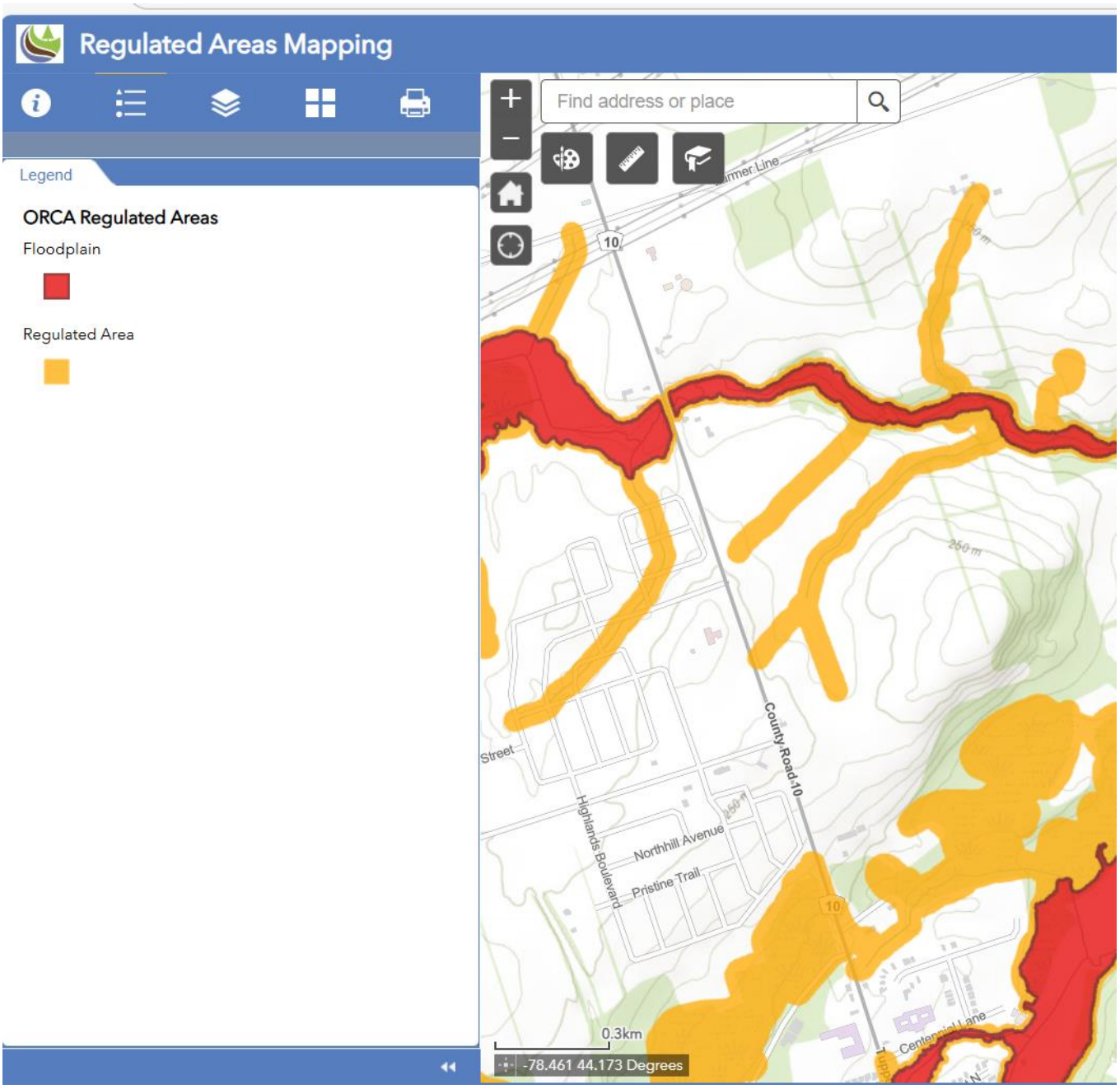
APPENDIX “D”

Storm Drainage Details

ORCA WATERSHED MAP



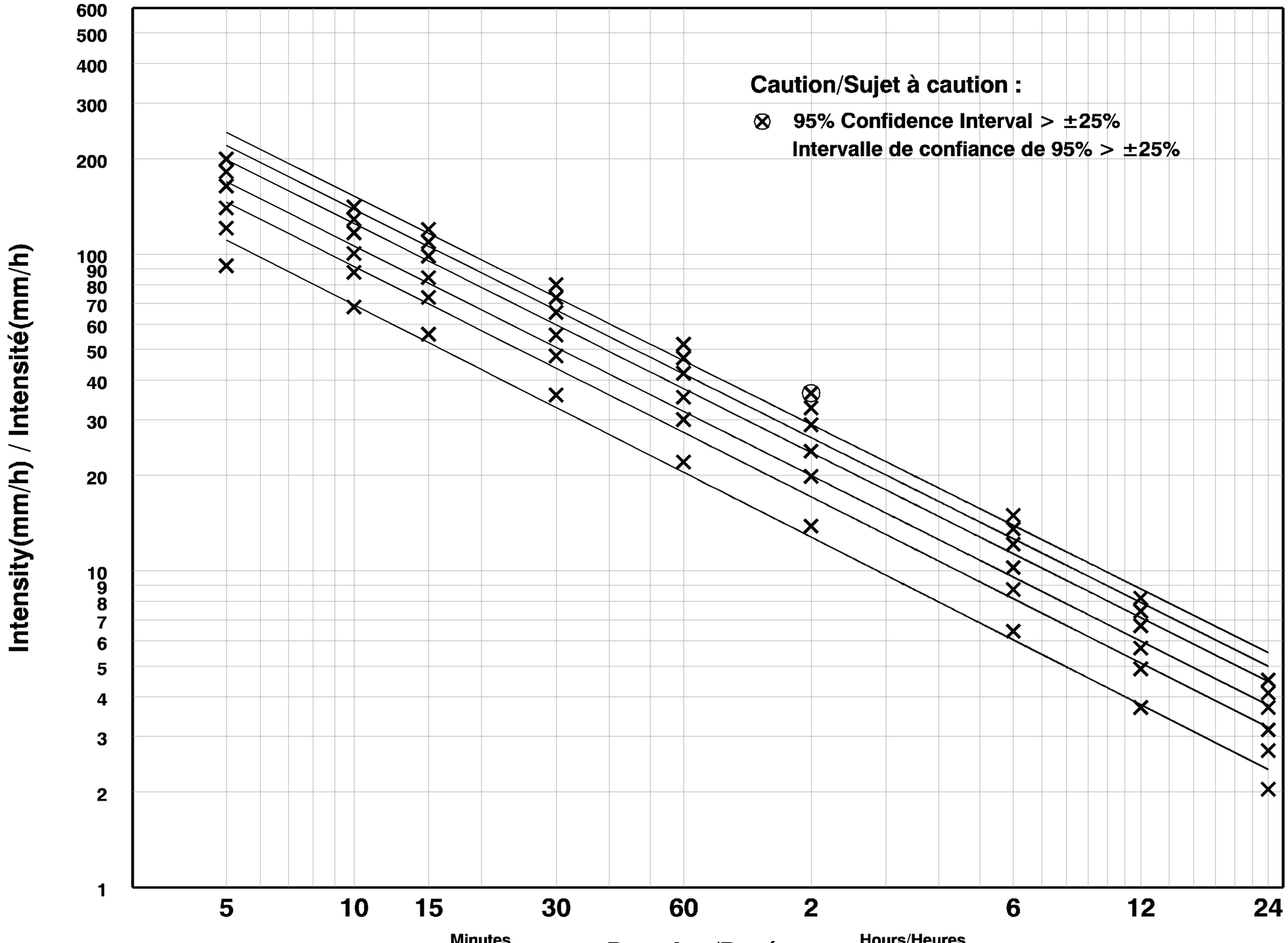
ORCA REGULATION MAPPING



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



PETERBOROUGH A
ON
6166418

1971 - 2006
33 years / ans

Latitude
44° 14'N
Longitude
78° 22'W

Elevation / Altitude
191 m

Environment Canada Environnement Canada

Canada

Intensity Duration Frequency Statistics for Peterborough

Location - Peterborough Airport 2014 Data

Rainfall Intensity = a/(Tc+b)^c

Tc = 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	

VALDOR ENGINEERING INC.
Municipal • Land Development • Water Resources
Site Development • Project Management • Contract Administration
Consulting Engineers - est. 1992

741 Rowntree Dairy Road, Suite 2
Woodbridge, Ontario L4L 5T9
TEL (905) 264-0054
FAX (905) 264-0069
info@valdor-engineering.com
www.valdor-engineering.com

STORMWATER MANAGEMENT REPORT

Proposed Community Centre

West side of County Rd 10, North of Fallis Line
Community of Millbrook
Township of Cavan Monaghan

August 2017
Rev: October 2017
Rev: November 2017
Rev: November 28, 2017

Prepared For: MacLennan Jaunkalns Miller Architects

File: **17114**

s:\projects\2017\17114\reports\swm\revision 1\17114 SWM Nov 28 2017.doc

VALDOR WATER RESOURCES

Professional Engineers
Ontario

Authorized by the Association of Professional Engineers
of Ontario to offer professional engineering services.

- **Quantity Control**: to be provided to such that post development flows do not exceed pre-development rates for rainfall events up to and including the 100 year storm.
- **Quality Control**: to be provided to achieve Enhanced (Level 1) treatment of stormwater runoff.

The following is a summary of the stormwater management analysis for an on-site solution:

2.1 Quantity Control

Stormwater quantity control is typically implemented to minimize the potential for downstream flooding, stream bank erosion and overflows of infrastructure. The impact of the proposed development has been analyzed as follows:

2.1.1 Pre-Development Flow

Peak flow calculations are based on rainfall intensity duration frequency (IDF) curves in accordance with the 2006 rainfall intensity duration frequency (IDF) data for the Peterborough Airport weather station which was obtained from the ORCA. The rainfall intensity values, *I*, for the 5 and 100 year return periods are calculated as follows:

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

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 subject site currently drains to a 600mm diameter culvert which discharges easterly under County Road 10. As indicated in **Figure 2** the existing catchment area for this culvert is 6.27 hectares which includes the subject site plus external areas to the west, north and south. There is no drainage directed westerly under existing conditions. Based on Visual Otthymo 5.0 (VO5) modelling, the calculation of the 5 year and 100 year pre-development peak flows to the existing culvert are provided in summarized in the first row of **Table 1A**. The pre-development peak flow calculations are provided in **Appendix "C"**.

Table 1A: Storm Drainage Peak Flows – Directed Easterly

Condition	Drainage Area (Ha)	5 Year Peak Flows (L/s)	100 Year Peak Flows (L/s)
Pre-Development	6.27	289	716
Post-Development	1.78	236	236

APPENDIX “E”

Stormwater Management Calculations

VALDOR ENGINEERING INC.
File: 21101
Date: Februrary 2026

Table E.1: Summary of VO Model Parameters
Pre-Development Conditions

Catchment ID	Area (ha)	VO5 Routine	TIMP	XIMP	CN II	CN II*	IA (mm)	Tpeak (hr)
101	24.37	NasHyd	-	-	77	78	7.1	0.62
102	13.27	NasHyd	-	-	77	78	6.1	0.70
Total	**37.64**							

VALDOR ENGINEERING INC.
File: 21101
Date: Februrary 2026

Table E.2: Summary of VO Model Parameters
Post-Development Conditions

Catchment ID	Area (ha)	VO5 Routine	TIMP	XIMP	CN II	CN II*	IA (mm)	Tpeak (hr)
201	21.49	StandHyd	0.75	0.70	61	55	5.0	-
202	13.27	StandHyd	0.60	0.45	61	55	5.0	-
203	2.88	StandHyd	0.80	0.65	61	55	5.0	-
Total	**37.64**							

VALDOR ENGINEERING INC.
File: 21101
Date: Februrary 2026

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	Area Weighted CN II*	IA (mm)	Area Weighted IA (mm)	C-Value	Area Weighted C-Value
		Type	Area (ha)							
		Forest (HSG 'B')	0.28	55			10		0.25	
		Meadow (HSG 'B')	3.22	58			8		0.28	
101	24.37	Row Crops (HSG 'B')	20.25	81	**77**	**78**	7	**7.1**	0.35	**0.34**
		Lawn (HSG 'B')	0.55	61			5		0.11	
		Other Impervious	0.07	98			2		0.95	
		Forest (HSG 'B')	0.00	55			10		0.25	
		Meadow (HSG 'B')	0.00	58			8		0.28	
102	13.27	Row Crops (HSG 'B')	8.81	81	**77**	**78**	7	**6.1**	0.35	**0.33**
		Lawn (HSG 'B')	3.50	61			5		0.11	
		Other Impervious	0.96	98			2		0.95	

VALDOR ENGINEERING INC.
File: 21101
Date: Februrary 2026

Table E.4: SWM Analysis - Calculation of Time to Peak

Subcatchment	A Area (ha)	C Runoff Coefficient (Area Weighted)	L (m) Catchment Length	Highest Elevation (m)	Lowest Elevation (m)	S (%) Catchment Slope	[1,2]T_c Method	T_c (min)	[3]Adjusted T_c (min)	[1,2]T_p (hr)
101	24.37	0.34	850.0	255.00	236.00	2.24	Airport	55.7	55.7	**0.62**
102	13.27	0.33	550.0	241.00	236.50	0.82	Airport	62.9	62.9	**0.70**

Notes:
1) T_p calculation for catchments with C < 0.40 is based on the Airport Formula: $T_c = 3.26 \times (1.1 - C) \times L^{0.5} / S_w^{0.33}$

$T_P = 0.67 T_c$

2) T_p calculation for catchments with C > 0.40 is based on the Bransby-Williams Formula: $T_c = (0.057)(L) / (S_w)^{0.2} (A)^{0.1}$

3) For the pre-development condition, a minimum time of concentration of 15 mins (Adjusted T_c) is to be used in the modelling.

VALDOR ENGINEERING INC.
Project: Marsville Estates Subdivision
File: 21101
Date: January 2026

Table E.5: SWM Pond Stage-Storage-Discharge Table

Stage Storage Curve						Outlet Structure						
Elevation (m)	Sec Area (m^2)	Avg Area (m^2)	Sec Volume (m^3)	Cumulative Volume (m^3)	Volume Above NWL (m^3)		Stage Active (m)	[1]Discharge m^3/s Orifice #1	Orifice #2 (Weir Flow)	Orifice #2 (Orifice Flow)	Spillway	Total	Comments:
						Invert Elevation (m)		235.50	236.50	236.50	238.20	Flow	
						Diameter (mm)/Length (m)		165	1.70	1.70	20.00		
						Height (m)		-	0.40	0.40			
						Orifice Area (m^2)		0.0214	-	0.6800	-		Weir Equation: $Q=1.837xLxH^{1.5}$
Forebay Below NWL													Orifice Eq'n: $Q = 0.6A(2gH)^{0.5}$
233.50	**149**	**-**	**-**	**0**		**Bottom of Forebay**							Spillway Design: $Q=1.67xLxH^{1.5}$
233.70	195	172	34	34									
234.90	**468**	**332**	**398**	**433**									
235.10	559	514	103	535									
235.30	650	605	121	656									
235.50	**741**	**696**	**139**	**796**		**NWL**							
Main Cell Below NWL													
233.50	**2,309**	**-**	**-**	**0**		**Bottom of Main Cell**							
233.70	2,452	2,380	476	476									
234.90	**3,311**	**2,882**	**3,458**	**3,934**									
235.10	3,571	3,441	688	4,622									
235.30	3,832	3,701	740	5,363									
235.50	**4,092**	**3,962**	**792**	**6,155**		**NWL**							
Forebay & Main Cell Above NWL													
235.50	**4,833**	**-**	**-**	**6,950**	**0**	**NWL**	0.00	0.000				**0.000**	**Permanent Pool Provided**
235.60	5,028	4,931	493	7,443	493		0.10	0.008				**0.008**	
235.70	5,224	5,126	513	7,956	1,006		0.20	0.019				**0.019**	
235.80	5,419	5,321	532	8,488	1,538		0.30	0.027				**0.027**	
235.90	5,614	5,516	552	9,040	2,089		0.40	0.032				**0.032**	
236.10	**6,004**	**5,809**	**1,162**	**10,202**	**3,251**		0.60	0.041		-		**0.041**	
236.30	6,284	6,144	1,229	11,430	4,480		0.80	0.048		-		**0.048**	
236.45	6,626	6,455	968	12,399	5,448		0.95	0.053		-		**0.053**	**Extended Detention Provided**
236.50	6,714	6,499	1,300	12,730	5,780		1.00	0.054	0.000	-		**0.054**	
236.70	6,842	6,778	1,356	14,086	7,136		1.20	0.060	0.254	-		**0.314**	
236.90	7,424	7,133	1,427	15,513	8,562		1.40	0.065	0.718	-		**0.783**	
237.50	**7,960**	7,692	4,615	20,128	13,177		2.00	0.079		1.616		**1.695**	
237.70	8,526	8,243	1,649	21,776	14,826		2.20	0.083		1.807		**1.890**	
237.90	9,093	8,810	1,762	23,538	16,588		2.40	0.087		1.980		**2.066**	
238.00	**9,376**	**9,234**	**923**	**24,462**	**17,511**		2.50	0.088		2.061		**2.149**	
238.10	9,496	9,436	944	25,405	18,455		2.60	0.090		2.138		**2.228**	
238.20	9,616	9,556	956	26,361	19,411		2.70	0.092		2.213	0.000	**2.305**	**100-year Storage Provided**
238.30	9,736	9,676	968	27,329	20,378		2.80	0.094	-	2.286	1.056	**3.436**	
238.40	9,856	9,796	980	28,308	21,358		2.90	0.095	-	2.356	2.987	**5.439**	
238.50	**9,976**	**9,916**	**992**	**29,300**	**22,349**	**Top of Berm (Inside Edge)**	3.00	0.097	-	2.425	5.488	**8.010**	**Top of Berm**

VALDOR ENGINEERING INC.
Project: Marsville Estates Subdivision
File: 21101
Date: January 2026

Table E.6: Permanent Pool Volume Requirements

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

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

1. 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.
2. For wetlands, wet ponds and hybrid ponds, all of the storage, except 40 m^3/ha, in Table 3.2 represents the permanent pool volume. The 40 m^3/ha represents the extended detention storage.
3. 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:	70.0 %	
Volume Level:	185.0 m^3/ha	Excluding Extended Detention
Area:	34.91 ha	
Total Required Volume:	**6,458 m^3**	

VALDOR ENGINEERING INC.
Project: Marsville Estates Subdivision
File: 21101
Date: January 2026

Table E.7: Extended Detention Requirements

Event	Area (ha)	R.V. (mm)	Required Ext. Det. Volume (m^3)	Provided Ext. Det. Volume (m^3)
25mm 4-hour Chicago Storm	34.91	15.66	5,467	5,780

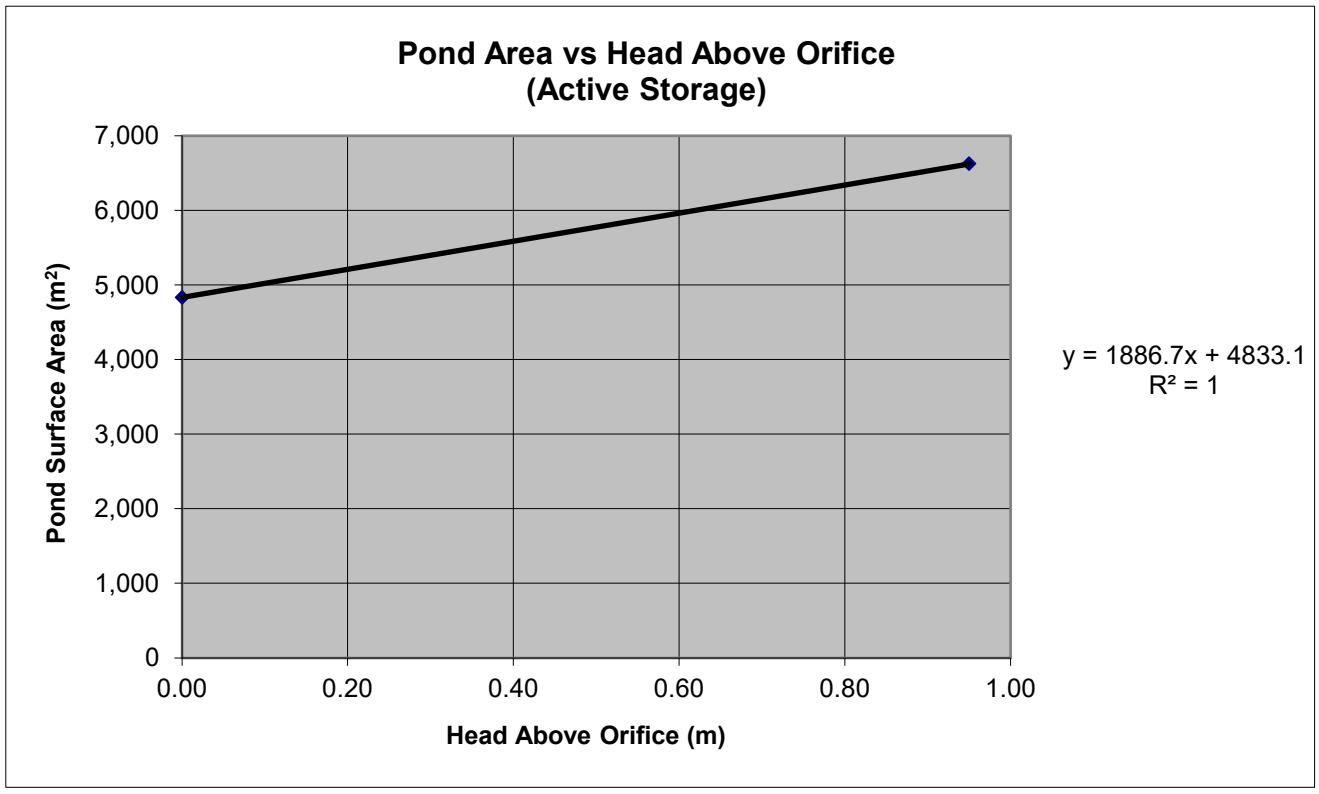
VALDOR ENGINEERING INC.
Project: Marsville Estates Subdivision
File: 21101
Date: January 2026

Table E.8: Extended Detention Drawdown Time

Extended Detention - SWM Pond

Orifice Sizing		
Orifice Size	165	mm
Orifice Inve	235.50	m
Orifice Area	0.021382465	sq. m
[1]$EDL_{erosion}$	236.50	m
NWL	235.50	m
C_2	1886.7	
C_3	4833.1	
h	0.9175	m
Drawdown T	48.9	hr

$y = mx + b$
$C_2 = m$
$C_3 = b$



VALDOR ENGINEERING INC.
Project: Marsville Estates Subdivision
File: 21101
Date: January 2026

Table E.9: Critical Storm Analysis

Storm Distribution	Theoretical 100-year Storage Volume Required (m^3)	Note
6-hour SCS	**13,307**	Critical Storm
12-hour SCS	12,277	
24-hour SCS	11,197	
1-hour AES	10,877	
6-hour AES	12,745	
12-hour AES	11,217	
24-hour AES	9,507	
4-hour Chicago	**11,870**	

Worksheet for Street G Overland Flow Route, Catchment 201

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.03000	m/m
Discharge	3.379	m³/s

Section Definitions

Station (m)	Elevation (m)
0+00.00	0.25
0+05.00	0.15
0+05.00	0.00
0+10.00	0.10
0+15.00	0.00
0+15.00	0.10
0+20.00	0.25

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.25)	(0+05.00, 0.15)	0.035
(0+05.00, 0.15)	(0+15.00, 0.10)	0.013
(0+15.00, 0.10)	(0+20.00, 0.25)	0.035

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth		0.22	m
Elevation Range	0.00 to 0.25 m		
Flow Area		2.03	m²
Wetted Perimeter		17.62	m

Worksheet for Street G Overland Flow Route, Catchment 201

Results

Hydraulic Radius		0.12	m
Top Width		17.36	m
Normal Depth		0.22	m
Critical Depth		0.26	m
Critical Slope		0.01167	m/m
Velocity		1.66	m/s
Velocity Head		0.14	m
Specific Energy		0.36	m
Froude Number		1.55	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	m
Length	0.00	m
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	m
Profile Description		
Profile Headloss	0.00	m
Downstream Velocity	Infinity	m/s
Upstream Velocity	Infinity	m/s
Normal Depth	0.22	m
Critical Depth	0.26	m
Channel Slope	0.03000	m/m
Critical Slope	0.01167	m/m

Worksheet for Street A Overland Flow Route, Catchment 202

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00500	m/m
Discharge	2.110	m³/s

Section Definitions

Station (m)	Elevation (m)
0+00.00	0.25
0+05.00	0.15
0+05.00	0.00
0+10.00	0.10
0+15.00	0.00
0+15.00	0.10
0+20.00	0.25

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.25)	(0+05.00, 0.15)	0.035
(0+05.00, 0.15)	(0+15.00, 0.10)	0.013
(0+15.00, 0.10)	(0+20.00, 0.25)	0.035

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.26	m
Elevation Range	0.00 to 0.25 m	
Flow Area	2.88	m²
Wetted Perimeter	20.28	m

Worksheet for Street A Overland Flow Route, Catchment 202

Results

Hydraulic Radius		0.14	m
Top Width		20.00	m
Normal Depth		0.26	m
Critical Depth		0.22	m
Critical Slope		0.01418	m/m
Velocity		0.73	m/s
Velocity Head		0.03	m
Specific Energy		0.29	m
Froude Number		0.62	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	m
Length	0.00	m
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	m
Profile Description		
Profile Headloss	0.00	m
Downstream Velocity	Infinity	m/s
Upstream Velocity	Infinity	m/s
Normal Depth	0.26	m
Critical Depth	0.22	m
Channel Slope	0.00500	m/m
Critical Slope	0.01418	m/m

Worksheet for Spillway to Pond

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.030	
Channel Slope	0.02000	m/m
Left Side Slope	3.00	m/m (H:V)
Right Side Slope	3.00	m/m (H:V)
Bottom Width	15.00	m
Discharge	5.768	m³/s

Results

Normal Depth	0.22	m
Flow Area	3.46	m²
Wetted Perimeter	16.40	m
Hydraulic Radius	0.21	m
Top Width	16.32	m
Critical Depth	0.24	m
Critical Slope	0.01445	m/m
Velocity	1.67	m/s
Velocity Head	0.14	m
Specific Energy	0.36	m
Froude Number	1.16	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	m
Length	0.00	m
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	m
Profile Description		
Profile Headloss	0.00	m
Downstream Velocity	Infinity	m/s
Upstream Velocity	Infinity	m/s
Normal Depth	0.22	m
Critical Depth	0.24	m
Channel Slope	0.02000	m/m

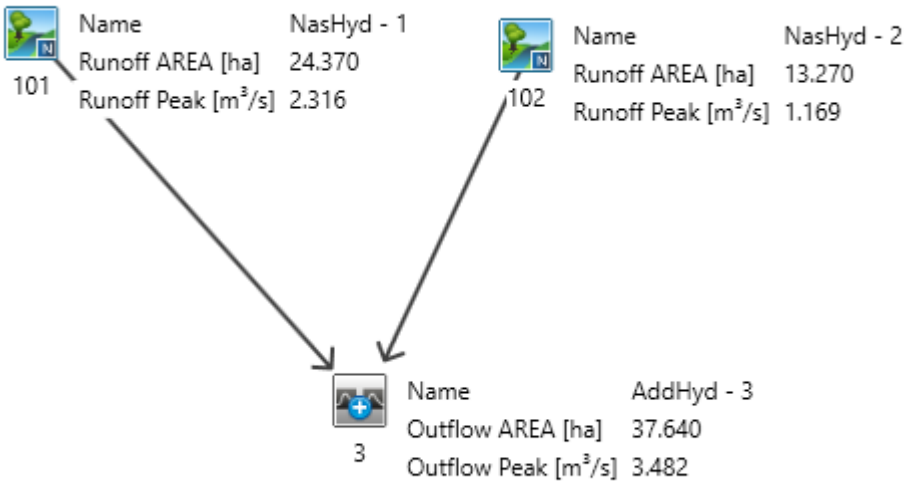


Figure E.1: VO Model Schematic – Pre-Development Storm Drainage

```
================================================================================
==============

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2019)
       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
         VV     I    SSSSS  UUUUU A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2022 Smart City Water Inc
All rights reserved.

                  *****  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\pyung\AppData\Local\Civica\VH5\98ec473c-00e0-4b07-a2f4-
5ebeb92859e6\a6aad5b8-e7a8-44af-b74b-f410404e8b67\scenar
  Summary filename: C:\Users\pyung\AppData\Local\Civica\VH5\98ec473c-00e0-4b07-a2f4-
5ebeb92859e6\a6aad5b8-e7a8-44af-b74b-f410404e8b67\scenar


DATE: 03-03-2026                          TIME: 01:44:26

USER:


COMMENTS: _____________________________________________________________

--------------------------------------------------------------------------------
--------------
  ************************************************
  ** SIMULATION : SCS_06hr_002yr                 **
  ************************************************


--------------------
|    READ STORM    |    Filename: C:\Users\pyung\AppD
|                  |              ata\Local\Temp\
|                  |              7a4704be-8ddb-4433-a197-d500bce3e961\d34b8ac3
| Ptotal= 45.23 mm |    Comments: SCS_06hr_002yr-CC
--------------------
                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    4.52 |  3.50    9.95 |  5.25    1.81
                0.25    1.81 |  2.00    4.52 |  3.75    4.52 |  5.50    1.81
                0.50    1.81 |  2.25    5.43 |  4.00    4.52 |  5.75    1.81
                0.75    2.71 |  2.50    5.43 |  4.25    3.62 |  6.00    1.81
                1.00    2.71 |  2.75   27.14 |  4.50    3.62 |
                1.25    2.71 |  3.00   70.57 |  4.75    2.71 |
                1.50    2.71 |  3.25    9.95 |  5.00    2.71 |

--------------------------------------------------------------------------------

--------------------
| CALIB            |
| NASHYD   (  0101)|   Area     (ha)=  24.37   Curve Number    (CN)= 78.0
|ID= 1 DT= 5.0 min |   Ia       (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.62

        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	2.71	3.250	70.57	4.83	2.71
0.167	0.00	1.750	2.71	3.333	9.95	4.92	2.71
0.250	0.00	1.833	4.52	3.417	9.95	5.00	2.71
0.333	1.81	1.917	4.52	3.500	9.95	5.08	2.71
0.417	1.81	2.000	4.52	3.583	9.95	5.17	2.71
0.500	1.81	2.083	4.52	3.667	9.95	5.25	2.71
0.583	1.81	2.167	4.52	3.750	9.95	5.33	1.81
0.667	1.81	2.250	4.52	3.833	4.52	5.42	1.81
0.750	1.81	2.333	5.43	3.917	4.52	5.50	1.81
0.833	2.71	2.417	5.43	4.000	4.52	5.58	1.81
0.917	2.71	2.500	5.43	4.083	4.52	5.67	1.81
1.000	2.71	2.583	5.43	4.167	4.52	5.75	1.81
1.083	2.71	2.667	5.43	4.250	4.52	5.83	1.81
1.167	2.71	2.750	5.43	4.333	3.62	5.92	1.81
1.250	2.71	2.833	27.14	4.417	3.62	6.00	1.81
1.333	2.71	2.917	27.14	4.500	3.62	6.08	1.81
1.417	2.71	3.000	27.14	4.583	3.62	6.17	1.81
1.500	2.71	3.083	70.57	4.667	3.62	6.25	1.81
1.583	2.71	3.167	70.57	4.750	3.62		

Unit Hyd Qpeak (cms)= 1.501

PEAK FLOW (cms)= 0.487 (i)
TIME TO PEAK (hrs)= 3.833
RUNOFF VOLUME (mm)= 13.243
TOTAL RAINFALL (mm)= 45.228
RUNOFF COEFFICIENT = 0.293

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

| CALIB |
| NASHYD   (0102)| Area   (ha)= 13.27   Curve Number   (CN)= 78.0
|ID= 1 DT= 5.0 min | Ia   (mm)=   6.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.70

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	2.71	3.250	70.57	4.83	2.71
0.167	0.00	1.750	2.71	3.333	9.95	4.92	2.71
0.250	0.00	1.833	4.52	3.417	9.95	5.00	2.71
0.333	1.81	1.917	4.52	3.500	9.95	5.08	2.71
0.417	1.81	2.000	4.52	3.583	9.95	5.17	2.71
0.500	1.81	2.083	4.52	3.667	9.95	5.25	2.71
0.583	1.81	2.167	4.52	3.750	9.95	5.33	1.81
0.667	1.81	2.250	4.52	3.833	4.52	5.42	1.81
0.750	1.81	2.333	5.43	3.917	4.52	5.50	1.81
0.833	2.71	2.417	5.43	4.000	4.52	5.58	1.81
0.917	2.71	2.500	5.43	4.083	4.52	5.67	1.81
1.000	2.71	2.583	5.43	4.167	4.52	5.75	1.81
1.083	2.71	2.667	5.43	4.250	4.52	5.83	1.81
1.167	2.71	2.750	5.43	4.333	3.62	5.92	1.81
1.250	2.71	2.833	27.14	4.417	3.62	6.00	1.81
1.333	2.71	2.917	27.14	4.500	3.62	6.08	1.81
1.417	2.71	3.000	27.14	4.583	3.62	6.17	1.81
1.500	2.71	3.083	70.57	4.667	3.62	6.25	1.81
1.583	2.71	3.167	70.57	4.750	3.62		

Unit Hyd Qpeak (cms)= 0.724

PEAK FLOW (cms)= 0.255 (i)

```
     TIME TO PEAK    (hrs)=   3.917
     RUNOFF VOLUME    (mm)=  13.821
     TOTAL RAINFALL   (mm)=  45.228
     RUNOFF COEFFICIENT   =   0.306

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

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0003)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)      (mm)
        ID1= 1 (  0101):    24.37   0.487     3.83    13.24
      + ID2= 2 (  0102):    13.27   0.255     3.92    13.82
        ================================================
        ID = 3 (  0003):    37.64   0.742     3.92    13.45

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
================================================================================
==============

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2019)
       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
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2022 Smart City Water Inc
All rights reserved.

                  *****  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\pyung\AppData\Local\Civica\VH5\98ec473c-00e0-4b07-a2f4-
5ebeb92859e6\a7c88137-2ae7-41fd-b062-a8aeb5d2d38d\scenar
  Summary filename: C:\Users\pyung\AppData\Local\Civica\VH5\98ec473c-00e0-4b07-a2f4-
5ebeb92859e6\a7c88137-2ae7-41fd-b062-a8aeb5d2d38d\scenar


DATE: 03-03-2026                          TIME: 01:44:26

USER:


COMMENTS: _____________________________________________________________

--------------------------------------------------------------------------------
--------------
  ***********************************************
  ** SIMULATION : SCS_06hr_005yr                **
  ***********************************************


--------------------
|    READ STORM    |    Filename: C:\Users\pyung\AppD
|                  |              ata\Local\Temp\
|                  |              7a4704be-8ddb-4433-a197-d500bce3e961\027c3668
| Ptotal= 63.49 mm |    Comments: SCS_06hr_005yr-CC
--------------------
```

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	6.35	3.50	13.97	5.25	2.54
0.25	2.54	2.00	6.35	3.75	6.35	5.50	2.54
0.50	2.54	2.25	7.62	4.00	6.35	5.75	2.54
0.75	3.81	2.50	7.62	4.25	5.08	6.00	2.54
1.00	3.81	2.75	38.09	4.50	5.08		
1.25	3.81	3.00	99.04	4.75	3.81		
1.50	3.81	3.25	13.97	5.00	3.81		

```
--------------------------------------------------------------------------------

--------------------
| CALIB            |
| NASHYD   (  0101)|   Area    (ha)=  24.37   Curve Number    (CN)= 78.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.62

        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	3.81	3.250	99.04	4.83	3.81
0.167	0.00	1.750	3.81	3.333	13.97	4.92	3.81
0.250	0.00	1.833	6.35	3.417	13.97	5.00	3.81
0.333	2.54	1.917	6.35	3.500	13.97	5.08	3.81
0.417	2.54	2.000	6.35	3.583	13.97	5.17	3.81
0.500	2.54	2.083	6.35	3.667	13.97	5.25	3.81
0.583	2.54	2.167	6.35	3.750	13.97	5.33	2.54
0.667	2.54	2.250	6.35	3.833	6.35	5.42	2.54
0.750	2.54	2.333	7.62	3.917	6.35	5.50	2.54
0.833	3.81	2.417	7.62	4.000	6.35	5.58	2.54
0.917	3.81	2.500	7.62	4.083	6.35	5.67	2.54
1.000	3.81	2.583	7.62	4.167	6.35	5.75	2.54
1.083	3.81	2.667	7.62	4.250	6.35	5.83	2.54
1.167	3.81	2.750	7.62	4.333	5.08	5.92	2.54
1.250	3.81	2.833	38.09	4.417	5.08	6.00	2.54
1.333	3.81	2.917	38.09	4.500	5.08	6.08	2.54
1.417	3.81	3.000	38.09	4.583	5.08	6.17	2.54
1.500	3.81	3.083	99.04	4.667	5.08	6.25	2.54
1.583	3.81	3.167	99.04	4.750	5.08		

```
     Unit Hyd Qpeak  (cms)=   1.501

     PEAK FLOW       (cms)=   0.941 (i)
     TIME TO PEAK    (hrs)=   3.833
     RUNOFF VOLUME    (mm)=  24.838
     TOTAL RAINFALL   (mm)=  63.493
     RUNOFF COEFFICIENT   =   0.391

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

--------------------------------------------------------------------------------

--------------------
| CALIB            |
| NASHYD   (  0102)|   Area    (ha)=  13.27   Curve Number    (CN)= 78.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.70

        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	3.81	3.250	99.04	4.83	3.81
0.167	0.00	1.750	3.81	3.333	13.97	4.92	3.81
0.250	0.00	1.833	6.35	3.417	13.97	5.00	3.81

0.333	2.54	1.917	6.35	3.500	13.97	5.08	3.81
0.417	2.54	2.000	6.35	3.583	13.97	5.17	3.81
0.500	2.54	2.083	6.35	3.667	13.97	5.25	3.81
0.583	2.54	2.167	6.35	3.750	13.97	5.33	2.54
0.667	2.54	2.250	6.35	3.833	6.35	5.42	2.54
0.750	2.54	2.333	7.62	3.917	6.35	5.50	2.54
0.833	3.81	2.417	7.62	4.000	6.35	5.58	2.54
0.917	3.81	2.500	7.62	4.083	6.35	5.67	2.54
1.000	3.81	2.583	7.62	4.167	6.35	5.75	2.54
1.083	3.81	2.667	7.62	4.250	6.35	5.83	2.54
1.167	3.81	2.750	7.62	4.333	5.08	5.92	2.54
1.250	3.81	2.833	38.09	4.417	5.08	6.00	2.54
1.333	3.81	2.917	38.09	4.500	5.08	6.08	2.54
1.417	3.81	3.000	38.09	4.583	5.08	6.17	2.54
1.500	3.81	3.083	99.04	4.667	5.08	6.25	2.54
1.583	3.81	3.167	99.04	4.750	5.08		

Unit Hyd Qpeak (cms)= 0.724

PEAK FLOW (cms)= 0.483 (i)
TIME TO PEAK (hrs)= 3.917
RUNOFF VOLUME (mm)= 25.527
TOTAL RAINFALL (mm)= 63.493
RUNOFF COEFFICIENT = 0.402

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

ADD HYD (0003) 1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0101):	24.37	0.941	3.83	24.84
+ ID2= 2 (0102):	13.27	0.483	3.92	25.53
ID = 3 (0003):	37.64	1.418	3.83	25.08

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
       V    V   I    SSSSS  U   U    A    L              (v 6.2.2019)
       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
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2022 Smart City Water Inc
All rights reserved.
```

***** 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\pyung\AppData\Local\Civica\VH5\98ec473c-00e0-4b07-a2f4-
5ebeb92859e6\55deaafb-62a9-4386-b3b7-396caff5db41\scenar
  Summary filename: C:\Users\pyung\AppData\Local\Civica\VH5\98ec473c-00e0-4b07-a2f4-
5ebeb92859e6\55deaafb-62a9-4386-b3b7-396caff5db41\scenar

DATE: 03-03-2026                          TIME: 01:44:26

USER:

COMMENTS: _____
```

```
  ************************************************
  ** SIMULATION : SCS_06hr_010yr                **
  ************************************************
```

READ STORM	Filename: C:\Users\pyung\AppData\Local\Temp\7a4704be-8ddb-4433-a197-d500bce3e961\3e1f6655
Ptotal= 74.28 mm	Comments: SCS_06hr_010yr-CC

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	7.43	3.50	16.34	5.25	2.97
0.25	2.97	2.00	7.43	3.75	7.43	5.50	2.97
0.50	2.97	2.25	8.91	4.00	7.43	5.75	2.97
0.75	4.46	2.50	8.91	4.25	5.94	6.00	2.97
1.00	4.46	2.75	44.57	4.50	5.94		
1.25	4.46	3.00	115.88	4.75	4.46		
1.50	4.46	3.25	16.34	5.00	4.46		

CALIB NASHYD (0101) ID= 1 DT= 5.0 min					
	Area	(ha)=	24.37	Curve Number (CN)=	78.0
	Ia	(mm)=	7.10	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=		0.62		

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	4.46	3.250	115.88	4.83	4.46
0.167	0.00	1.750	4.46	3.333	16.34	4.92	4.46
0.250	0.00	1.833	7.43	3.417	16.34	5.00	4.46
0.333	2.97	1.917	7.43	3.500	16.34	5.08	4.46
0.417	2.97	2.000	7.43	3.583	16.34	5.17	4.46
0.500	2.97	2.083	7.43	3.667	16.34	5.25	4.46
0.583	2.97	2.167	7.43	3.750	16.34	5.33	2.97
0.667	2.97	2.250	7.43	3.833	7.43	5.42	2.97
0.750	2.97	2.333	8.91	3.917	7.43	5.50	2.97
0.833	4.46	2.417	8.91	4.000	7.43	5.58	2.97
0.917	4.46	2.500	8.91	4.083	7.43	5.67	2.97
1.000	4.46	2.583	8.91	4.167	7.43	5.75	2.97
1.083	4.46	2.667	8.91	4.250	7.43	5.83	2.97
1.167	4.46	2.750	8.91	4.333	5.94	5.92	2.97
1.250	4.46	2.833	44.57	4.417	5.94	6.00	2.97
1.333	4.46	2.917	44.57	4.500	5.94	6.08	2.97
1.417	4.46	3.000	44.57	4.583	5.94	6.17	2.97
1.500	4.46	3.083	115.88	4.667	5.94	6.25	2.97
1.583	4.46	3.167	115.88	4.750	5.94		

Unit Hyd Qpeak (cms)= 1.501

PEAK FLOW (cms)= 1.243 (i)
TIME TO PEAK (hrs)= 3.833
RUNOFF VOLUME (mm)= 32.512
TOTAL RAINFALL (mm)= 74.283

```
     RUNOFF COEFFICIENT    =    0.438

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

---------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0102)  |   Area     (ha)=  13.27   Curve Number    (CN)= 78.0
|ID= 1 DT= 5.0 min   |   Ia       (mm)=   6.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.70

        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    4.46  | 3.250  115.88  |  4.83    4.46
    0.167    0.00  | 1.750    4.46  | 3.333   16.34  |  4.92    4.46
    0.250    0.00  | 1.833    7.43  | 3.417   16.34  |  5.00    4.46
    0.333    2.97  | 1.917    7.43  | 3.500   16.34  |  5.08    4.46
    0.417    2.97  | 2.000    7.43  | 3.583   16.34  |  5.17    4.46
    0.500    2.97  | 2.083    7.43  | 3.667   16.34  |  5.25    4.46
    0.583    2.97  | 2.167    7.43  | 3.750   16.34  |  5.33    2.97
    0.667    2.97  | 2.250    7.43  | 3.833    7.43  |  5.42    2.97
    0.750    2.97  | 2.333    8.91  | 3.917    7.43  |  5.50    2.97
    0.833    4.46  | 2.417    8.91  | 4.000    7.43  |  5.58    2.97
    0.917    4.46  | 2.500    8.91  | 4.083    7.43  |  5.67    2.97
    1.000    4.46  | 2.583    8.91  | 4.167    7.43  |  5.75    2.97
    1.083    4.46  | 2.667    8.91  | 4.250    7.43  |  5.83    2.97
    1.167    4.46  | 2.750    8.91  | 4.333    5.94  |  5.92    2.97
    1.250    4.46  | 2.833   44.57  | 4.417    5.94  |  6.00    2.97
    1.333    4.46  | 2.917   44.57  | 4.500    5.94  |  6.08    2.97
    1.417    4.46  | 3.000   44.57  | 4.583    5.94  |  6.17    2.97
    1.500    4.46  | 3.083  115.88  | 4.667    5.94  |  6.25    2.97
    1.583    4.46  | 3.167  115.88  | 4.750    5.94  |

     Unit Hyd Qpeak  (cms)=    0.724

     PEAK FLOW       (cms)=    0.634 (i)
     TIME TO PEAK    (hrs)=    3.917
     RUNOFF VOLUME    (mm)=   33.247
     TOTAL RAINFALL   (mm)=   74.283
     RUNOFF COEFFICIENT    =    0.448

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

---------------------------------------------------------------------------

--------------------
| ADD HYD  (  0003)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------           (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0101):     24.37    1.243     3.83    32.51
      + ID2= 2 (  0102):     13.27    0.634     3.92    33.25
        ================================================
        ID = 3 (  0003):     37.64    1.871     3.83    32.77

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
---------------------------------------------------------------------------
===========================================================================
===============

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2019)
       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
         VV     I    SSSSS  UUUUU  A   A  LLLLL

       OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM

       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2022 Smart City Water Inc
All rights reserved.

                  *****  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\pyung\AppData\Local\Civica\VH5\98ec473c-00e0-4b07-a2f4-
5ebeb92859e6\d392bd31-65c8-4fc5-8273-80e798543b9c\scenar
  Summary filename: C:\Users\pyung\AppData\Local\Civica\VH5\98ec473c-00e0-4b07-a2f4-
5ebeb92859e6\d392bd31-65c8-4fc5-8273-80e798543b9c\scenar

DATE: 03-03-2026                          TIME: 01:44:26

USER:


COMMENTS: _____________________________________________________

---------------------------------------------------------------------------------------------
--------------
  ************************************************
  ** SIMULATION : SCS_06hr_025yr                 **
  ************************************************


--------------------
|    READ STORM    |    Filename: C:\Users\pyung\AppD
|                  |              ata\Local\Temp\
|                  |              7a4704be-8ddb-4433-a197-d500bce3e961\1340e8c9
| Ptotal= 89.36 mm |    Comments: SCS_06hr_025yr-CC
--------------------
                  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    8.94  |  3.50   19.66  |  5.25    3.57
                  0.25    3.57  |  2.00    8.94  |  3.75    8.94  |  5.50    3.57
                  0.50    3.57  |  2.25   10.72  |  4.00    8.94  |  5.75    3.57
                  0.75    5.36  |  2.50   10.72  |  4.25    7.15  |  6.00    3.57
                  1.00    5.36  |  2.75   53.62  |  4.50    7.15  |
                  1.25    5.36  |  3.00  139.42  |  4.75    5.36  |
                  1.50    5.36  |  3.25   19.66  |  5.00    5.36  |

---------------------------------------------------------------------------

--------------------
| CALIB              |
| NASHYD   (  0101)  |   Area     (ha)=  24.37   Curve Number    (CN)= 78.0
|ID= 1 DT= 5.0 min   |   Ia       (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.62

        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    5.36  | 3.250  139.42  |  4.83    5.36
    0.167    0.00  | 1.750    5.36  | 3.333   19.66  |  4.92    5.36
    0.250    0.00  | 1.833    8.94  | 3.417   19.66  |  5.00    5.36
    0.333    3.57  | 1.917    8.94  | 3.500   19.66  |  5.08    5.36
    0.417    3.57  | 2.000    8.94  | 3.583   19.66  |  5.17    5.36
    0.500    3.57  | 2.083    8.94  | 3.667   19.66  |  5.25    5.36
```

0.583	3.57	2.167	8.94	3.750	19.66	5.33	3.57
0.667	3.57	2.250	8.94	3.833	8.94	5.42	3.57
0.750	3.57	2.333	10.72	3.917	8.94	5.50	3.57
0.833	5.36	2.417	10.72	4.000	8.94	5.58	3.57
0.917	5.36	2.500	10.72	4.083	8.94	5.67	3.57
1.000	5.36	2.583	10.72	4.167	8.94	5.75	3.57
1.083	5.36	2.667	10.72	4.250	8.94	5.83	3.57
1.167	5.36	2.750	10.72	4.333	7.15	5.92	3.57
1.250	5.36	2.833	53.62	4.417	7.15	6.00	3.57
1.333	5.36	2.917	53.62	4.500	7.15	6.08	3.57
1.417	5.36	3.000	53.62	4.583	7.15	6.17	3.57
1.500	5.36	3.083	139.42	4.667	7.15	6.25	3.57
1.583	5.36	3.167	139.42	4.750	7.15		

Unit Hyd Qpeak (cms)= 1.501

PEAK FLOW (cms)= 1.694 (i)
TIME TO PEAK (hrs)= 3.833
RUNOFF VOLUME (mm)= 43.967
TOTAL RAINFALL (mm)= 89.360
RUNOFF COEFFICIENT = 0.492

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

CALIB			
NASHYD (0102)	Area (ha)= 13.27	Curve Number (CN)= 78.0	
ID= 1 DT= 5.0 min	Ia (mm)= 6.10	# of Linear Res.(N)= 3.00	
	U.H. Tp(hrs)= 0.70		

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	5.36	3.250	139.42	4.83	5.36
0.167	0.00	1.750	5.36	3.333	19.66	4.92	5.36
0.250	0.00	1.833	8.94	3.417	19.66	5.00	5.36
0.333	3.57	1.917	8.94	3.500	19.66	5.08	5.36
0.417	3.57	2.000	8.94	3.583	19.66	5.17	5.36
0.500	3.57	2.083	8.94	3.667	19.66	5.25	5.36
0.583	3.57	2.167	8.94	3.750	19.66	5.33	3.57
0.667	3.57	2.250	8.94	3.833	8.94	5.42	3.57
0.750	3.57	2.333	10.72	3.917	8.94	5.50	3.57
0.833	5.36	2.417	10.72	4.000	8.94	5.58	3.57
0.917	5.36	2.500	10.72	4.083	8.94	5.67	3.57
1.000	5.36	2.583	10.72	4.167	8.94	5.75	3.57
1.083	5.36	2.667	10.72	4.250	8.94	5.83	3.57
1.167	5.36	2.750	10.72	4.333	7.15	5.92	3.57
1.250	5.36	2.833	53.62	4.417	7.15	6.00	3.57
1.333	5.36	2.917	53.62	4.500	7.15	6.08	3.57
1.417	5.36	3.000	53.62	4.583	7.15	6.17	3.57
1.500	5.36	3.083	139.42	4.667	7.15	6.25	3.57
1.583	5.36	3.167	139.42	4.750	7.15		

Unit Hyd Qpeak (cms)= 0.724

PEAK FLOW (cms)= 0.859 (i)
TIME TO PEAK (hrs)= 3.917
RUNOFF VOLUME (mm)= 44.752
TOTAL RAINFALL (mm)= 89.360
RUNOFF COEFFICIENT = 0.501

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

ADD HYD (0003)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0101):	24.37	1.694	3.83	43.97
+ ID2= 2 (0102):	13.27	0.859	3.92	44.75
ID = 3 (0003):	37.64	2.549	3.83	44.24

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

FINISH

```
       V    V   I    SSSSS  U   U    A    L              (v 6.2.2019)
       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
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2022 Smart City Water Inc
All rights reserved.
```

***** 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\pyung\AppData\Local\Civica\VH5\98ec473c-00e0-4b07-a2f4-5ebeb92859e6\bbcb84d5-474b-4744-a094-84f92bd08a0f\scenar
Summary filename: C:\Users\pyung\AppData\Local\Civica\VH5\98ec473c-00e0-4b07-a2f4-5ebeb92859e6\bbcb84d5-474b-4744-a094-84f92bd08a0f\scenar

DATE: 03-03-2026 TIME: 01:44:26

USER:

COMMENTS: _____

```
  ************************************************
  ** SIMULATION : SCS_06hr_050yr                **
  ************************************************
```

READ STORM	Filename: C:\Users\pyung\AppData\Local\Temp\7a4704be-8ddb-4433-a197-d500bce3e961\86be049a
Ptotal= 99.27 mm	Comments: SCS_06hr_050yr-CC

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	9.93	3.50	21.84	5.25	3.97
0.25	3.97	2.00	9.93	3.75	9.93	5.50	3.97
0.50	3.97	2.25	11.91	4.00	9.93	5.75	3.97
0.75	5.96	2.50	11.91	4.25	7.94	6.00	3.97

1.00	5.96	2.75	59.56	4.50	7.94		
1.25	5.96	3.00	154.85	4.75	5.96		
1.50	5.96	3.25	21.84	5.00	5.96		

CALIB			
NASHYD (0101)	Area (ha)= 24.37	Curve Number (CN)= 78.0	
ID= 1 DT= 5.0 min	Ia (mm)= 7.10	# of Linear Res.(N)= 3.00	
	U.H. Tp(hrs)= 0.62		

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	5.96	3.250	154.85	4.83	5.96
0.167	0.00	1.750	5.96	3.333	21.84	4.92	5.96
0.250	0.00	1.833	9.93	3.417	21.84	5.00	5.96
0.333	3.97	1.917	9.93	3.500	21.84	5.08	5.96
0.417	3.97	2.000	9.93	3.583	21.84	5.17	5.96
0.500	3.97	2.083	9.93	3.667	21.84	5.25	5.96
0.583	3.97	2.167	9.93	3.750	21.84	5.33	3.97
0.667	3.97	2.250	9.93	3.833	9.93	5.42	3.97
0.750	3.97	2.333	11.91	3.917	9.93	5.50	3.97
0.833	5.96	2.417	11.91	4.000	9.93	5.58	3.97
0.917	5.96	2.500	11.91	4.083	9.93	5.67	3.97
1.000	5.96	2.583	11.91	4.167	9.93	5.75	3.97
1.083	5.96	2.667	11.91	4.250	9.93	5.83	3.97
1.167	5.96	2.750	11.91	4.333	7.94	5.92	3.97
1.250	5.96	2.833	59.56	4.417	7.94	6.00	3.97
1.333	5.96	2.917	59.56	4.500	7.94	6.08	3.97
1.417	5.96	3.000	59.56	4.583	7.94	6.17	3.97
1.500	5.96	3.083	154.85	4.667	7.94	6.25	3.97
1.583	5.96	3.167	154.85	4.750	7.94		

Unit Hyd Qpeak (cms)= 1.501

PEAK FLOW (cms)= 2.005 (i)
TIME TO PEAK (hrs)= 3.833
RUNOFF VOLUME (mm)= 51.861
TOTAL RAINFALL (mm)= 99.273
RUNOFF COEFFICIENT = 0.522

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

CALIB			
NASHYD (0102)	Area (ha)= 13.27	Curve Number (CN)= 78.0	
ID= 1 DT= 5.0 min	Ia (mm)= 6.10	# of Linear Res.(N)= 3.00	
	U.H. Tp(hrs)= 0.70		

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	5.96	3.250	154.85	4.83	5.96
0.167	0.00	1.750	5.96	3.333	21.84	4.92	5.96
0.250	0.00	1.833	9.93	3.417	21.84	5.00	5.96
0.333	3.97	1.917	9.93	3.500	21.84	5.08	5.96
0.417	3.97	2.000	9.93	3.583	21.84	5.17	5.96
0.500	3.97	2.083	9.93	3.667	21.84	5.25	5.96
0.583	3.97	2.167	9.93	3.750	21.84	5.33	3.97
0.667	3.97	2.250	9.93	3.833	9.93	5.42	3.97
0.750	3.97	2.333	11.91	3.917	9.93	5.50	3.97
0.833	5.96	2.417	11.91	4.000	9.93	5.58	3.97
0.917	5.96	2.500	11.91	4.083	9.93	5.67	3.97
1.000	5.96	2.583	11.91	4.167	9.93	5.75	3.97
1.083	5.96	2.667	11.91	4.250	9.93	5.83	3.97
1.167	5.96	2.750	11.91	4.333	7.94	5.92	3.97
1.250	5.96	2.833	59.56	4.417	7.94	6.00	3.97
1.333	5.96	2.917	59.56	4.500	7.94	6.08	3.97
1.417	5.96	3.000	59.56	4.583	7.94	6.17	3.97
1.500	5.96	3.083	154.85	4.667	7.94	6.25	3.97
1.583	5.96	3.167	154.85	4.750	7.94		

Unit Hyd Qpeak (cms)= 0.724

PEAK FLOW (cms)= 1.014 (i)
TIME TO PEAK (hrs)= 3.917
RUNOFF VOLUME (mm)= 52.672
TOTAL RAINFALL (mm)= 99.273
RUNOFF COEFFICIENT = 0.531

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

ADD HYD (0003)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0101):	24.37	2.005	3.83	51.86
+ ID2= 2 (0102):	13.27	1.014	3.92	52.67
ID = 3 (0003):	37.64	3.015	3.83	52.15

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
      V    V   I    SSSSS  U   U    A    L              (v 6.2.2019)
      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
        VV     I    SSSSS  UUUUU  A   A  LLLLL

       OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
      O   O    T      T    H   H   Y Y   MM MM  O   O
      O   O    T      T    H   H    Y    M   M  O   O
       OOO     T      T    H   H    Y    M   M   OOO
```

Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2022 Smart City Water Inc
All rights reserved.

***** 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\pyung\AppData\Local\Civica\VH5\98ec473c-00e0-4b07-a2f4-5ebeb92859e6\402fec9a-3591-4064-ae7a-acdf5b4d3af4\scenar
Summary filename: C:\Users\pyung\AppData\Local\Civica\VH5\98ec473c-00e0-4b07-a2f4-5ebeb92859e6\402fec9a-3591-4064-ae7a-acdf5b4d3af4\scenar

DATE: 03-03-2026 TIME: 01:44:26

USER:

COMMENTS: _____

```
--------------------------------------------------------------------------------------------------
---------------
  ************************************************
  ** SIMULATION : SCS_06hr_100yr                 **
  ************************************************


--------------------
|    READ STORM    |    Filename: C:\Users\pyung\AppD
|                  |              ata\Local\Temp\
|                  |              7a4704be-8ddb-4433-a197-d500bce3e961\3571379c
| Ptotal=108.89 mm |   Comments: SCS_06hr_100yr-CC
--------------------
                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   10.89 |   3.50   23.96 |  5.25    4.36
                0.25    4.36 |  2.00   10.89 |   3.75   10.89 |  5.50    4.36
                0.50    4.36 |  2.25   13.07 |   4.00   10.89 |  5.75    4.36
                0.75    6.53 |  2.50   13.07 |   4.25    8.71 |  6.00    4.36
                1.00    6.53 |  2.75   65.33 |   4.50    8.71 |
                1.25    6.53 |  3.00  169.87 |   4.75    6.53 |
                1.50    6.53 |  3.25   23.96 |   5.00    6.53 |

--------------------------------------------------------------------------------

--------------------
| CALIB            |
| NASHYD   (  0101)|   Area     (ha)=  24.37   Curve Number    (CN)= 78.0
|ID= 1 DT= 5.0 min |   Ia       (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.62

        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    6.53 | 3.250  169.87 |  4.83    6.53
               0.167    0.00 | 1.750    6.53 | 3.333   23.96 |  4.92    6.53
               0.250    0.00 | 1.833   10.89 | 3.417   23.96 |  5.00    6.53
               0.333    4.36 | 1.917   10.89 | 3.500   23.96 |  5.08    6.53
               0.417    4.36 | 2.000   10.89 | 3.583   23.96 |  5.17    6.53
               0.500    4.36 | 2.083   10.89 | 3.667   23.96 |  5.25    6.53
               0.583    4.36 | 2.167   10.89 | 3.750   23.96 |  5.33    4.36
               0.667    4.36 | 2.250   10.89 | 3.833   10.89 |  5.42    4.36
               0.750    4.36 | 2.333   13.07 | 3.917   10.89 |  5.50    4.36
               0.833    6.53 | 2.417   13.07 | 4.000   10.89 |  5.58    4.36
               0.917    6.53 | 2.500   13.07 | 4.083   10.89 |  5.67    4.36
               1.000    6.53 | 2.583   13.07 | 4.167   10.89 |  5.75    4.36
               1.083    6.53 | 2.667   13.07 | 4.250   10.89 |  5.83    4.36
               1.167    6.53 | 2.750   13.07 | 4.333    8.71 |  5.92    4.36
               1.250    6.53 | 2.833   65.33 | 4.417    8.71 |  6.00    4.36
               1.333    6.53 | 2.917   65.33 | 4.500    8.71 |  6.08    4.36
               1.417    6.53 | 3.000   65.33 | 4.583    8.71 |  6.17    4.36
               1.500    6.53 | 3.083  169.87 | 4.667    8.71 |  6.25    4.36
               1.583    6.53 | 3.167  169.87 | 4.750    8.71 |

    Unit Hyd Qpeak  (cms)=   1.501

    PEAK FLOW       (cms)=   2.316 (i)
    TIME TO PEAK    (hrs)=   3.833
    RUNOFF VOLUME    (mm)=  59.745
    TOTAL RAINFALL   (mm)= 108.895
    RUNOFF COEFFICIENT   =   0.549

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

--------------------------------------------------------------------------------
--------------------

--------------------
| CALIB            |
| NASHYD   (  0102)|   Area     (ha)=  13.27   Curve Number    (CN)= 78.0
|ID= 1 DT= 5.0 min |   Ia       (mm)=   6.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.70

        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    6.53 | 3.250  169.87 |  4.83    6.53
               0.167    0.00 | 1.750    6.53 | 3.333   23.96 |  4.92    6.53
               0.250    0.00 | 1.833   10.89 | 3.417   23.96 |  5.00    6.53
               0.333    4.36 | 1.917   10.89 | 3.500   23.96 |  5.08    6.53
               0.417    4.36 | 2.000   10.89 | 3.583   23.96 |  5.17    6.53
               0.500    4.36 | 2.083   10.89 | 3.667   23.96 |  5.25    6.53
               0.583    4.36 | 2.167   10.89 | 3.750   23.96 |  5.33    4.36
               0.667    4.36 | 2.250   10.89 | 3.833   10.89 |  5.42    4.36
               0.750    4.36 | 2.333   13.07 | 3.917   10.89 |  5.50    4.36
               0.833    6.53 | 2.417   13.07 | 4.000   10.89 |  5.58    4.36
               0.917    6.53 | 2.500   13.07 | 4.083   10.89 |  5.67    4.36
               1.000    6.53 | 2.583   13.07 | 4.167   10.89 |  5.75    4.36
               1.083    6.53 | 2.667   13.07 | 4.250   10.89 |  5.83    4.36
               1.167    6.53 | 2.750   13.07 | 4.333    8.71 |  5.92    4.36
               1.250    6.53 | 2.833   65.33 | 4.417    8.71 |  6.00    4.36
               1.333    6.53 | 2.917   65.33 | 4.500    8.71 |  6.08    4.36
               1.417    6.53 | 3.000   65.33 | 4.583    8.71 |  6.17    4.36
               1.500    6.53 | 3.083  169.87 | 4.667    8.71 |  6.25    4.36
               1.583    6.53 | 3.167  169.87 | 4.750    8.71 |

    Unit Hyd Qpeak  (cms)=   0.724

    PEAK FLOW       (cms)=   1.169 (i)
    TIME TO PEAK    (hrs)=   3.917
    RUNOFF VOLUME    (mm)=  60.576
    TOTAL RAINFALL   (mm)= 108.895
    RUNOFF COEFFICIENT   =   0.556

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

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0003)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK      R.V.
--------------------          (ha)    (cms)    (hrs)      (mm)
       ID1= 1 (  0101):    24.37    2.316     3.83     59.75
     + ID2= 2 (  0102):    13.27    1.169     3.92     60.58
       ================================================
       ID = 3 (  0003):    37.64    3.482     3.83     60.04

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
================================================================================
===============

      V    V   I    SSSSS  U   U    A    L              (v 6.2.2019)
      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
        VV     I    SSSSS  UUUUU  A   A  LLLLL

       OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
      O   O    T      T    H   H   Y Y   MM MM  O   O
      O   O    T      T    H   H    Y    M   M  O   O
       OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2022 Smart City Water Inc
All rights reserved.
```

***** 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\pyung\AppData\Local\Civica\VH5\98ec473c-00e0-4b07-a2f4-5ebeb92859e6\be9f8263-ff06-4fea-bf75-82b60e82fcc3\scenar
Summary filename: C:\Users\pyung\AppData\Local\Civica\VH5\98ec473c-00e0-4b07-a2f4-5ebeb92859e6\be9f8263-ff06-4fea-bf75-82b60e82fcc3\scenar

DATE: 03-03-2026 TIME: 01:45:48

USER:

COMMENTS: _____

** SIMULATION : TIMMINS **

READ STORM | Ptotal=234.70 mm | Filename: C:\Users\pyung\AppData\Local\Temp\feb4f861-c1eb-4cd1-b495-558387eb0cee\44e0b45d
Comments: TIMMINS-CC

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	18.24	3.00	3.65	6.00	52.29	9.00	15.81
0.25	18.24	3.25	3.65	6.25	52.29	9.25	15.81
0.50	18.24	3.50	3.65	6.50	52.29	9.50	15.81
0.75	18.24	3.75	3.65	6.75	52.29	9.75	15.81
1.00	24.32	4.00	6.08	7.00	24.32	10.00	15.81
1.25	24.32	4.25	6.08	7.25	24.32	10.25	15.81
1.50	24.32	4.50	6.08	7.50	24.32	10.50	15.81
1.75	24.32	4.75	6.08	7.75	24.32	10.75	15.81
2.00	12.16	5.00	24.32	8.00	27.97	11.00	9.73
2.25	12.16	5.25	24.32	8.25	27.97	11.25	9.73
2.50	12.16	5.50	24.32	8.50	27.97	11.50	9.73
2.75	12.16	5.75	24.32	8.75	27.97	11.75	9.73

CALIB | NASHYD (0101) | ID= 1 DT= 5.0 min | Area (ha)= 24.37 Curve Number (CN)= 78.0
Ia (mm)= 7.10 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.62

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	18.24	3.083	3.65	6.083	52.29	9.08	15.81
0.167	18.24	3.167	3.65	6.167	52.29	9.17	15.81
0.250	18.24	3.250	3.65	6.250	52.29	9.25	15.81
0.333	18.24	3.333	3.65	6.333	52.29	9.33	15.81
0.417	18.24	3.417	3.65	6.417	52.29	9.42	15.81
0.500	18.24	3.500	3.65	6.500	52.29	9.50	15.81
0.583	18.24	3.583	3.65	6.583	52.29	9.58	15.81
0.667	18.24	3.667	3.65	6.667	52.29	9.67	15.81
0.750	18.24	3.750	3.65	6.750	52.29	9.75	15.81
0.833	18.24	3.833	3.65	6.833	52.29	9.83	15.81
0.917	18.24	3.917	3.65	6.917	52.29	9.92	15.81
1.000	18.24	4.000	3.65	7.000	52.29	10.00	15.81
1.083	24.32	4.083	6.08	7.083	24.32	10.08	15.81
1.167	24.32	4.167	6.08	7.167	24.32	10.17	15.81
1.250	24.32	4.250	6.08	7.250	24.32	10.25	15.81
1.333	24.32	4.333	6.08	7.333	24.32	10.33	15.81
1.417	24.32	4.417	6.08	7.417	24.32	10.42	15.81
1.500	24.32	4.500	6.08	7.500	24.32	10.50	15.81
1.583	24.32	4.583	6.08	7.583	24.32	10.58	15.81
1.667	24.32	4.667	6.08	7.667	24.32	10.67	15.81
1.750	24.32	4.750	6.08	7.750	24.32	10.75	15.81
1.833	24.32	4.833	6.08	7.833	24.32	10.83	15.81
1.917	24.32	4.917	6.08	7.917	24.32	10.92	15.81
2.000	24.32	5.000	6.08	8.000	24.32	11.00	15.81
2.083	12.16	5.083	24.32	8.083	27.97	11.08	9.73
2.167	12.16	5.167	24.32	8.167	27.97	11.17	9.73
2.250	12.16	5.250	24.32	8.250	27.97	11.25	9.73
2.333	12.16	5.333	24.32	8.333	27.97	11.33	9.73
2.417	12.16	5.417	24.32	8.417	27.97	11.42	9.73
2.500	12.16	5.500	24.32	8.500	27.97	11.50	9.73
2.583	12.16	5.583	24.32	8.583	27.97	11.58	9.73
2.667	12.16	5.667	24.32	8.667	27.97	11.67	9.73
2.750	12.16	5.750	24.32	8.750	27.97	11.75	9.73
2.833	12.16	5.833	24.32	8.833	27.97	11.83	9.73
2.917	12.16	5.917	24.32	8.917	27.97	11.92	9.73
3.000	12.16	6.000	24.32	9.000	27.97	12.00	9.73

Unit Hyd Qpeak (cms)= 1.501

PEAK FLOW (cms)= 2.478 (i)
TIME TO PEAK (hrs)= 7.250
RUNOFF VOLUME (mm)= 173.107
TOTAL RAINFALL (mm)= 234.700
RUNOFF COEFFICIENT = 0.738

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

CALIB | NASHYD (0102) | ID= 1 DT= 5.0 min | Area (ha)= 13.27 Curve Number (CN)= 78.0
Ia (mm)= 6.10 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.70

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	18.24	3.083	3.65	6.083	52.29	9.08	15.81
0.167	18.24	3.167	3.65	6.167	52.29	9.17	15.81
0.250	18.24	3.250	3.65	6.250	52.29	9.25	15.81
0.333	18.24	3.333	3.65	6.333	52.29	9.33	15.81
0.417	18.24	3.417	3.65	6.417	52.29	9.42	15.81
0.500	18.24	3.500	3.65	6.500	52.29	9.50	15.81
0.583	18.24	3.583	3.65	6.583	52.29	9.58	15.81
0.667	18.24	3.667	3.65	6.667	52.29	9.67	15.81
0.750	18.24	3.750	3.65	6.750	52.29	9.75	15.81
0.833	18.24	3.833	3.65	6.833	52.29	9.83	15.81
0.917	18.24	3.917	3.65	6.917	52.29	9.92	15.81
1.000	18.24	4.000	3.65	7.000	52.29	10.00	15.81
1.083	24.32	4.083	6.08	7.083	24.32	10.08	15.81
1.167	24.32	4.167	6.08	7.167	24.32	10.17	15.81
1.250	24.32	4.250	6.08	7.250	24.32	10.25	15.81
1.333	24.32	4.333	6.08	7.333	24.32	10.33	15.81
1.417	24.32	4.417	6.08	7.417	24.32	10.42	15.81

```
                1.500   24.32 | 4.500    6.08 | 7.500   24.32 | 10.50   15.81
                1.583   24.32 | 4.583    6.08 | 7.583   24.32 | 10.58   15.81
                1.667   24.32 | 4.667    6.08 | 7.667   24.32 | 10.67   15.81
                1.750   24.32 | 4.750    6.08 | 7.750   24.32 | 10.75   15.81
                1.833   24.32 | 4.833    6.08 | 7.833   24.32 | 10.83   15.81
                1.917   24.32 | 4.917    6.08 | 7.917   24.32 | 10.92   15.81
                2.000   24.32 | 5.000    6.08 | 8.000   24.32 | 11.00   15.81
                2.083   12.16 | 5.083   24.32 | 8.083   27.97 | 11.08    9.73
                2.167   12.16 | 5.167   24.32 | 8.167   27.97 | 11.17    9.73
                2.250   12.16 | 5.250   24.32 | 8.250   27.97 | 11.25    9.73
                2.333   12.16 | 5.333   24.32 | 8.333   27.97 | 11.33    9.73
                2.417   12.16 | 5.417   24.32 | 8.417   27.97 | 11.42    9.73
                2.500   12.16 | 5.500   24.32 | 8.500   27.97 | 11.50    9.73
                2.583   12.16 | 5.583   24.32 | 8.583   27.97 | 11.58    9.73
                2.667   12.16 | 5.667   24.32 | 8.667   27.97 | 11.67    9.73
                2.750   12.16 | 5.750   24.32 | 8.750   27.97 | 11.75    9.73
                2.833   12.16 | 5.833   24.32 | 8.833   27.97 | 11.83    9.73
                2.917   12.16 | 5.917   24.32 | 8.917   27.97 | 11.92    9.73
                3.000   12.16 | 6.000   24.32 | 9.000   27.97 | 12.00    9.73

     Unit Hyd Qpeak  (cms)=   0.724

     PEAK FLOW       (cms)=   1.292 (i)
     TIME TO PEAK    (hrs)=   7.333
     RUNOFF VOLUME    (mm)= 174.051
     TOTAL RAINFALL   (mm)= 234.700
     RUNOFF COEFFICIENT   =   0.742

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

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0003)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)     (cms)    (hrs)      (mm)
        ID1= 1 (  0101):    24.37   2.478     7.25   173.11
      + ID2= 2 (  0102):    13.27   1.292     7.33   174.05
        ================================================
        ID = 3 (  0003):    37.64   3.762     7.25   173.44

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

 FINISH
================================================================================
===============
```

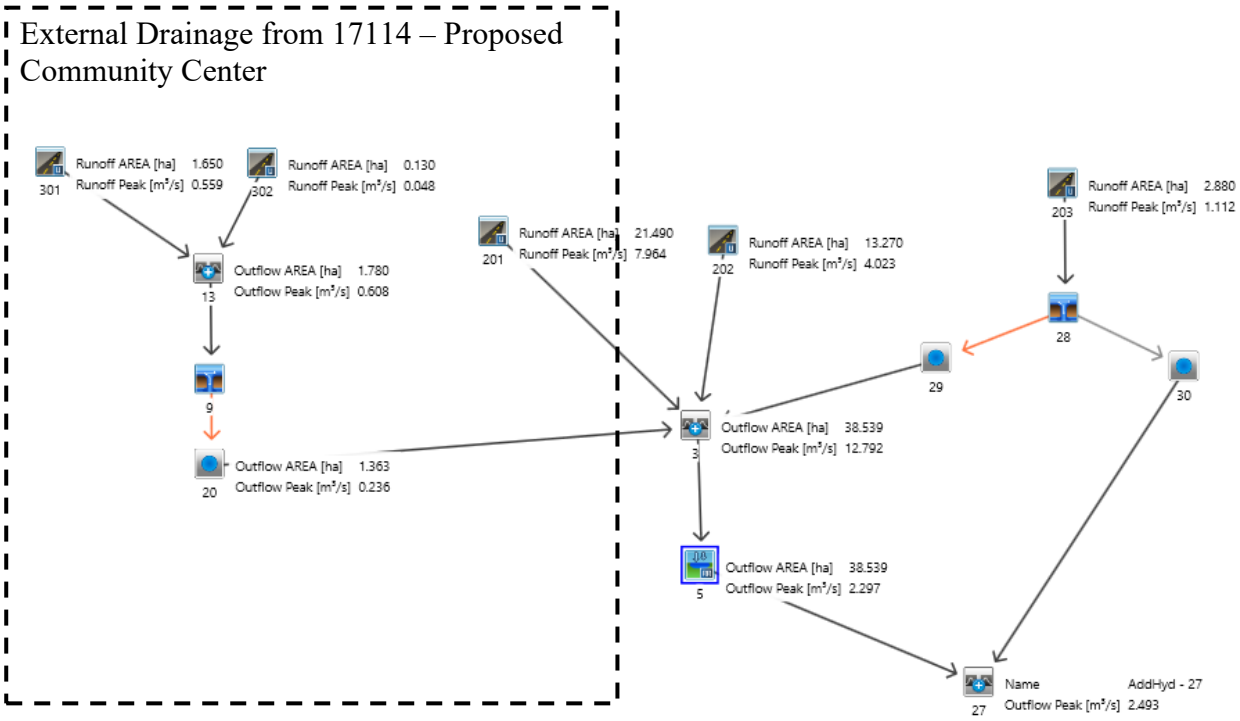


Figure E.2: VO Model Schematic – Post-Development Storm Drainage

```
================================================================================
==============

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2019)
       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
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2022 Smart City Water Inc
All rights reserved.

                  *****  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\pyung\AppData\Local\Civica\VH5\98ec473c-00e0-4b07-a2f4-
5ebeb92859e6\cf56d88e-9210-4a54-9992-dcc0e20ec0b9\scenar
  Summary filename: C:\Users\pyung\AppData\Local\Civica\VH5\98ec473c-00e0-4b07-a2f4-
5ebeb92859e6\cf56d88e-9210-4a54-9992-dcc0e20ec0b9\scenar

DATE: 03-03-2026                          TIME: 01:44:04

USER:


COMMENTS: _____________________________________________________________

--------------------------------------------------------------------------------
--------------
  ************************************************
  ** SIMULATION : 25mmchi                       **
  ************************************************


--------------------
|    READ STORM    |    Filename: C:\Users\pyung\AppD
|                  |              ata\Local\Temp\
|                  |              9708c7a4-1a89-478a-a0fe-e415ca74d84b\3763531c
| Ptotal= 25.02 mm |    Comments: 25mmchi
--------------------
                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            |
| STANDHYD ( 0201) |   Area    (ha)=  21.49
|ID= 1 DT= 5.0 min |   Total Imp(%)=  75.00   Dir. Conn.(%)=  70.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=     16.12          5.37
     Dep. Storage     (mm)=      1.00          5.00
     Average Slope     (%)=      1.00          2.00
     Length            (m)=    378.51         30.00
     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          2.12
               over (min)        10.00         40.00
     Storage Coeff.  (min)=       8.06 (ii)    35.81 (ii)
     Unit Hyd. Tpeak (min)=      10.00         40.00
     Unit Hyd. peak  (cms)=       0.13          0.03
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.23          0.02          1.229 (iii)
     TIME TO PEAK    (hrs)=       1.58          2.33          1.58
     RUNOFF VOLUME    (mm)=      24.02          2.24         17.49
     TOTAL RAINFALL   (mm)=      25.02         25.02         25.02
     RUNOFF COEFFICIENT   =       0.96          0.09          0.70

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  55.0     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.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD ( 0202) |   Area    (ha)=  13.27
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=  45.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      7.96          5.31
     Dep. Storage     (mm)=      1.00          5.00
     Average Slope     (%)=      1.00          2.00
     Length            (m)=    297.43         30.00
     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	3.13	
over (min)		5.00	35.00	
Storage Coeff. (min)=		6.97 (ii)	30.70 (ii)	
Unit Hyd. Tpeak (min)=		5.00	35.00	
Unit Hyd. peak (cms)=		0.17	0.04	
				TOTALS
PEAK FLOW	(cms)=	0.57	0.02	0.572 (iii)
TIME TO PEAK	(hrs)=	1.50	2.17	1.50
RUNOFF VOLUME	(mm)=	24.02	2.65	12.27
TOTAL RAINFALL	(mm)=	25.02	25.02	25.02
RUNOFF COEFFICIENT	=	0.96	0.11	0.49

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 55.0 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.

CALIB
STANDHYD (0301)
ID= 1 DT= 5.0 min

Area (ha)= 1.65
Total Imp(%)= 62.00 Dir. Conn.(%)= 40.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.02	0.63
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	2.00	2.00
Length	(m)=	104.88	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	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	5.51	
over (min)		5.00	10.00	
Storage Coeff. (min)=		3.03 (ii)	5.02 (ii)	
Unit Hyd. Tpeak (min)=		5.00	10.00	
Unit Hyd. peak (cms)=		0.27	0.16	
				TOTALS
PEAK FLOW	(cms)=	0.07	0.01	0.081 (iii)
TIME TO PEAK	(hrs)=	1.50	1.58	1.50
RUNOFF VOLUME	(mm)=	23.02	2.90	10.95
TOTAL RAINFALL	(mm)=	25.02	25.02	25.02
RUNOFF COEFFICIENT	=	0.92	0.12	0.44

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 53.0 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.

CALIB
STANDHYD (0302)
ID= 1 DT= 5.0 min

Area (ha)= 0.13
Total Imp(%)= 74.00 Dir. Conn.(%)= 15.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.10	0.03
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	2.00	2.00
Length	(m)=	25.00	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	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	26.80	
over (min)		5.00	5.00	
Storage Coeff. (min)=		1.28 (ii)	3.81 (ii)	
Unit Hyd. Tpeak (min)=		5.00	5.00	
Unit Hyd. peak (cms)=		0.33	0.25	
				TOTALS
PEAK FLOW	(cms)=	0.00	0.00	0.005 (iii)
TIME TO PEAK	(hrs)=	1.50	1.50	1.50
RUNOFF VOLUME	(mm)=	23.02	5.97	8.51
TOTAL RAINFALL	(mm)=	25.02	25.02	25.02
RUNOFF COEFFICIENT	=	0.92	0.24	0.34

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 53.0 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 (0013)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0301):	1.65	0.081	1.50	10.95
+ ID2= 2 (0302):	0.13	0.005	1.50	8.51
ID = 3 (0013):	1.78	0.086	1.50	10.77

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
--------------------------------------------------------------------------------
--------------------
| DUHYD    (  0009)|
| Inlet Cap.= 0.236|
| #of Inlets=     1|
| Total(cms)=   0.2|      AREA     QPEAK     TPEAK     R.V.
--------------------      (ha)     (cms)     (hrs)     (mm)
     TOTAL HYD.(ID= 1):   1.78      0.09      1.50    10.77
     ====================================================
     MAJOR SYS.(ID= 2):   0.00      0.00      0.00     0.00
     MINOR SYS.(ID= 3):   1.78      0.09      1.50    10.77

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

  --------------------------
  | Junction Command(0020) |
  --------------------------

                          AREA     QPEAK    TPEAK     R.V.
                          (ha)     (cms)    (hrs)     (mm)
  INFLOW : ID= 9(  0009)    1.78     0.09     1.50    10.77
  OUTFLOW: ID= 2(  0020)    1.78     0.09     1.50    10.77

  --------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0203)|    Area    (ha)=   2.88
|ID= 1 DT= 5.0 min |    Total Imp(%)=  80.00   Dir. Conn.(%)=  65.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.30          0.58
     Dep. Storage     (mm)=       1.00          5.00
     Average Slope     (%)=       1.00          2.00
     Length            (m)=     138.56         30.00
     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          6.03
               over (min)         5.00         25.00
     Storage Coeff.  (min)=       4.41 (ii)    22.67 (ii)
     Unit Hyd. Tpeak (min)=       5.00         25.00
     Unit Hyd. peak  (cms)=       0.23          0.05
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.20          0.01        0.202 (iii)
     TIME TO PEAK    (hrs)=       1.50          1.92          1.50
     RUNOFF VOLUME    (mm)=      24.02          3.49         16.83
     TOTAL RAINFALL   (mm)=      25.02         25.02         25.02
     RUNOFF COEFFICIENT   =       0.96          0.14          0.67

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  55.0    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.

--------------------------------------------------------------------------------
--------------------
| DUHYD    (  0028)|
| Inlet Cap.= 0.569|
| #of Inlets=     1|
| Total(cms)=   0.6|      AREA     QPEAK     TPEAK     R.V.
--------------------      (ha)     (cms)     (hrs)     (mm)
     TOTAL HYD.(ID= 1):   2.88      0.20      1.50    16.83
     ====================================================
     MAJOR SYS.(ID= 2):   0.00      0.00      0.00     0.00
     MINOR SYS.(ID= 3):   2.88      0.20      1.50    16.83

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

  --------------------------
  | Junction Command(0029) |
  --------------------------

                          AREA     QPEAK    TPEAK     R.V.
                          (ha)     (cms)    (hrs)     (mm)
  INFLOW : ID= 9(  0028)    2.88     0.20     1.50    16.83
  OUTFLOW: ID= 2(  0029)    2.88     0.20     1.50    16.83

  --------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0003)|
|   1 +  2 =  3    |          AREA     QPEAK     TPEAK      R.V.
--------------------          (ha)     (cms)     (hrs)      (mm)
       ID1= 1 (  0020):      1.78     0.086      1.50     10.77
     + ID2= 2 (  0201):     21.49     1.229      1.58     17.49
       ================================================
       ID = 3 (  0003):     23.27     1.277      1.58     16.97

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0003)|
|   3 +  2 =  1    |          AREA     QPEAK     TPEAK      R.V.
--------------------          (ha)     (cms)     (hrs)      (mm)
       ID1= 3 (  0003):     23.27     1.277      1.58     16.97
     + ID2= 2 (  0202):     13.27     0.572      1.50     12.27
       ================================================
       ID = 1 (  0003):     36.54     1.827      1.50     15.26

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0003)|
|   1 +  2 =  3    |          AREA     QPEAK     TPEAK      R.V.
--------------------          (ha)     (cms)     (hrs)      (mm)
       ID1= 1 (  0003):     36.54     1.827      1.50     15.26
     + ID2= 2 (  0029):      2.88     0.202      1.50     16.83
       ================================================
       ID = 3 (  0003):     39.42     2.029      1.50     15.38

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
```

```
| RESERVOIR(  0005)|     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   |    0.7834      0.8562
                          0.0075      0.0493   |    1.6951      1.3177
                          0.0195      0.1006   |    1.8899      1.4826
                          0.0265      0.1538   |    2.0662      1.6588
                          0.0320      0.2089   |    2.1489      1.7511
                          0.0409      0.3251   |    2.2285      1.8455
                          0.0481      0.4480   |    2.3053      1.9411
                          0.0529      0.5448   |    3.4358      2.0378
                          0.0544      0.5780   |    5.4391      2.1358
                          0.3140      0.7136   |    8.0099      2.2349

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0003)     39.420     2.029      1.50      15.38
   OUTFLOW: ID= 1 (  0005)     39.420     0.053      4.25      15.34

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  2.62
                  TIME SHIFT OF PEAK FLOW          (min)=165.00
                  MAXIMUM  STORAGE   USED        (ha.m.)=  0.5502

--------------------------------------------------------------------------------

  --------------------------
  | Junction Command(0030) |
  --------------------------

                          AREA     QPEAK    TPEAK     R.V.
                          (ha)     (cms)    (hrs)     (mm)
  INFLOW : ID= 8(  0028)    0.00      0.00     0.00      0.00
  OUTFLOW: ID= 2(  0030)    0.00      0.00     0.00      0.00

  ------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0027)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)     (cms)    (hrs)     (mm)
*** W A R N I N G :  HYDROGRAPH   0030 <ID= 1> IS DRY.
*** W A R N I N G :  HYDROGRAPH   0027 = HYDROGRAPH 0005
       ID1= 1 (  0030):     0.00   0.000     0.00      0.00
     + ID2= 2 (  0005):    39.42   0.053     4.25     15.34
       ================================================
       ID = 3 (  0027):    39.42   0.053     4.25     15.34

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
================================================================================
===============

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2019)
       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
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2022 Smart City Water Inc
All rights reserved.

                  *****  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\pyung\AppData\Local\Civica\VH5\98ec473c-00e0-4b07-a2f4-
5ebeb92859e6\13d2d871-e704-4d38-b50d-c3e3769529e6\scenar
  Summary filename: C:\Users\pyung\AppData\Local\Civica\VH5\98ec473c-00e0-4b07-a2f4-
5ebeb92859e6\13d2d871-e704-4d38-b50d-c3e3769529e6\scenar

DATE: 03-03-2026                          TIME: 01:44:05

USER:


COMMENTS: _____________________________________________________

--------------------------------------------------------------------------------
---------------
  ************************************************
  ** SIMULATION : SCS_06hr_002yr                 **
  ************************************************

--------------------
|    READ STORM    |    Filename: C:\Users\pyung\AppD
|                  |              ata\Local\Temp\
|                  |              9708c7a4-1a89-478a-a0fe-e415ca74d84b\d34b8ac3
| Ptotal= 45.23 mm |    Comments: SCS_06hr_002yr-CC
--------------------
                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    4.52 |  3.50    9.95 |  5.25    1.81
                0.25    1.81 |  2.00    4.52 |  3.75    4.52 |  5.50    1.81
                0.50    1.81 |  2.25    5.43 |  4.00    4.52 |  5.75    1.81
                0.75    2.71 |  2.50    5.43 |  4.25    3.62 |  6.00    1.81
                1.00    2.71 |  2.75   27.14 |  4.50    3.62 |
                1.25    2.71 |  3.00   70.57 |  4.75    2.71 |
                1.50    2.71 |  3.25    9.95 |  5.00    2.71 |

--------------------------------------------------------------------------------

--------------------
| CALIB            |
| STANDHYD (  0201)|   Area     (ha)=  21.49
|ID= 1 DT= 5.0 min |   Total Imp(%)=  75.00   Dir. Conn.(%)=  70.00
--------------------

                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       16.12          5.37
     Dep. Storage     (mm)=        1.00          5.00
     Average Slope     (%)=        1.00          2.00
     Length            (m)=      378.51         30.00
     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    2.71 | 3.250   70.57 |  4.83    2.71
               0.167    0.00 | 1.750    2.71 | 3.333    9.95 |  4.92    2.71
               0.250    0.00 | 1.833    4.52 | 3.417    9.95 |  5.00    2.71
               0.333    1.81 | 1.917    4.52 | 3.500    9.95 |  5.08    2.71
               0.417    1.81 | 2.000    4.52 | 3.583    9.95 |  5.17    2.71
               0.500    1.81 | 2.083    4.52 | 3.667    9.95 |  5.25    2.71
               0.583    1.81 | 2.167    4.52 | 3.750    9.95 |  5.33    1.81
               0.667    1.81 | 2.250    4.52 | 3.833    4.52 |  5.42    1.81
               0.750    1.81 | 2.333    5.43 | 3.917    4.52 |  5.50    1.81
               0.833    2.71 | 2.417    5.43 | 4.000    4.52 |  5.58    1.81
```

0.917	2.71	2.500	5.43	4.083	4.52	5.67	1.81
1.000	2.71	2.583	5.43	4.167	4.52	5.75	1.81
1.083	2.71	2.667	5.43	4.250	4.52	5.83	1.81
1.167	2.71	2.750	5.43	4.333	3.62	5.92	1.81
1.250	2.71	2.833	27.14	4.417	3.62	6.00	1.81
1.333	2.71	2.917	27.14	4.500	3.62	6.08	1.81
1.417	2.71	3.000	27.14	4.583	3.62	6.17	1.81
1.500	2.71	3.083	70.57	4.667	3.62	6.25	1.81
1.583	2.71	3.167	70.57	4.750	3.62		

Max.Eff.Inten.(mm/hr)=	70.57	18.61	
over (min)	5.00	15.00	
Storage Coeff. (min)=	6.53 (ii)	11.05 (ii)	
Unit Hyd. Tpeak (min)=	5.00	15.00	
Unit Hyd. peak (cms)=	0.18	0.09	
			TOTALS
PEAK FLOW (cms)=	2.76	0.17	2.894 (iii)
TIME TO PEAK (hrs)=	3.25	3.33	3.25
RUNOFF VOLUME (mm)=	44.23	7.87	33.32
TOTAL RAINFALL (mm)=	45.23	45.23	45.23
RUNOFF COEFFICIENT =	0.98	0.17	0.74

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 55.0 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.

CALIB
STANDHYD (0202)
ID= 1 DT= 5.0 min

Area (ha)= 13.27
Total Imp(%)= 60.00 Dir. Conn.(%)= 45.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	7.96	5.31
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	297.43	30.00
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	2.71	3.250	70.57	4.83	2.71
0.167	0.00	1.750	2.71	3.333	9.95	4.92	2.71
0.250	0.00	1.833	4.52	3.417	9.95	5.00	2.71
0.333	1.81	1.917	4.52	3.500	9.95	5.08	2.71
0.417	1.81	2.000	4.52	3.583	9.95	5.17	2.71
0.500	1.81	2.083	4.52	3.667	9.95	5.25	2.71
0.583	1.81	2.167	4.52	3.750	9.95	5.33	1.81
0.667	1.81	2.250	4.52	3.833	4.52	5.42	1.81
0.750	1.81	2.333	5.43	3.917	4.52	5.50	1.81
0.833	2.71	2.417	5.43	4.000	4.52	5.58	1.81
0.917	2.71	2.500	5.43	4.083	4.52	5.67	1.81
1.000	2.71	2.583	5.43	4.167	4.52	5.75	1.81
1.083	2.71	2.667	5.43	4.250	4.52	5.83	1.81
1.167	2.71	2.750	5.43	4.333	3.62	5.92	1.81
1.250	2.71	2.833	27.14	4.417	3.62	6.00	1.81
1.333	2.71	2.917	27.14	4.500	3.62	6.08	1.81
1.417	2.71	3.000	27.14	4.583	3.62	6.17	1.81
1.500	2.71	3.083	70.57	4.667	3.62	6.25	1.81
1.583	2.71	3.167	70.57	4.750	3.62		

Max.Eff.Inten.(mm/hr)=	70.57	21.65	
over (min)	5.00	20.00	
Storage Coeff. (min)=	5.65 (ii)	16.60 (ii)	
Unit Hyd. Tpeak (min)=	5.00	20.00	
Unit Hyd. peak (cms)=	0.20	0.06	
			TOTALS
PEAK FLOW (cms)=	1.12	0.17	1.227 (iii)
TIME TO PEAK (hrs)=	3.25	3.42	3.25
RUNOFF VOLUME (mm)=	44.23	8.98	24.84
TOTAL RAINFALL (mm)=	45.23	45.23	45.23
RUNOFF COEFFICIENT =	0.98	0.20	0.55

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 55.0 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.

CALIB
STANDHYD (0301)
ID= 1 DT= 5.0 min

Area (ha)= 1.65
Total Imp(%)= 62.00 Dir. Conn.(%)= 40.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.02	0.63
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	2.00	2.00
Length	(m)=	104.88	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	2.71	3.250	70.57	4.83	2.71
0.167	0.00	1.750	2.71	3.333	9.95	4.92	2.71
0.250	0.00	1.833	4.52	3.417	9.95	5.00	2.71
0.333	1.81	1.917	4.52	3.500	9.95	5.08	2.71
0.417	1.81	2.000	4.52	3.583	9.95	5.17	2.71
0.500	1.81	2.083	4.52	3.667	9.95	5.25	2.71
0.583	1.81	2.167	4.52	3.750	9.95	5.33	1.81
0.667	1.81	2.250	4.52	3.833	4.52	5.42	1.81
0.750	1.81	2.333	5.43	3.917	4.52	5.50	1.81
0.833	2.71	2.417	5.43	4.000	4.52	5.58	1.81
0.917	2.71	2.500	5.43	4.083	4.52	5.67	1.81
1.000	2.71	2.583	5.43	4.167	4.52	5.75	1.81
1.083	2.71	2.667	5.43	4.250	4.52	5.83	1.81
1.167	2.71	2.750	5.43	4.333	3.62	5.92	1.81
1.250	2.71	2.833	27.14	4.417	3.62	6.00	1.81
1.333	2.71	2.917	27.14	4.500	3.62	6.08	1.81
1.417	2.71	3.000	27.14	4.583	3.62	6.17	1.81
1.500	2.71	3.083	70.57	4.667	3.62	6.25	1.81
1.583	2.71	3.167	70.57	4.750	3.62		

Max.Eff.Inten.(mm/hr)=	70.57	29.65	
over (min)	5.00	5.00	
Storage Coeff. (min)=	2.45 (ii)	4.07 (ii)	
Unit Hyd. Tpeak (min)=	5.00	5.00	
Unit Hyd. peak (cms)=	0.30	0.24	
			TOTALS
PEAK FLOW (cms)=	0.13	0.05	0.181 (iii)
TIME TO PEAK (hrs)=	3.25	3.25	3.25
RUNOFF VOLUME (mm)=	43.23	9.58	23.04
TOTAL RAINFALL (mm)=	45.23	45.23	45.23
RUNOFF COEFFICIENT =	0.96	0.21	0.51

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

```
       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  53.0     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.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0302)|   Area    (ha)=   0.13
|ID= 1 DT= 5.0 min |   Total Imp(%)=  74.00   Dir. Conn.(%)=  15.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      0.10          0.03
     Dep. Storage     (mm)=      2.00          5.00
     Average Slope     (%)=      2.00          2.00
     Length            (m)=     25.00         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    2.71 | 3.250   70.57 | 4.83    2.71
               0.167    0.00 | 1.750    2.71 | 3.333    9.95 | 4.92    2.71
               0.250    0.00 | 1.833    4.52 | 3.417    9.95 | 5.00    2.71
               0.333    1.81 | 1.917    4.52 | 3.500    9.95 | 5.08    2.71
               0.417    1.81 | 2.000    4.52 | 3.583    9.95 | 5.17    2.71
               0.500    1.81 | 2.083    4.52 | 3.667    9.95 | 5.25    2.71
               0.583    1.81 | 2.167    4.52 | 3.750    9.95 | 5.33    1.81
               0.667    1.81 | 2.250    4.52 | 3.833    4.52 | 5.42    1.81
               0.750    1.81 | 2.333    5.43 | 3.917    4.52 | 5.50    1.81
               0.833    2.71 | 2.417    5.43 | 4.000    4.52 | 5.58    1.81
               0.917    2.71 | 2.500    5.43 | 4.083    4.52 | 5.67    1.81
               1.000    2.71 | 2.583    5.43 | 4.167    4.52 | 5.75    1.81
               1.083    2.71 | 2.667    5.43 | 4.250    4.52 | 5.83    1.81
               1.167    2.71 | 2.750    5.43 | 4.333    3.62 | 5.92    1.81
               1.250    2.71 | 2.833   27.14 | 4.417    3.62 | 6.00    1.81
               1.333    2.71 | 2.917   27.14 | 4.500    3.62 | 6.08    1.81
               1.417    2.71 | 3.000   27.14 | 4.583    3.62 | 6.17    1.81
               1.500    2.71 | 3.083   70.57 | 4.667    3.62 | 6.25    1.81
               1.583    2.71 | 3.167   70.57 | 4.750    3.62 |

     Max.Eff.Inten.(mm/hr)=      70.57       107.61
               over (min)        5.00         5.00
     Storage Coeff.  (min)=      1.04 (ii)    3.09 (ii)
     Unit Hyd. Tpeak (min)=      5.00         5.00
     Unit Hyd. peak  (cms)=      0.34         0.27
                                                    *TOTALS*
     PEAK FLOW       (cms)=      0.00         0.01          0.014 (iii)
     TIME TO PEAK    (hrs)=      3.25         3.25           3.25
     RUNOFF VOLUME    (mm)=     43.23        16.96          20.88
     TOTAL RAINFALL   (mm)=     45.23        45.23          45.23
     RUNOFF COEFFICIENT   =      0.96         0.37           0.46

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  53.0     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  (  0013)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK      R.V.
-------------------          (ha)    (cms)    (hrs)      (mm)
       ID1= 1 (  0301):     1.65    0.181     3.25     23.04
     + ID2= 2 (  0302):     0.13    0.014     3.25     20.88
       ================================================
       ID = 3 (  0013):     1.78    0.196     3.25     22.88

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| DUHYD    (  0009)|
| Inlet Cap.= 0.236|
| #of Inlets=     1|
| Total(cms)=   0.2|      AREA     QPEAK     TPEAK     R.V.
-------------------       (ha)     (cms)     (hrs)     (mm)
    TOTAL HYD.(ID= 1):   1.78      0.20      3.25    22.88
    ================================================
    MAJOR SYS.(ID= 2):   0.00      0.00      0.00     0.00
    MINOR SYS.(ID= 3):   1.78      0.20      3.25    22.88

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

  -------------------------
  | Junction Command(0020) |
  -------------------------

                           AREA     QPEAK    TPEAK     R.V.
                           (ha)     (cms)    (hrs)     (mm)
  INFLOW : ID= 9(  0009)    1.78     0.20     3.25    22.88
  OUTFLOW: ID= 2(  0020)    1.78     0.20     3.25    22.88

  --------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0203)|   Area    (ha)=   2.88
|ID= 1 DT= 5.0 min |   Total Imp(%)=  80.00   Dir. Conn.(%)=  65.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      2.30          0.58
     Dep. Storage     (mm)=      1.00          5.00
     Average Slope     (%)=      1.00          2.00
     Length            (m)=    138.56         30.00
     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    2.71 | 3.250   70.57 | 4.83    2.71
               0.167    0.00 | 1.750    2.71 | 3.333    9.95 | 4.92    2.71
               0.250    0.00 | 1.833    4.52 | 3.417    9.95 | 5.00    2.71
               0.333    1.81 | 1.917    4.52 | 3.500    9.95 | 5.08    2.71
               0.417    1.81 | 2.000    4.52 | 3.583    9.95 | 5.17    2.71
               0.500    1.81 | 2.083    4.52 | 3.667    9.95 | 5.25    2.71
               0.583    1.81 | 2.167    4.52 | 3.750    9.95 | 5.33    1.81
               0.667    1.81 | 2.250    4.52 | 3.833    4.52 | 5.42    1.81
               0.750    1.81 | 2.333    5.43 | 3.917    4.52 | 5.50    1.81
               0.833    2.71 | 2.417    5.43 | 4.000    4.52 | 5.58    1.81
               0.917    2.71 | 2.500    5.43 | 4.083    4.52 | 5.67    1.81
               1.000    2.71 | 2.583    5.43 | 4.167    4.52 | 5.75    1.81
               1.083    2.71 | 2.667    5.43 | 4.250    4.52 | 5.83    1.81
               1.167    2.71 | 2.750    5.43 | 4.333    3.62 | 5.92    1.81
               1.250    2.71 | 2.833   27.14 | 4.417    3.62 | 6.00    1.81
               1.333    2.71 | 2.917   27.14 | 4.500    3.62 | 6.08    1.81
               1.417    2.71 | 3.000   27.14 | 4.583    3.62 | 6.17    1.81
```

```
                1.500    2.71 | 3.083   70.57 | 4.667    3.62 |  6.25    1.81
                1.583    2.71 | 3.167   70.57 | 4.750    3.62 |

     Max.Eff.Inten.(mm/hr)=      70.57        38.22
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       3.57 (ii)    7.83 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.26         0.13
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.36         0.04          0.408 (iii)
     TIME TO PEAK    (hrs)=       3.25         3.25           3.25
     RUNOFF VOLUME    (mm)=      44.23        11.14          32.65
     TOTAL RAINFALL   (mm)=      45.23        45.23          45.23
     RUNOFF COEFFICIENT   =       0.98         0.25           0.72

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  55.0    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.

--------------------------------------------------------------------------------
--------------------
| DUHYD    (  0028)|
| Inlet Cap.= 0.569|
| #of Inlets=     1|
| Total(cms)=   0.6|      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)      (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 1):   2.88      0.41      3.25   32.65
     ==========================================================
     MAJOR SYS.(ID= 2):   0.00      0.00      0.00    0.00
     MINOR SYS.(ID= 3):   2.88      0.41      3.25   32.65

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

  --------------------------
  | Junction Command(0029) |
  --------------------------

                          AREA     QPEAK   TPEAK     R.V.
                          (ha)     (cms)   (hrs)     (mm)
  INFLOW : ID= 9(  0028)    2.88      0.41    3.25    32.65
  OUTFLOW: ID= 2(  0029)    2.88      0.41    3.25    32.65

  ------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0003)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0020):     1.78    0.196     3.25    22.88
     + ID2= 2 (  0201):    21.49    2.894     3.25    33.32
       ==========================================================
       ID = 3 (  0003):    23.27    3.089     3.25    32.52

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0003)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0003):    23.27    3.089     3.25    32.52
     + ID2= 2 (  0202):    13.27    1.227     3.25    24.84
       ==========================================================
       ID = 1 (  0003):    36.54    4.316     3.25    29.73

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0003)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0003):    36.54    4.316     3.25    29.73
     + ID2= 2 (  0029):     2.88    0.408     3.25    32.65
       ==========================================================
       ID = 3 (  0003):    39.42    4.725     3.25    29.94

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0005)|     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   |    0.7834      0.8562
                          0.0075      0.0493   |    1.6951      1.3177
                          0.0195      0.1006   |    1.8899      1.4826
                          0.0265      0.1538   |    2.0662      1.6588
                          0.0320      0.2089   |    2.1489      1.7511
                          0.0409      0.3251   |    2.2285      1.8455
                          0.0481      0.4480   |    2.3053      1.9411
                          0.0529      0.5448   |    3.4358      2.0378
                          0.0544      0.5780   |    5.4391      2.1358
                          0.3140      0.7136   |    8.0099      2.2349

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
  INFLOW : ID= 2 (  0003)     39.420     4.725      3.25      29.94
  OUTFLOW: ID= 1 (  0005)     39.420     0.673      3.83      29.90

                PEAK   FLOW   REDUCTION [Qout/Qin](%)= 14.24
                TIME SHIFT OF PEAK FLOW          (min)= 35.00
                MAXIMUM  STORAGE   USED       (ha.m.)=  0.8232

--------------------------------------------------------------------------------

  --------------------------
  | Junction Command(0030) |
  --------------------------

                          AREA     QPEAK   TPEAK     R.V.
                          (ha)     (cms)   (hrs)     (mm)
  INFLOW : ID= 8(  0028)    0.00      0.00    0.00     0.00
  OUTFLOW: ID= 2(  0030)    0.00      0.00    0.00     0.00

  ------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0027)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
*** W A R N I N G :  HYDROGRAPH   0030 <ID= 1> IS DRY.
*** W A R N I N G :  HYDROGRAPH   0027 = HYDROGRAPH 0005
       ID1= 1 (  0030):     0.00    0.000     0.00     0.00
     + ID2= 2 (  0005):    39.42    0.673     3.83    29.90
       ==========================================================
       ID = 3 (  0027):    39.42    0.673     3.83    29.90

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
================================================================================
===============

      V    V   I    SSSSS  U   U    A    L             (v 6.2.2019)
```

```
       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
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2022 Smart City Water Inc
All rights reserved.

                  *****  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\pyung\AppData\Local\Civica\VH5\98ec473c-00e0-4b07-a2f4-
5ebeb92859e6\01fa6634-0905-4886-aef8-21c20da2814d\scenar
  Summary filename: C:\Users\pyung\AppData\Local\Civica\VH5\98ec473c-00e0-4b07-a2f4-
5ebeb92859e6\01fa6634-0905-4886-aef8-21c20da2814d\scenar

DATE: 03-03-2026                          TIME: 01:44:05

USER:


COMMENTS: _____________________________________________________________

--------------------------------------------------------------------------------------------------
---------------
  ************************************************
  ** SIMULATION : SCS_06hr_005yr                **
  ************************************************

--------------------
|    READ STORM    |    Filename: C:\Users\pyung\AppD
|                  |              ata\Local\Temp\
|                  |              9708c7a4-1a89-478a-a0fe-e415ca74d84b\027c3668
| Ptotal= 63.49 mm |   Comments: SCS_06hr_005yr-CC
--------------------
                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    6.35 |   3.50   13.97 |  5.25    2.54
                0.25    2.54 |  2.00    6.35 |   3.75    6.35 |  5.50    2.54
                0.50    2.54 |  2.25    7.62 |   4.00    6.35 |  5.75    2.54
                0.75    3.81 |  2.50    7.62 |   4.25    5.08 |  6.00    2.54
                1.00    3.81 |  2.75   38.09 |   4.50    5.08 |
                1.25    3.81 |  3.00   99.04 |   4.75    3.81 |
                1.50    3.81 |  3.25   13.97 |   5.00    3.81 |

--------------------------------------------------------------------------------

--------------------
| CALIB            |
| STANDHYD (  0201)|   Area     (ha)=  21.49
|ID= 1 DT= 5.0 min |   Total Imp(%)=  75.00   Dir. Conn.(%)=  70.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       16.12          5.37
     Dep. Storage     (mm)=        1.00          5.00
     Average Slope     (%)=        1.00          2.00
     Length            (m)=      378.51         30.00
     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    3.81 | 3.250   99.04 |  4.83    3.81
     0.167    0.00 | 1.750    3.81 | 3.333   13.97 |  4.92    3.81
     0.250    0.00 | 1.833    6.35 | 3.417   13.97 |  5.00    3.81
     0.333    2.54 | 1.917    6.35 | 3.500   13.97 |  5.08    3.81
     0.417    2.54 | 2.000    6.35 | 3.583   13.97 |  5.17    3.81
     0.500    2.54 | 2.083    6.35 | 3.667   13.97 |  5.25    3.81
     0.583    2.54 | 2.167    6.35 | 3.750   13.97 |  5.33    2.54
     0.667    2.54 | 2.250    6.35 | 3.833    6.35 |  5.42    2.54
     0.750    2.54 | 2.333    7.62 | 3.917    6.35 |  5.50    2.54
     0.833    3.81 | 2.417    7.62 | 4.000    6.35 |  5.58    2.54
     0.917    3.81 | 2.500    7.62 | 4.083    6.35 |  5.67    2.54
     1.000    3.81 | 2.583    7.62 | 4.167    6.35 |  5.75    2.54
     1.083    3.81 | 2.667    7.62 | 4.250    6.35 |  5.83    2.54
     1.167    3.81 | 2.750    7.62 | 4.333    5.08 |  5.92    2.54
     1.250    3.81 | 2.833   38.09 | 4.417    5.08 |  6.00    2.54
     1.333    3.81 | 2.917   38.09 | 4.500    5.08 |  6.08    2.54
     1.417    3.81 | 3.000   38.09 | 4.583    5.08 |  6.17    2.54
     1.500    3.81 | 3.083   99.04 | 4.667    5.08 |  6.25    2.54
     1.583    3.81 | 3.167   99.04 | 4.750    5.08 |

  Max.Eff.Inten.(mm/hr)=      99.04        35.62
            over (min)        5.00        10.00
  Storage Coeff.  (min)=      5.70 (ii)    9.65 (ii)
  Unit Hyd. Tpeak (min)=      5.00        10.00
  Unit Hyd. peak  (cms)=      0.20         0.11
                                                  *TOTALS*
  PEAK FLOW       (cms)=      3.95         0.36      4.306 (iii)
  TIME TO PEAK    (hrs)=      3.25         3.33       3.25
  RUNOFF VOLUME    (mm)=     62.49        15.14      48.29
  TOTAL RAINFALL   (mm)=     63.49        63.49      63.49
  RUNOFF COEFFICIENT   =      0.98         0.24       0.76

    (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
        CN*  =  55.0     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.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0202)|   Area     (ha)=  13.27
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=  45.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        7.96          5.31
     Dep. Storage     (mm)=        1.00          5.00
     Average Slope     (%)=        1.00          2.00
     Length            (m)=      297.43         30.00
     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    3.81 | 3.250   99.04 |  4.83    3.81
     0.167    0.00 | 1.750    3.81 | 3.333   13.97 |  4.92    3.81
     0.250    0.00 | 1.833    6.35 | 3.417   13.97 |  5.00    3.81
     0.333    2.54 | 1.917    6.35 | 3.500   13.97 |  5.08    3.81
     0.417    2.54 | 2.000    6.35 | 3.583   13.97 |  5.17    3.81
     0.500    2.54 | 2.083    6.35 | 3.667   13.97 |  5.25    3.81
```

0.583	2.54	2.167	6.35	3.750	13.97	5.33	2.54
0.667	2.54	2.250	6.35	3.833	6.35	5.42	2.54
0.750	2.54	2.333	7.62	3.917	6.35	5.50	2.54
0.833	3.81	2.417	7.62	4.000	6.35	5.58	2.54
0.917	3.81	2.500	7.62	4.083	6.35	5.67	2.54
1.000	3.81	2.583	7.62	4.167	6.35	5.75	2.54
1.083	3.81	2.667	7.62	4.250	6.35	5.83	2.54
1.167	3.81	2.750	7.62	4.333	5.08	5.92	2.54
1.250	3.81	2.833	38.09	4.417	5.08	6.00	2.54
1.333	3.81	2.917	38.09	4.500	5.08	6.08	2.54
1.417	3.81	3.000	38.09	4.583	5.08	6.17	2.54
1.500	3.81	3.083	99.04	4.667	5.08	6.25	2.54
1.583	3.81	3.167	99.04	4.750	5.08		

Max.Eff.Inten.(mm/hr)=		99.04	45.69	
over (min)		5.00	15.00	
Storage Coeff. (min)=		4.93 (ii)	13.06 (ii)	
Unit Hyd. Tpeak (min)=		5.00	15.00	
Unit Hyd. peak (cms)=		0.22	0.08	
				TOTALS
PEAK FLOW	(cms)=	1.59	0.39	1.913 (iii)
TIME TO PEAK	(hrs)=	3.25	3.33	3.25
RUNOFF VOLUME	(mm)=	62.49	16.98	37.46
TOTAL RAINFALL	(mm)=	63.49	63.49	63.49
RUNOFF COEFFICIENT	=	0.98	0.27	0.59

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 55.0 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.

CALIB
STANDHYD (0301)
ID= 1 DT= 5.0 min

Area (ha)= 1.65
Total Imp(%)= 62.00 Dir. Conn.(%)= 40.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.02	0.63
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	2.00	2.00
Length	(m)=	104.88	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	3.81	3.250	99.04	4.83	3.81
0.167	0.00	1.750	3.81	3.333	13.97	4.92	3.81
0.250	0.00	1.833	6.35	3.417	13.97	5.00	3.81
0.333	2.54	1.917	6.35	3.500	13.97	5.08	3.81
0.417	2.54	2.000	6.35	3.583	13.97	5.17	3.81
0.500	2.54	2.083	6.35	3.667	13.97	5.25	3.81
0.583	2.54	2.167	6.35	3.750	13.97	5.33	2.54
0.667	2.54	2.250	6.35	3.833	6.35	5.42	2.54
0.750	2.54	2.333	7.62	3.917	6.35	5.50	2.54
0.833	3.81	2.417	7.62	4.000	6.35	5.58	2.54
0.917	3.81	2.500	7.62	4.083	6.35	5.67	2.54
1.000	3.81	2.583	7.62	4.167	6.35	5.75	2.54
1.083	3.81	2.667	7.62	4.250	6.35	5.83	2.54
1.167	3.81	2.750	7.62	4.333	5.08	5.92	2.54
1.250	3.81	2.833	38.09	4.417	5.08	6.00	2.54
1.333	3.81	2.917	38.09	4.500	5.08	6.08	2.54
1.417	3.81	3.000	38.09	4.583	5.08	6.17	2.54
1.500	3.81	3.083	99.04	4.667	5.08	6.25	2.54
1.583	3.81	3.167	99.04	4.750	5.08		

Max.Eff.Inten.(mm/hr)=		99.04	55.25	
over (min)		5.00	5.00	
Storage Coeff. (min)=		2.14 (ii)	3.55 (ii)	
Unit Hyd. Tpeak (min)=		5.00	5.00	
Unit Hyd. peak (cms)=		0.31	0.26	
				TOTALS
PEAK FLOW	(cms)=	0.18	0.10	0.280 (iii)
TIME TO PEAK	(hrs)=	3.25	3.25	3.25
RUNOFF VOLUME	(mm)=	61.49	17.93	35.35
TOTAL RAINFALL	(mm)=	63.49	63.49	63.49
RUNOFF COEFFICIENT	=	0.97	0.28	0.56

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 53.0 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.

CALIB
STANDHYD (0302)
ID= 1 DT= 5.0 min

Area (ha)= 0.13
Total Imp(%)= 74.00 Dir. Conn.(%)= 15.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.10	0.03
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	2.00	2.00
Length	(m)=	25.00	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	3.81	3.250	99.04	4.83	3.81
0.167	0.00	1.750	3.81	3.333	13.97	4.92	3.81
0.250	0.00	1.833	6.35	3.417	13.97	5.00	3.81
0.333	2.54	1.917	6.35	3.500	13.97	5.08	3.81
0.417	2.54	2.000	6.35	3.583	13.97	5.17	3.81
0.500	2.54	2.083	6.35	3.667	13.97	5.25	3.81
0.583	2.54	2.167	6.35	3.750	13.97	5.33	2.54
0.667	2.54	2.250	6.35	3.833	6.35	5.42	2.54
0.750	2.54	2.333	7.62	3.917	6.35	5.50	2.54
0.833	3.81	2.417	7.62	4.000	6.35	5.58	2.54
0.917	3.81	2.500	7.62	4.083	6.35	5.67	2.54
1.000	3.81	2.583	7.62	4.167	6.35	5.75	2.54
1.083	3.81	2.667	7.62	4.250	6.35	5.83	2.54
1.167	3.81	2.750	7.62	4.333	5.08	5.92	2.54
1.250	3.81	2.833	38.09	4.417	5.08	6.00	2.54
1.333	3.81	2.917	38.09	4.500	5.08	6.08	2.54
1.417	3.81	3.000	38.09	4.583	5.08	6.17	2.54
1.500	3.81	3.083	99.04	4.667	5.08	6.25	2.54
1.583	3.81	3.167	99.04	4.750	5.08		

Max.Eff.Inten.(mm/hr)=		99.04	184.74	
over (min)		5.00	5.00	
Storage Coeff. (min)=		0.91 (ii)	2.70 (ii)	
Unit Hyd. Tpeak (min)=		5.00	5.00	
Unit Hyd. peak (cms)=		0.34	0.29	
				TOTALS
PEAK FLOW	(cms)=	0.01	0.02	0.023 (iii)
TIME TO PEAK	(hrs)=	3.25	3.25	3.25

```
     RUNOFF VOLUME    (mm)=      61.49        29.34          34.14
     TOTAL RAINFALL   (mm)=      63.49        63.49          63.49
     RUNOFF COEFFICIENT   =       0.97         0.46           0.54

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  53.0    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  (  0013)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)     (cms)    (hrs)     (mm)
        ID1= 1 (  0301):     1.65   0.280     3.25    35.35
      + ID2= 2 (  0302):     0.13   0.023     3.25    34.14
        ================================================
        ID = 3 (  0013):     1.78   0.303     3.25    35.26

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| DUHYD    (  0009)|
| Inlet Cap.= 0.236|
| #of Inlets=     1|
| Total(cms)=   0.2|      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)      (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 1):   1.78      0.30      3.25   35.26
     ================================================
     MAJOR SYS.(ID= 2):   0.10      0.07      3.25   35.26
     MINOR SYS.(ID= 3):   1.68      0.24      3.08   35.26

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

  --------------------------
  | Junction Command(0020) |
  --------------------------

                          AREA     QPEAK   TPEAK     R.V.
                          (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 9(  0009)    1.68     0.24    3.08    35.26
  OUTFLOW: ID= 2(  0020)    1.68     0.24    3.08    35.26

  --------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0203)|   Area    (ha)=   2.88
|ID= 1 DT= 5.0 min |   Total Imp(%)=  80.00   Dir. Conn.(%)=  65.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.30         0.58
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     138.56        30.00
     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    3.81 | 3.250   99.04 |  4.83    3.81
                0.167    0.00 | 1.750    3.81 | 3.333   13.97 |  4.92    3.81
                0.250    0.00 | 1.833    6.35 | 3.417   13.97 |  5.00    3.81
                0.333    2.54 | 1.917    6.35 | 3.500   13.97 |  5.08    3.81
                0.417    2.54 | 2.000    6.35 | 3.583   13.97 |  5.17    3.81
                0.500    2.54 | 2.083    6.35 | 3.667   13.97 |  5.25    3.81
                0.583    2.54 | 2.167    6.35 | 3.750   13.97 |  5.33    2.54
                0.667    2.54 | 2.250    6.35 | 3.833    6.35 |  5.42    2.54
                0.750    2.54 | 2.333    7.62 | 3.917    6.35 |  5.50    2.54
                0.833    3.81 | 2.417    7.62 | 4.000    6.35 |  5.58    2.54
                0.917    3.81 | 2.500    7.62 | 4.083    6.35 |  5.67    2.54
                1.000    3.81 | 2.583    7.62 | 4.167    6.35 |  5.75    2.54
                1.083    3.81 | 2.667    7.62 | 4.250    6.35 |  5.83    2.54
                1.167    3.81 | 2.750    7.62 | 4.333    5.08 |  5.92    2.54
                1.250    3.81 | 2.833   38.09 | 4.417    5.08 |  6.00    2.54
                1.333    3.81 | 2.917   38.09 | 4.500    5.08 |  6.08    2.54
                1.417    3.81 | 3.000   38.09 | 4.583    5.08 |  6.17    2.54
                1.500    3.81 | 3.083   99.04 | 4.667    5.08 |  6.25    2.54
                1.583    3.81 | 3.167   99.04 | 4.750    5.08 |

     Max.Eff.Inten.(mm/hr)=      99.04        69.95
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       3.12 (ii)    6.84 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.27         0.14
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.51         0.09        0.600 (iii)
     TIME TO PEAK    (hrs)=       3.25         3.25         3.25
     RUNOFF VOLUME    (mm)=      62.49        20.50        47.79
     TOTAL RAINFALL   (mm)=      63.49        63.49        63.49
     RUNOFF COEFFICIENT   =       0.98         0.32         0.75

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  55.0    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.

--------------------------------------------------------------------------------
--------------------
| DUHYD    (  0028)|
| Inlet Cap.= 0.569|
| #of Inlets=     1|
| Total(cms)=   0.6|      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)      (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 1):   2.88      0.60      3.25   47.79
     ================================================
     MAJOR SYS.(ID= 2):   0.02      0.03      3.25   47.79
     MINOR SYS.(ID= 3):   2.86      0.57      3.25   47.79

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

  --------------------------
  | Junction Command(0029) |
  --------------------------

                          AREA     QPEAK   TPEAK     R.V.
                          (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 9(  0028)    2.86     0.57    3.25    47.79
  OUTFLOW: ID= 2(  0029)    2.86     0.57    3.25    47.79

  --------------------------------------------------------------------------------
--------------------
| ADD HYD  (  0003)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
```

```
--------------------          (ha)     (cms)     (hrs)      (mm)
        ID1= 1 (  0020):     1.68    0.236      3.08     35.26
      + ID2= 2 (  0201):    21.49    4.306      3.25     48.29
        ==================================================
        ID = 3 (  0003):    23.17    4.542      3.25     47.34

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0003)|
|   3 +  2 =  1    |          AREA     QPEAK     TPEAK      R.V.
--------------------          (ha)     (cms)     (hrs)      (mm)
        ID1= 3 (  0003):    23.17    4.542      3.25     47.34
      + ID2= 2 (  0202):    13.27    1.913      3.25     37.46
        ==================================================
        ID = 1 (  0003):    36.44    6.455      3.25     43.74

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0003)|
|   1 +  2 =  3    |          AREA     QPEAK     TPEAK      R.V.
--------------------          (ha)     (cms)     (hrs)      (mm)
        ID1= 1 (  0003):    36.44    6.455      3.25     43.74
      + ID2= 2 (  0029):     2.86    0.569      3.25     47.79
        ==================================================
        ID = 3 (  0003):    39.30    7.024      3.25     44.04

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0005)|     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   |    0.7834      0.8562
                          0.0075      0.0493   |    1.6951      1.3177
                          0.0195      0.1006   |    1.8899      1.4826
                          0.0265      0.1538   |    2.0662      1.6588
                          0.0320      0.2089   |    2.1489      1.7511
                          0.0409      0.3251   |    2.2285      1.8455
                          0.0481      0.4480   |    2.3053      1.9411
                          0.0529      0.5448   |    3.4358      2.0378
                          0.0544      0.5780   |    5.4391      2.1358
                          0.3140      0.7136   |    8.0099      2.2349

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0003)    39.296     7.024      3.25      44.04
   OUTFLOW: ID= 1 (  0005)    39.296     1.279      3.75      44.04

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 18.21
                  TIME SHIFT OF PEAK FLOW         (min)= 30.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  1.1073
--------------------------------------------------------------------------------

  --------------------------
  | Junction Command(0030) |
  --------------------------

                           AREA     QPEAK   TPEAK     R.V.
                           (ha)     (cms)    (hrs)     (mm)
  INFLOW : ID= 8(  0028)    0.02     0.03     3.25     47.79
  OUTFLOW: ID= 2(  0030)    0.02     0.03     3.25     47.79

  --------------------------------------------------------------------------------
```

```
--------------------
| ADD HYD  (  0027)|
|   1 +  2 =  3    |          AREA     QPEAK     TPEAK      R.V.
--------------------          (ha)     (cms)     (hrs)      (mm)
        ID1= 1 (  0030):     0.02     0.031      3.25     47.79
      + ID2= 2 (  0005):    39.30     1.279      3.75     44.00
        ==================================================
        ID = 3 (  0027):    39.32     1.279      3.75     44.00

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
================================================================================
==============

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2019)
       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
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2022 Smart City Water Inc
All rights reserved.

                  *****  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\pyung\AppData\Local\Civica\VH5\98ec473c-00e0-4b07-a2f4-
5ebeb92859e6\cd815e83-ced5-4ed3-adde-df1d0b4cfc26\scenar
  Summary filename: C:\Users\pyung\AppData\Local\Civica\VH5\98ec473c-00e0-4b07-a2f4-
5ebeb92859e6\cd815e83-ced5-4ed3-adde-df1d0b4cfc26\scenar


DATE: 03-03-2026                          TIME: 01:44:05

USER:



COMMENTS: _____________________________________________________

--------------------------------------------------------------------------------
---------------
  ************************************************
  ** SIMULATION : SCS_06hr_010yr                 **
  ************************************************


--------------------
|    READ STORM    |    Filename: C:\Users\pyung\AppD
|                  |              ata\Local\Temp\
|                  |              9708c7a4-1a89-478a-a0fe-e415ca74d84b\3e1f6655
| Ptotal= 74.28 mm |    Comments: SCS_06hr_010yr-CC
--------------------
                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     7.43 |    3.50    16.34 |  5.25     2.97
                0.25     2.97 |  2.00     7.43 |    3.75     7.43 |  5.50     2.97
                0.50     2.97 |  2.25     8.91 |    4.00     7.43 |  5.75     2.97
                0.75     4.46 |  2.50     8.91 |    4.25     5.94 |  6.00     2.97
                1.00     4.46 |  2.75    44.57 |    4.50     5.94 |
                1.25     4.46 |  3.00   115.88 |    4.75     4.46 |
                1.50     4.46 |  3.25    16.34 |    5.00     4.46 |
```

```
--------------------------------------------------------------------------------

--------------------
| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=  21.49
|ID= 1 DT= 5.0 min |   Total Imp(%)=  75.00   Dir. Conn.(%)=  70.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      16.12          5.37
     Dep. Storage     (mm)=       1.00          5.00
     Average Slope     (%)=       1.00          2.00
     Length            (m)=     378.51         30.00
     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    4.46 | 3.250  115.88 | 4.83    4.46
              0.167    0.00 | 1.750    4.46 | 3.333   16.34 | 4.92    4.46
              0.250    0.00 | 1.833    7.43 | 3.417   16.34 | 5.00    4.46
              0.333    2.97 | 1.917    7.43 | 3.500   16.34 | 5.08    4.46
              0.417    2.97 | 2.000    7.43 | 3.583   16.34 | 5.17    4.46
              0.500    2.97 | 2.083    7.43 | 3.667   16.34 | 5.25    4.46
              0.583    2.97 | 2.167    7.43 | 3.750   16.34 | 5.33    2.97
              0.667    2.97 | 2.250    7.43 | 3.833    7.43 | 5.42    2.97
              0.750    2.97 | 2.333    8.91 | 3.917    7.43 | 5.50    2.97
              0.833    4.46 | 2.417    8.91 | 4.000    7.43 | 5.58    2.97
              0.917    4.46 | 2.500    8.91 | 4.083    7.43 | 5.67    2.97
              1.000    4.46 | 2.583    8.91 | 4.167    7.43 | 5.75    2.97
              1.083    4.46 | 2.667    8.91 | 4.250    7.43 | 5.83    2.97
              1.167    4.46 | 2.750    8.91 | 4.333    5.94 | 5.92    2.97
              1.250    4.46 | 2.833   44.57 | 4.417    5.94 | 6.00    2.97
              1.333    4.46 | 2.917   44.57 | 4.500    5.94 | 6.08    2.97
              1.417    4.46 | 3.000   44.57 | 4.583    5.94 | 6.17    2.97
              1.500    4.46 | 3.083  115.88 | 4.667    5.94 | 6.25    2.97
              1.583    4.46 | 3.167  115.88 | 4.750    5.94 |

     Max.Eff.Inten.(mm/hr)=     115.88        47.45
               over (min)          5.00        10.00
     Storage Coeff.  (min)=       5.35 (ii)    9.06 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.21         0.12
                                                        *TOTALS*
     PEAK FLOW       (cms)=       4.66         0.50       5.149 (iii)
     TIME TO PEAK    (hrs)=       3.25         3.33        3.25
     RUNOFF VOLUME    (mm)=      73.28        20.21       57.36
     TOTAL RAINFALL   (mm)=      74.28        74.28       74.28
     RUNOFF COEFFICIENT   =       0.99         0.27        0.77


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  55.0     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.

--------------------------------------------------------------------------------

--------------------
| CALIB            |
| STANDHYD (  0202)|   Area    (ha)=  13.27
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=  45.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       7.96          5.31
     Dep. Storage     (mm)=       1.00          5.00
     Average Slope     (%)=       1.00          2.00
     Length            (m)=     297.43         30.00
     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    4.46 | 3.250  115.88 | 4.83    4.46
              0.167    0.00 | 1.750    4.46 | 3.333   16.34 | 4.92    4.46
              0.250    0.00 | 1.833    7.43 | 3.417   16.34 | 5.00    4.46
              0.333    2.97 | 1.917    7.43 | 3.500   16.34 | 5.08    4.46
              0.417    2.97 | 2.000    7.43 | 3.583   16.34 | 5.17    4.46
              0.500    2.97 | 2.083    7.43 | 3.667   16.34 | 5.25    4.46
              0.583    2.97 | 2.167    7.43 | 3.750   16.34 | 5.33    2.97
              0.667    2.97 | 2.250    7.43 | 3.833    7.43 | 5.42    2.97
              0.750    2.97 | 2.333    8.91 | 3.917    7.43 | 5.50    2.97
              0.833    4.46 | 2.417    8.91 | 4.000    7.43 | 5.58    2.97
              0.917    4.46 | 2.500    8.91 | 4.083    7.43 | 5.67    2.97
              1.000    4.46 | 2.583    8.91 | 4.167    7.43 | 5.75    2.97
              1.083    4.46 | 2.667    8.91 | 4.250    7.43 | 5.83    2.97
              1.167    4.46 | 2.750    8.91 | 4.333    5.94 | 5.92    2.97
              1.250    4.46 | 2.833   44.57 | 4.417    5.94 | 6.00    2.97
              1.333    4.46 | 2.917   44.57 | 4.500    5.94 | 6.08    2.97
              1.417    4.46 | 3.000   44.57 | 4.583    5.94 | 6.17    2.97
              1.500    4.46 | 3.083  115.88 | 4.667    5.94 | 6.25    2.97
              1.583    4.46 | 3.167  115.88 | 4.750    5.94 |

     Max.Eff.Inten.(mm/hr)=     115.88        60.43
               over (min)          5.00        15.00
     Storage Coeff.  (min)=       4.63 (ii)   11.90 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.22         0.09
                                                        *TOTALS*
     PEAK FLOW       (cms)=       1.87         0.54       2.325 (iii)
     TIME TO PEAK    (hrs)=       3.25         3.33        3.25
     RUNOFF VOLUME    (mm)=      73.28        22.50       45.35
     TOTAL RAINFALL   (mm)=      74.28        74.28       74.28
     RUNOFF COEFFICIENT   =       0.99         0.30        0.61

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  55.0     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.

--------------------------------------------------------------------------------

--------------------
| CALIB            |
| STANDHYD (  0301)|   Area    (ha)=   1.65
|ID= 1 DT= 5.0 min |   Total Imp(%)=  62.00   Dir. Conn.(%)=  40.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.02          0.63
     Dep. Storage     (mm)=       2.00          5.00
     Average Slope     (%)=       2.00          2.00
     Length            (m)=     104.88         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    4.46 | 3.250  115.88 | 4.83    4.46
              0.167    0.00 | 1.750    4.46 | 3.333   16.34 | 4.92    4.46
```

0.250	0.00	1.833	7.43	3.417	16.34	5.00	4.46
0.333	2.97	1.917	7.43	3.500	16.34	5.08	4.46
0.417	2.97	2.000	7.43	3.583	16.34	5.17	4.46
0.500	2.97	2.083	7.43	3.667	16.34	5.25	4.46
0.583	2.97	2.167	7.43	3.750	16.34	5.33	2.97
0.667	2.97	2.250	7.43	3.833	7.43	5.42	2.97
0.750	2.97	2.333	8.91	3.917	7.43	5.50	2.97
0.833	4.46	2.417	8.91	4.000	7.43	5.58	2.97
0.917	4.46	2.500	8.91	4.083	7.43	5.67	2.97
1.000	4.46	2.583	8.91	4.167	7.43	5.75	2.97
1.083	4.46	2.667	8.91	4.250	7.43	5.83	2.97
1.167	4.46	2.750	8.91	4.333	5.94	5.92	2.97
1.250	4.46	2.833	44.57	4.417	5.94	6.00	2.97
1.333	4.46	2.917	44.57	4.500	5.94	6.08	2.97
1.417	4.46	3.000	44.57	4.583	5.94	6.17	2.97
1.500	4.46	3.083	115.88	4.667	5.94	6.25	2.97
1.583	4.46	3.167	115.88	4.750	5.94		

Max.Eff.Inten.(mm/hr)=		115.88	72.76	
over (min)		5.00	5.00	
Storage Coeff. (min)=		2.01 (ii)	3.33 (ii)	
Unit Hyd. Tpeak (min)=		5.00	5.00	
Unit Hyd. peak (cms)=		0.31	0.26	
				TOTALS
PEAK FLOW	(cms)=	0.21	0.13	0.343 (iii)
TIME TO PEAK	(hrs)=	3.25	3.25	3.25
RUNOFF VOLUME	(mm)=	72.28	23.66	43.11
TOTAL RAINFALL	(mm)=	74.28	74.28	74.28
RUNOFF COEFFICIENT	=	0.97	0.32	0.58

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 53.0 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.

CALIB
STANDHYD (0302)
ID= 1 DT= 5.0 min

Area (ha)= 0.13
Total Imp(%)= 74.00 Dir. Conn.(%)= 15.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.10	0.03
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	2.00	2.00
Length	(m)=	25.00	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	4.46	3.250	115.88	4.83	4.46
0.167	0.00	1.750	4.46	3.333	16.34	4.92	4.46
0.250	0.00	1.833	7.43	3.417	16.34	5.00	4.46
0.333	2.97	1.917	7.43	3.500	16.34	5.08	4.46
0.417	2.97	2.000	7.43	3.583	16.34	5.17	4.46
0.500	2.97	2.083	7.43	3.667	16.34	5.25	4.46
0.583	2.97	2.167	7.43	3.750	16.34	5.33	2.97
0.667	2.97	2.250	7.43	3.833	7.43	5.42	2.97
0.750	2.97	2.333	8.91	3.917	7.43	5.50	2.97
0.833	4.46	2.417	8.91	4.000	7.43	5.58	2.97
0.917	4.46	2.500	8.91	4.083	7.43	5.67	2.97
1.000	4.46	2.583	8.91	4.167	7.43	5.75	2.97
1.083	4.46	2.667	8.91	4.250	7.43	5.83	2.97
1.167	4.46	2.750	8.91	4.333	5.94	5.92	2.97
1.250	4.46	2.833	44.57	4.417	5.94	6.00	2.97
1.333	4.46	2.917	44.57	4.500	5.94	6.08	2.97
1.417	4.46	3.000	44.57	4.583	5.94	6.17	2.97
1.500	4.46	3.083	115.88	4.667	5.94	6.25	2.97
1.583	4.46	3.167	115.88	4.750	5.94		

Max.Eff.Inten.(mm/hr)=		115.88	234.25	
over (min)		5.00	5.00	
Storage Coeff. (min)=		0.85 (ii)	2.53 (ii)	
Unit Hyd. Tpeak (min)=		5.00	5.00	
Unit Hyd. peak (cms)=		0.34	0.29	
				TOTALS
PEAK FLOW	(cms)=	0.01	0.02	0.029 (iii)
TIME TO PEAK	(hrs)=	3.25	3.25	3.25
RUNOFF VOLUME	(mm)=	72.28	37.37	42.58
TOTAL RAINFALL	(mm)=	74.28	74.28	74.28
RUNOFF COEFFICIENT	=	0.97	0.50	0.57

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 53.0 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 (0013)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0301):	1.65	0.343	3.25	43.11
+ ID2= 2 (0302):	0.13	0.029	3.25	42.58
ID = 3 (0013):	1.78	0.372	3.25	43.07

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

DUHYD (0009)
Inlet Cap.= 0.236
#of Inlets= 1
Total(cms)= 0.2

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
TOTAL HYD.(ID= 1):	1.78	0.37	3.25	43.07
MAJOR SYS.(ID= 2):	0.22	0.14	3.25	43.07
MINOR SYS.(ID= 3):	1.56	0.24	3.08	43.07

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

Junction Command(0020)

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 9(0009)	1.56	0.24	3.08	43.07
OUTFLOW: ID= 2(0020)	1.56	0.24	3.08	43.07

CALIB
STANDHYD (0203) Area (ha)= 2.88

|ID= 1 DT= 5.0 min | Total Imp(%)= 80.00 Dir. Conn.(%)= 65.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	2.30	0.58
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	138.56	30.00
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	4.46	3.250	115.88	4.83	4.46
0.167	0.00	1.750	4.46	3.333	16.34	4.92	4.46
0.250	0.00	1.833	7.43	3.417	16.34	5.00	4.46
0.333	2.97	1.917	7.43	3.500	16.34	5.08	4.46
0.417	2.97	2.000	7.43	3.583	16.34	5.17	4.46
0.500	2.97	2.083	7.43	3.667	16.34	5.25	4.46
0.583	2.97	2.167	7.43	3.750	16.34	5.33	2.97
0.667	2.97	2.250	7.43	3.833	7.43	5.42	2.97
0.750	2.97	2.333	8.91	3.917	7.43	5.50	2.97
0.833	4.46	2.417	8.91	4.000	7.43	5.58	2.97
0.917	4.46	2.500	8.91	4.083	7.43	5.67	2.97
1.000	4.46	2.583	8.91	4.167	7.43	5.75	2.97
1.083	4.46	2.667	8.91	4.250	7.43	5.83	2.97
1.167	4.46	2.750	8.91	4.333	5.94	5.92	2.97
1.250	4.46	2.833	44.57	4.417	5.94	6.00	2.97
1.333	4.46	2.917	44.57	4.500	5.94	6.08	2.97
1.417	4.46	3.000	44.57	4.583	5.94	6.17	2.97
1.500	4.46	3.083	115.88	4.667	5.94	6.25	2.97
1.583	4.46	3.167	115.88	4.750	5.94		

Max.Eff.Inten.(mm/hr)=		115.88	91.32	
over (min)		5.00	10.00	
Storage Coeff. (min)=		2.93 (ii)	6.42 (ii)	
Unit Hyd. Tpeak (min)=		5.00	10.00	
Unit Hyd. peak (cms)=		0.28	0.14	
				TOTALS
PEAK FLOW	(cms)=	0.60	0.12	0.718 (iii)
TIME TO PEAK	(hrs)=	3.25	3.25	3.25
RUNOFF VOLUME	(mm)=	73.28	26.83	57.02
TOTAL RAINFALL	(mm)=	74.28	74.28	74.28
RUNOFF COEFFICIENT	=	0.99	0.36	0.77

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 55.0 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.

DUHYD (0028)				
Inlet Cap.= 0.569				
#of Inlets= 1				
Total(cms)= 0.6		AREA	QPEAK	TPEAK	R.V.
		(ha)	(cms)	(hrs)	(mm)
TOTAL HYD.(ID= 1):		2.88	0.72	3.25	57.02
MAJOR SYS.(ID= 2):		0.14	0.15	3.25	57.02
MINOR SYS.(ID= 3):		2.74	0.57	3.08	57.02

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

Junction Command(0029)		AREA	QPEAK	TPEAK	R.V.
		(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 9(	0028)	2.74	0.57	3.08	57.02
OUTFLOW: ID= 2(	0029)	2.74	0.57	3.08	57.02

ADD HYD (0003)					
1 + 2 = 3		AREA	QPEAK	TPEAK	R.V.
		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (	0020):	1.56	0.236	3.08	43.07
+ ID2= 2 (	0201):	21.49	5.149	3.25	57.36
ID = 3 (	0003):	23.05	5.385	3.25	56.39

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0003)					
3 + 2 = 1		AREA	QPEAK	TPEAK	R.V.
		(ha)	(cms)	(hrs)	(mm)
ID1= 3 (	0003):	23.05	5.385	3.25	56.39
+ ID2= 2 (	0202):	13.27	2.325	3.25	45.35
ID = 1 (	0003):	36.32	7.710	3.25	52.36

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0003)					
1 + 2 = 3		AREA	QPEAK	TPEAK	R.V.
		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (	0003):	36.32	7.710	3.25	52.36
+ ID2= 2 (	0029):	2.74	0.569	3.08	57.02
ID = 3 (	0003):	39.06	8.279	3.25	52.69

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR(0005)		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	0.7834	0.8562
		0.0075	0.0493	1.6951	1.3177
		0.0195	0.1006	1.8899	1.4826
		0.0265	0.1538	2.0662	1.6588
		0.0320	0.2089	2.1489	1.7511
		0.0409	0.3251	2.2285	1.8455
		0.0481	0.4480	2.3053	1.9411
		0.0529	0.5448	3.4358	2.0378
		0.0544	0.5780	5.4391	2.1358
		0.3140	0.7136	8.0099	2.2349

		AREA	QPEAK	TPEAK	R.V.
		(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (	0003)	39.062	8.279	3.25	52.69
OUTFLOW: ID= 1 (	0005)	39.062	1.625	3.67	52.64

PEAK FLOW REDUCTION [Qout/Qin](%)= 19.63
TIME SHIFT OF PEAK FLOW (min)= 25.00

```
                MAXIMUM  STORAGE   USED       (ha.m.)=  1.2828
--------------------------------------------------------------------------------

  -------------------------
  | Junction Command(0030) |
  -------------------------

                          AREA     QPEAK    TPEAK     R.V.
                          (ha)     (cms)    (hrs)     (mm)
  INFLOW : ID= 8(  0028)    0.14     0.15     3.25    57.02
  OUTFLOW: ID= 2(  0030)    0.14     0.15     3.25    57.02

  --------------------------------------------------------------------------------

-------------------
| ADD HYD  (  0027)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0030):     0.14    0.149     3.25    57.02
     + ID2= 2 (  0005):    39.06    1.625     3.67    52.64
       ==========================================================
       ID = 3 (  0027):    39.20    1.625     3.67    52.66

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
================================================================================
==============

      V    V   I    SSSSS  U   U    A    L              (v 6.2.2019)
      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
        VV     I    SSSSS  UUUUU  A   A  LLLLL

       OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
      O   O    T      T    H   H   Y Y   MM MM  O   O
      O   O    T      T    H   H    Y    M   M  O   O
       OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2022 Smart City Water Inc
All rights reserved.


                  *****  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\pyung\AppData\Local\Civica\VH5\98ec473c-00e0-4b07-a2f4-
5ebeb92859e6\93de604b-1a52-4987-a805-6dffa18913fe\scenar
  Summary filename: C:\Users\pyung\AppData\Local\Civica\VH5\98ec473c-00e0-4b07-a2f4-
5ebeb92859e6\93de604b-1a52-4987-a805-6dffa18913fe\scenar


DATE: 03-03-2026                          TIME: 01:44:05

USER:



COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
---------------
  ************************************************
  ** SIMULATION : SCS_06hr_025yr                 **
  ************************************************

--------------------
|    READ STORM    |    Filename: C:\Users\pyung\AppD
|                  |              ata\Local\Temp\
|                  |              9708c7a4-1a89-478a-a0fe-e415ca74d84b\1340e8c9
| Ptotal= 89.36 mm |    Comments: SCS_06hr_025yr-CC
--------------------

                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    8.94 |'  3.50   19.66 |  5.25    3.57
                0.25    3.57 |  2.00    8.94 |'  3.75    8.94 |  5.50    3.57
                0.50    3.57 |  2.25   10.72 |'  4.00    8.94 |  5.75    3.57
                0.75    5.36 |  2.50   10.72 |'  4.25    7.15 |  6.00    3.57
                1.00    5.36 |  2.75   53.62 |'  4.50    7.15 |
                1.25    5.36 |  3.00  139.42 |'  4.75    5.36 |
                1.50    5.36 |  3.25   19.66 |'  5.00    5.36 |

--------------------------------------------------------------------------------

--------------------
| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=  21.49
|ID= 1 DT= 5.0 min |   Total Imp(%)=  75.00   Dir. Conn.(%)=  70.00
--------------------

                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       16.12          5.37
     Dep. Storage     (mm)=        1.00          5.00
     Average Slope     (%)=        1.00          2.00
     Length            (m)=      378.51         30.00
     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    5.36 | 3.250  139.42 |  4.83    5.36
               0.167    0.00 | 1.750    5.36 | 3.333   19.66 |  4.92    5.36
               0.250    0.00 | 1.833    8.94 | 3.417   19.66 |  5.00    5.36
               0.333    3.57 | 1.917    8.94 | 3.500   19.66 |  5.08    5.36
               0.417    3.57 | 2.000    8.94 | 3.583   19.66 |  5.17    5.36
               0.500    3.57 | 2.083    8.94 | 3.667   19.66 |  5.25    5.36
               0.583    3.57 | 2.167    8.94 | 3.750   19.66 |  5.33    3.57
               0.667    3.57 | 2.250    8.94 | 3.833    8.94 |  5.42    3.57
               0.750    3.57 | 2.333   10.72 | 3.917    8.94 |  5.50    3.57
               0.833    5.36 | 2.417   10.72 | 4.000    8.94 |  5.58    3.57
               0.917    5.36 | 2.500   10.72 | 4.083    8.94 |  5.67    3.57
               1.000    5.36 | 2.583   10.72 | 4.167    8.94 |  5.75    3.57
               1.083    5.36 | 2.667   10.72 | 4.250    8.94 |  5.83    3.57
               1.167    5.36 | 2.750   10.72 | 4.333    7.15 |  5.92    3.57
               1.250    5.36 | 2.833   53.62 | 4.417    7.15 |  6.00    3.57
               1.333    5.36 | 2.917   53.62 | 4.500    7.15 |  6.08    3.57
               1.417    5.36 | 3.000   53.62 | 4.583    7.15 |  6.17    3.57
               1.500    5.36 | 3.083  139.42 | 4.667    7.15 |  6.25    3.57
               1.583    5.36 | 3.167  139.42 | 4.750    7.15 |

     Max.Eff.Inten.(mm/hr)=     139.42         65.79
               over (min)         5.00         10.00
     Storage Coeff.  (min)=       4.97 (ii)     8.42 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.22          0.12
                                                      *TOTALS*
     PEAK FLOW       (cms)=       5.65          0.71      6.357 (iii)
     TIME TO PEAK    (hrs)=       3.25          3.25        3.25
     RUNOFF VOLUME    (mm)=      88.36         28.09       70.28
     TOTAL RAINFALL   (mm)=      89.36         89.36       89.36
     RUNOFF COEFFICIENT   =       0.99          0.31        0.79

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

```
       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  55.0     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.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0202)|   Area    (ha)=  13.27
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=  45.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       7.96          5.31
     Dep. Storage     (mm)=       1.00          5.00
     Average Slope     (%)=       1.00          2.00
     Length            (m)=     297.43         30.00
     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    5.36 | 3.250  139.42 | 4.833    5.36
               0.167    0.00 | 1.750    5.36 | 3.333   19.66 | 4.92     5.36
               0.250    0.00 | 1.833    8.94 | 3.417   19.66 | 5.00     5.36
               0.333    3.57 | 1.917    8.94 | 3.500   19.66 | 5.08     5.36
               0.417    3.57 | 2.000    8.94 | 3.583   19.66 | 5.17     5.36
               0.500    3.57 | 2.083    8.94 | 3.667   19.66 | 5.25     5.36
               0.583    3.57 | 2.167    8.94 | 3.750   19.66 | 5.33     3.57
               0.667    3.57 | 2.250    8.94 | 3.833    8.94 | 5.42     3.57
               0.750    3.57 | 2.333   10.72 | 3.917    8.94 | 5.50     3.57
               0.833    5.36 | 2.417   10.72 | 4.000    8.94 | 5.58     3.57
               0.917    5.36 | 2.500   10.72 | 4.083    8.94 | 5.67     3.57
               1.000    5.36 | 2.583   10.72 | 4.167    8.94 | 5.75     3.57
               1.083    5.36 | 2.667   10.72 | 4.250    8.94 | 5.83     3.57
               1.167    5.36 | 2.750   10.72 | 4.333    7.15 | 5.92     3.57
               1.250    5.36 | 2.833   53.62 | 4.417    7.15 | 6.00     3.57
               1.333    5.36 | 2.917   53.62 | 4.500    7.15 | 6.08     3.57
               1.417    5.36 | 3.000   53.62 | 4.583    7.15 | 6.17     3.57
               1.500    5.36 | 3.083  139.42 | 4.667    7.15 | 6.25     3.57
               1.583    5.36 | 3.167  139.42 | 4.750    7.15 |

     Max.Eff.Inten.(mm/hr)=     139.42         83.08
                over (min)        5.00         10.00
     Storage Coeff.  (min)=       4.30 (ii)    9.26 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.23          0.12
                                                      *TOTALS*
     PEAK FLOW       (cms)=       2.27          0.86          3.129 (iii)
     TIME TO PEAK    (hrs)=       3.25          3.25           3.25
     RUNOFF VOLUME    (mm)=      88.36         31.02          56.82
     TOTAL RAINFALL   (mm)=      89.36         89.36          89.36
     RUNOFF COEFFICIENT   =       0.99          0.35           0.64

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  55.0     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.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0301)|   Area    (ha)=   1.65
|ID= 1 DT= 5.0 min |   Total Imp(%)=  62.00   Dir. Conn.(%)=  40.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.02          0.63
     Dep. Storage     (mm)=       2.00          5.00
     Average Slope     (%)=       2.00          2.00
     Length            (m)=     104.88         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    5.36 | 3.250  139.42 | 4.83     5.36
               0.167    0.00 | 1.750    5.36 | 3.333   19.66 | 4.92     5.36
               0.250    0.00 | 1.833    8.94 | 3.417   19.66 | 5.00     5.36
               0.333    3.57 | 1.917    8.94 | 3.500   19.66 | 5.08     5.36
               0.417    3.57 | 2.000    8.94 | 3.583   19.66 | 5.17     5.36
               0.500    3.57 | 2.083    8.94 | 3.667   19.66 | 5.25     5.36
               0.583    3.57 | 2.167    8.94 | 3.750   19.66 | 5.33     3.57
               0.667    3.57 | 2.250    8.94 | 3.833    8.94 | 5.42     3.57
               0.750    3.57 | 2.333   10.72 | 3.917    8.94 | 5.50     3.57
               0.833    5.36 | 2.417   10.72 | 4.000    8.94 | 5.58     3.57
               0.917    5.36 | 2.500   10.72 | 4.083    8.94 | 5.67     3.57
               1.000    5.36 | 2.583   10.72 | 4.167    8.94 | 5.75     3.57
               1.083    5.36 | 2.667   10.72 | 4.250    8.94 | 5.83     3.57
               1.167    5.36 | 2.750   10.72 | 4.333    7.15 | 5.92     3.57
               1.250    5.36 | 2.833   53.62 | 4.417    7.15 | 6.00     3.57
               1.333    5.36 | 2.917   53.62 | 4.500    7.15 | 6.08     3.57
               1.417    5.36 | 3.000   53.62 | 4.583    7.15 | 6.17     3.57
               1.500    5.36 | 3.083  139.42 | 4.667    7.15 | 6.25     3.57
               1.583    5.36 | 3.167  139.42 | 4.750    7.15 |

     Max.Eff.Inten.(mm/hr)=     139.42         99.56
                over (min)        5.00          5.00
     Storage Coeff.  (min)=       1.87 (ii)     3.10 (ii)
     Unit Hyd. Tpeak (min)=       5.00          5.00
     Unit Hyd. peak  (cms)=       0.32          0.27
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.26          0.18          0.435 (iii)
     TIME TO PEAK    (hrs)=       3.25          3.25           3.25
     RUNOFF VOLUME    (mm)=      87.36         32.46          54.42
     TOTAL RAINFALL   (mm)=      89.36         89.36          89.36
     RUNOFF COEFFICIENT   =       0.98          0.36           0.61

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  53.0     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.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0302)|   Area    (ha)=   0.13
|ID= 1 DT= 5.0 min |   Total Imp(%)=  74.00   Dir. Conn.(%)=  15.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.10          0.03
     Dep. Storage     (mm)=       2.00          5.00
     Average Slope     (%)=       2.00          2.00
     Length            (m)=      25.00         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	5.36	3.250	139.42	4.83	5.36
0.167	0.00	1.750	5.36	3.333	19.66	4.92	5.36
0.250	0.00	1.833	8.94	3.417	19.66	5.00	5.36
0.333	3.57	1.917	8.94	3.500	19.66	5.08	5.36
0.417	3.57	2.000	8.94	3.583	19.66	5.17	5.36
0.500	3.57	2.083	8.94	3.667	19.66	5.25	5.36
0.583	3.57	2.167	8.94	3.750	19.66	5.33	3.57
0.667	3.57	2.250	8.94	3.833	8.94	5.42	3.57
0.750	3.57	2.333	10.72	3.917	8.94	5.50	3.57
0.833	5.36	2.417	10.72	4.000	8.94	5.58	3.57
0.917	5.36	2.500	10.72	4.083	8.94	5.67	3.57
1.000	5.36	2.583	10.72	4.167	8.94	5.75	3.57
1.083	5.36	2.667	10.72	4.250	8.94	5.83	3.57
1.167	5.36	2.750	10.72	4.333	7.15	5.92	3.57
1.250	5.36	2.833	53.62	4.417	7.15	6.00	3.57
1.333	5.36	2.917	53.62	4.500	7.15	6.08	3.57
1.417	5.36	3.000	53.62	4.583	7.15	6.17	3.57
1.500	5.36	3.083	139.42	4.667	7.15	6.25	3.57
1.583	5.36	3.167	139.42	4.750	7.15		

Max.Eff.Inten.(mm/hr)=		139.42	306.60	
over (min)		5.00	5.00	
Storage Coeff. (min)=		0.79 (ii)	2.35 (ii)	
Unit Hyd. Tpeak (min)=		5.00	5.00	
Unit Hyd. peak (cms)=		0.34	0.30	
				TOTALS
PEAK FLOW	(cms)=	0.01	0.03	0.037 (iii)
TIME TO PEAK	(hrs)=	3.25	3.25	3.25
RUNOFF VOLUME	(mm)=	87.36	49.22	54.94
TOTAL RAINFALL	(mm)=	89.36	89.36	89.36
RUNOFF COEFFICIENT	=	0.98	0.55	0.61

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 53.0 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 (0013)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0301):	1.65	0.435	3.25	54.42
+ ID2= 2 (0302):	0.13	0.037	3.25	54.94
ID = 3 (0013):	1.78	0.472	3.25	54.46

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

DUHYD (0009)
Inlet Cap.= 0.236
#of Inlets= 1
Total(cms)= 0.2

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
TOTAL HYD.(ID= 1):	1.78	0.47	3.25	54.46
MAJOR SYS.(ID= 2):	0.33	0.24	3.25	54.46
MINOR SYS.(ID= 3):	1.45	0.24	3.08	54.46

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

Junction Command(0020)

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 9(0009)	1.45	0.24	3.08	54.46
OUTFLOW: ID= 2(0020)	1.45	0.24	3.08	54.46

CALIB
STANDHYD (0203)
ID= 1 DT= 5.0 min

Area (ha)= 2.88
Total Imp(%)= 80.00 Dir. Conn.(%)= 65.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	2.30	0.58
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	138.56	30.00
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	5.36	3.250	139.42	4.83	5.36
0.167	0.00	1.750	5.36	3.333	19.66	4.92	5.36
0.250	0.00	1.833	8.94	3.417	19.66	5.00	5.36
0.333	3.57	1.917	8.94	3.500	19.66	5.08	5.36
0.417	3.57	2.000	8.94	3.583	19.66	5.17	5.36
0.500	3.57	2.083	8.94	3.667	19.66	5.25	5.36
0.583	3.57	2.167	8.94	3.750	19.66	5.33	3.57
0.667	3.57	2.250	8.94	3.833	8.94	5.42	3.57
0.750	3.57	2.333	10.72	3.917	8.94	5.50	3.57
0.833	5.36	2.417	10.72	4.000	8.94	5.58	3.57
0.917	5.36	2.500	10.72	4.083	8.94	5.67	3.57
1.000	5.36	2.583	10.72	4.167	8.94	5.75	3.57
1.083	5.36	2.667	10.72	4.250	8.94	5.83	3.57
1.167	5.36	2.750	10.72	4.333	7.15	5.92	3.57
1.250	5.36	2.833	53.62	4.417	7.15	6.00	3.57
1.333	5.36	2.917	53.62	4.500	7.15	6.08	3.57
1.417	5.36	3.000	53.62	4.583	7.15	6.17	3.57
1.500	5.36	3.083	139.42	4.667	7.15	6.25	3.57
1.583	5.36	3.167	139.42	4.750	7.15		

Max.Eff.Inten.(mm/hr)=		139.42	123.68	
over (min)		5.00	10.00	
Storage Coeff. (min)=		2.72 (ii)	5.97 (ii)	
Unit Hyd. Tpeak (min)=		5.00	10.00	
Unit Hyd. peak (cms)=		0.29	0.15	
				TOTALS
PEAK FLOW	(cms)=	0.72	0.16	0.887 (iii)
TIME TO PEAK	(hrs)=	3.25	3.25	3.25
RUNOFF VOLUME	(mm)=	88.36	36.46	70.19
TOTAL RAINFALL	(mm)=	89.36	89.36	89.36
RUNOFF COEFFICIENT	=	0.99	0.41	0.79

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 55.0 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.

```
--------------------------------------------------------------------------------
--------------------
| DUHYD    (  0028)|
| Inlet Cap.= 0.569|
| #of Inlets=     1|
| Total(cms)=   0.6|      AREA     QPEAK     TPEAK     R.V.
------------------       (ha)      (cms)     (hrs)     (mm)
     TOTAL HYD.(ID= 1):   2.88      0.89      3.25    70.19
     ==========================================================
     MAJOR SYS.(ID= 2):   0.31      0.32      3.25    70.19
     MINOR SYS.(ID= 3):   2.57      0.57      3.08    70.19

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

  -------------------------
  | Junction Command(0029) |
  -------------------------

                           AREA     QPEAK    TPEAK     R.V.
                           (ha)     (cms)    (hrs)     (mm)
  INFLOW : ID= 9(  0028)    2.57      0.57     3.08    70.19
  OUTFLOW: ID= 2(  0029)    2.57      0.57     3.08    70.19

  ------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0003)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
------------------          (ha)     (cms)    (hrs)     (mm)
       ID1= 1 (  0020):     1.45    0.236     3.08    54.46
     + ID2= 2 (  0201):    21.49    6.357     3.25    70.28
       ==========================================================
       ID = 3 (  0003):    22.94    6.593     3.25    69.28

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0003)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
------------------          (ha)     (cms)    (hrs)     (mm)
       ID1= 3 (  0003):    22.94    6.593     3.25    69.28
     + ID2= 2 (  0202):    13.27    3.129     3.25    56.82
       ==========================================================
       ID = 1 (  0003):    36.21    9.722     3.25    64.71

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0003)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
------------------          (ha)     (cms)    (hrs)     (mm)
       ID1= 1 (  0003):    36.21    9.722     3.25    64.71
     + ID2= 2 (  0029):     2.57    0.569     3.08    70.19
       ==========================================================
       ID = 3 (  0003):    38.78   10.291     3.25    65.08

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0005)|     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    |    0.7834      0.8562
                          0.0075      0.0493    |    1.6951      1.3177
                          0.0195      0.1006    |    1.8899      1.4826
                          0.0265      0.1538    |    2.0662      1.6588
                          0.0320      0.2089    |    2.1489      1.7511
                          0.0409      0.3251    |    2.2285      1.8455
                          0.0481      0.4480    |    2.3053      1.9411
                          0.0529      0.5448    |    3.4358      2.0378
                          0.0544      0.5780    |    5.4391      2.1358
                          0.3140      0.7136    |    8.0099      2.2349

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
  INFLOW : ID= 2 (  0003)     38.781    10.291      3.25      65.08
  OUTFLOW: ID= 1 (  0005)     38.781     1.963      3.67      65.03

                PEAK   FLOW   REDUCTION [Qout/Qin](%)= 19.07
                TIME SHIFT OF PEAK FLOW          (min)= 25.00
                MAXIMUM  STORAGE   USED       (ha.m.)=  1.5562

--------------------------------------------------------------------------------

  -------------------------
  | Junction Command(0030) |
  -------------------------

                           AREA     QPEAK    TPEAK     R.V.
                           (ha)     (cms)    (hrs)     (mm)
  INFLOW : ID= 8(  0028)    0.31      0.32     3.25    70.19
  OUTFLOW: ID= 2(  0030)    0.31      0.32     3.25    70.19

  ------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0027)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
------------------          (ha)     (cms)    (hrs)     (mm)
       ID1= 1 (  0030):     0.31    0.318     3.25    70.19
     + ID2= 2 (  0005):    38.78    1.963     3.67    65.03
       ==========================================================
       ID = 3 (  0027):    39.09    1.963     3.67    65.07

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
================================================================================
==============

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2019)
       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
         VV     I    SSSSS  UUUUU  A   A  LLLLL

       OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
      O   O    T      T    H   H   Y Y   MM MM  O   O
      O   O    T      T    H   H    Y    M   M  O   O
       OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2022 Smart City Water Inc
All rights reserved.


                  *****  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\pyung\AppData\Local\Civica\VH5\98ec473c-00e0-4b07-a2f4-
5ebeb92859e6\0a67dd6e-b68c-4681-8609-002088686549\scenar
  Summary filename: C:\Users\pyung\AppData\Local\Civica\VH5\98ec473c-00e0-4b07-a2f4-
5ebeb92859e6\0a67dd6e-b68c-4681-8609-002088686549\scenar
```

DATE: 03-03-2026 TIME: 01:44:05

USER:

COMMENTS: _____

** SIMULATION : SCS_06hr_050yr **

READ STORM | Filename: C:\Users\pyung\AppData\Local\Temp\9708c7a4-1a89-478a-a0fe-e415ca74d84b\86be049a
Ptotal= 99.27 mm | Comments: SCS_06hr_050yr-CC

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	9.93	3.50	21.84	5.25	3.97
0.25	3.97	2.00	9.93	3.75	9.93	5.50	3.97
0.50	3.97	2.25	11.91	4.00	9.93	5.75	3.97
0.75	5.96	2.50	11.91	4.25	7.94	6.00	3.97
1.00	5.96	2.75	59.56	4.50	7.94		
1.25	5.96	3.00	154.85	4.75	5.96		
1.50	5.96	3.25	21.84	5.00	5.96		

CALIB STANDHYD (0201) ID= 1 DT= 5.0 min | Area (ha)= 21.49 Total Imp(%)= 75.00 Dir. Conn.(%)= 70.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	16.12	5.37
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	378.51	30.00
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	5.96	3.250	154.85	4.83	5.96
0.167	0.00	1.750	5.96	3.333	21.84	4.92	5.96
0.250	0.00	1.833	9.93	3.417	21.84	5.00	5.96
0.333	3.97	1.917	9.93	3.500	21.84	5.08	5.96
0.417	3.97	2.000	9.93	3.583	21.84	5.17	5.96
0.500	3.97	2.083	9.93	3.667	21.84	5.25	5.96
0.583	3.97	2.167	9.93	3.750	21.84	5.33	3.97
0.667	3.97	2.250	9.93	3.833	9.93	5.42	3.97
0.750	3.97	2.333	11.91	3.917	9.93	5.50	3.97
0.833	5.96	2.417	11.91	4.000	9.93	5.58	3.97
0.917	5.96	2.500	11.91	4.083	9.93	5.67	3.97
1.000	5.96	2.583	11.91	4.167	9.93	5.75	3.97
1.083	5.96	2.667	11.91	4.250	9.93	5.83	3.97
1.167	5.96	2.750	11.91	4.333	7.94	5.92	3.97
1.250	5.96	2.833	59.56	4.417	7.94	6.00	3.97
1.333	5.96	2.917	59.56	4.500	7.94	6.08	3.97
1.417	5.96	3.000	59.56	4.583	7.94	6.17	3.97
1.500	5.96	3.083	154.85	4.667	7.94	6.25	3.97
1.583	5.96	3.167	154.85	4.750	7.94		

Max.Eff.Inten.(mm/hr)=	154.85	78.81		
over (min)	5.00	10.00		
Storage Coeff. (min)=	4.77 (ii)	8.07 (ii)		
Unit Hyd. Tpeak (min)=	5.00	10.00		
Unit Hyd. peak (cms)=	0.22	0.13		
			TOTALS	
PEAK FLOW (cms)=	6.30	0.87	7.166 (iii)	
TIME TO PEAK (hrs)=	3.25	3.25	3.25	
RUNOFF VOLUME (mm)=	98.27	33.71	78.90	
TOTAL RAINFALL (mm)=	99.27	99.27	99.27	
RUNOFF COEFFICIENT =	0.99	0.34	0.79	

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 55.0 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.

CALIB STANDHYD (0202) ID= 1 DT= 5.0 min | Area (ha)= 13.27 Total Imp(%)= 60.00 Dir. Conn.(%)= 45.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	7.96	5.31
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	297.43	30.00
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	5.96	3.250	154.85	4.83	5.96
0.167	0.00	1.750	5.96	3.333	21.84	4.92	5.96
0.250	0.00	1.833	9.93	3.417	21.84	5.00	5.96
0.333	3.97	1.917	9.93	3.500	21.84	5.08	5.96
0.417	3.97	2.000	9.93	3.583	21.84	5.17	5.96
0.500	3.97	2.083	9.93	3.667	21.84	5.25	5.96
0.583	3.97	2.167	9.93	3.750	21.84	5.33	3.97
0.667	3.97	2.250	9.93	3.833	9.93	5.42	3.97
0.750	3.97	2.333	11.91	3.917	9.93	5.50	3.97
0.833	5.96	2.417	11.91	4.000	9.93	5.58	3.97
0.917	5.96	2.500	11.91	4.083	9.93	5.67	3.97
1.000	5.96	2.583	11.91	4.167	9.93	5.75	3.97
1.083	5.96	2.667	11.91	4.250	9.93	5.83	3.97
1.167	5.96	2.750	11.91	4.333	7.94	5.92	3.97
1.250	5.96	2.833	59.56	4.417	7.94	6.00	3.97
1.333	5.96	2.917	59.56	4.500	7.94	6.08	3.97
1.417	5.96	3.000	59.56	4.583	7.94	6.17	3.97
1.500	5.96	3.083	154.85	4.667	7.94	6.25	3.97
1.583	5.96	3.167	154.85	4.750	7.94		

Max.Eff.Inten.(mm/hr)=	154.85	99.04		
over (min)	5.00	10.00		
Storage Coeff. (min)=	4.12 (ii)	8.88 (ii)		
Unit Hyd. Tpeak (min)=	5.00	10.00		
Unit Hyd. peak (cms)=	0.24	0.12		
			TOTALS	
PEAK FLOW (cms)=	2.53	1.05	3.576 (iii)	
TIME TO PEAK (hrs)=	3.25	3.25	3.25	
RUNOFF VOLUME (mm)=	98.27	37.06	64.61	

```
     TOTAL RAINFALL   (mm)=      99.27        99.27          99.27
     RUNOFF COEFFICIENT   =       0.99         0.37           0.65

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  55.0     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.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0301)|   Area    (ha)=   1.65
|ID= 1 DT= 5.0 min |   Total Imp(%)=  62.00   Dir. Conn.(%)=  40.00
--------------------

                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.02         0.63
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     104.88        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    5.96 | 3.250  154.85 | 4.83    5.96
              0.167    0.00 | 1.750    5.96 | 3.333   21.84 | 4.92    5.96
              0.250    0.00 | 1.833    9.93 | 3.417   21.84 | 5.00    5.96
              0.333    3.97 | 1.917    9.93 | 3.500   21.84 | 5.08    5.96
              0.417    3.97 | 2.000    9.93 | 3.583   21.84 | 5.17    5.96
              0.500    3.97 | 2.083    9.93 | 3.667   21.84 | 5.25    5.96
              0.583    3.97 | 2.167    9.93 | 3.750   21.84 | 5.33    3.97
              0.667    3.97 | 2.250    9.93 | 3.833    9.93 | 5.42    3.97
              0.750    3.97 | 2.333   11.91 | 3.917    9.93 | 5.50    3.97
              0.833    5.96 | 2.417   11.91 | 4.000    9.93 | 5.58    3.97
              0.917    5.96 | 2.500   11.91 | 4.083    9.93 | 5.67    3.97
              1.000    5.96 | 2.583   11.91 | 4.167    9.93 | 5.75    3.97
              1.083    5.96 | 2.667   11.91 | 4.250    9.93 | 5.83    3.97
              1.167    5.96 | 2.750   11.91 | 4.333    7.94 | 5.92    3.97
              1.250    5.96 | 2.833   59.56 | 4.417    7.94 | 6.00    3.97
              1.333    5.96 | 2.917   59.56 | 4.500    7.94 | 6.08    3.97
              1.417    5.96 | 3.000   59.56 | 4.583    7.94 | 6.17    3.97
              1.500    5.96 | 3.083  154.85 | 4.667    7.94 | 6.25    3.97
              1.583    5.96 | 3.167  154.85 | 4.750    7.94 |

     Max.Eff.Inten.(mm/hr)=     154.85       118.39
               over (min)          5.00         5.00
     Storage Coeff.  (min)=       1.79 (ii)    2.97 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.32         0.28
                                                    *TOTALS*
     PEAK FLOW       (cms)=       0.28         0.21          0.497 (iii)
     TIME TO PEAK    (hrs)=       3.25         3.25           3.25
     RUNOFF VOLUME    (mm)=      97.27        38.68          62.12
     TOTAL RAINFALL   (mm)=      99.27        99.27          99.27
     RUNOFF COEFFICIENT   =       0.98         0.39           0.63

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  53.0     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.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0302)|   Area    (ha)=   0.13
|ID= 1 DT= 5.0 min |   Total Imp(%)=  74.00   Dir. Conn.(%)=  15.00
--------------------

                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.10         0.03
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      25.00        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    5.96 | 3.250  154.85 | 4.83    5.96
              0.167    0.00 | 1.750    5.96 | 3.333   21.84 | 4.92    5.96
              0.250    0.00 | 1.833    9.93 | 3.417   21.84 | 5.00    5.96
              0.333    3.97 | 1.917    9.93 | 3.500   21.84 | 5.08    5.96
              0.417    3.97 | 2.000    9.93 | 3.583   21.84 | 5.17    5.96
              0.500    3.97 | 2.083    9.93 | 3.667   21.84 | 5.25    5.96
              0.583    3.97 | 2.167    9.93 | 3.750   21.84 | 5.33    3.97
              0.667    3.97 | 2.250    9.93 | 3.833    9.93 | 5.42    3.97
              0.750    3.97 | 2.333   11.91 | 3.917    9.93 | 5.50    3.97
              0.833    5.96 | 2.417   11.91 | 4.000    9.93 | 5.58    3.97
              0.917    5.96 | 2.500   11.91 | 4.083    9.93 | 5.67    3.97
              1.000    5.96 | 2.583   11.91 | 4.167    9.93 | 5.75    3.97
              1.083    5.96 | 2.667   11.91 | 4.250    9.93 | 5.83    3.97
              1.167    5.96 | 2.750   11.91 | 4.333    7.94 | 5.92    3.97
              1.250    5.96 | 2.833   59.56 | 4.417    7.94 | 6.00    3.97
              1.333    5.96 | 2.917   59.56 | 4.500    7.94 | 6.08    3.97
              1.417    5.96 | 3.000   59.56 | 4.583    7.94 | 6.17    3.97
              1.500    5.96 | 3.083  154.85 | 4.667    7.94 | 6.25    3.97
              1.583    5.96 | 3.167  154.85 | 4.750    7.94 |

     Max.Eff.Inten.(mm/hr)=     154.85       355.53
               over (min)          5.00         5.00
     Storage Coeff.  (min)=       0.76 (ii)    2.26 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.30
                                                    *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.03          0.043 (iii)
     TIME TO PEAK    (hrs)=       3.25         3.25           3.25
     RUNOFF VOLUME    (mm)=      97.27        57.33          63.32
     TOTAL RAINFALL   (mm)=      99.27        99.27          99.27
     RUNOFF COEFFICIENT   =       0.98         0.58           0.64

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  53.0     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  (  0013)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK      R.V.
--------------------          (ha)    (cms)    (hrs)       (mm)
       ID1= 1 (  0301):      1.65    0.497     3.25     62.12
     + ID2= 2 (  0302):      0.13    0.043     3.25     63.32
       ================================================
```

```
       ID = 3 (  0013):     1.78   0.540     3.25    62.21

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
------------------
| DUHYD    (  0009)|
| Inlet Cap.= 0.236|
| #of Inlets=    1|
| Total(cms)=   0.2|      AREA     QPEAK     TPEAK     R.V.
------------------       (ha)     (cms)     (hrs)     (mm)
    TOTAL HYD.(ID= 1):   1.78      0.54      3.25    62.21
    ========================================================
    MAJOR SYS.(ID= 2):   0.38      0.30      3.25    62.21
    MINOR SYS.(ID= 3):   1.40      0.24      3.08    62.21

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

  -------------------------
  | Junction Command(0020) |
  -------------------------

                         AREA     QPEAK    TPEAK     R.V.
                         (ha)     (cms)    (hrs)     (mm)
  INFLOW : ID= 9(  0009)    1.40     0.24     3.08    62.21
  OUTFLOW: ID= 2(  0020)    1.40     0.24     3.08    62.21

  --------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0203)|   Area    (ha)=   2.88
|ID= 1 DT= 5.0 min |   Total Imp(%)=  80.00   Dir. Conn.(%)=  65.00
--------------------
                        IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=      2.30          0.58
    Dep. Storage     (mm)=      1.00          5.00
    Average Slope     (%)=      1.00          2.00
    Length            (m)=    138.56         30.00
    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    5.96 | 3.250  154.85 | 4.833    5.96
   0.167    0.00 | 1.750    5.96 | 3.333   21.84 | 4.92     5.96
   0.250    0.00 | 1.833    9.93 | 3.417   21.84 | 5.00     5.96
   0.333    3.97 | 1.917    9.93 | 3.500   21.84 | 5.08     5.96
   0.417    3.97 | 2.000    9.93 | 3.583   21.84 | 5.17     5.96
   0.500    3.97 | 2.083    9.93 | 3.667   21.84 | 5.25     5.96
   0.583    3.97 | 2.167    9.93 | 3.750   21.84 | 5.33     3.97
   0.667    3.97 | 2.250    9.93 | 3.833    9.93 | 5.42     3.97
   0.750    3.97 | 2.333   11.91 | 3.917    9.93 | 5.50     3.97
   0.833    5.96 | 2.417   11.91 | 4.000    9.93 | 5.58     3.97
   0.917    5.96 | 2.500   11.91 | 4.083    9.93 | 5.67     3.97
   1.000    5.96 | 2.583   11.91 | 4.167    9.93 | 5.75     3.97
   1.083    5.96 | 2.667   11.91 | 4.250    9.93 | 5.83     3.97
   1.167    5.96 | 2.750   11.91 | 4.333    7.94 | 5.92     3.97
   1.250    5.96 | 2.833   59.56 | 4.417    7.94 | 6.00     3.97
   1.333    5.96 | 2.917   59.56 | 4.500    7.94 | 6.08     3.97
   1.417    5.96 | 3.000   59.56 | 4.583    7.94 | 6.17     3.97
   1.500    5.96 | 3.083  154.85 | 4.667    7.94 | 6.25     3.97
   1.583    5.96 | 3.167  154.85 | 4.750    7.94 |

    Max.Eff.Inten.(mm/hr)=     154.85       146.18
              over (min)          5.00        10.00
    Storage Coeff.  (min)=      2.61 (ii)    5.72 (ii)
    Unit Hyd. Tpeak (min)=      5.00        10.00
    Unit Hyd. peak  (cms)=      0.29         0.15
                                                      *TOTALS*
    PEAK FLOW       (cms)=      0.80         0.20        1.000 (iii)
    TIME TO PEAK    (hrs)=      3.25         3.25         3.25
    RUNOFF VOLUME    (mm)=     98.27        43.20        79.00
    TOTAL RAINFALL   (mm)=     99.27        99.27        99.27
    RUNOFF COEFFICIENT   =      0.99         0.44         0.80

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

      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  55.0    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.

--------------------------------------------------------------------------------
------------------
| DUHYD    (  0028)|
| Inlet Cap.= 0.569|
| #of Inlets=    1|
| Total(cms)=   0.6|      AREA     QPEAK     TPEAK     R.V.
------------------       (ha)     (cms)     (hrs)     (mm)
    TOTAL HYD.(ID= 1):   2.88      1.00      3.25    79.00
    ========================================================
    MAJOR SYS.(ID= 2):   0.40      0.43      3.25    79.00
    MINOR SYS.(ID= 3):   2.48      0.57      3.08    79.00

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

  -------------------------
  | Junction Command(0029) |
  -------------------------

                         AREA     QPEAK    TPEAK     R.V.
                         (ha)     (cms)    (hrs)     (mm)
  INFLOW : ID= 9(  0028)    2.48     0.57     3.08    79.00
  OUTFLOW: ID= 2(  0029)    2.48     0.57     3.08    79.00

  --------------------------------------------------------------------------------
------------------
| ADD HYD  (  0003)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK      R.V.
------------------          (ha)    (cms)    (hrs)      (mm)
       ID1= 1 (  0020):     1.40    0.236     3.08     62.21
     + ID2= 2 (  0201):    21.49    7.166     3.25     78.90
       ================================================
       ID = 3 (  0003):    22.89    7.402     3.25     77.88

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

------------------
| ADD HYD  (  0003)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK      R.V.
------------------          (ha)    (cms)    (hrs)      (mm)
       ID1= 3 (  0003):    22.89    7.402     3.25     77.88
     + ID2= 2 (  0202):    13.27    3.576     3.25     64.61
       ================================================
       ID = 1 (  0003):    36.16   10.978     3.25     73.01

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

------------------
| ADD HYD  (  0003)|
```

```
|   1 +  2 =  3    |        AREA    QPEAK    TPEAK     R.V.
------------------          (ha)     (cms)    (hrs)      (mm)
       ID1= 1 (  0003):    36.16  10.978     3.25    73.01
     + ID2= 2 (  0029):     2.48   0.569     3.08    79.00
       ================================================
       ID = 3 (  0003):    38.65  11.547     3.25    73.39

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
------------------------------------------------------------------------------
------------------
| RESERVOIR(  0005)|     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    |    0.7834      0.8562
                         0.0075      0.0493    |    1.6951      1.3177
                         0.0195      0.1006    |    1.8899      1.4826
                         0.0265      0.1538    |    2.0662      1.6588
                         0.0320      0.2089    |    2.1489      1.7511
                         0.0409      0.3251    |    2.2285      1.8455
                         0.0481      0.4480    |    2.3053      1.9411
                         0.0529      0.5448    |    3.4358      2.0378
                         0.0544      0.5780    |    5.4391      2.1358
                         0.3140      0.7136    |    8.0099      2.2349

                             AREA     QPEAK     TPEAK       R.V.
                             (ha)     (cms)     (hrs)       (mm)
  INFLOW : ID= 2 (  0003)   38.645    11.547      3.25      73.39
  OUTFLOW: ID= 1 (  0005)   38.645     2.140      3.67      73.35

                PEAK   FLOW   REDUCTION [Qout/Qin](%)= 18.54
                TIME SHIFT OF PEAK FLOW         (min)= 25.00
                MAXIMUM  STORAGE   USED       (ha.m.)=  1.7419
------------------------------------------------------------------------------

  --------------------------
  | Junction Command(0030) |
  --------------------------

                          AREA     QPEAK   TPEAK     R.V.
                          (ha)     (cms)    (hrs)     (mm)
  INFLOW : ID= 8(  0028)   0.40      0.43    3.25    79.00
  OUTFLOW: ID= 2(  0030)   0.40      0.43    3.25    79.00

  ----------------------------------------------------------------------------
------------------
| ADD HYD  (  0027)|
|   1 +  2 =  3    |        AREA    QPEAK    TPEAK     R.V.
------------------          (ha)     (cms)    (hrs)      (mm)
       ID1= 1 (  0030):     0.40   0.431     3.25    79.00
     + ID2= 2 (  0005):    38.65   2.140     3.67    73.35
       ================================================
       ID = 3 (  0027):    39.04   2.223     3.25    73.41

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
------------------------------------------------------------------------------
==============================================================================
===============

      V    V   I    SSSSS  U   U    A    L              (v 6.2.2019)
      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
        VV     I    SSSSS  UUUUU  A   A  LLLLL

       OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
      O   O    T      T    H   H   Y Y   MM MM  O   O
      O   O    T      T    H   H    Y    M   M  O   O
```

```
       OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2022 Smart City Water Inc
All rights reserved.


                  *****  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\pyung\AppData\Local\Civica\VH5\98ec473c-00e0-4b07-a2f4-
5ebeb92859e6\2c519166-439f-47b1-9f7e-c057afcfaf0c\scenar
  Summary filename: C:\Users\pyung\AppData\Local\Civica\VH5\98ec473c-00e0-4b07-a2f4-
5ebeb92859e6\2c519166-439f-47b1-9f7e-c057afcfaf0c\scenar


DATE: 03-03-2026                          TIME: 01:44:05

USER:


COMMENTS: _____________________________________________________

-------------------------------------------------------------------------------------------------
---------------
  ************************************************
  ** SIMULATION : SCS_06hr_100yr                 **
  ************************************************


--------------------
|    READ STORM    |    Filename: C:\Users\pyung\AppD
|                  |              ata\Local\Temp\
|                  |              9708c7a4-1a89-478a-a0fe-e415ca74d84b\3571379c
| Ptotal=108.89 mm |    Comments: SCS_06hr_100yr-CC
--------------------
                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   10.89  |   3.50   23.96  |  5.25    4.36
                0.25    4.36  |  2.00   10.89  |   3.75   10.89  |  5.50    4.36
                0.50    4.36  |  2.25   13.07  |   4.00   10.89  |  5.75    4.36
                0.75    6.53  |  2.50   13.07  |   4.25    8.71  |  6.00    4.36
                1.00    6.53  |  2.75   65.33  |   4.50    8.71  |
                1.25    6.53  |  3.00  169.87  |   4.75    6.53  |
                1.50    6.53  |  3.25   23.96  |   5.00    6.53  |

-------------------------------------------------------------------------------

--------------------
| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=  21.49
|ID= 1 DT= 5.0 min |   Total Imp(%)=  75.00   Dir. Conn.(%)=  70.00
--------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        16.12          5.37
     Dep. Storage     (mm)=         1.00          5.00
     Average Slope     (%)=         1.00          2.00
     Length            (m)=       378.51         30.00
     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    6.53  | 3.250  169.87  |  4.83    6.53
                0.167   0.00  | 1.750    6.53  | 3.333   23.96  |  4.92    6.53
```

0.250	0.00	1.833	10.89	3.417	23.96	5.00	6.53
0.333	4.36	1.917	10.89	3.500	23.96	5.08	6.53
0.417	4.36	2.000	10.89	3.583	23.96	5.17	6.53
0.500	4.36	2.083	10.89	3.667	23.96	5.25	6.53
0.583	4.36	2.167	10.89	3.750	23.96	5.33	4.36
0.667	4.36	2.250	10.89	3.833	10.89	5.42	4.36
0.750	4.36	2.333	13.07	3.917	10.89	5.50	4.36
0.833	6.53	2.417	13.07	4.000	10.89	5.58	4.36
0.917	6.53	2.500	13.07	4.083	10.89	5.67	4.36
1.000	6.53	2.583	13.07	4.167	10.89	5.75	4.36
1.083	6.53	2.667	13.07	4.250	10.89	5.83	4.36
1.167	6.53	2.750	13.07	4.333	8.71	5.92	4.36
1.250	6.53	2.833	65.33	4.417	8.71	6.00	4.36
1.333	6.53	2.917	65.33	4.500	8.71	6.08	4.36
1.417	6.53	3.000	65.33	4.583	8.71	6.17	4.36
1.500	6.53	3.083	169.87	4.667	8.71	6.25	4.36
1.583	6.53	3.167	169.87	4.750	8.71		

Max.Eff.Inten.(mm/hr)=		169.87	92.12	
over (min)		5.00	10.00	
Storage Coeff. (min)=		4.59 (ii)	7.78 (ii)	
Unit Hyd. Tpeak (min)=		5.00	10.00	
Unit Hyd. peak (cms)=		0.23	0.13	
				TOTALS
PEAK FLOW	(cms)=	6.93	1.04	7.964 (iii)
TIME TO PEAK	(hrs)=	3.25	3.25	3.25
RUNOFF VOLUME	(mm)=	107.89	39.47	87.37
TOTAL RAINFALL	(mm)=	108.90	108.90	108.90
RUNOFF COEFFICIENT	=	0.99	0.36	0.80

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 55.0 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.

CALIB
STANDHYD (0202)
ID= 1 DT= 5.0 min

Area (ha)= 13.27
Total Imp(%)= 60.00 Dir. Conn.(%)= 45.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	7.96	5.31
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	297.43	30.00
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	6.53	3.250	169.87	4.83	6.53
0.167	0.00	1.750	6.53	3.333	23.96	4.92	6.53
0.250	0.00	1.833	10.89	3.417	23.96	5.00	6.53
0.333	4.36	1.917	10.89	3.500	23.96	5.08	6.53
0.417	4.36	2.000	10.89	3.583	23.96	5.17	6.53
0.500	4.36	2.083	10.89	3.667	23.96	5.25	6.53
0.583	4.36	2.167	10.89	3.750	23.96	5.33	4.36
0.667	4.36	2.250	10.89	3.833	10.89	5.42	4.36
0.750	4.36	2.333	13.07	3.917	10.89	5.50	4.36
0.833	6.53	2.417	13.07	4.000	10.89	5.58	4.36
0.917	6.53	2.500	13.07	4.083	10.89	5.67	4.36
1.000	6.53	2.583	13.07	4.167	10.89	5.75	4.36
1.083	6.53	2.667	13.07	4.250	10.89	5.83	4.36
1.167	6.53	2.750	13.07	4.333	8.71	5.92	4.36
1.250	6.53	2.833	65.33	4.417	8.71	6.00	4.36
1.333	6.53	2.917	65.33	4.500	8.71	6.08	4.36
1.417	6.53	3.000	65.33	4.583	8.71	6.17	4.36
1.500	6.53	3.083	169.87	4.667	8.71	6.25	4.36
1.583	6.53	3.167	169.87	4.750	8.71		

Max.Eff.Inten.(mm/hr)=		169.87	115.27	
over (min)		5.00	10.00	
Storage Coeff. (min)=		3.97 (ii)	8.56 (ii)	
Unit Hyd. Tpeak (min)=		5.00	10.00	
Unit Hyd. peak (cms)=		0.24	0.12	
				TOTALS
PEAK FLOW	(cms)=	2.78	1.25	4.023 (iii)
TIME TO PEAK	(hrs)=	3.25	3.25	3.25
RUNOFF VOLUME	(mm)=	107.90	43.21	72.32
TOTAL RAINFALL	(mm)=	108.90	108.90	108.90
RUNOFF COEFFICIENT	=	0.99	0.40	0.66

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 55.0 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.

CALIB
STANDHYD (0301)
ID= 1 DT= 5.0 min

Area (ha)= 1.65
Total Imp(%)= 62.00 Dir. Conn.(%)= 40.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.02	0.63
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	2.00	2.00
Length	(m)=	104.88	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	6.53	3.250	169.87	4.83	6.53
0.167	0.00	1.750	6.53	3.333	23.96	4.92	6.53
0.250	0.00	1.833	10.89	3.417	23.96	5.00	6.53
0.333	4.36	1.917	10.89	3.500	23.96	5.08	6.53
0.417	4.36	2.000	10.89	3.583	23.96	5.17	6.53
0.500	4.36	2.083	10.89	3.667	23.96	5.25	6.53
0.583	4.36	2.167	10.89	3.750	23.96	5.33	4.36
0.667	4.36	2.250	10.89	3.833	10.89	5.42	4.36
0.750	4.36	2.333	13.07	3.917	10.89	5.50	4.36
0.833	6.53	2.417	13.07	4.000	10.89	5.58	4.36
0.917	6.53	2.500	13.07	4.083	10.89	5.67	4.36
1.000	6.53	2.583	13.07	4.167	10.89	5.75	4.36
1.083	6.53	2.667	13.07	4.250	10.89	5.83	4.36
1.167	6.53	2.750	13.07	4.333	8.71	5.92	4.36
1.250	6.53	2.833	65.33	4.417	8.71	6.00	4.36
1.333	6.53	2.917	65.33	4.500	8.71	6.08	4.36
1.417	6.53	3.000	65.33	4.583	8.71	6.17	4.36
1.500	6.53	3.083	169.87	4.667	8.71	6.25	4.36
1.583	6.53	3.167	169.87	4.750	8.71		

Max.Eff.Inten.(mm/hr)=		169.87	137.48
over (min)		5.00	5.00
Storage Coeff. (min)=		1.73 (ii)	2.86 (ii)
Unit Hyd. Tpeak (min)=		5.00	5.00

```
     Unit Hyd. peak  (cms)=       0.32         0.28
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.31         0.25          0.559 (iii)
     TIME TO PEAK    (hrs)=       3.25         3.25           3.25
     RUNOFF VOLUME    (mm)=     106.90        45.00          69.76
     TOTAL RAINFALL   (mm)=     108.90       108.90         108.90
     RUNOFF COEFFICIENT   =       0.98         0.41           0.64

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  53.0    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.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0302)|   Area    (ha)=   0.13
|ID= 1 DT= 5.0 min |   Total Imp(%)=  74.00   Dir. Conn.(%)=  15.00
--------------------

                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.10         0.03
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      25.00        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    6.53 | 3.250  169.87 | 4.83    6.53
               0.167    0.00 | 1.750    6.53 | 3.333   23.96 | 4.92    6.53
               0.250    0.00 | 1.833   10.89 | 3.417   23.96 | 5.00    6.53
               0.333    4.36 | 1.917   10.89 | 3.500   23.96 | 5.08    6.53
               0.417    4.36 | 2.000   10.89 | 3.583   23.96 | 5.17    6.53
               0.500    4.36 | 2.083   10.89 | 3.667   23.96 | 5.25    6.53
               0.583    4.36 | 2.167   10.89 | 3.750   23.96 | 5.33    4.36
               0.667    4.36 | 2.250   10.89 | 3.833   10.89 | 5.42    4.36
               0.750    4.36 | 2.333   13.07 | 3.917   10.89 | 5.50    4.36
               0.833    6.53 | 2.417   13.07 | 4.000   10.89 | 5.58    4.36
               0.917    6.53 | 2.500   13.07 | 4.083   10.89 | 5.67    4.36
               1.000    6.53 | 2.583   13.07 | 4.167   10.89 | 5.75    4.36
               1.083    6.53 | 2.667   13.07 | 4.250   10.89 | 5.83    4.36
               1.167    6.53 | 2.750   13.07 | 4.333    8.71 | 5.92    4.36
               1.250    6.53 | 2.833   65.33 | 4.417    8.71 | 6.00    4.36
               1.333    6.53 | 2.917   65.33 | 4.500    8.71 | 6.08    4.36
               1.417    6.53 | 3.000   65.33 | 4.583    8.71 | 6.17    4.36
               1.500    6.53 | 3.083  169.87 | 4.667    8.71 | 6.25    4.36
               1.583    6.53 | 3.167  169.87 | 4.750    8.71 |

     Max.Eff.Inten.(mm/hr)=     169.87       403.92
               over (min)          5.00         5.00
     Storage Coeff.  (min)=       0.73 (ii)    2.17 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.31
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.04          0.048 (iii)
     TIME TO PEAK    (hrs)=       3.25         3.25           3.25
     RUNOFF VOLUME    (mm)=     106.89        65.40          71.62
     TOTAL RAINFALL   (mm)=     108.90       108.90         108.90
     RUNOFF COEFFICIENT   =       0.98         0.60           0.66

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.
```

```
       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  53.0    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  (  0013)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0301):     1.65   0.559     3.25    69.76
     + ID2= 2 (  0302):     0.13   0.048     3.25    71.62
       ================================================
       ID = 3 (  0013):     1.78   0.608     3.25    69.90

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| DUHYD    (  0009)|
| Inlet Cap.= 0.236|
| #of Inlets=     1|
| Total(cms)=   0.2|      AREA     QPEAK     TPEAK     R.V.
--------------------      (ha)     (cms)     (hrs)     (mm)
     TOTAL HYD.(ID= 1):   1.78      0.61      3.25    69.90
     ================================================
     MAJOR SYS.(ID= 2):   0.42      0.37      3.25    69.90
     MINOR SYS.(ID= 3):   1.36      0.24      3.08    69.90

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

  --------------------------
  | Junction Command(0020) |
  --------------------------

                           AREA     QPEAK    TPEAK     R.V.
                           (ha)     (cms)    (hrs)     (mm)
  INFLOW : ID= 9(  0009)    1.36      0.24     3.08    69.90
  OUTFLOW: ID= 2(  0020)    1.36      0.24     3.08    69.90

  --------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0203)|   Area    (ha)=   2.88
|ID= 1 DT= 5.0 min |   Total Imp(%)=  80.00   Dir. Conn.(%)=  65.00
--------------------

                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.30         0.58
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     138.56        30.00
     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    6.53 | 3.250  169.87 | 4.83    6.53
               0.167    0.00 | 1.750    6.53 | 3.333   23.96 | 4.92    6.53
               0.250    0.00 | 1.833   10.89 | 3.417   23.96 | 5.00    6.53
               0.333    4.36 | 1.917   10.89 | 3.500   23.96 | 5.08    6.53
               0.417    4.36 | 2.000   10.89 | 3.583   23.96 | 5.17    6.53
               0.500    4.36 | 2.083   10.89 | 3.667   23.96 | 5.25    6.53
               0.583    4.36 | 2.167   10.89 | 3.750   23.96 | 5.33    4.36
```

```
                0.667    4.36 | 2.250   10.89 | 3.833   10.89 |  5.42    4.36
                0.750    4.36 | 2.333   13.07 | 3.917   10.89 |  5.50    4.36
                0.833    6.53 | 2.417   13.07 | 4.000   10.89 |  5.58    4.36
                0.917    6.53 | 2.500   13.07 | 4.083   10.89 |  5.67    4.36
                1.000    6.53 | 2.583   13.07 | 4.167   10.89 |  5.75    4.36
                1.083    6.53 | 2.667   13.07 | 4.250   10.89 |  5.83    4.36
                1.167    6.53 | 2.750   13.07 | 4.333    8.71 |  5.92    4.36
                1.250    6.53 | 2.833   65.33 | 4.417    8.71 |  6.00    4.36
                1.333    6.53 | 2.917   65.33 | 4.500    8.71 |  6.08    4.36
                1.417    6.53 | 3.000   65.33 | 4.583    8.71 |  6.17    4.36
                1.500    6.53 | 3.083  169.87 | 4.667    8.71 |  6.25    4.36
                1.583    6.53 | 3.167  169.87 | 4.750    8.71 |

     Max.Eff.Inten.(mm/hr)=     169.87       168.85
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       2.51 (ii)    5.51 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.29         0.16
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.88         0.23          1.112 (iii)
     TIME TO PEAK    (hrs)=       3.25         3.25           3.25
     RUNOFF VOLUME    (mm)=     107.90        50.02          87.64
     TOTAL RAINFALL   (mm)=     108.90       108.90         108.90
     RUNOFF COEFFICIENT   =       0.99         0.46           0.80

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  55.0     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.

--------------------------------------------------------------------------------
--------------------
| DUHYD    (  0028)|
| Inlet Cap.= 0.569|
| #of Inlets=     1|
| Total(cms)=   0.6|      AREA     QPEAK     TPEAK     R.V.
-------------------      (ha)      (cms)     (hrs)     (mm)
     TOTAL HYD.(ID= 1):   2.88      1.11      3.25    87.64
     ==========================================================
     MAJOR SYS.(ID= 2):   0.46      0.54      3.25    87.64
     MINOR SYS.(ID= 3):   2.42      0.57      3.08    87.64

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

  --------------------------
  | Junction Command(0029) |
  --------------------------

                           AREA     QPEAK    TPEAK     R.V.
                           (ha)     (cms)    (hrs)     (mm)
  INFLOW : ID= 9(  0028)    2.42      0.57     3.08    87.64
  OUTFLOW: ID= 2(  0029)    2.42      0.57     3.08    87.64

  --------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0003)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
-------------------           (ha)     (cms)    (hrs)     (mm)
       ID1= 1 (  0020):      1.36    0.236     3.08    69.90
     + ID2= 2 (  0201):     21.49    7.964     3.25    87.37
       ==========================================================
       ID = 3 (  0003):     22.85    8.200     3.25    86.32

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------


--------------------
| ADD HYD  (  0003)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
-------------------           (ha)     (cms)    (hrs)     (mm)
       ID1= 3 (  0003):     22.85    8.200     3.25    86.32
     + ID2= 2 (  0202):     13.27    4.023     3.25    72.32
       ==========================================================
       ID = 1 (  0003):     36.12   12.223     3.25    81.18

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0003)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
-------------------           (ha)     (cms)    (hrs)     (mm)
       ID1= 1 (  0003):     36.12   12.223     3.25    81.18
     + ID2= 2 (  0029):      2.42    0.569     3.08    87.64
       ==========================================================
       ID = 3 (  0003):     38.54   12.792     3.25    81.58

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0005)|     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    |    0.7834      0.8562
                         0.0075      0.0493    |    1.6951      1.3177
                         0.0195      0.1006    |    1.8899      1.4826
                         0.0265      0.1538    |    2.0662      1.6588
                         0.0320      0.2089    |    2.1489      1.7511
                         0.0409      0.3251    |    2.2285      1.8455
                         0.0481      0.4480    |    2.3053      1.9411
                         0.0529      0.5448    |    3.4358      2.0378
                         0.0544      0.5780    |    5.4391      2.1358
                         0.3140      0.7136    |    8.0099      2.2349

                             AREA     QPEAK     TPEAK       R.V.
                             (ha)     (cms)     (hrs)       (mm)
  INFLOW : ID= 2 (  0003)    38.539    12.792     3.25      81.58
  OUTFLOW: ID= 1 (  0005)    38.539     2.297     3.75      81.54

               PEAK   FLOW   REDUCTION [Qout/Qin](%)= 17.96
               TIME SHIFT OF PEAK FLOW          (min)= 30.00
               MAXIMUM  STORAGE   USED       (ha.m.)=  1.9309

--------------------------------------------------------------------------------

  --------------------------
  | Junction Command(0030) |
  --------------------------

                           AREA     QPEAK    TPEAK     R.V.
                           (ha)     (cms)    (hrs)     (mm)
  INFLOW : ID= 8(  0028)    0.46      0.54     3.25    87.64
  OUTFLOW: ID= 2(  0030)    0.46      0.54     3.25    87.64

  --------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0027)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
-------------------           (ha)     (cms)    (hrs)     (mm)
       ID1= 1 (  0030):      0.46    0.543     3.25    87.64
     + ID2= 2 (  0005):     38.54    2.297     3.75    81.54
       ==========================================================
```

```
       ID = 3 (  0027):    39.00   2.493     3.25    81.61

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
================================================================================
==============

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2019)
       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
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2022 Smart City Water Inc
All rights reserved.


                  *****  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\pyung\AppData\Local\Civica\VH5\98ec473c-00e0-4b07-a2f4-
5ebeb92859e6\83cf2ee9-b48a-40d6-b5bd-fcc4e5ac4f2d\scenar
  Summary filename: C:\Users\pyung\AppData\Local\Civica\VH5\98ec473c-00e0-4b07-a2f4-
5ebeb92859e6\83cf2ee9-b48a-40d6-b5bd-fcc4e5ac4f2d\scenar


DATE: 03-03-2026                          TIME: 01:44:05

USER:



COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
---------------
  ************************************************
  ** SIMULATION : TIMMINS                       **
  ************************************************


--------------------
|    READ STORM    |    Filename: C:\Users\pyung\AppD
|                  |              ata\Local\Temp\
|                  |              9708c7a4-1a89-478a-a0fe-e415ca74d84b\44e0b45d
| Ptotal=234.70 mm |    Comments: TIMMINS-CC
--------------------
                TIME     RAIN |  TIME     RAIN |'  TIME     RAIN |  TIME     RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.00    18.24 |  3.00    3.65 |   6.00   52.29 |  9.00   15.81
               0.25    18.24 |  3.25    3.65 |   6.25   52.29 |  9.25   15.81
               0.50    18.24 |  3.50    3.65 |   6.50   52.29 |  9.50   15.81
               0.75    18.24 |  3.75    3.65 |   6.75   52.29 |  9.75   15.81
               1.00    24.32 |  4.00    6.08 |   7.00   24.32 | 10.00   15.81
               1.25    24.32 |  4.25    6.08 |   7.25   24.32 | 10.25   15.81
               1.50    24.32 |  4.50    6.08 |   7.50   24.32 | 10.50   15.81
               1.75    24.32 |  4.75    6.08 |   7.75   24.32 | 10.75   15.81
               2.00    12.16 |  5.00   24.32 |   8.00   27.97 | 11.00    9.73
               2.25    12.16 |  5.25   24.32 |   8.25   27.97 | 11.25    9.73
               2.50    12.16 |  5.50   24.32 |   8.50   27.97 | 11.50    9.73
               2.75    12.16 |  5.75   24.32 |   8.75   27.97 | 11.75    9.73

--------------------------------------------------------------------------------

--------------------
| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=  21.49
|ID= 1 DT= 5.0 min |   Total Imp(%)=  75.00   Dir. Conn.(%)=  70.00
--------------------

                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       16.12          5.37
     Dep. Storage     (mm)=        1.00          5.00
     Average Slope     (%)=        1.00          2.00
     Length            (m)=      378.51         30.00
     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    18.24 | 3.083    3.65 |  6.083   52.29 |  9.08   15.81
             0.167    18.24 | 3.167    3.65 |  6.167   52.29 |  9.17   15.81
             0.250    18.24 | 3.250    3.65 |  6.250   52.29 |  9.25   15.81
             0.333    18.24 | 3.333    3.65 |  6.333   52.29 |  9.33   15.81
             0.417    18.24 | 3.417    3.65 |  6.417   52.29 |  9.42   15.81
             0.500    18.24 | 3.500    3.65 |  6.500   52.29 |  9.50   15.81
             0.583    18.24 | 3.583    3.65 |  6.583   52.29 |  9.58   15.81
             0.667    18.24 | 3.667    3.65 |  6.667   52.29 |  9.67   15.81
             0.750    18.24 | 3.750    3.65 |  6.750   52.29 |  9.75   15.81
             0.833    18.24 | 3.833    3.65 |  6.833   52.29 |  9.83   15.81
             0.917    18.24 | 3.917    3.65 |  6.917   52.29 |  9.92   15.81
             1.000    18.24 | 4.000    3.65 |  7.000   52.29 | 10.00   15.81
             1.083    24.32 | 4.083    6.08 |  7.083   24.32 | 10.08   15.81
             1.167    24.32 | 4.167    6.08 |  7.167   24.32 | 10.17   15.81
             1.250    24.32 | 4.250    6.08 |  7.250   24.32 | 10.25   15.81
             1.333    24.32 | 4.333    6.08 |  7.333   24.32 | 10.33   15.81
             1.417    24.32 | 4.417    6.08 |  7.417   24.32 | 10.42   15.81
             1.500    24.32 | 4.500    6.08 |  7.500   24.32 | 10.50   15.81
             1.583    24.32 | 4.583    6.08 |  7.583   24.32 | 10.58   15.81
             1.667    24.32 | 4.667    6.08 |  7.667   24.32 | 10.67   15.81
             1.750    24.32 | 4.750    6.08 |  7.750   24.32 | 10.75   15.81
             1.833    24.32 | 4.833    6.08 |  7.833   24.32 | 10.83   15.81
             1.917    24.32 | 4.917    6.08 |  7.917   24.32 | 10.92   15.81
             2.000    24.32 | 5.000    6.08 |  8.000   24.32 | 11.00   15.81
             2.083    12.16 | 5.083   24.32 |  8.083   27.97 | 11.08    9.73
             2.167    12.16 | 5.167   24.32 |  8.167   27.97 | 11.17    9.73
             2.250    12.16 | 5.250   24.32 |  8.250   27.97 | 11.25    9.73
             2.333    12.16 | 5.333   24.32 |  8.333   27.97 | 11.33    9.73
             2.417    12.16 | 5.417   24.32 |  8.417   27.97 | 11.42    9.73
             2.500    12.16 | 5.500   24.32 |  8.500   27.97 | 11.50    9.73
             2.583    12.16 | 5.583   24.32 |  8.583   27.97 | 11.58    9.73
             2.667    12.16 | 5.667   24.32 |  8.667   27.97 | 11.67    9.73
             2.750    12.16 | 5.750   24.32 |  8.750   27.97 | 11.75    9.73
             2.833    12.16 | 5.833   24.32 |  8.833   27.97 | 11.83    9.73
             2.917    12.16 | 5.917   24.32 |  8.917   27.97 | 11.92    9.73
             3.000    12.16 | 6.000   24.32 |  9.000   27.97 | 12.00    9.73

     Max.Eff.Inten.(mm/hr)=      52.29         42.61
               over (min)        5.00         20.00
     Storage Coeff.  (min)=      7.36 (ii)    15.71 (ii)
     Unit Hyd. Tpeak (min)=      5.00         20.00
     Unit Hyd. peak  (cms)=      0.17          0.07
                                                      *TOTALS*
     PEAK FLOW       (cms)=      2.18          0.59      2.772 (iii)
     TIME TO PEAK    (hrs)=      7.00          7.00        7.00
     RUNOFF VOLUME    (mm)=    233.70        131.64      203.08
     TOTAL RAINFALL   (mm)=    234.70        234.70      234.70
     RUNOFF COEFFICIENT   =      1.00          0.56        0.87

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
```

```
        CN*  =  55.0    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.

--------------------------------------------------------------------------------
-------------------
| CALIB           |
| STANDHYD (  0202)|   Area    (ha)=  13.27
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=  45.00
-------------------
                          IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=      7.96         5.31
    Dep. Storage     (mm)=      1.00         5.00
    Average Slope     (%)=      1.00         2.00
    Length            (m)=    297.43        30.00
    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   18.24 | 3.083    3.65 | 6.083   52.29 | 9.08   15.81
     0.167   18.24 | 3.167    3.65 | 6.167   52.29 | 9.17   15.81
     0.250   18.24 | 3.250    3.65 | 6.250   52.29 | 9.25   15.81
     0.333   18.24 | 3.333    3.65 | 6.333   52.29 | 9.33   15.81
     0.417   18.24 | 3.417    3.65 | 6.417   52.29 | 9.42   15.81
     0.500   18.24 | 3.500    3.65 | 6.500   52.29 | 9.50   15.81
     0.583   18.24 | 3.583    3.65 | 6.583   52.29 | 9.58   15.81
     0.667   18.24 | 3.667    3.65 | 6.667   52.29 | 9.67   15.81
     0.750   18.24 | 3.750    3.65 | 6.750   52.29 | 9.75   15.81
     0.833   18.24 | 3.833    3.65 | 6.833   52.29 | 9.83   15.81
     0.917   18.24 | 3.917    3.65 | 6.917   52.29 | 9.92   15.81
     1.000   18.24 | 4.000    3.65 | 7.000   52.29 | 10.00  15.81
     1.083   24.32 | 4.083    6.08 | 7.083   24.32 | 10.08  15.81
     1.167   24.32 | 4.167    6.08 | 7.167   24.32 | 10.17  15.81
     1.250   24.32 | 4.250    6.08 | 7.250   24.32 | 10.25  15.81
     1.333   24.32 | 4.333    6.08 | 7.333   24.32 | 10.33  15.81
     1.417   24.32 | 4.417    6.08 | 7.417   24.32 | 10.42  15.81
     1.500   24.32 | 4.500    6.08 | 7.500   24.32 | 10.50  15.81
     1.583   24.32 | 4.583    6.08 | 7.583   24.32 | 10.58  15.81
     1.667   24.32 | 4.667    6.08 | 7.667   24.32 | 10.67  15.81
     1.750   24.32 | 4.750    6.08 | 7.750   24.32 | 10.75  15.81
     1.833   24.32 | 4.833    6.08 | 7.833   24.32 | 10.83  15.81
     1.917   24.32 | 4.917    6.08 | 7.917   24.32 | 10.92  15.81
     2.000   24.32 | 5.000    6.08 | 8.000   24.32 | 11.00  15.81
     2.083   12.16 | 5.083   24.32 | 8.083   27.97 | 11.08   9.73
     2.167   12.16 | 5.167   24.32 | 8.167   27.97 | 11.17   9.73
     2.250   12.16 | 5.250   24.32 | 8.250   27.97 | 11.25   9.73
     2.333   12.16 | 5.333   24.32 | 8.333   27.97 | 11.33   9.73
     2.417   12.16 | 5.417   24.32 | 8.417   27.97 | 11.42   9.73
     2.500   12.16 | 5.500   24.32 | 8.500   27.97 | 11.50   9.73
     2.583   12.16 | 5.583   24.32 | 8.583   27.97 | 11.58   9.73
     2.667   12.16 | 5.667   24.32 | 8.667   27.97 | 11.67   9.73
     2.750   12.16 | 5.750   24.32 | 8.750   27.97 | 11.75   9.73
     2.833   12.16 | 5.833   24.32 | 8.833   27.97 | 11.83   9.73
     2.917   12.16 | 5.917   24.32 | 8.917   27.97 | 11.92   9.73
     3.000   12.16 | 6.000   24.32 | 9.000   27.97 | 12.00   9.73

    Max.Eff.Inten.(mm/hr)=      52.29        51.56
              over (min)        5.00        15.00
    Storage Coeff.  (min)=      6.37 (ii)   14.11 (ii)
    Unit Hyd. Tpeak (min)=      5.00        15.00
    Unit Hyd. peak  (cms)=      0.18         0.08
                                                    *TOTALS*
    PEAK FLOW       (cms)=      0.87         0.72        1.589 (iii)
    TIME TO PEAK    (hrs)=      7.00         7.00         7.00
    RUNOFF VOLUME    (mm)=    233.70       139.69       181.99
    TOTAL RAINFALL   (mm)=    234.70       234.70       234.70
    RUNOFF COEFFICIENT   =      1.00         0.60         0.78

      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
          CN*  =  55.0    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.

--------------------------------------------------------------------------------
-------------------
| CALIB           |
| STANDHYD (  0301)|   Area    (ha)=   1.65
|ID= 1 DT= 5.0 min |   Total Imp(%)=  62.00   Dir. Conn.(%)=  40.00
-------------------
                          IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=      1.02         0.63
    Dep. Storage     (mm)=      2.00         5.00
    Average Slope     (%)=      2.00         2.00
    Length            (m)=    104.88        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   18.24 | 3.083    3.65 | 6.083   52.29 | 9.08   15.81
     0.167   18.24 | 3.167    3.65 | 6.167   52.29 | 9.17   15.81
     0.250   18.24 | 3.250    3.65 | 6.250   52.29 | 9.25   15.81
     0.333   18.24 | 3.333    3.65 | 6.333   52.29 | 9.33   15.81
     0.417   18.24 | 3.417    3.65 | 6.417   52.29 | 9.42   15.81
     0.500   18.24 | 3.500    3.65 | 6.500   52.29 | 9.50   15.81
     0.583   18.24 | 3.583    3.65 | 6.583   52.29 | 9.58   15.81
     0.667   18.24 | 3.667    3.65 | 6.667   52.29 | 9.67   15.81
     0.750   18.24 | 3.750    3.65 | 6.750   52.29 | 9.75   15.81
     0.833   18.24 | 3.833    3.65 | 6.833   52.29 | 9.83   15.81
     0.917   18.24 | 3.917    3.65 | 6.917   52.29 | 9.92   15.81
     1.000   18.24 | 4.000    3.65 | 7.000   52.29 | 10.00  15.81
     1.083   24.32 | 4.083    6.08 | 7.083   24.32 | 10.08  15.81
     1.167   24.32 | 4.167    6.08 | 7.167   24.32 | 10.17  15.81
     1.250   24.32 | 4.250    6.08 | 7.250   24.32 | 10.25  15.81
     1.333   24.32 | 4.333    6.08 | 7.333   24.32 | 10.33  15.81
     1.417   24.32 | 4.417    6.08 | 7.417   24.32 | 10.42  15.81
     1.500   24.32 | 4.500    6.08 | 7.500   24.32 | 10.50  15.81
     1.583   24.32 | 4.583    6.08 | 7.583   24.32 | 10.58  15.81
     1.667   24.32 | 4.667    6.08 | 7.667   24.32 | 10.67  15.81
     1.750   24.32 | 4.750    6.08 | 7.750   24.32 | 10.75  15.81
     1.833   24.32 | 4.833    6.08 | 7.833   24.32 | 10.83  15.81
     1.917   24.32 | 4.917    6.08 | 7.917   24.32 | 10.92  15.81
     2.000   24.32 | 5.000    6.08 | 8.000   24.32 | 11.00  15.81
     2.083   12.16 | 5.083   24.32 | 8.083   27.97 | 11.08   9.73
     2.167   12.16 | 5.167   24.32 | 8.167   27.97 | 11.17   9.73
     2.250   12.16 | 5.250   24.32 | 8.250   27.97 | 11.25   9.73
     2.333   12.16 | 5.333   24.32 | 8.333   27.97 | 11.33   9.73
     2.417   12.16 | 5.417   24.32 | 8.417   27.97 | 11.42   9.73
     2.500   12.16 | 5.500   24.32 | 8.500   27.97 | 11.50   9.73
     2.583   12.16 | 5.583   24.32 | 8.583   27.97 | 11.58   9.73
     2.667   12.16 | 5.667   24.32 | 8.667   27.97 | 11.67   9.73
     2.750   12.16 | 5.750   24.32 | 8.750   27.97 | 11.75   9.73
     2.833   12.16 | 5.833   24.32 | 8.833   27.97 | 11.83   9.73
     2.917   12.16 | 5.917   24.32 | 8.917   27.97 | 11.92   9.73
     3.000   12.16 | 6.000   24.32 | 9.000   27.97 | 12.00   9.73

    Max.Eff.Inten.(mm/hr)=      52.29        60.53
              over (min)        5.00         5.00
    Storage Coeff.  (min)=      2.77 (ii)    4.58 (ii)
    Unit Hyd. Tpeak (min)=      5.00         5.00
```

```
     Unit Hyd. peak  (cms)=       0.28         0.23
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.10         0.11          0.201 (iii)
     TIME TO PEAK    (hrs)=       6.75         7.00          7.00
     RUNOFF VOLUME    (mm)=     232.70       143.26        179.04
     TOTAL RAINFALL   (mm)=     234.70       234.70        234.70
     RUNOFF COEFFICIENT   =       0.99         0.61          0.76

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  53.0    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.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0302)|   Area    (ha)=   0.13
|ID= 1 DT= 5.0 min |   Total Imp(%)=  74.00   Dir. Conn.(%)=  15.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.10         0.03
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      25.00        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   18.24  |  3.083   3.65  |  6.083   52.29  |  9.08   15.81
     0.167   18.24  |  3.167   3.65  |  6.167   52.29  |  9.17   15.81
     0.250   18.24  |  3.250   3.65  |  6.250   52.29  |  9.25   15.81
     0.333   18.24  |  3.333   3.65  |  6.333   52.29  |  9.33   15.81
     0.417   18.24  |  3.417   3.65  |  6.417   52.29  |  9.42   15.81
     0.500   18.24  |  3.500   3.65  |  6.500   52.29  |  9.50   15.81
     0.583   18.24  |  3.583   3.65  |  6.583   52.29  |  9.58   15.81
     0.667   18.24  |  3.667   3.65  |  6.667   52.29  |  9.67   15.81
     0.750   18.24  |  3.750   3.65  |  6.750   52.29  |  9.75   15.81
     0.833   18.24  |  3.833   3.65  |  6.833   52.29  |  9.83   15.81
     0.917   18.24  |  3.917   3.65  |  6.917   52.29  |  9.92   15.81
     1.000   18.24  |  4.000   3.65  |  7.000   52.29  | 10.00   15.81
     1.083   24.32  |  4.083   6.08  |  7.083   24.32  | 10.08   15.81
     1.167   24.32  |  4.167   6.08  |  7.167   24.32  | 10.17   15.81
     1.250   24.32  |  4.250   6.08  |  7.250   24.32  | 10.25   15.81
     1.333   24.32  |  4.333   6.08  |  7.333   24.32  | 10.33   15.81
     1.417   24.32  |  4.417   6.08  |  7.417   24.32  | 10.42   15.81
     1.500   24.32  |  4.500   6.08  |  7.500   24.32  | 10.50   15.81
     1.583   24.32  |  4.583   6.08  |  7.583   24.32  | 10.58   15.81
     1.667   24.32  |  4.667   6.08  |  7.667   24.32  | 10.67   15.81
     1.750   24.32  |  4.750   6.08  |  7.750   24.32  | 10.75   15.81
     1.833   24.32  |  4.833   6.08  |  7.833   24.32  | 10.83   15.81
     1.917   24.32  |  4.917   6.08  |  7.917   24.32  | 10.92   15.81
     2.000   24.32  |  5.000   6.08  |  8.000   24.32  | 11.00   15.81
     2.083   12.16  |  5.083  24.32  |  8.083   27.97  | 11.08    9.73
     2.167   12.16  |  5.167  24.32  |  8.167   27.97  | 11.17    9.73
     2.250   12.16  |  5.250  24.32  |  8.250   27.97  | 11.25    9.73
     2.333   12.16  |  5.333  24.32  |  8.333   27.97  | 11.33    9.73
     2.417   12.16  |  5.417  24.32  |  8.417   27.97  | 11.42    9.73
     2.500   12.16  |  5.500  24.32  |  8.500   27.97  | 11.50    9.73
     2.583   12.16  |  5.583  24.32  |  8.583   27.97  | 11.58    9.73
     2.667   12.16  |  5.667  24.32  |  8.667   27.97  | 11.67    9.73
     2.750   12.16  |  5.750  24.32  |  8.750   27.97  | 11.75    9.73
     2.833   12.16  |  5.833  24.32  |  8.833   27.97  | 11.83    9.73
     2.917   12.16  |  5.917  24.32  |  8.917   27.97  | 11.92    9.73
     3.000   12.16  |  6.000  24.32  |  9.000   27.97  | 12.00    9.73

     Max.Eff.Inten.(mm/hr)=      52.29       151.45
               over (min)        5.00         5.00
     Storage Coeff.  (min)=      1.17 (ii)    3.48 (ii)
     Unit Hyd. Tpeak (min)=      5.00         5.00
     Unit Hyd. peak  (cms)=      0.34         0.26
                                                        *TOTALS*
     PEAK FLOW       (cms)=      0.00         0.01          0.017 (iii)
     TIME TO PEAK    (hrs)=      6.50         7.00          7.00
     RUNOFF VOLUME    (mm)=    232.70       179.99        187.88
     TOTAL RAINFALL   (mm)=    234.70       234.70        234.70
     RUNOFF COEFFICIENT   =      0.99         0.77          0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  53.0    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  (  0013)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK      R.V.
--------------------          (ha)    (cms)    (hrs)      (mm)
       ID1= 1 (  0301):      1.65    0.201     7.00    179.04
     + ID2= 2 (  0302):      0.13    0.017     7.00    187.88
       ================================================
       ID = 3 (  0013):      1.78    0.218     7.00    179.68

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| DUHYD    (  0009)|
| Inlet Cap.= 0.236|
| #of Inlets=     1|
| Total(cms)=   0.2|      AREA     QPEAK     TPEAK     R.V.
--------------------      (ha)      (cms)     (hrs)     (mm)
     TOTAL HYD.(ID= 1):   1.78      0.22      7.00   179.68
     ================================================
     MAJOR SYS.(ID= 2):   0.00      0.00      0.00     0.00
     MINOR SYS.(ID= 3):   1.78      0.22      7.00   179.68

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

  -------------------------
  | Junction Command(0020) |
  -------------------------

                             AREA     QPEAK    TPEAK      R.V.
                             (ha)     (cms)    (hrs)      (mm)
  INFLOW : ID= 9(  0009)     1.78      0.22     7.00    179.68
  OUTFLOW: ID= 2(  0020)     1.78      0.22     7.00    179.68

  --------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0203)|   Area    (ha)=   2.88
|ID= 1 DT= 5.0 min |   Total Imp(%)=  80.00   Dir. Conn.(%)=  65.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.30         0.58
     Dep. Storage     (mm)=       1.00         5.00
```

```
Average Slope     (%)=       1.00         2.00
Length            (m)=     138.56        30.00
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	18.24	3.083	3.65	6.083	52.29	9.08	15.81
0.167	18.24	3.167	3.65	6.167	52.29	9.17	15.81
0.250	18.24	3.250	3.65	6.250	52.29	9.25	15.81
0.333	18.24	3.333	3.65	6.333	52.29	9.33	15.81
0.417	18.24	3.417	3.65	6.417	52.29	9.42	15.81
0.500	18.24	3.500	3.65	6.500	52.29	9.50	15.81
0.583	18.24	3.583	3.65	6.583	52.29	9.58	15.81
0.667	18.24	3.667	3.65	6.667	52.29	9.67	15.81
0.750	18.24	3.750	3.65	6.750	52.29	9.75	15.81
0.833	18.24	3.833	3.65	6.833	52.29	9.83	15.81
0.917	18.24	3.917	3.65	6.917	52.29	9.92	15.81
1.000	18.24	4.000	3.65	7.000	52.29	10.00	15.81
1.083	24.32	4.083	6.08	7.083	24.32	10.08	15.81
1.167	24.32	4.167	6.08	7.167	24.32	10.17	15.81
1.250	24.32	4.250	6.08	7.250	24.32	10.25	15.81
1.333	24.32	4.333	6.08	7.333	24.32	10.33	15.81
1.417	24.32	4.417	6.08	7.417	24.32	10.42	15.81
1.500	24.32	4.500	6.08	7.500	24.32	10.50	15.81
1.583	24.32	4.583	6.08	7.583	24.32	10.58	15.81
1.667	24.32	4.667	6.08	7.667	24.32	10.67	15.81
1.750	24.32	4.750	6.08	7.750	24.32	10.75	15.81
1.833	24.32	4.833	6.08	7.833	24.32	10.83	15.81
1.917	24.32	4.917	6.08	7.917	24.32	10.92	15.81
2.000	24.32	5.000	6.08	8.000	24.32	11.00	15.81
2.083	12.16	5.083	24.32	8.083	27.97	11.08	9.73
2.167	12.16	5.167	24.32	8.167	27.97	11.17	9.73
2.250	12.16	5.250	24.32	8.250	27.97	11.25	9.73
2.333	12.16	5.333	24.32	8.333	27.97	11.33	9.73
2.417	12.16	5.417	24.32	8.417	27.97	11.42	9.73
2.500	12.16	5.500	24.32	8.500	27.97	11.50	9.73
2.583	12.16	5.583	24.32	8.583	27.97	11.58	9.73
2.667	12.16	5.667	24.32	8.667	27.97	11.67	9.73
2.750	12.16	5.750	24.32	8.750	27.97	11.75	9.73
2.833	12.16	5.833	24.32	8.833	27.97	11.83	9.73
2.917	12.16	5.917	24.32	8.917	27.97	11.92	9.73
3.000	12.16	6.000	24.32	9.000	27.97	12.00	9.73

```
Max.Eff.Inten.(mm/hr)=      52.29        71.28
          over (min)        5.00        10.00
Storage Coeff.  (min)=     4.03 (ii)    8.83 (ii)
Unit Hyd. Tpeak (min)=       5.00        10.00
Unit Hyd. peak  (cms)=       0.24         0.12
                                                 *TOTALS*
PEAK FLOW       (cms)=       0.27         0.11          0.384 (iii)
TIME TO PEAK    (hrs)=       6.92         7.00           7.00
RUNOFF VOLUME    (mm)=     233.70       153.31         205.56
TOTAL RAINFALL   (mm)=     234.70       234.70         234.70
RUNOFF COEFFICIENT   =       1.00         0.65           0.88

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  55.0     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.

--------------------------------------------------------------------------------
--------------------
| DUHYD    (  0028)|
| Inlet Cap.= 0.569|
| #of Inlets=     1|
| Total(cms)=   0.6|
--------------------
```

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
TOTAL HYD.(ID= 1):	2.88	0.38	7.00	205.56
MAJOR SYS.(ID= 2):	0.00	0.00	0.00	0.00
MINOR SYS.(ID= 3):	2.88	0.38	7.00	205.56

```
    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

  -------------------------
  | Junction Command(0029) |
  -------------------------
```

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 9(0028)	2.88	0.38	7.00	205.56
OUTFLOW: ID= 2(0029)	2.88	0.38	7.00	205.56

```
  --------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0003)|
|   1 +  2 =  3    |
--------------------
```

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0020):	1.78	0.218	7.00	179.68
+ ID2= 2 (0201):	21.49	2.772	7.00	203.08
ID = 3 (0003):	23.27	2.990	7.00	201.29

```
    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0003)|
|   3 +  2 =  1    |
--------------------
```

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 3 (0003):	23.27	2.990	7.00	201.29
+ ID2= 2 (0202):	13.27	1.589	7.00	181.99
ID = 1 (0003):	36.54	4.579	7.00	194.28

```
    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0003)|
|   1 +  2 =  3    |
--------------------
```

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0003):	36.54	4.579	7.00	194.28
+ ID2= 2 (0029):	2.88	0.384	7.00	205.56
ID = 3 (0003):	39.42	4.963	7.00	195.11

```
    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0005)|     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	0.7834	0.8562
0.0075	0.0493	1.6951	1.3177
0.0195	0.1006	1.8899	1.4826
0.0265	0.1538	2.0662	1.6588
0.0320	0.2089	2.1489	1.7511
0.0409	0.3251	2.2285	1.8455

```
                          0.0481      0.4480   |    2.3053      1.9411
                          0.0529      0.5448   |    3.4358      2.0378
                          0.0544      0.5780   |    5.4391      2.1358
                          0.3140      0.7136   |    8.0099      2.2349

                               AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0003)     39.420     4.963      7.00     195.11
   OUTFLOW: ID= 1 (  0005)     39.420     3.558      7.17     195.07

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 71.69
                  TIME SHIFT OF PEAK FLOW         (min)= 10.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  2.0718

--------------------------------------------------------------------------------

  --------------------------
  | Junction Command(0030) |
  --------------------------

                           AREA     QPEAK   TPEAK     R.V.
                           (ha)     (cms)    (hrs)     (mm)
  INFLOW : ID= 8(  0028)    0.00     0.00    0.00     0.00
  OUTFLOW: ID= 2(  0030)    0.00     0.00    0.00     0.00

  ------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0027)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
*** W A R N I N G :  HYDROGRAPH   0030 <ID= 1> IS DRY.
*** W A R N I N G :  HYDROGRAPH   0027 = HYDROGRAPH 0005
        ID1= 1 (  0030):    0.00   0.000     0.00     0.00
      + ID2= 2 (  0005):   39.42   3.558     7.17   195.07
        ==========================================================
        ID = 3 (  0027):   39.42   3.558     7.17   195.07

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

 FINISH
================================================================================================
==============
```

APPENDIX “F”

Floodplain Analysis

VALDOR ENGINEERING INC.
Project: Millbrook Subdivision, Phase 2
File: 21101
Date: January 2026

Table F.1: VO5 Model Parameters - Floodplain Drainage Area

Subcatchment	Area (ha)	VO5 Routine	TIMP	XIMP	CN II	IA (mm)	Tp (hr)
101	619.42	NasHyd	-	-	71	7.1	2.09
102	39.69	NasHyd	-	-	84	6.9	0.27
103	289.68	NasHyd	-	-	74	7.0	1.46
104	79.44	NasHyd	-	-	64	7.6	1.02
105	13.65	NasHyd	-	-	78	7.9	0.63
106	13.86	NasHyd	-	-	84	7.0	0.22
107	28.41	NasHyd	-	-	79	7.0	0.66
108	33.73	NasHyd	-	-	80	7.0	1.05
109	2.78	NasHyd	-	-	58	8.0	0.33
110	91.15	NasHyd	-	-	87	5.0	0.27
Total	**1,211.81**						

VALDOR ENGINEERING INC.
Project: Millbrook Subdivision, Phase 2
File: 21101
Date: January 2026

Table F.2: 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)						
		Row Crops (HSG 'B')	289.42	81		7		0.35	
		Forest (HSG 'B')	105.02	55		10		0.25	
		Meadow (HSG 'B')	55.36	44		8		0.28	
		Low-Density Dev. (HSG 'B')	115.53	68		4.4		0.40	
101	619.42	Row Crops (HSG 'C')	41.37	88	**71**	7	**7.1**	0.55	**0.36**
		Forest (HSG 'C')	4.80	70		10		0.35	
		Meadow (HSG 'C')	1.08	58		8		0.40	
		Low-Density Dev. (HSG 'C')	0.00	79		4.4		0.50	
		Other Impervious	6.84	98		2		0.95	
		Row Crops (HSG 'B')	24.08	81		7		0.35	
		Forest (HSG 'B')	0.00	55		10		0.25	
		Meadow (HSG 'B')	0.00	44		8		0.28	
		Low-Density Dev. (HSG 'B')	0.00	68		4.4		0.40	
102	39.69	Row Crops (HSG 'C')	14.79	88	**84**	7	**6.9**	0.55	**0.44**
		Forest (HSG 'C')	0.00	70		10		0.35	
		Meadow (HSG 'C')	0.00	58		8		0.40	
		Low-Density Dev. (HSG 'C')	0.00	79		4.4		0.50	
		Other Impervious	0.82	98		2		0.95	
		Row Crops (HSG 'B')	165.41	81		7		0.35	
		Forest (HSG 'B')	28.02	55		10		0.25	
		Meadow (HSG 'B')	15.15	44		8		0.28	
		Low-Density Dev. (HSG 'B')	48.01	68		4.4		0.40	
103	289.68	Row Crops (HSG 'C')	9.77	88	**74**	7	**7.0**	0.55	**0.36**
		Forest (HSG 'C')	16.32	70		10		0.35	
		Meadow (HSG 'C')	1.04	58		8		0.40	
		Low-Density Dev. (HSG 'C')	2.16	79		4.4		0.50	
		Other Impervious	3.80	98		2		0.95	
		Row Crops (HSG 'B')	38.96	81		7		0.35	
		Forest (HSG 'B')	8.22	55		10		0.25	
		Meadow (HSG 'B')	31.24	44		8		0.28	
		Low-Density Dev. (HSG 'B')	0.00	68		4.4		0.40	
104	79.44	Row Crops (HSG 'C')	0.00	88	**64**	7	**7.6**	0.55	**0.32**
		Forest (HSG 'C')	0.00	70		10		0.35	
		Meadow (HSG 'C')	0.00	58		8		0.40	
		Low-Density Dev. (HSG 'C')	0.00	79		4.4		0.50	
		Other Impervious	1.02	98		2		0.95	
		Row Crops (HSG 'B')	6.02	81		7		0.35	
		Forest (HSG 'B')	0.43	55		10		0.25	
		Meadow (HSG 'B')	0.51	44		8		0.28	
		Low-Density Dev. (HSG 'B')	0.00	68		4.4		0.40	
105	13.65	Row Crops (HSG 'C')	3.20	88	**78**	7	**7.9**	0.55	**0.39**
		Forest (HSG 'C')	3.49	70		10		0.35	
		Meadow (HSG 'C')	0.00	58		8		0.40	
		Low-Density Dev. (HSG 'C')	0.00	79		4.4		0.50	
		Other Impervious	0.00	98		2		0.95	

VALDOR ENGINEERING INC.
Project: Millbrook Subdivision, Phase 2
File: 21101
Date: January 2026

Table F.2 (Cont'd): 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)						
		Row Crops (HSG 'B')	7.44	81		**7**		0.35	
		Forest (HSG 'B')	0.00	55		**10**		0.25	
		Meadow (HSG 'B')	0.00	44		**8**		0.28	
		Low-Density Dev. (HSG 'B')	0.00	68		**4.4**		0.40	
106	13.86	Row Crops (HSG 'C')	6.25	88	**84**	**7**	**7.0**	0.55	**0.44**
		Forest (HSG 'C')	0.17	70		**10**		0.35	
		Meadow (HSG 'C')	0.00	58		**8**		0.40	
		Low-Density Dev. (HSG 'C')	0.00	79		**4.4**		0.50	
		Other Impervious	0.00	98		**2**		0.95	
		Row Crops (HSG 'B')	24.64	81		**7**		0.35	
		Forest (HSG 'B')	0.00	55		**10**		0.25	
		Meadow (HSG 'B')	3.27	58		**8**		0.28	
		Low-Density Dev. (HSG 'B')	0.00	68		**4.4**		0.40	
107	28.41	Row Crops (HSG 'C')	0.00	88	**79**	**7**	**7.0**	0.55	**0.35**
		Forest (HSG 'C')	0.00	70		**10**		0.35	
		Meadow (HSG 'C')	0.00	58		**8**		0.40	
		Low-Density Dev. (HSG 'C')	0.00	79		**4.4**		0.50	
		Other Impervious	0.50	98		**2**		0.95	
		Row Crops (HSG 'B')	31.39	81		**7**		0.35	
		Forest (HSG 'B')	0.00	55		**10**		0.25	
		Meadow (HSG 'B')	1.70	58		**8**		0.28	
		Low-Density Dev. (HSG 'B')	0.00	68		**4.4**		0.40	
108	33.73	Row Crops (HSG 'C')	0.00	88	**80**	**7**	**7.0**	0.55	**0.36**
		Forest (HSG 'C')	0.00	70		**10**		0.35	
		Meadow (HSG 'C')	0.00	58		**8**		0.40	
		Low-Density Dev. (HSG 'C')	0.00	79		**4.4**		0.50	
		Other Impervious	0.64	98		**2**		0.95	
		Row Crops (HSG 'B')	0.00	81		**7**		0.35	
		Forest (HSG 'B')	0.00	55		**10**		0.25	
		Meadow (HSG 'B')	1.89	58		**8**		0.28	
		Low-Density Dev. (HSG 'B')	0.00	68		**4.4**		0.40	
109	2.78	Row Crops (HSG 'C')	0.00	88	**58**	**7**	**8.0**	0.55	**0.32**
		Forest (HSG 'C')	0.00	70		**10**		0.35	
		Meadow (HSG 'C')	0.89	58		**8**		0.40	
		Low-Density Dev. (HSG 'C')	0.00	79		**4.4**		0.50	
		Other Impervious	0.00	98		**2**		0.95	
		Row Crops (HSG 'B')	27.31	81		**7**		0.35	
		Forest (HSG 'B')	9.74	55		**10**		0.25	
		Meadow (HSG 'B')	0.00	58		**8**		0.28	
		Low-Density Dev. (HSG 'B')	0.00	68		**4.4**		0.40	
110	91.15	Row Crops (HSG 'C')	7.20	88	**87**	**7**	**5.0**	0.55	**0.65**
		Forest (HSG 'C')	2.33	70		**10**		0.35	
		Meadow (HSG 'C')	0.00	58		**8**		0.40	
		Low-Density Dev. (HSG 'C')	0.00	79		**4.4**		0.50	
		Other Impervious	44.58	98		**2**		0.95	

Note: All agricultural areas were assumed to have 2% imperviousness to account for roads, houses, etc., except for *Catchments 105, 106* and *109*.

VALDOR ENGINEERING INC.
Project: Millbrook Subdivision, Phase 2
File: 21101
Date: January 2026

Table F.3: Calculation of Time to Peak

Subcatchment	A Area (ha)	C Runoff Coefficient	L Catchment Length (m)	Highest Elevation (m)	Lowest Elevation (m)	S Catchment Slope (%)	[1,2]T_c Method	T_c (min)	T_p (hr)
101	619.42	0.36	6781	320.00	237.00	1.22	Airport	186.8	2.09
102	39.69	0.44	1010	354.00	237.00	11.58	Bransby-Williams	24.4	0.27
103	289.68	0.36	4294	316.00	240.40	1.76	Airport	131.0	1.46
104	79.44	0.32	2375	300.00	240.40	2.51	Airport	91.5	1.02
105	13.65	0.39	495	240.40	236.58	0.77	Airport	56.0	0.63
106	13.86	0.44	552	251.00	234.49	2.99	Bransby-Williams	19.4	0.22
107	28.41	0.35	1134	278.00	247.00	2.73	Airport	58.9	0.66
108	33.73	0.36	2303	278.00	234.49	1.89	Airport	94.1	1.05
109	2.78	0.32	309	245.20	234.03	3.61	Airport	29.3	0.33
110	91.15	0.65	710	234.03	225.00	1.27	Bransby-Williams	24.6	0.27

Notes:
1) T_p calculation for catchments with C < 0.40 is based on the Airport Formula:

$$T_c = 3.26 \times (1.1 - C) \times L^{0.5} / S_w^{0.33}$$

2) T_p calculation for catchments with C > 0.40 is based on the Bransby-Williams Formula:

$$T_c = (0.057)(L) / (S_w)^{0.2} (A)^{0.1}$$

$$T_P = 0.67 T_c$$

Table F.4: Critical Storm Analysis

Return Period	Distribution	Peak Flow (m^3/s)					
		Flow Node #1	Flow Node #2	Flow Node #3	Flow Node #4	Flow Node #5	Flow Node #6
100-year	6-hour AES	4.873	14.520	26.162	28.572	31.279	1.851
	12-hour AES	3.515	14.457	25.218	27.333	29.792	1.598
	24-hour AES	2.183	13.349	22.894	24.749	26.921	1.250
	6-hour SCS	**5.881**	14.392	25.668	27.931	30.495	1.962
	12-hour SCS	5.777	14.562	25.882	28.127	30.783	1.959
	24-hour SCS	5.610	14.617	25.478	27.637	30.812	1.919
	4-hour Chicago	4.216	11.590	20.435	22.217	24.185	1.474
Regional	**Timmins Storm**	4.131	**29.637**	**49.855**	**53.519**	**57.571**	**2.228**

Notes:

1) 100-year storm files were created using the latest Peterborough Airport IDF data (1971-2006).

2) The Timmins storm is the Regulatory storm used to delineate the Regulatory floodlines.

VALDOR ENGINEERING INC.

Project: Millbrook Subdivision, Phase 2

File: 21101

Date: January 2026

Table F.5: HEC-RAS Flow Input Summary

Flow Node #	HEC-RAS Flow Change Location	Regulatory Flow (cms)
1	XS-1.970	4.131
2	XS-1.637	29.637
3	XS-1.517	49.855
4	XS-1.259	53.519
5	XS-1.044	57.571

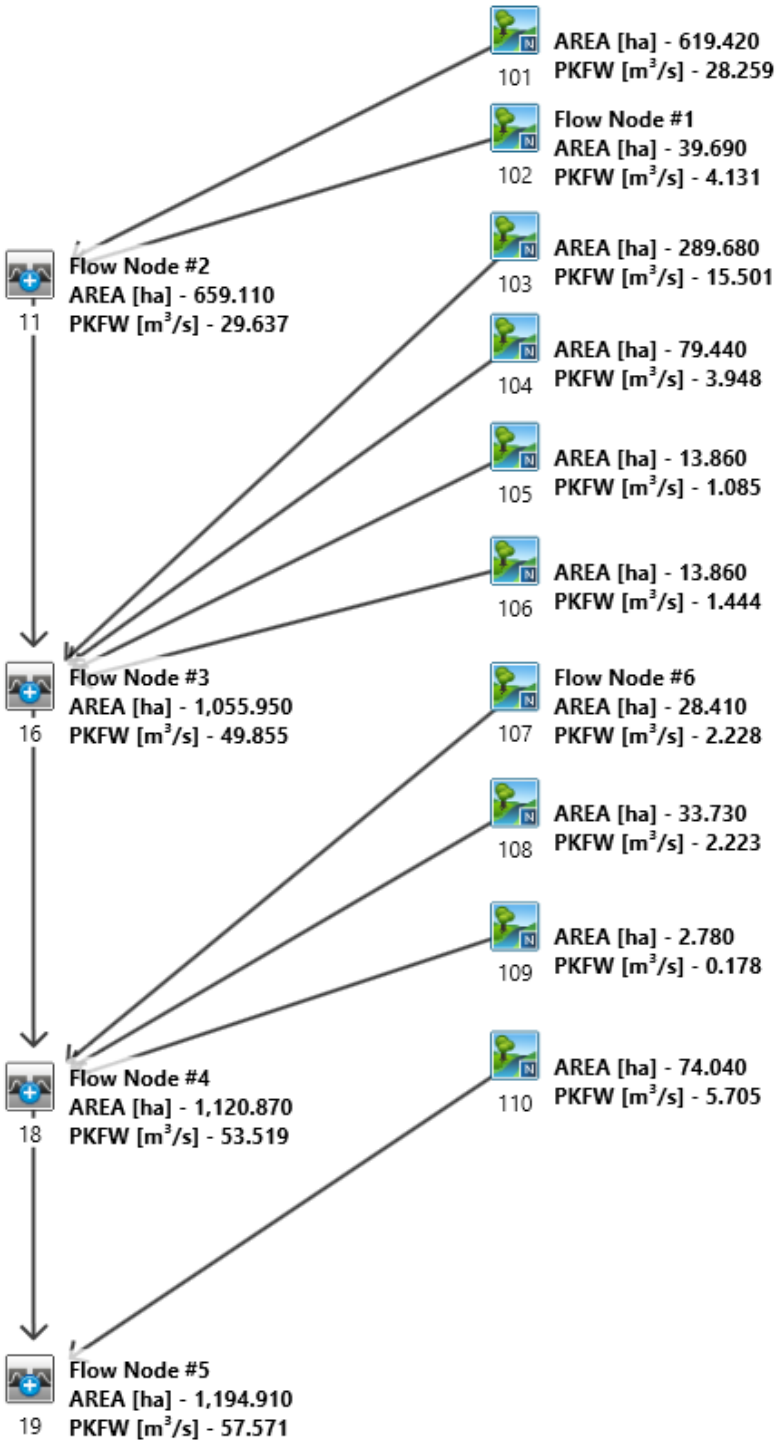


Figure F.1: VO5 Model Schematic – Floodplain Drainage Area

```
================================================================================================
==============

       V    V   I    SSSSS  U   U    A    L             (v 5.1.2000)
       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
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Civica Infrastructure
Copyright 2007 - 2013 Civica Infrastructure
All rights reserved.


                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\VO2\voin.dat
  Output  filename: C:\Users\Valdor\AppData\Local\Civica\VH5\fc940250-ed07-412c-85e3-
c94b4cb6310f\d91049d9-a688-4ecb-b223-ba12ef13b779\scena
  Summary filename: C:\Users\Valdor\AppData\Local\Civica\VH5\fc940250-ed07-412c-85e3-
c94b4cb6310f\d91049d9-a688-4ecb-b223-ba12ef13b779\scena


DATE: 04-16-2020                          TIME: 04:12:50

USER:


COMMENTS: _____________________________________________________


  ************************************************
  ** SIMULATION : AES_06H_100Y                  **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                   min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      ---------------------
    READ STORM                15.0
    [ Ptot= 89.91 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\18d0c31e-dd18-495d-b10c-0705
    remark: AES_06H_100Y
*
 ** CALIB NASHYD         0101  1 10.0  619.42   14.24  5.00  36.76 0.41   0.000
    [CN=71.0         ]
    [ N = 3.0:Tp 2.09]
*
    READ STORM                15.0
    [ Ptot= 89.91 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\18d0c31e-dd18-495d-b10c-0705
    remark: AES_06H_100Y
*
 ** CALIB NASHYD         0102  1 10.0   39.69    4.87  2.83  51.99 0.58   0.000
    [CN=84.0         ]
    [ N = 3.0:Tp 0.27]
*
    ADD [  0101+  0102]  0011  3 10.0  659.11   14.52  5.00  37.68  n/a   0.000
*
    READ STORM                15.0
    [ Ptot= 89.91 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\18d0c31e-dd18-495d-b10c-0705
    remark: AES_06H_100Y
*
 ** CALIB NASHYD         0103  1 10.0  289.68    9.57  4.33  39.93 0.44   0.000
    [CN=74.0         ]
    [ N = 3.0:Tp 1.46]
*
    READ STORM                15.0
    [ Ptot= 89.91 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\18d0c31e-dd18-495d-b10c-0705
    remark: AES_06H_100Y
*
 ** CALIB NASHYD         0104  1 10.0   79.44    2.52  3.83  30.08 0.33   0.000
    [CN=64.0         ]
    [ N = 3.0:Tp 1.02]
*
    READ STORM                15.0
    [ Ptot= 89.91 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\18d0c31e-dd18-495d-b10c-0705
    remark: AES_06H_100Y
*
 ** CALIB NASHYD         0105  1 10.0   13.86    0.89  3.33  43.76 0.49   0.000
    [CN=78.0         ]
    [ N = 3.0:Tp 0.63]
*
    READ STORM                15.0
    [ Ptot= 89.91 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\18d0c31e-dd18-495d-b10c-0705
    remark: AES_06H_100Y
*
 ** CALIB NASHYD         0106  1 10.0   13.86    1.77  2.83  51.39 0.57   0.000
    [CN=84.0         ]
    [ N = 3.0:Tp 0.22]
*
    ADD [  0103+  0104]  0016  3 10.0  369.12   11.89  4.17  37.81  n/a   0.000
*
    ADD [  0016+  0105]  0016  1 10.0  382.98   12.42  4.17  38.03  n/a   0.000
*
    ADD [  0016+  0106]  0016  3 10.0  396.84   12.69  4.17  38.49  n/a   0.000
*
    ADD [  0016+  0011]  0016  1 10.0 1055.95   26.16  4.50  37.98  n/a   0.000
*
    READ STORM                15.0
    [ Ptot= 89.91 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\18d0c31e-dd18-495d-b10c-0705
    remark: AES_06H_100Y
*
 ** CALIB NASHYD         0107  1 10.0   28.41    1.85  3.33  45.68 0.51   0.000
    [CN=79.0         ]
    [ N = 3.0:Tp 0.66]
*
    READ STORM                15.0
    [ Ptot= 89.91 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\18d0c31e-dd18-495d-b10c-0705
    remark: AES_06H_100Y
*
 ** CALIB NASHYD         0108  1 10.0   33.73    1.67  3.83  46.95 0.52   0.000
    [CN=80.0         ]
    [ N = 3.0:Tp 1.05]
*
    READ STORM                15.0
    [ Ptot= 89.91 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\18d0c31e-dd18-495d-b10c-0705
```

```
    remark: AES_06H_100Y
*
 ** CALIB NASHYD         0109  1 10.0    2.78    0.14  2.83  25.14 0.28   0.000
    [CN=58.0         ]
    [ N = 3.0:Tp 0.33]
*
    ADD [  0107+  0108]  0018  3 10.0   62.14    3.37  3.50  46.37  n/a   0.000
*
    ADD [  0018+  0109]  0018  1 10.0   64.92    3.45  3.50  45.46  n/a   0.000
*
    ADD [  0018+  0016]  0018  3 10.0 1120.87   28.57  4.33  38.42  n/a   0.000
*
    READ STORM                15.0
    [ Ptot= 89.91 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\18d0c31e-dd18-495d-b10c-0705
    remark: AES_06H_100Y
*
 ** CALIB NASHYD         0110  1 10.0   74.04    4.65  3.33  44.15 0.49   0.000
    [CN=78.0         ]
    [ N = 3.0:Tp 0.66]
*
    ADD [  0110+  0018]  0019  3 10.0 1194.91   31.28  4.17  38.77  n/a   0.000
*
================================================================================
===============


       V    V   I    SSSSS  U   U    A    L              (v 5.1.2000)
       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
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Civica Infrastructure
Copyright 2007 - 2013 Civica Infrastructure
All rights reserved.


                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\VO2\voin.dat
  Output  filename: C:\Users\Valdor\AppData\Local\Civica\VH5\fc940250-ed07-412c-85e3-
c94b4cb6310f\50a00891-fbe2-400e-a0b9-72764faa6f8b\scena
  Summary filename: C:\Users\Valdor\AppData\Local\Civica\VH5\fc940250-ed07-412c-85e3-
c94b4cb6310f\50a00891-fbe2-400e-a0b9-72764faa6f8b\scena


DATE: 04-16-2020                          TIME: 04:12:50

USER:


COMMENTS: _____________________________________________________


  ************************************************
  ** SIMULATION : AES_12H_100Y                  **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    READ STORM                15.0
    [ Ptot= 98.38 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\f45c328c-4e82-4fdb-b741-0a29
    remark: AES_12H_100Y
*
 ** CALIB NASHYD         0101  1 10.0  619.42   13.89  7.50  42.72 0.43   0.000
    [CN=71.0         ]
    [ N = 3.0:Tp 2.09]
*
    READ STORM                15.0
    [ Ptot= 98.38 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\f45c328c-4e82-4fdb-b741-0a29
    remark: AES_12H_100Y
*
 ** CALIB NASHYD         0102  1 10.0   39.69    3.52  5.17  59.32 0.60   0.000
    [CN=84.0         ]
    [ N = 3.0:Tp 0.27]
*
    ADD [  0101+  0102]  0011  3 10.0  659.11   14.46  7.33  43.72  n/a   0.000
*
    READ STORM                15.0
    [ Ptot= 98.38 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\f45c328c-4e82-4fdb-b741-0a29
    remark: AES_12H_100Y
*
 ** CALIB NASHYD         0103  1 10.0  289.68    8.94  6.67  46.23 0.47   0.000
    [CN=74.0         ]
    [ N = 3.0:Tp 1.46]
*
    READ STORM                15.0
    [ Ptot= 98.38 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\f45c328c-4e82-4fdb-b741-0a29
    remark: AES_12H_100Y
*
 ** CALIB NASHYD         0104  1 10.0   79.44    2.27  6.17  35.27 0.36   0.000
    [CN=64.0         ]
    [ N = 3.0:Tp 1.02]
*
    READ STORM                15.0
    [ Ptot= 98.38 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\f45c328c-4e82-4fdb-b741-0a29
    remark: AES_12H_100Y
*
 ** CALIB NASHYD         0105  1 10.0   13.86    0.77  5.50  50.48 0.51   0.000
    [CN=78.0         ]
    [ N = 3.0:Tp 0.63]
*
    READ STORM                15.0
    [ Ptot= 98.38 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\f45c328c-4e82-4fdb-b741-0a29
    remark: AES_12H_100Y
*
 ** CALIB NASHYD         0106  1 10.0   13.86    1.26  5.17  58.65 0.60   0.000
    [CN=84.0         ]
    [ N = 3.0:Tp 0.22]
*
    ADD [  0103+  0104]  0016  3 10.0  369.12   11.06  6.50  43.87  n/a   0.000
*
    ADD [  0016+  0105]  0016  1 10.0  382.98   11.54  6.50  44.11  n/a   0.000
*
    ADD [  0016+  0106]  0016  3 10.0  396.84   11.85  6.33  44.62  n/a   0.000
*
    ADD [  0016+  0011]  0016  1 10.0 1055.95   25.22  7.00  44.06  n/a   0.000
*
```

```
    READ STORM                15.0
    [ Ptot= 98.38 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\f45c328c-4e82-4fdb-b741-0a29
    remark: AES_12H_100Y
*
 ** CALIB NASHYD         0107  1 10.0   28.41    1.60  5.50  52.54 0.53   0.000
    [CN=79.0         ]
    [ N = 3.0:Tp 0.66]
*
    READ STORM                15.0
    [ Ptot= 98.38 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\f45c328c-4e82-4fdb-b741-0a29
    remark: AES_12H_100Y
*
 ** CALIB NASHYD         0108  1 10.0   33.73    1.50  6.00  53.91 0.55   0.000
    [CN=80.0         ]
    [ N = 3.0:Tp 1.05]
*
    READ STORM                15.0
    [ Ptot= 98.38 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\f45c328c-4e82-4fdb-b741-0a29
    remark: AES_12H_100Y
*
 ** CALIB NASHYD         0109  1 10.0    2.78    0.11  5.33  29.66 0.30   0.000
    [CN=58.0         ]
    [ N = 3.0:Tp 0.33]
*
    ADD [  0107+  0108]  0018  3 10.0   62.14    2.98  5.67  53.28  n/a   0.000
*
    ADD [  0018+  0109]  0018  1 10.0   64.92    3.06  5.67  52.27  n/a   0.000
*
    ADD [  0018+  0016]  0018  3 10.0 1120.87   27.33  6.67  44.53  n/a   0.000
*
    READ STORM                15.0
    [ Ptot= 98.38 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\f45c328c-4e82-4fdb-b741-0a29
    remark: AES_12H_100Y
*
 ** CALIB NASHYD         0110  1 10.0   74.04    4.02  5.50  50.89 0.52   0.000
    [CN=78.0         ]
    [ N = 3.0:Tp 0.66]
*
    ADD [  0110+  0018]  0019  3 10.0 1194.91   29.79  6.50  44.93  n/a   0.000
*
================================================================================
==============


       V    V   I    SSSSS  U   U    A    L             (v 5.1.2000)
       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
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Civica Infrastructure
Copyright 2007 - 2013 Civica Infrastructure
All rights reserved.

                  *****  S U M M A R Y   O U T P U T  *****

  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\VO2\voin.dat
  Output  filename: C:\Users\Valdor\AppData\Local\Civica\VH5\fc940250-ed07-412c-85e3-
c94b4cb6310f\787b7d4c-ba4b-4dd7-bbac-e94848b88fff\scena
  Summary filename: C:\Users\Valdor\AppData\Local\Civica\VH5\fc940250-ed07-412c-85e3-
c94b4cb6310f\787b7d4c-ba4b-4dd7-bbac-e94848b88fff\scena


DATE: 04-16-2020                          TIME: 04:12:50

USER:


COMMENTS: _____________________________________________________


  ************************************************
  ** SIMULATION : AES_24H_100Y                  **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                   min     ha   '  cms   hrs     mm          cms


     START @  0.00 hrs
     ---------------------
    READ STORM                15.0
    [ Ptot=108.66 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\33a008b9-b049-483a-970d-8f7f
    remark: AES_24H_100Y
*
 ** CALIB NASHYD         0101  1 10.0  619.42   12.69 12.00  50.24 0.46   0.000
    [CN=71.0         ]
    [ N = 3.0:Tp 2.09]
*
    READ STORM                15.0
    [ Ptot=108.66 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\33a008b9-b049-483a-970d-8f7f
    remark: AES_24H_100Y
*
 ** CALIB NASHYD         0102  1 10.0   39.69    2.18 10.17  68.38 0.63   0.000
    [CN=84.0         ]
    [ N = 3.0:Tp 0.27]
*
    ADD [  0101+  0102]  0011  3 10.0  659.11   13.35 12.00  51.33  n/a   0.000
*
    READ STORM                15.0
    [ Ptot=108.66 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\33a008b9-b049-483a-970d-8f7f
    remark: AES_24H_100Y
*
 ** CALIB NASHYD         0103  1 10.0  289.68    7.93 11.17  54.14 0.50   0.000
    [CN=74.0         ]
    [ N = 3.0:Tp 1.46]
*
    READ STORM                15.0
    [ Ptot=108.66 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\33a008b9-b049-483a-970d-8f7f
    remark: AES_24H_100Y
*
 ** CALIB NASHYD         0104  1 10.0   79.44    1.99 10.67  41.87 0.39   0.000
    [CN=64.0         ]
    [ N = 3.0:Tp 1.02]
*
    READ STORM                15.0
    [ Ptot=108.66 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\33a008b9-b049-483a-970d-8f7f
```

```
    remark: AES_24H_100Y
*
 ** CALIB NASHYD         0105  1 10.0   13.86    0.60 10.33  58.87 0.54   0.000
    [CN=78.0         ]
    [ N = 3.0:Tp 0.63]
*
    READ STORM                 15.0
    [ Ptot=108.66 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\33a008b9-b049-483a-970d-8f7f
    remark: AES_24H_100Y
*
 ** CALIB NASHYD         0106  1 10.0   13.86    0.76 10.17  67.61 0.62   0.000
    [CN=84.0         ]
    [ N = 3.0:Tp 0.22]
*
    ADD [  0103+  0104]  0016  3 10.0  369.12    9.82 11.00  51.49  n/a   0.000
*
    ADD [  0016+  0105]  0016  1 10.0  382.98   10.25 11.00  51.76  n/a   0.000
*
    ADD [  0016+  0106]  0016  3 10.0  396.84   10.49 11.00  52.32  n/a   0.000
*
    ADD [  0016+  0011]  0016  1 10.0 1055.95   22.89 11.50  51.70  n/a   0.000
*
    READ STORM                 15.0
    [ Ptot=108.66 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\33a008b9-b049-483a-970d-8f7f
    remark: AES_24H_100Y
*
 ** CALIB NASHYD         0107  1 10.0   28.41    1.25 10.33  61.07 0.56   0.000
    [CN=79.0         ]
    [ N = 3.0:Tp 0.66]
*
    READ STORM                 15.0
    [ Ptot=108.66 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\33a008b9-b049-483a-970d-8f7f
    remark: AES_24H_100Y
*
 ** CALIB NASHYD         0108  1 10.0   33.73    1.29 10.67  62.57 0.58   0.000
    [CN=80.0         ]
    [ N = 3.0:Tp 1.05]
*
    READ STORM                 15.0
    [ Ptot=108.66 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\33a008b9-b049-483a-970d-8f7f
    remark: AES_24H_100Y
*
 ** CALIB NASHYD         0109  1 10.0    2.78    0.08 10.17  35.46 0.33   0.000
    [CN=58.0         ]
    [ N = 3.0:Tp 0.33]
*
    ADD [  0107+  0108]  0018  3 10.0   62.14    2.50 10.50  61.89  n/a   0.000
*
    ADD [  0018+  0109]  0018  1 10.0   64.92    2.56 10.50  60.75  n/a   0.000
*
    ADD [  0018+  0016]  0018  3 10.0 1120.87   24.75 11.33  52.23  n/a   0.000
*
    READ STORM                 15.0
    [ Ptot=108.66 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\33a008b9-b049-483a-970d-8f7f
    remark: AES_24H_100Y
*
 ** CALIB NASHYD         0110  1 10.0   74.04    3.16 10.33  59.29 0.55   0.000
    [CN=78.0         ]
    [ N = 3.0:Tp 0.66]
*
    ADD [  0110+  0018]  0019  3 10.0 1194.91   26.92 11.00  52.66  n/a   0.000
*
================================================================================
===============

       V    V   I    SSSSS  U   U    A    L             (v 5.1.2000)
       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
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Civica Infrastructure
Copyright 2007 - 2013 Civica Infrastructure
All rights reserved.

                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\VO2\voin.dat
  Output  filename: C:\Users\Valdor\AppData\Local\Civica\VH5\fc940250-ed07-412c-85e3-
c94b4cb6310f\78dcc635-f2c6-41ad-8070-422e86ac486c\scena
  Summary filename: C:\Users\Valdor\AppData\Local\Civica\VH5\fc940250-ed07-412c-85e3-
c94b4cb6310f\78dcc635-f2c6-41ad-8070-422e86ac486c\scena


DATE: 04-16-2020                          TIME: 04:12:50

USER:


COMMENTS: _____________________________________________________


  ************************************************
  ** SIMULATION : Chicago_04H_100Y              **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

     START @  0.00 hrs
     --------------------
    CHIC STORM                 10.0
    [ Ptot= 78.18 mm ]
*
 ** CALIB NASHYD         0101  1 10.0  619.42   11.15  4.00  28.90 0.37   0.000
    [CN=71.0         ]
    [ N = 3.0:Tp 2.09]
*
    CHIC STORM                 10.0
    [ Ptot= 78.18 mm ]
*
 ** CALIB NASHYD         0102  1 10.0   39.69    4.22  1.50  42.09 0.54   0.000
    [CN=84.0         ]
    [ N = 3.0:Tp 0.27]
*
    ADD [  0101+  0102]  0011  3 10.0  659.11   11.59  4.00  29.69  n/a   0.000
*
    CHIC STORM                 10.0
    [ Ptot= 78.18 mm ]
*
 ** CALIB NASHYD         0103  1 10.0  289.68    7.41  3.17  31.58 0.40   0.000
    [CN=74.0         ]
    [ N = 3.0:Tp 1.46]
```

```
*
    CHIC STORM                10.0
    [ Ptot= 78.18 mm ]
*
 ** CALIB NASHYD         0104  1 10.0   79.44    1.90  2.67  23.33 0.30   0.000
    [CN=64.0         ]
    [ N = 3.0:Tp 1.02]
*
    CHIC STORM                10.0
    [ Ptot= 78.18 mm ]
*
 ** CALIB NASHYD         0105  1 10.0   13.86    0.70  2.00  34.79 0.45   0.000
    [CN=78.0         ]
    [ N = 3.0:Tp 0.63]
*
    CHIC STORM                10.0
    [ Ptot= 78.18 mm ]
*
 ** CALIB NASHYD         0106  1 10.0   13.86    1.68  1.50  41.59 0.53   0.000
    [CN=84.0         ]
    [ N = 3.0:Tp 0.22]
*
    ADD [  0103+  0104]  0016  3 10.0  369.12    9.15  3.00  29.81  n/a   0.000
*
    ADD [  0016+  0105]  0016  1 10.0  382.98    9.55  3.00  29.99  n/a   0.000
*
    ADD [  0016+  0106]  0016  3 10.0  396.84    9.79  3.00  30.39  n/a   0.000
*
    ADD [  0016+  0011]  0016  1 10.0 1055.95   20.44  3.50  29.95  n/a   0.000
*
    CHIC STORM                10.0
    [ Ptot= 78.18 mm ]
*
 ** CALIB NASHYD         0107  1 10.0   28.41    1.47  2.17  36.52 0.47   0.000
    [CN=79.0         ]
    [ N = 3.0:Tp 0.66]
*
    CHIC STORM                10.0
    [ Ptot= 78.18 mm ]
*
 ** CALIB NASHYD         0108  1 10.0   33.73    1.31  2.67  37.62 0.48   0.000
    [CN=80.0         ]
    [ N = 3.0:Tp 1.05]
*
    CHIC STORM                10.0
    [ Ptot= 78.18 mm ]
*
 ** CALIB NASHYD         0109  1 10.0    2.78    0.11  1.67  19.30 0.25   0.000
    [CN=58.0         ]
    [ N = 3.0:Tp 0.33]
*
    ADD [  0107+  0108]  0018  3 10.0   62.14    2.66  2.33  37.11  n/a   0.000
*
    ADD [  0018+  0109]  0018  1 10.0   64.92    2.72  2.33  36.35  n/a   0.000
*
    ADD [  0018+  0016]  0018  3 10.0 1120.87   22.22  3.33  30.32  n/a   0.000
*
    CHIC STORM                10.0
    [ Ptot= 78.18 mm ]
*
 ** CALIB NASHYD         0110  1 10.0   74.04    3.68  2.17  35.16 0.45   0.000
    [CN=78.0         ]
    [ N = 3.0:Tp 0.66]
*
    ADD [  0110+  0018]  0019  3 10.0 1194.91   24.19  3.00  30.62  n/a   0.000
*
================================================================================
===============
```

```
      V    V   I    SSSSS  U   U    A    L             (v 5.1.2000)
      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
        VV     I    SSSSS  UUUUU  A   A  LLLLL

       OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
      O   O    T      T    H   H   Y Y   MM MM  O   O
      O   O    T      T    H   H    Y    M   M  O   O
       OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Civica Infrastructure
Copyright 2007 - 2013 Civica Infrastructure
All rights reserved.


                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\VO2\voin.dat
  Output  filename: C:\Users\Valdor\AppData\Local\Civica\VH5\fc940250-ed07-412c-85e3-
c94b4cb6310f\eafb628b-280d-4f39-90bf-793af59bdab3\scena
  Summary filename: C:\Users\Valdor\AppData\Local\Civica\VH5\fc940250-ed07-412c-85e3-
c94b4cb6310f\eafb628b-280d-4f39-90bf-793af59bdab3\scena


DATE: 04-16-2020                          TIME: 04:12:51

USER:


COMMENTS: _____________________________________________________


  ************************************************
  ** SIMULATION : SCS_06H_100Y                  **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

     START @  0.00 hrs
     --------------------
    READ STORM                15.0
    [ Ptot= 89.90 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\c90ad3c2-a919-48f5-8269-fb8b
    remark: SCS_06H_100Y
*
 ** CALIB NASHYD         0101  1 10.0  619.42   13.97  5.67  36.75 0.41   0.000
    [CN=71.0         ]
    [ N = 3.0:Tp 2.09]
*
    READ STORM                15.0
    [ Ptot= 89.90 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\c90ad3c2-a919-48f5-8269-fb8b
    remark: SCS_06H_100Y
*
 ** CALIB NASHYD         0102  1 10.0   39.69    5.88  3.33  51.98 0.58   0.000
    [CN=84.0         ]
    [ N = 3.0:Tp 0.27]
*
    ADD [  0101+  0102]  0011  3 10.0  659.11   14.39  5.50  37.67  n/a   0.000
*
    READ STORM                15.0
    [ Ptot= 89.90 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\c90ad3c2-a919-48f5-8269-fb8b
    remark: SCS_06H_100Y
*
```

```
 ** CALIB NASHYD         0103  1 10.0  289.68    9.42  4.83  39.92 0.44   0.000
    [CN=74.0         ]
    [ N = 3.0:Tp 1.46]
*
    READ STORM                 15.0
    [ Ptot= 89.90 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\c90ad3c2-a919-48f5-8269-fb8b
    remark: SCS_06H_100Y
*
 ** CALIB NASHYD         0104  1 10.0   79.44    2.53  4.33  30.08 0.33   0.000
    [CN=64.0         ]
    [ N = 3.0:Tp 1.02]
*
    READ STORM                 15.0
    [ Ptot= 89.90 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\c90ad3c2-a919-48f5-8269-fb8b
    remark: SCS_06H_100Y
*
 ** CALIB NASHYD         0105  1 10.0   13.86    0.94  3.83  43.75 0.49   0.000
    [CN=78.0         ]
    [ N = 3.0:Tp 0.63]
*
    READ STORM                 15.0
    [ Ptot= 89.90 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\c90ad3c2-a919-48f5-8269-fb8b
    remark: SCS_06H_100Y
*
 ** CALIB NASHYD         0106  1 10.0   13.86    2.31  3.33  51.39 0.57   0.000
    [CN=84.0         ]
    [ N = 3.0:Tp 0.22]
*
    ADD [  0103+  0104]  0016  3 10.0  369.12   11.72  4.67  37.80  n/a   0.000
*
    ADD [  0016+  0105]  0016  1 10.0  382.98   12.23  4.67  38.02  n/a   0.000
*
    ADD [  0016+  0106]  0016  3 10.0  396.84   12.47  4.67  38.49  n/a   0.000
*
    ADD [  0016+  0011]  0016  1 10.0 1055.95   25.67  5.00  37.98  n/a   0.000
*
    READ STORM                 15.0
    [ Ptot= 89.90 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\c90ad3c2-a919-48f5-8269-fb8b
    remark: SCS_06H_100Y
*
 ** CALIB NASHYD         0107  1 10.0   28.41    1.96  3.83  45.68 0.51   0.000
    [CN=79.0         ]
    [ N = 3.0:Tp 0.66]
*
    READ STORM                 15.0
    [ Ptot= 89.90 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\c90ad3c2-a919-48f5-8269-fb8b
    remark: SCS_06H_100Y
*
 ** CALIB NASHYD         0108  1 10.0   33.73    1.68  4.33  46.94 0.52   0.000
    [CN=80.0         ]
    [ N = 3.0:Tp 1.05]
*
    READ STORM                 15.0
    [ Ptot= 89.90 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\c90ad3c2-a919-48f5-8269-fb8b
    remark: SCS_06H_100Y
*
 ** CALIB NASHYD         0109  1 10.0    2.78    0.16  3.50  25.13 0.28   0.000
    [CN=58.0         ]
    [ N = 3.0:Tp 0.33]
*
    ADD [  0107+  0108]  0018  3 10.0   62.14    3.48  4.00  46.36  n/a   0.000
*
    ADD [  0018+  0109]  0018  1 10.0   64.92    3.56  4.00  45.45  n/a   0.000
*
    ADD [  0018+  0016]  0018  3 10.0 1120.87   27.93  4.83  38.41  n/a   0.000
*
    READ STORM                 15.0
    [ Ptot= 89.90 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\c90ad3c2-a919-48f5-8269-fb8b
    remark: SCS_06H_100Y
*
 ** CALIB NASHYD         0110  1 10.0   74.04    4.93  3.83  44.14 0.49   0.000
    [CN=78.0         ]
    [ N = 3.0:Tp 0.66]
*
    ADD [  0110+  0018]  0019  3 10.0 1194.91   30.50  4.67  38.76  n/a   0.000
*
================================================================================
==============


       V    V   I    SSSSS  U   U    A    L             (v 5.1.2000)
       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
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Civica Infrastructure
Copyright 2007 - 2013 Civica Infrastructure
All rights reserved.


                    *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\VO2\voin.dat
  Output  filename: C:\Users\Valdor\AppData\Local\Civica\VH5\fc940250-ed07-412c-85e3-
c94b4cb6310f\bd39010c-1463-4444-a5cf-533585f87d24\scena
  Summary filename: C:\Users\Valdor\AppData\Local\Civica\VH5\fc940250-ed07-412c-85e3-
c94b4cb6310f\bd39010c-1463-4444-a5cf-533585f87d24\scena


DATE: 04-16-2020                          TIME: 04:12:51

USER:


COMMENTS: _____________________________________________________


  ************************************************
  ** SIMULATION : SCS_12H_100Y                   **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms


     START @  0.00 hrs
     --------------------
    READ STORM                 15.0
    [ Ptot= 98.39 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\bea2a157-eca0-44af-8e97-4724
```

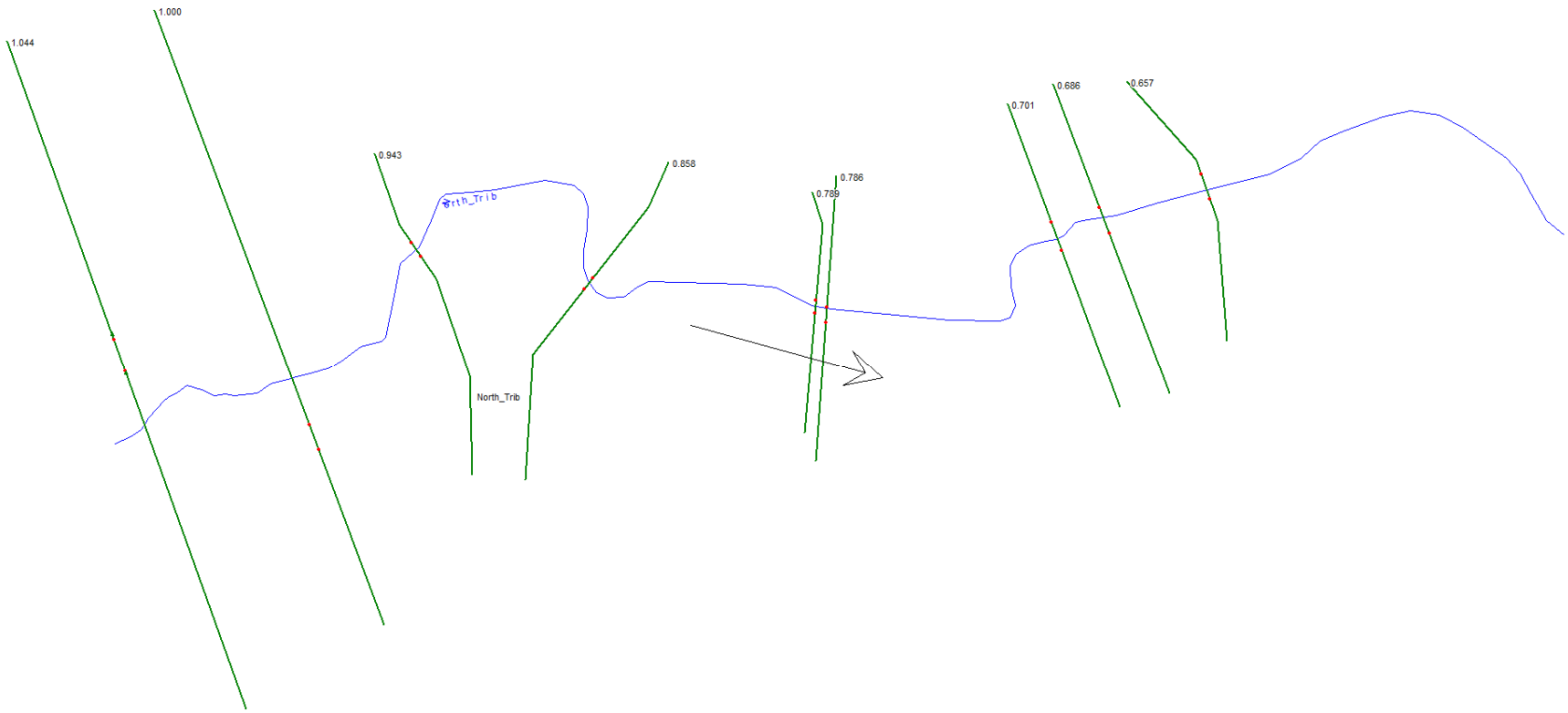
```
    remark: SCS_12H_100Y
*
 ** CALIB NASHYD         0101  1 10.0  619.42   14.11  8.50  42.73 0.43   0.000
    [CN=71.0         ]
    [ N = 3.0:Tp 2.09]
*
    READ STORM                 15.0
    [ Ptot= 98.39 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\bea2a157-eca0-44af-8e97-4724
    remark: SCS_12H_100Y
*
 ** CALIB NASHYD         0102  1 10.0   39.69    5.78  6.33  59.33 0.60   0.000
    [CN=84.0         ]
    [ N = 3.0:Tp 0.27]
*
    ADD [  0101+  0102]  0011  3 10.0  659.11   14.56  8.50  43.73  n/a   0.000
*
    READ STORM                 15.0
    [ Ptot= 98.39 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\bea2a157-eca0-44af-8e97-4724
    remark: SCS_12H_100Y
*
 ** CALIB NASHYD         0103  1 10.0  289.68    9.49  7.67  46.24 0.47   0.000
    [CN=74.0         ]
    [ N = 3.0:Tp 1.46]
*
    READ STORM                 15.0
    [ Ptot= 98.39 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\bea2a157-eca0-44af-8e97-4724
    remark: SCS_12H_100Y
*
 ** CALIB NASHYD         0104  1 10.0   79.44    2.57  7.17  35.27 0.36   0.000
    [CN=64.0         ]
    [ N = 3.0:Tp 1.02]
*
    READ STORM                 15.0
    [ Ptot= 98.39 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\bea2a157-eca0-44af-8e97-4724
    remark: SCS_12H_100Y
*
 ** CALIB NASHYD         0105  1 10.0   13.86    0.94  6.83  50.49 0.51   0.000
    [CN=78.0         ]
    [ N = 3.0:Tp 0.63]
*
    READ STORM                 15.0
    [ Ptot= 98.39 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\bea2a157-eca0-44af-8e97-4724
    remark: SCS_12H_100Y
*
 ** CALIB NASHYD         0106  1 10.0   13.86    2.24  6.33  58.66 0.60   0.000
    [CN=84.0         ]
    [ N = 3.0:Tp 0.22]
*
    ADD [  0103+  0104]  0016  3 10.0  369.12   11.84  7.67  43.88  n/a   0.000
*
    ADD [  0016+  0105]  0016  1 10.0  382.98   12.38  7.50  44.12  n/a   0.000
*
    ADD [  0016+  0106]  0016  3 10.0  396.84   12.60  7.50  44.63  n/a   0.000
*
    ADD [  0016+  0011]  0016  1 10.0 1055.95   25.88  8.00  44.07  n/a   0.000
*
    READ STORM                 15.0
    [ Ptot= 98.39 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\bea2a157-eca0-44af-8e97-4724
    remark: SCS_12H_100Y
*
 ** CALIB NASHYD         0107  1 10.0   28.41    1.96  6.83  52.55 0.53   0.000
    [CN=79.0         ]
    [ N = 3.0:Tp 0.66]
*
    READ STORM                 15.0
    [ Ptot= 98.39 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\bea2a157-eca0-44af-8e97-4724
    remark: SCS_12H_100Y
*
 ** CALIB NASHYD         0108  1 10.0   33.73    1.69  7.17  53.92 0.55   0.000
    [CN=80.0         ]
    [ N = 3.0:Tp 1.05]
*
    READ STORM                 15.0
    [ Ptot= 98.39 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\bea2a157-eca0-44af-8e97-4724
    remark: SCS_12H_100Y
*
 ** CALIB NASHYD         0109  1 10.0    2.78    0.16  6.50  29.66 0.30   0.000
    [CN=58.0         ]
    [ N = 3.0:Tp 0.33]
*
    ADD [  0107+  0108]  0018  3 10.0   62.14    3.49  7.00  53.29  n/a   0.000
*
    ADD [  0018+  0109]  0018  1 10.0   64.92    3.57  7.00  52.28  n/a   0.000
*
    ADD [  0018+  0016]  0018  3 10.0 1120.87   28.13  7.83  44.54  n/a   0.000
*
    READ STORM                 15.0
    [ Ptot= 98.39 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\bea2a157-eca0-44af-8e97-4724
    remark: SCS_12H_100Y
*
 ** CALIB NASHYD         0110  1 10.0   74.04    4.94  6.83  50.89 0.52   0.000
    [CN=78.0         ]
    [ N = 3.0:Tp 0.66]
*
    ADD [  0110+  0018]  0019  3 10.0 1194.91   30.78  7.50  44.94  n/a   0.000
*
================================================================================
===============


       V    V   I    SSSSS  U   U    A    L             (v 5.1.2000)
       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
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Civica Infrastructure
Copyright 2007 - 2013 Civica Infrastructure
All rights reserved.


                    *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\VO2\voin.dat
  Output  filename: C:\Users\Valdor\AppData\Local\Civica\VH5\fc940250-ed07-412c-85e3-
c94b4cb6310f\1703e436-fb5e-4a9b-9300-6f1566aa8aa3\scena
```

```
  Summary filename: C:\Users\Valdor\AppData\Local\Civica\VH5\fc940250-ed07-412c-85e3-
c94b4cb6310f\1703e436-fb5e-4a9b-9300-6f1566aa8aa3\scena

DATE: 04-16-2020                          TIME: 04:12:51

USER:

COMMENTS: _____

  ************************************************
  ** SIMULATION : SCS_24H_100Y                  **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                   min     ha   '  cms   hrs     mm          cms

     START @  0.00 hrs
     --------------------
    READ STORM                15.0
    [ Ptot=108.68 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\66439c18-cbce-4ddc-a123-48e8
    remark: SCS_24H_100Y
*
 ** CALIB NASHYD         0101  1 10.0  619.42   13.98 14.50  50.25 0.46   0.000
    [CN=71.0         ]
    [ N = 3.0:Tp 2.09]
*
    READ STORM                15.0
    [ Ptot=108.68 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\66439c18-cbce-4ddc-a123-48e8
    remark: SCS_24H_100Y
*
 ** CALIB NASHYD         0102  1 10.0   39.69    5.61 12.33  68.39 0.63   0.000
    [CN=84.0         ]
    [ N = 3.0:Tp 0.27]
*
    ADD [  0101+  0102]  0011  3 10.0  659.11   14.62 14.33  51.34  n/a   0.000
*
    READ STORM                15.0
    [ Ptot=108.68 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\66439c18-cbce-4ddc-a123-48e8
    remark: SCS_24H_100Y
*
 ** CALIB NASHYD         0103  1 10.0  289.68    9.43 13.67  54.15 0.50   0.000
    [CN=74.0         ]
    [ N = 3.0:Tp 1.46]
*
    READ STORM                15.0
    [ Ptot=108.68 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\66439c18-cbce-4ddc-a123-48e8
    remark: SCS_24H_100Y
*
 ** CALIB NASHYD         0104  1 10.0   79.44    2.58 13.17  41.88 0.39   0.000
    [CN=64.0         ]
    [ N = 3.0:Tp 1.02]
*
    READ STORM                15.0
    [ Ptot=108.68 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\66439c18-cbce-4ddc-a123-48e8
    remark: SCS_24H_100Y
*
 ** CALIB NASHYD         0105  1 10.0   13.86    0.93 12.67  58.88 0.54   0.000
    [CN=78.0         ]
    [ N = 3.0:Tp 0.63]
*
    READ STORM                15.0
    [ Ptot=108.68 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\66439c18-cbce-4ddc-a123-48e8
    remark: SCS_24H_100Y
*
 ** CALIB NASHYD         0106  1 10.0   13.86    2.16 12.33  67.63 0.62   0.000
    [CN=84.0         ]
    [ N = 3.0:Tp 0.22]
*
    ADD [  0103+  0104]  0016  3 10.0  369.12   11.82 13.50  51.51  n/a   0.000
*
    ADD [  0016+  0105]  0016  1 10.0  382.98   12.36 13.50  51.78  n/a   0.000
*
    ADD [  0016+  0106]  0016  3 10.0  396.84   12.51 13.33  52.33  n/a   0.000
*
    ADD [  0016+  0011]  0016  1 10.0 1055.95   25.48 14.00  51.71  n/a   0.000
*
    READ STORM                15.0
    [ Ptot=108.68 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\66439c18-cbce-4ddc-a123-48e8
    remark: SCS_24H_100Y
*
 ** CALIB NASHYD         0107  1 10.0   28.41    1.92 12.83  61.09 0.56   0.000
    [CN=79.0         ]
    [ N = 3.0:Tp 0.66]
*
    READ STORM                15.0
    [ Ptot=108.68 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\66439c18-cbce-4ddc-a123-48e8
    remark: SCS_24H_100Y
*
 ** CALIB NASHYD         0108  1 10.0   33.73    1.67 13.17  62.59 0.58   0.000
    [CN=80.0         ]
    [ N = 3.0:Tp 1.05]
*
    READ STORM                15.0
    [ Ptot=108.68 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\66439c18-cbce-4ddc-a123-48e8
    remark: SCS_24H_100Y
*
 ** CALIB NASHYD         0109  1 10.0    2.78    0.16 12.50  35.47 0.33   0.000
    [CN=58.0         ]
    [ N = 3.0:Tp 0.33]
*
    ADD [  0107+  0108]  0018  3 10.0   62.14    3.43 13.00  61.90  n/a   0.000
*
    ADD [  0018+  0109]  0018  1 10.0   64.92    3.52 12.83  60.77  n/a   0.000
*
    ADD [  0018+  0016]  0018  3 10.0 1120.87   27.64 13.50  52.24  n/a   0.000
*
    READ STORM                15.0
    [ Ptot=108.68 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\66439c18-cbce-4ddc-a123-48e8
    remark: SCS_24H_100Y
*
 ** CALIB NASHYD         0110  1 10.0   74.04    4.85 12.83  59.30 0.55   0.000
    [CN=78.0         ]
    [ N = 3.0:Tp 0.66]
*
    ADD [  0110+  0018]  0019  3 10.0 1194.91   30.81 13.33  52.68  n/a   0.000
*
```

```
================================================================================================
==============

       V    V   I    SSSSS  U   U    A    L             (v 5.1.2000)
       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
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Civica Infrastructure
Copyright 2007 - 2013 Civica Infrastructure
All rights reserved.


                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\VO2\voin.dat
  Output  filename: C:\Users\Valdor\AppData\Local\Civica\VH5\fc940250-ed07-412c-85e3-
c94b4cb6310f\f433b504-7c7e-4816-9319-f294e19ddee0\scena
  Summary filename: C:\Users\Valdor\AppData\Local\Civica\VH5\fc940250-ed07-412c-85e3-
c94b4cb6310f\f433b504-7c7e-4816-9319-f294e19ddee0\scena


DATE: 04-16-2020                          TIME: 04:12:51

USER:


COMMENTS: _____________________________________________________


  ************************************************
  ** SIMULATION : TIMMINS                       **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                   min     ha   '  cms   hrs     mm          cms

     START @  0.00 hrs
     ---------------------
    READ STORM                15.0
    [ Ptot=193.00 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\e2c3a379-de84-4204-9e38-978b
    remark: * Timmins Storm
*
 ** CALIB NASHYD         0101  1 10.0  619.42   28.26  9.83 119.31 0.62   0.000
    [CN=71.0         ]
    [ N = 3.0:Tp 2.09]
*
    READ STORM                15.0
    [ Ptot=193.00 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\e2c3a379-de84-4204-9e38-978b
    remark: * Timmins Storm
*
 ** CALIB NASHYD         0102  1 10.0   39.69    4.13  7.00 146.43 0.76   0.000
    [CN=84.0         ]
    [ N = 3.0:Tp 0.27]
*
    ADD [  0101+  0102]  0011  3 10.0  659.11   29.64  9.83 120.95  n/a   0.000
*
    READ STORM                15.0
    [ Ptot=193.00 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\e2c3a379-de84-4204-9e38-978b
    remark: * Timmins Storm
*
 ** CALIB NASHYD         0103  1 10.0  289.68   15.50  9.17 125.69 0.65   0.000
    [CN=74.0         ]
    [ N = 3.0:Tp 1.46]
*
    READ STORM                15.0
    [ Ptot=193.00 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\e2c3a379-de84-4204-9e38-978b
    remark: * Timmins Storm
*
 ** CALIB NASHYD         0104  1 10.0   79.44    3.95  7.83 104.70 0.54   0.000
    [CN=64.0         ]
    [ N = 3.0:Tp 1.02]
*
    READ STORM                15.0
    [ Ptot=193.00 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\e2c3a379-de84-4204-9e38-978b
    remark: * Timmins Storm
*
 ** CALIB NASHYD         0105  1 10.0   13.86    1.08  7.17 133.41 0.69   0.000
    [CN=78.0         ]
    [ N = 3.0:Tp 0.63]
*
    READ STORM                15.0
    [ Ptot=193.00 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\e2c3a379-de84-4204-9e38-978b
    remark: * Timmins Storm
*
 ** CALIB NASHYD         0106  1 10.0   13.86    1.44  7.00 144.89 0.75   0.000
    [CN=84.0         ]
    [ N = 3.0:Tp 0.22]
*
    ADD [  0103+  0104]  0016  3 10.0  369.12   19.21  9.00 121.17  n/a   0.000
*
    ADD [  0016+  0105]  0016  1 10.0  382.98   19.98  9.00 121.62  n/a   0.000
*
    ADD [  0016+  0106]  0016  3 10.0  396.84   20.79  9.00 122.43  n/a   0.000
*
    ADD [  0016+  0011]  0016  1 10.0 1055.95   49.86  9.17 121.50  n/a   0.000
*
    READ STORM                15.0
    [ Ptot=193.00 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\e2c3a379-de84-4204-9e38-978b
    remark: * Timmins Storm
*
 ** CALIB NASHYD         0107  1 10.0   28.41    2.23  7.33 136.43 0.71   0.000
    [CN=79.0         ]
    [ N = 3.0:Tp 0.66]
*
    READ STORM                15.0
    [ Ptot=193.00 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\e2c3a379-de84-4204-9e38-978b
    remark: * Timmins Storm
*
 ** CALIB NASHYD         0108  1 10.0   33.73    2.22  7.83 138.66 0.72   0.000
    [CN=80.0         ]
    [ N = 3.0:Tp 1.05]
*
    READ STORM                15.0
    [ Ptot=193.00 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\e2c3a379-de84-4204-9e38-978b
```

```
    remark: * Timmins Storm
*
 ** CALIB NASHYD         0109  1 10.0    2.78    0.18  7.00  92.40 0.48   0.000
    [CN=58.0         ]
    [ N = 3.0:Tp 0.33]
*
    ADD [  0107+  0108]  0018  3 10.0   62.14    4.33  7.50 137.64  n/a   0.000
*
    ADD [  0018+  0109]  0018  1 10.0   64.92    4.46  7.33 135.70  n/a   0.000
*
    ADD [  0018+  0016]  0018  3 10.0 1120.87   53.52  9.17 122.33  n/a   0.000
*
    READ STORM                15.0
    [ Ptot=193.00 mm ]
    fname : C:\Users\Valdor\AppData\Local\Temp\0693206a-483c-4eba-94cf-
0cec1e63814b\e2c3a379-de84-4204-9e38-978b
    remark: * Timmins Storm
*
 ** CALIB NASHYD         0110  1 10.0   74.04    5.70  7.33 133.88 0.69   0.000
    [CN=78.0         ]
    [ N = 3.0:Tp 0.66]
*
    ADD [  0110+  0018]  0019  3 10.0 1194.91   57.57  9.17 123.04  n/a   0.000
*
 FINISH

================================================================================
==============
```

Valdor Engineering Inc.
File: 21101
Date: February 2026



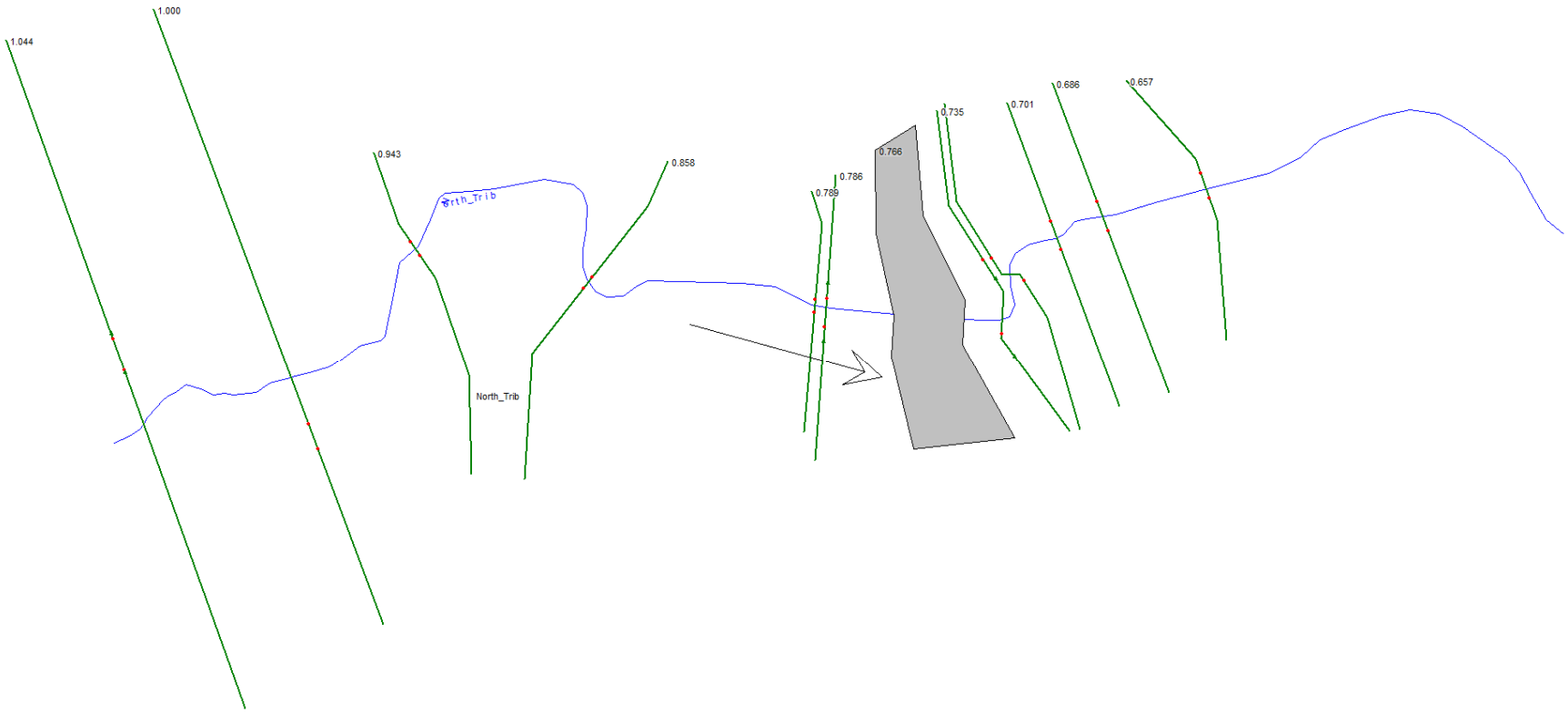
HEC-RAS Model Schematic – Pre-Development

HEC-RAS OUTPUT - EXISTING

HEC-RAS Plan: Plan 27 River: North_Trib Reach: North_Trib Profile: Regional

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
North_Trib	1.044	Regional	57.57	233.62	236.16	236.16	237.26	0.009953	4.80	13.38	65.68	1.02
North_Trib	1.000	Regional	57.57	233.30	235.16		235.27	0.003649	2.23	55.11	49.77	0.58
North_Trib	0.943	Regional	57.57	233.25	234.85		235.03	0.006405	2.92	47.06	51.16	0.77
North_Trib	0.858	Regional	57.57	232.68	234.67		234.75	0.002437	2.18	67.05	55.99	0.50
North_Trib	0.789	Regional	57.57	231.80	233.91	233.91	234.43	0.009374	4.24	31.61	31.68	0.95
North_Trib	0.786	Regional	57.57	231.60	233.76	233.76	234.29	0.009512	4.12	30.27	30.18	0.95
North_Trib	0.701	Regional	57.57	230.44	232.27	232.27	232.76	0.008340	3.47	28.05	32.75	0.89
North_Trib	0.686	Regional	57.57	229.70	231.39	231.39	231.95	0.009650	3.73	24.60	24.07	0.96
North_Trib	0.657	Regional	57.57	229.20	230.86	230.86	231.38	0.009552	3.68	27.74	31.51	0.95

Valdor Engineering Inc.
File: 21101
Date: February 2026



HEC-RAS Model Schematic – Post-Development

HEC-RAS OUTPUT - PROPOSED

HEC-RAS Plan: Plan 001 River: North_Trib Reach: North_Trib Profile: Regional

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
North_Trib	1.044	Regional	57.57	233.62	236.16	236.16	237.26	0.009953	4.80	13.38	65.68	1.02
North_Trib	1.000	Regional	57.57	233.30	235.16		235.28	0.003564	2.21	55.54	49.83	0.57
North_Trib	0.943	Regional	57.57	233.25	234.87		235.05	0.005907	2.85	48.59	52.12	0.74
North_Trib	0.858	Regional	57.57	232.68	234.72		234.80	0.002185	2.10	69.93	57.17	0.48
North_Trib	0.789	Regional	57.57	231.80	234.38		234.61	0.003531	2.99	48.08	39.25	0.60
North_Trib	0.786	Regional	57.57	231.56	234.40	233.32	234.59	0.001807	2.13	36.19	39.43	0.40
North_Trib	0.766		Culvert									
North_Trib	0.735	Regional	57.57	231.10	232.72	232.24	232.93	0.003088	2.11	32.23	37.32	0.54
North_Trib	0.720	Regional	57.57	230.88	232.67		232.89	0.003239	2.26	39.14	37.03	0.56
North_Trib	0.701	Regional	57.57	230.44	232.27	232.27	232.76	0.008340	3.47	28.05	32.75	0.89
North_Trib	0.686	Regional	57.57	229.70	231.23	231.23	231.80	0.010191	3.61	22.57	22.67	0.93
North_Trib	0.657	Regional	57.57	229.20	230.86	230.86	231.38	0.009552	3.68	27.74	31.51	0.95

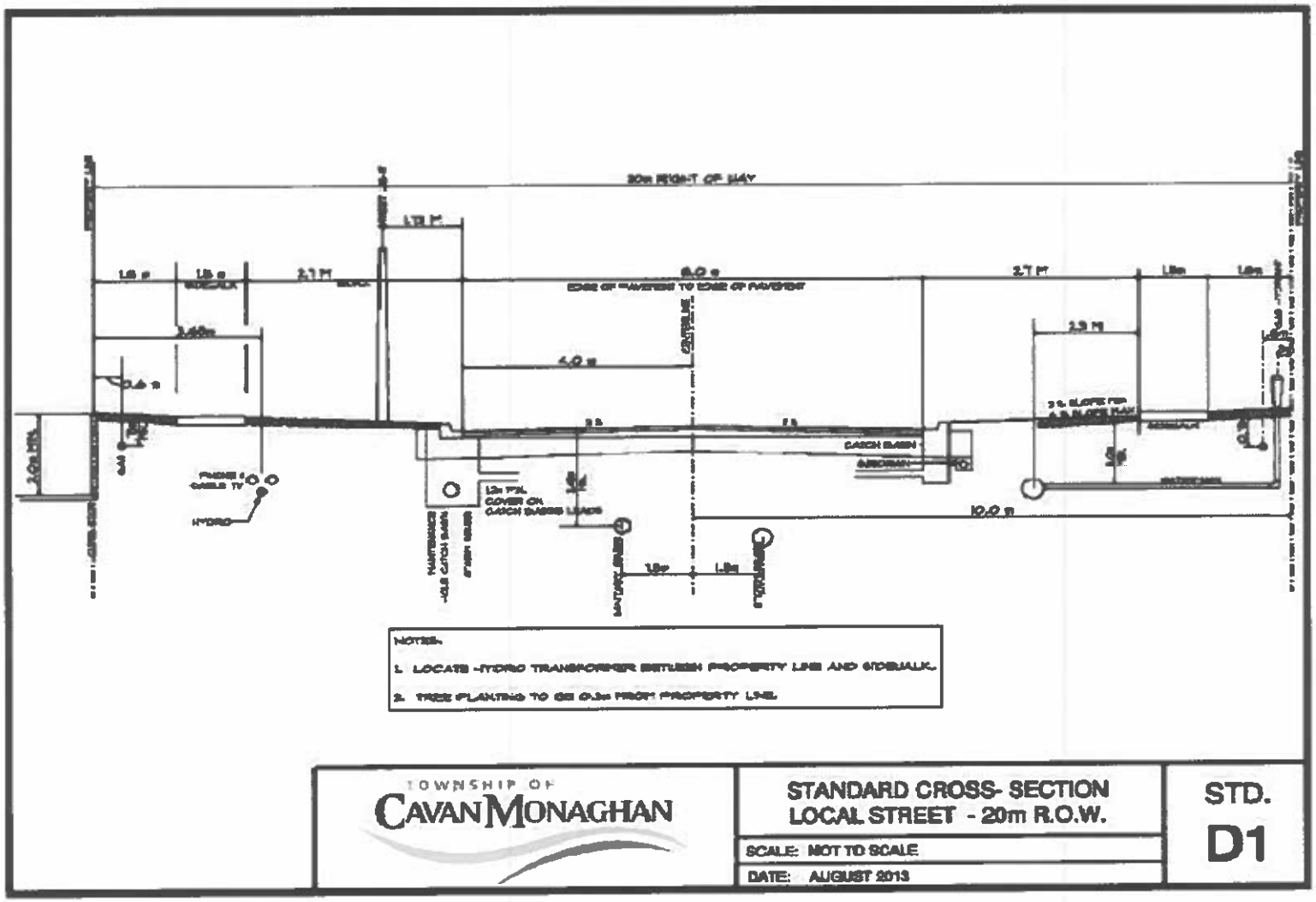
Valdor Engineering Inc.
File: 21101
Date: March 2026

Table F.6: HEC-RAS Existing and Post-Development Regional Water Elevations

River Sta	Profile	Q Total	W.S. Elev - old	W.S. Elev - Proposed	Comparison
		(m3/s)	(m)	(m)	(m)
1.044	Timmins	57.57	236.16	236.16	0.00
1.000	Timmins	57.57	235.16	235.16	0.00
0.943	Timmins	57.57	234.85	234.87	0.02
0.858	Timmins	57.57	234.67	234.72	0.05
0.789	Timmins	57.57	233.91	234.38	0.47
0.786	Timmins	57.57	233.76	234.40	0.64
0.774	Timmins	57.57		234.40	-
0.766	Timmins	57.57		CULVERT	-
0.735	Timmins	57.57		232.72	-
0.720	Timmins	57.57		232.67	-
0.701	Timmins	57.57	232.27	232.27	0.00
0.686	Timmins	57.57	231.39	231.23	-0.16
0.657	Timmins	57.57	230.86	230.86	0.00

APPENDIX “G”

Standard Road & Sidewalk Cross Sections


20m RIGHT OF WAY
EDGE OF PAVEMENT TO EDGE OF PAVEMENT
8.0 m
4.0 m
10.0 m
CATCH BASIN LEADS
NOTES:
1. LOCATE HYDRO TRANSFORMER BETWEEN PROPERTY LINE AND SIDEWALK.
2. TREE PLANTING TO BE 0.3m FROM PROPERTY LINE.
TOWNSHIP OF
CAVAN MONAGHAN
STANDARD CROSS- SECTION
LOCAL STREET - 20m R.O.W.
SCALE: NOT TO SCALE
DATE: AUGUST 2013
STD.
D1

APPENDIX “H”

Water Balance and Excerpts from the Geotechnical Investigation Report

Table H.1: Infiltration Trench Calculations (Parking Lots)

VALDOR ENGINEERING INC.
571 Chrislea Road, Unit 4, 2nd Floor, Woodbridge, Ontario, L4L 8A2
Tel: 905-264-0054 Fax: 905-264-0069
info@valdor-engineering.com www.valdor-engineering.com

Project No: 21101
Date: January 2026

Total Req'd Annual Infiltration Volume to Achieve Target (m^3)	*Total Actual Annual Infiltration Volume per Design (m^3)*	*Soil Infiltration Rate (mm/h)*	*Minimum Total Drainage Area to Infiltration Facilities (ha)*	*Maximum Trench Length per Site Plan (m)*	*Initial Abstraction (Trench Drainage Area) (mm)*	*Retention Time (hr)*	*Total Annual Rainfall Depth (mm)*	*Total Rainfall Depth Available for Infiltration Per Rainfall Analysis Assuming Ia=5.0mm (mm)*	*Annual Rainfall Depth Needed to Achieve Target Infiltration (mm)*	*[1] Req'd Design Storm Depth to Achieve Annual Infiltration Requirements (Assuming Ia=5.0 mm) (mm)*	*Provided Event-Based Runoff Volume to be Infiltrated (Based on Req'd Design Storm Depth (m^3)*
20,112	11,948	12	2.04	-	0.0	48	712.5	585.46	985.5	15.0	306.1

Maximum Allowable Depth	
P, Design Soil Infiltration Rate (mm/h):	**12**
T, Drawdown Time (hr):	**48**
d, Maximum Allowable Depth (m):	**0.58**

Minimum Bottom Area	
V, Runoff Volume to Infiltrated (m^3):	**306**
P, Design Soil Infiltration Rate (mm/h):	**12**
n, Void Ratio (clear stone):	**0.40**
Δt, Drawdown Time (hr):	**48**
A, Minimum Bottom Area (m^2):	**1,329**

$$d = \frac{P \cdot T}{1000}$$ *Equation 4.2, Stormwater Management Planning and Design Manual, MOE, 2003*

$$A = \frac{1000 \cdot V}{P \cdot n \cdot \Delta t}$$ *Equation 4.3, Stormwater Management Planning and Design Manual, MOE, 2003*

Infiltration Trench Design

Infiltration Trench Location	Drainage Area (ha)	Available Infiltration Volume (m^3)	Length (m)	Width (m)	[3]Design Depth (m)	Bottom Area (m^2)	Void Ratio	Storage Volume Provided (m^3)	Lesser of Available Infiltration Volume or Storage Volume Provided (m^3)
Commercial Lot (Block 188)	0.55	81.8	-	-	0.55	450	0.40	99.0	81.8
Commercial Lot (Block 189)	0.09	13.5	-	-	0.55	70	0.40	15.4	13.5
Commercial Block (Building A,B, Retail A-G, QSR A-D, Wash Station)	2.06	309.2	*Refer to 21101 FSR December 2023 Proposed Commercial Development, Phase 1*					146.0	146.0
Medium density (Block 186)	0.26	38.6	-	-	0.55	180	0.40	39.6	38.6
Medium Density (Block 187)	0.18	26.3	-	-	0.55	120	0.40	26.4	26.3

Total drainage area to infiltration trenches (ha): 0.64
Total Bottom Area Provided (m^2): 520
Total Infiltration Volume Used (m^3): 306.1

Notes:

Infiltration facilities are sized based on the following criteria (SWMPDM, MOE, 2003) and/or assumptions:

(1) Infiltration trench volume should be sized based on the runoff generated by a 4-hr 15-mm event or smaller.
(2) Drainage areas should be sufficient to provide required runoff quantity.
(3) The maximum allowable depth of the infiltration facility is based on the soil infiltrate rate and the retention time.
(4) It is feasible to convey the runoff to the infiltration facility.
(5) The seasonal high water table should be at least 1 m below the infiltration trench.

Table H.2: Soakaway Pits

VALDOR ENGINEERING INC.
571 Chrislea Road, Unit 4, 2nd Floor, Woodbridge, Ontario, L4L 8A2
Tel: 905-264-0054 Fax: 905-264-0069
info@valdor-engineering.com www.valdor-engineering.com

Project No: 21101
Date: January 2026

Total Req'd Annual Infiltration Volume to Achieve Target (m^3)	*Total Actual Annual Infiltration Volume per Design (m^3)*	*Soil Infiltration Rate (mm/h)*	*Minimum Total Drainage Area to Infiltration Facilities (ha)*	*Maximum Trench Length per Site Plan (m)*	*Initial Abstraction (Trench Drainage Area) (mm)*	*Retention Time (hr)*	*Total Annual Rainfall Depth (mm)*	*Total Rainfall Depth Available for Infiltration Per Rainfall Analysis Assuming Ia=5.0mm (mm)*	*[1] Req'd Design Storm Depth to Achieve Annual Infiltration Requirements (Assuming Ia=5.0 mm) (mm)*	*Provided Event-Based Runoff Volume to be Infiltrated (Based on Req'd Design Storm Depth (m^3)*
36,960	1,360	**12**	**0.23**	**-**	**0.0**	**48**	**712.5**	**585.46**	**15.0**	34.9

Maximum Allowable Depth	
P, Design Soil Infiltration Rate (mm/h):	**12**
T, Drawdown Time (hr):	**48**
d, Maximum Allowable Depth (m):	**0.58**

Minimum Bottom Area	
V, Runoff Volume to Infiltrated (m^3):	**35**
P, Design Soil Infiltration Rate (mm/h):	**12**
n, Void Ratio (clear stone):	**0.40**
Δt, Drawdown Time (hr):	**48**
A, Minimum Bottom Area (m^2):	**151**

7,020.00
11,948.00
7,060.61
1,360.30
27,388.91
27,132.00
-256.91

$$d = \frac{P \cdot T}{1000}$$ *Equation 4.2, Stormwater Management Planning and Design Manual, MOE, 2003*

$$A = \frac{1000 \cdot V}{P \cdot n \cdot \Delta t}$$ *Equation 4.3, Stormwater Management Planning and Design Manual, MOE, 2003*

Infiltration LID Design											
Infiltration LID Location	**# of Units**	**Rear Roof Area per Unit (m^2)**	**Available Infiltration Volume per Unit (m^3)**	**Length (m)**	**Width (m)**	**Design Depth (m)**	**Bottom Area per Unit (m^2)**	**Void Ratio**	**Storage Volume Provided per Unit (m^3)**	**Lesser of Available Infiltration Volume or Storage Volume Provided (m^3)**	**Total Volume of Storage Volume Provided (m3)**
7.62m Townhouse Units	44	**52.8**	0.79	**2.5**	**2.0**	**0.55**	5.0	0.40	1.10	0.79	34.85
										Total Bottom Area Provided (m^2):	**220**
										Total Infiltration Volume Used (m^3):	**34.9**

Notes:

Infiltration facilities are sized based on the following criteria (SWMPDM, MOE, 2003) and/or assumptions:

(1) Soak away pit volume should be sized based on the runoff generated by a 4-hr 15-mm event or smaller.
(2) Drainage areas should be sufficient to provide required runoff quantity.
(3) The maximum allowable depth of the infiltration facility is based on the soil infiltrate rate and the retention time.
(4) It is feasible to convey the runoff to the infiltration facility.
(5) The seasonal high water table should be at least 1 m below the infiltration trench.

Table H.3: Infiltration Trench Calculations (Residential Lots)

VALDOR ENGINEERING INC.
571 Chrislea Road, Unit 4, 2nd Floor, Woodbridge, Ontario, L4L 8A2
Tel: 905-264-0054 Fax: 905-264-0069
info@valdor-engineering.com www.valdor-engineering.com

Project No: 21101
Date: January 2026

Total Req'd Annual Infiltration Volume to Achieve Target (m^3)	*Total Actual Annual Infiltration Volume per Design (m^3)*	*Soil Infiltration Rate (mm/h)*	*Minimum Total Drainage Area to Infiltration Facilities (ha)*	*Maximum Trench Length per Site Plan (m)*	*Initial Abstraction (Trench Drainage Area) (mm)*	*Retention Time (hr)*	*Total Annual Rainfall Depth (mm)*	*Total Rainfall Depth Available for Infiltration Per Rainfall Analysis Assuming Ia=5.0mm (mm)*	*Annual Rainfall Depth Needed to Achieve Target Infiltration (mm)*	*[1] Req'd Design Storm Depth to Achieve Annual Infiltration Requirements (Assuming Ia=5.0 mm) (mm)*	*Provided Event-Based Runoff Volume to be Infiltrated (Based on Req'd Design Storm Depth (m^3)*
20,112	7,061	12	1.21	-	0.0	48	712.5	585.46	1,667.7	15.0	180.9

Maximum Allowable Depth	
P, Design Soil Infiltration Rate (mm/h):	**12**
T, Drawdown Time (hr):	**48**
d, Maximum Allowable Depth (m):	**0.58**

Minimum Bottom Area	
V, Runoff Volume to Infiltrated (m^3):	**181**
P, Design Soil Infiltration Rate (mm/h):	**12**
n, Void Ratio (clear stone):	**0.40**
Δt, Drawdown Time (hr):	**48**
A, Minimum Bottom Area (m^2):	**785**

$$d = \frac{P \cdot T}{1000}$$ *Equation 4.2, Stormwater Management Planning and Design Manual, MOE, 2003*

$$A = \frac{1000 \cdot V}{P \cdot n \cdot \Delta t}$$ *Equation 4.3, Stormwater Management Planning and Design Manual, MOE, 2003*

Infiltration Trench Design

Infiltration Trench Location	Drainage Area (ha)	Available Infiltration Volume (m^3)	Length (m)	Width (m)	[3]Design Depth (m)	Bottom Area (m^2)	Void Ratio	Storage Volume Provided (m^3)	Lesser of Available Infiltration Volume or Storage Volume Provided (m^3)
(Lots 16-30, 144-120, Block 162)	1.21	180.9	830.0	1.0	0.55	830	0.40	182.6	180.9

Total drainage area to infiltration trenches (ha):	**1.21**
Total Bottom Area Provided (m^2):	**830**
Total Infiltration Volume Used (m^3):	**180.9**

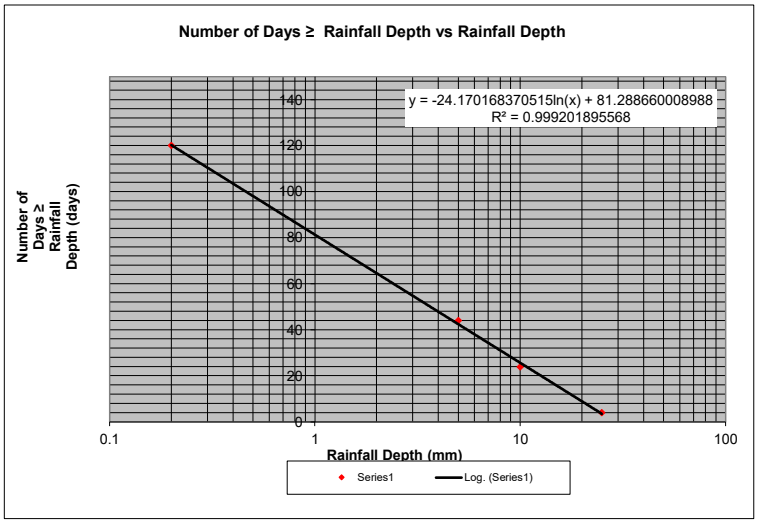
Notes:

Infiltration facilities are sized based on the following criteria (SWMPDM, MOE, 2003) and/or assumptions:

(1) Infiltration trench volume should be sized based on the runoff generated by a 4-hr 15-mm event or smaller.
(2) Drainage areas should be sufficient to provide required runoff quantity.
(3) The maximum allowable depth of the infiltration facility is based on the soil infiltrate rate and the retention time.
(4) It is feasible to convey the runoff to the infiltration facility.
(5) The seasonal high water table should be at least 1 m below the infiltration trench.

Table H.4: Rainfall Analysis (IA = 0 mm)

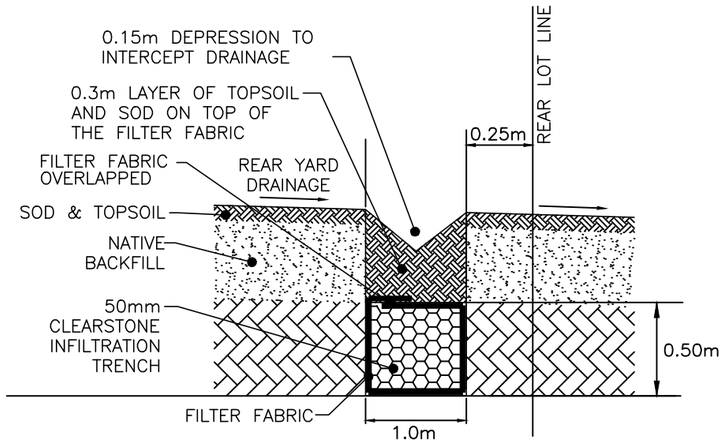
VALDOR ENGINEERING INC.
File: 21101
January 2026



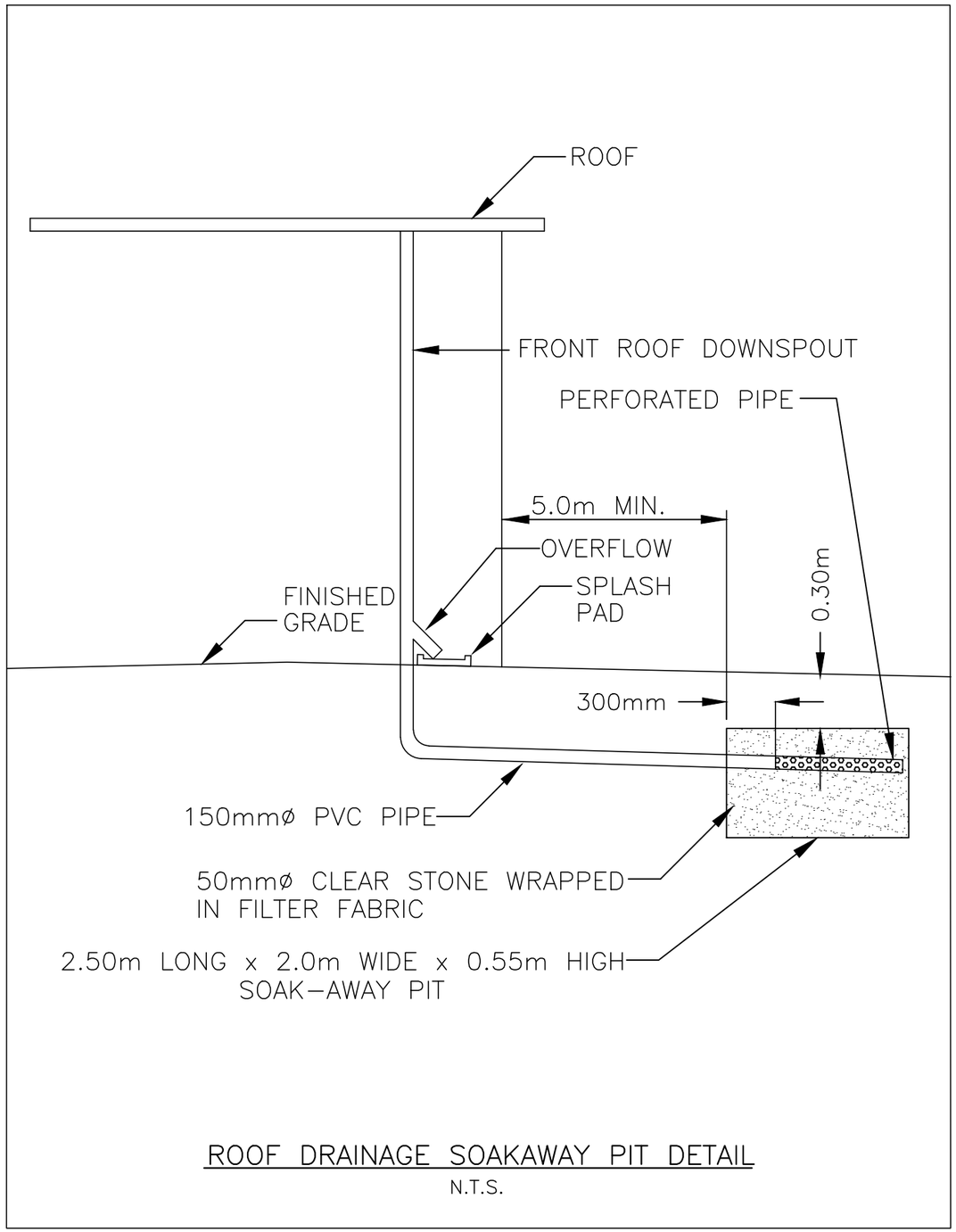
Normal Rainfall Depth (mm)	Normal Days ≥ Rainfall Depth (days)
0.2	120
5	44
10	23.8
25	3.9

Peterborough Airport Climate Normals (1981 - 2010)
712.5 Normal Annual Rainfall Depth (mm)
120 Normal Annual Days with Rainfall (≥ 0.2 mm)
855.3 Normal Annual Precipitation Depth (mm)

Simulated Depth (mm)	Simulated Days ≥ Sim Depth (days)	Average Event Depth (mm)	Simulated Days Equal to Avg Depth (days)	Assumed IA (mm)	Runoff (Rain - IA) (mm)	INF Design Storm (mm)	Event Based Maximum Design INF Depth (mm)	Event Based Design INF Depth (mm)	Annual Incremental Design INF Depth (mm)	Annual Cumulative Design INF Depth (mm)	Annual Incremental Total Rain Depth (mm)	Annual Percent of Total Rain (%)	Annual Cumulative Total Rain Depth (mm)	Annual Cumulative Percent of Total Depth (%)
0.2	120.19													
0.5	98.04	0.2 - 0.5	22.15	**0.00**	0.00	**15.00**	15.00	0.00	0.00	0.00		0.000	0.0	0.000
1.5	71.49	1	26.55	0.00	1.00	15.00	15.00	1.00	26.55	26.55	26.55	0.037	26.6	0.037
2.5	59.14	2	12.35	0.00	2.00	15.00	15.00	2.00	24.69	51.25	24.69	0.035	51.2	0.072
3.5	51.01	3	8.13	0.00	3.00	15.00	15.00	3.00	24.40	75.64	24.40	0.034	75.6	0.106
4.5	44.93	4	6.07	0.00	4.00	15.00	15.00	4.00	24.30	99.94	24.30	0.034	99.9	0.140
5.5	40.08	5	4.85	0.00	5.00	15.00	15.00	5.00	24.25	124.19	24.25	0.034	124.2	0.174
6.5	36.05	6	4.04	0.00	6.00	15.00	15.00	6.00	24.23	148.42	24.23	0.034	148.4	0.208
7.5	32.59	7	3.46	0.00	7.00	15.00	15.00	7.00	24.21	172.63	24.21	0.034	172.6	0.242
8.5	29.56	8	3.03	0.00	8.00	15.00	15.00	8.00	24.20	196.83	24.20	0.034	196.8	0.276
9.5	26.87	9	2.69	0.00	9.00	15.00	15.00	9.00	24.20	221.03	24.20	0.034	221.0	0.310
10.5	24.46	10	2.42	0.00	10.00	15.00	15.00	10.00	24.19	245.22	24.19	0.034	245.2	0.344
11.5	22.26	11	2.20	0.00	11.00	15.00	15.00	11.00	24.19	269.41	24.19	0.034	269.4	0.378
12.5	20.24	12	2.02	0.00	12.00	15.00	15.00	12.00	24.18	293.59	24.18	0.034	293.6	0.412
13.5	18.38	13	1.86	0.00	13.00	15.00	15.00	13.00	24.18	317.77	24.18	0.034	317.8	0.446
14.5	16.65	14	1.73	0.00	14.00	15.00	15.00	14.00	24.18	341.95	24.18	0.034	342.0	0.480
15.5	15.04	15	1.61	0.00	15.00	15.00	15.00	15.00	24.18	366.13	24.18	0.034	366.1	0.514
16.5	13.53	16	1.51	0.00	16.00	15.00	15.00	15.00	22.67	388.80	24.18	0.034	390.3	0.548
17.5	12.11	17	1.42	0.00	17.00	15.00	15.00	15.00	21.33	410.13	24.18	0.034	414.5	0.582
18.5	10.77	18	1.34	0.00	18.00	15.00	15.00	15.00	20.15	430.28	24.18	0.034	438.7	0.616
19.5	9.49	19	1.27	0.00	19.00	15.00	15.00	15.00	19.09	449.36	24.18	0.034	462.8	0.650
20.5	8.28	20	1.21	0.00	20.00	15.00	15.00	15.00	18.13	467.50	24.18	0.034	487.0	0.684
21.5	7.13	21	1.15	0.00	21.00	15.00	15.00	15.00	17.27	484.76	24.17	0.034	511.2	0.717
22.5	6.03	22	1.10	0.00	22.00	15.00	15.00	15.00	16.48	501.25	24.17	0.034	535.4	0.751
23.5	4.98	23	1.05	0.00	23.00	15.00	15.00	15.00	15.77	517.01	24.17	0.034	559.5	0.785
24.5	3.98	24	1.01	0.00	24.00	15.00	15.00	15.00	15.11	532.12	24.17	0.034	583.7	0.819
25.5	3.01	25	0.97	0.00	25.00	15.00	15.00	15.00	14.50	546.62	24.17	0.034	607.9	0.853
26.5	2.08	26	0.93	0.00	26.00	15.00	15.00	15.00	13.95	560.57	24.17	0.034	632.1	0.887
27.5	1.18	27	0.90	0.00	27.00	15.00	15.00	15.00	13.43	574.00	24.17	0.034	656.2	0.921
28.5	0.32	28	0.86	0.00	28.00	15.00	15.00	15.00	12.95	586.95	24.17	0.034	680.4	0.955
29	-0.10	≥ 29	-0.10	0.00	29.00	15.00	15.00	15.00	-1.49	**585.46**	32.10	0.045	712.5	1.000



SURFACE INFILTRATION TRENCH DETAIL
WITHIN RESIDENTIAL LOT
N.T.S.



ROOF DRAINAGE SOAKAWAY PIT DETAIL
N.T.S.

PROJECT
FALLIS LINE NORTH SUBDIVISION
TOWNSHIP OF CAVAN MONAGHAN

TITLE
INFILTRATION TRENCH AND SOAKAWAY PIT DETAIL

VALDOR ENGINEERING INC.
Consulting Engineers - Project Managers
571 Chrislea Road, Unit 4, 2nd Floor, WOODBRIDGE, ONTARIO, L4L 8A2
TEL (905)264-0054, FAX (905)264-0069
E-MAIL: info@valdor-engineering.com
www.valdor-engineering.com

PREPARED BY	CHECKED BY
P.Y.	P.Z.
SCALE: N.T.S	DATE: FEB 2026
PROJECT: 21101	**FIGURE H.1**

ACAD File: N:\Projects\2021\21101\Hydrotechnical\0-Working\Figures\21101_Infiltration Roof drainage detail.dwg Layout: Proposed Printed: Mar. 03, 2026

Hydrogeological and Geotechnical Assessment

Proposed Residential and Commercial Development; Fallis Line, Millbrook, ON

Vargas P Inc.

12 June 2025

→ The Power of Commitment

5.1.3 Preliminary Infiltration Rates

The plotted gradation curves for the soil samples tested were compared to the gradation curves and descriptions in the Supplementary Guidelines to the Ontario Building Code[7] to determine the infiltration rates for the soils. The estimated coefficient of permeability and corresponding estimated infiltration rate ranges for the soils encountered in the Site are provided in the table below:

Table 9 Preliminary Infiltration Rate Ranges based on Site Soils

Soil Description (USCS Symbol)*	Coefficient of Permeability, K (cm/sec)	Percolation Time, T (mins/cm) **	Range of Estimated Infiltration Rates 1/T (mm/hr)
Non-Cohesive Sand Till (SM)	10^{-3} to 10^{-5}	8 to 20	30 to 75
Non-Cohesive Silt Till (ML)	10^{-5} to 10^{-6}	20 to 50	12 to 30
Cohesive Clay Till (CL)	Less than 10^{-6}	Over 50	Less than 12
*Soils encountered at the Site **Provided in the Supplementary Guidelines (Ontario Ministry of Municipal Affairs and Housing, August 15, 2006)			

The infiltration rates provided above are suitable for preliminary design; however, in-situ infiltration testing is recommended once design details for the Low Impact Development (LID) infiltration facilities are available.

It is noted that slight variations in the soil stratigraphy may cause variations in the permeability of the soil in both vertical and horizontal orientations.

A safety correction factor from Appendix C of the Low Impact Storm Water Management Planning and Design Guide must be applied to the measured in-situ infiltration rates.

LIDs can be applied to any soil type; however, it is recommended that more permeable zones are targeted and that sub-grade infiltration locations be kept away from private lands. LIDs require maintenance and long-term care. If possible, naturally occurring infiltration strategies such as roof water discharged via downspouts to sodded lawns with adequate topsoil depths and maximized flow path distances are recommended.

5.1.4 Construction Dewatering

Excavations are expected to extend into the underlying glacial till deposit for this development. Based upon our subsurface investigation, groundwater seepage will be encountered at depth. Dewatering to remove groundwater seepage as well as surface water runoff and precipitation to ensure safe and dry working conditions may be required depending on the depth of the excavation and the time of the year. Pumping from collection sumps to an acceptable outlet will control this expected groundwater infiltration.

It is recommended that prior to commencing the construction of the site servicing, consideration be given to the excavation of a series of trial excavations along the alignment of the proposed sewers / watermains to determine more accurately the soil behaviour and if any dewatering works are required.

Should any excavations require more intensive dewatering or groundwater control, the use of filtered sumps, or other suitable method of dewatering is recommended. If short-term pumping of groundwater at volumes greater than 50,000 L/day and less than 400,000 L/day is required during the construction stage, the Environmental Activity and Sector Registry (EASR) must be completed. If the projected construction dewatering volumes exceed 400,000 L/day, then a Category 3 Permit to Take Water (PTTW) will be required from the MECP.

It is not the purpose of this report to assess the planned water taking related to any required dewatering work. Once the detailed design drawings have been prepared, a water taking assessment can be completed to determine

[7] Ontario Ministry of Municipal Affairs and Housing – Building and Development Branch. Supplementary Standard SB-6. Percolation Time and Soil Descriptions. August 15, 2006.

requirements of dewatering and recommendations for an EASR or PTTW application, should they be needed. At the construction stage of the development, any monitoring wells at the Site are to be decommissioned in accordance with O. Reg. 903 by a licensed and experienced contractor.

5.1.5 Water Balance

The following subsections describe the water balance and establish a post-development infiltration target for the proposed development based upon the referenced Draft Plan of Subdivision. For purposes of the water balance, the Site has been divided into "North Subcatchment" and "South Subcatchment" for completion of the water balance calculations. The subcatchment areas are based upon the environmental protection area and creek which runs through the Site.

The Thornthwaite Method calculations are provided in **Appendix E.1** and are summarized in **Table 10**.

Table 10 Summary of Thornthwaite Method Calculations

Station	Precipitation (mm/yr)	Adjusted ET (mm/yr)	Surplus (mm/yr)
Peterborough (1991 – 2020)	839.8	562.6	277.2

The calculations indicate that 277.2 mm/year of water is available as either runoff or infiltration.

5.1.5.1 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"[8]. It is based on three sub-factors which are:

- Topography sub-factor;
- Soil sub-factor; and
- Cover sub-factor.

The slope of the Site was considered to be an intermediate value (0.15) between "rolling" (slope of 2.8 to 3.8 m per km) to "hilly" (average slope of 28 to 47 m per km). The soil factor was assigned a value of 0.25 based upon the soils encountered at the Site. The land cover factor considered agricultural, naturalized, gravel driveway and rooftop areas. The existing vegetation factor for the pre-development site ranged from agriculture (0.1) to naturalized areas (0.175). The existing residential structures were also considered in the pre-development calculations (see **Appendix E.2** for a breakdown of the areas). The Site subcatchment areas included "North Subcatchment" comprising about 8.8 ha north of the creek and "South Subcatchment" comprising nearly 25 ha south of the creek. **Table 11** summarizes the expected pre-development water balance values for the Site. Based upon the values presented below, 99.7% of the Site is pervious and 0.3% is impervious.

Table 11 Pre-Development Land Use Summary

Land Use	Area (m^2)
North Subcatchment	
Agricultural	78,023
Treed / Naturalized	9,600
Sub-Total – North Subcatchment	**87,623**
South Subcatchment	
Agricultural	238,003

[8] MOEE Hydrogeological Technical Information Requirements for Land Development Applications. April 1995.

Land Use	Area (m^2)
Treed / Naturalized	9,600
Existing Residential -Rooftops -Driveway	 -575 -400
Sub-Total – South Subcatchment	**248,578**
TOTAL AREA	**336,200**

Table 12 summarizes the pre-development water balance calculations:

Table 12 Pre-Development Water Balance Results

ID	Area (m^2)	Area for Recharge (m^2)	Precipitation (m^3/yr)	ET (m^3/yr)	Runoff (m^3/yr)	Infiltration (m^3/yr)
NSC	87,623	87,623	73,585	49,297	11,878	12,410
% of Precipitation in this Subcatchment				67.0%	16.1%	16.9%
SSC	248,578	247,603	208,755	139,466	34,508	34,782
% Precipitation in this Subcatchment				66.8%	16.5%	16.7%
Site	336,200	335,225	282,341	188,763	46,386	47,192
% of Total Precipitation				66.9%	16.4%	16.7%

Note: NSC refers to North Subcatchment. SSC refers to South Subcatchment.

It was assumed that the stormwater runoff from existing rooftops will have an infiltration factor of 37.5% (i.e. 37.5% of the rooftop runoff will be infiltrated). Based upon these values, the Site infiltrates on the order of 47,192 m^3/year (~140 mm/year) or about 16.7% of the precipitation that falls on the Site each year. Further, the pre-development catchments north and south infiltrate an estimated 12,410 m^3 per year and 34,782 m^3 per year, respectively. In our opinion, the infiltration volume of these pre-development catchments is to be maintained to support downgradient receptors such as the creek that bisects the Site.

5.1.5.2 Post-Development Water Balance (No Infiltration Enhancements)

The computation of the water budget was repeated for the proposed development assuming no infiltration enhancements, that is, runoff from impervious surfaces is unrecoverable and not infiltrated into the ground. The anticipated impact of the development is related to increased runoff from imperious surfaces such as building rooftops and asphalt surfaces. These are assumed to be impervious surfaces with zero infiltration capacity in this model.

The post-development water balance was based upon the Draft Plan of Subdivision provided to GHD and indicated single detached residential lots, street townhouses, medium density residential buildings, commercial lots, a stormwater management pond, asphalt roads, a park area, and an environmental protection area. The purpose of these post-development calculations with no infiltration enhancements is to illustrate that based upon these calculations that the post-development conditions will require LIDs to mitigation the expected additional stormwater runoff and anticipated reduction of pre-development infiltration.

Several assumptions were made to develop the post-development water balance. These assumptions include:

– Asphalt has 0% infiltration capacity
– Evaporation from impervious surfaces assumed to be 20% of precipitation
– Residential single lots
    - Assumed rooftops cover 55% of the lot
    - Assumed driveways cover 10% of the lot

- Assumed lawns cover 35% of the lot

– Townhouse lots
  - Assumed rooftops cover 65% of the lot
  - Assumed driveways cover 10% of the lot
  - Assumed lawns cover 25% of the lot
– Commercial
  - Assumed rooftops cover 20% of the lot
  - Assumed asphalt covers 65% of the lot
  - Assumed landscaping covers 15% of the lot

The areas of the north and south catchments were maintained within the post-development calculations. The detailed calculations are provided in **Appendix E.3**. A summary of the computations is provided in **Table 13**.

Table 13 Post-Development Summary (No Enhancements)

Description / Parameter	Value
Site Area	336,200 m^2
Pervious Areas -Lawn / Grass -Park -Environmental Protection area (EP)	128,810 m^2 (38.3% of the Site area) -90,010 m^2 -19,300 m^2 -19,500 m^2
Impervious Areas -Rooftops -Asphalt roadways and driveways -Stormwater pond	207,390 m^2 (61.7% of the Site area) -87,110 m^2 -112,680 m^2 -7,700 m^2
Total Water Surplus -Percent of Precipitation – 62.0%	175,039 m^3/yr
Evapotranspiration -Percent of Precipitation – 38.0%	107,302 m^3/yr
Total Estimated Infiltration -Percent of Precipitation – 7.1% Infiltration % Difference (pre- vs post-)	20,060 m^3/yr (-57%) (decrease)
North Catchment Estimated Infiltration Infiltration % Difference (pre- vs post-)	7,873 m^3/yr (-37%) (decrease)
South Catchment Estimated Infiltration Infiltration % Difference (pre- vs post-)	12,188 m^3/yr (-65%) (decrease)
Total Estimated Runoff -Percent of Precipitation – 54.9% Runoff % Difference (pre- vs post-)	154,978 m^3/yr (234%) (increase)

Under this scenario, impervious surfaces increased by about 60%; the total infiltration volume decreased by about 57% and runoff volume increased by nearly 234%. Based upon this scenario, mitigative strategies are required to minimize infiltration losses and reduce storm water runoff.

5.1.5.3 Post-Development Water Balance (With Downspout Disconnection)

Based on the calculations presented above, infiltration and recharge to the shallow groundwater regime will be reduced by about 27,132 m^3/year from the pre-development site compared to post-development site and based upon the Draft Plan of Subdivision provided. The reduction does not consider the incorporation of LID strategies. The post-construction water budget computations were repeated considering enhanced infiltration options which are also known as LID technologies. The water balance provides generic infiltration and runoff values that was completed solely for demonstration purposes to illustrate that pre-development conditions can be maintained. Specific LID design criteria and selection of actual LID technologies will be the responsibility of the stormwater engineer for the development. 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 in order to balance the water budget.

The post-development water balance was modelled to show that stormwater from building roof tops can be directed via downspouts (disconnected from storm sewers) to sodded areas or undeveloped areas (e.g. open spaces) for infiltration. Downspout disconnection, for example, can reduce runoff by 25% to 50% based on LID documentation developed by the Credit Valley Conservation and Toronto and Region Conservation Authority. For this Site, based upon the shallow underlying soils, the reduction of 37.5% of the stormwater via downspout disconnection was assumed.

A summary of the post-construction water budget with downspout disconnection mitigation from each rooftop was modelled. The data summary is presented in **Table 14**.

Table 14 Post-Development Summary with Enhanced Infiltration – Downspout Disconnection

Description / Parameter	Value
Site Area	336,200 m^2
Rooftop Infiltration Target	27,132 m^3/yr
Rooftop Stormwater Surplus Available -Single Detached Lot rooftops -Medium Density rooftops -Townhouse rooftops -Commercial rooftops	58,457 m^3/yr 26,272 m^3/yr 2,936 m^3/yr 17,075 m^3/yr 12,174 m^3/yr
Infiltration via Pervious Surfaces (grass, EP area etc.)	15,721 m^3/yr
Downspout Disconnection Infiltration	21,921 m^3/yr
Total Estimated Infiltration using Downspout Disconnection (based upon 37.5% rooftop runoff reduction)	41,982 m^3/yr (5,211 m^3/yr LESS than pre-development)
North Catchment Estimated Infiltration using LIDs Infiltration % Difference (pre- vs post-)	12,905 m^3/yr (4%) (increase)
South Catchment Estimated Infiltration using LIDs Infiltration % Difference (pre- vs post-)	29,077 m^3/yr (-16%) (decrease)

Assuming that rooftop runoff can be reduced by 37.5% using downspout disconnection, the water balance calculations (using downspout disconnection only) show that there can be an infiltration surplus in the north area and an infiltration deficit in the southern area. Overall, infiltration reduction will be on the order of about 11% when compared with pre-development values.

Based upon the water balance calculations with downspout disconnection only, additional infiltration measures would be required to maintain post-development infiltration values at pre-development levels from a quantity perspective.

5.1.5.4 Post-Development Water Balance (With Enhanced Infiltration – Downspout Disconnection and Soakaway Pits)

The post-construction water budget computations were repeated considering additional infiltration measures. Downspout disconnection can reduce runoff by 25% to 50% and soakaway pits can reduce runoff by 85%, as outlined within LID documentation developed by the Credit Valley Conservation and Toronto and Region Conservation Authority.

In our model, GHD assumed the following LIDs for this enhanced example:

– Rooftop runoff for single detached lots within the north and south catchments was directed to sodded areas / lawn via downspout disconnection assuming an infiltration factor of 37.5%
– Rooftop runoff for medium density residential lots and townhouses within the north and south catchments was directed to soakaway pits assuming an infiltration factor of 85%
– Rooftop runoff for the commercial areas within the south catchment was directed to soakaway pits assuming an infiltration factor of 85%

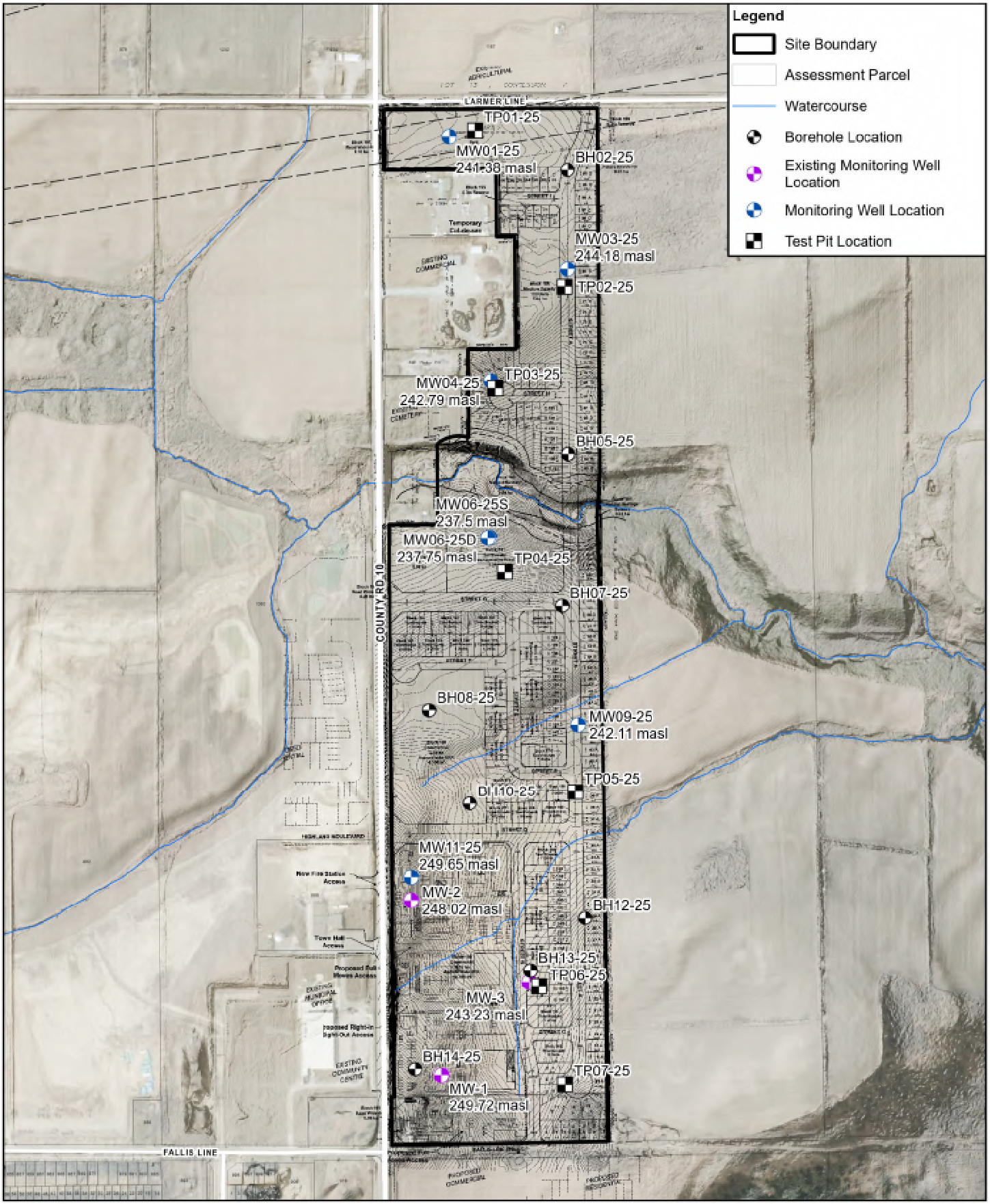
Stormwater runoff from road surfaces and driveways is assumed to be lost and not infiltrated. As noted previously, this is a generic water balance to illustrate that there is sufficient surplus water to be infiltrated to match pre-development values. The actual LIDs selected will be at the discretion of the stormwater design team.

A summary of the post-construction water budget with mitigation measures for infiltration is presented in the following table:

Table 15 Post-Development Summary with Enhanced Infiltration – Downspout Disconnection and Soakaway Pits

Description / Parameter	Value
Site Area	336,200 m^2
Rooftop Stormwater Surplus Available -Single Detached Lot rooftops -Medium Density rooftops -Townhouse rooftops -Commercial rooftops	58,457 m^3/yr 26,272 m^3/yr 2,936 m^3/yr 17,075 m^3/yr 12,174 m^3/yr
Infiltration via Pervious Surfaces (grass, EP etc.)	20,060 m^3/yr
Downspout Disconnection Infiltration	9,852 m^3/yr
Soakaway Pit Infiltration	27,357 m^3/yr
Total Estimated Infiltration using LIDs -Percent of Precipitation – 20.3% Infiltration % Difference (pre- vs post-)	57,269 m^3/yr (21.4%) (increase)
North Catchment Estimated Infiltration using LIDs Infiltration % Difference (pre- vs post-)	13,786 m^3/yr (11%) (increase)
South Catchment Estimated Infiltration using LIDs Infiltration % Difference (pre- vs post-)	43,483 m^3/yr (25%) (increase)
Total Estimated Runoff -Percent of Precipitation – 41.7% Runoff % Difference (pre- vs post-)	117,769 m^3/yr (154%) (increase)

Based upon the data modelled, the overall infiltration values are shown to **exceed** the pre-development values for the north and south catchments. The calculations illustrate that there is sufficient stormwater available that, if it can be infiltrated, will meet the pre-development values. At the detailed design stage, the use of downspouts and infiltration chambers can be finalized to ensure the water balance is maintained.



1:7,000

0 70 140 210

Metres

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 17N

N

GHD

Vargas P Inc.
North of Fallis Line, Lot 13, Concession 6
Township of Cavan-Monaghan, Ontario

Hydrogeological and Geotechnical Investigation Report

Test Hole Plan

Project No. 12662438
Revision No.
Date Jun 12, 2025

Figure 2

Attribution: Imagery accessed from the Ontario Imagery Web Map Service on Jun 12, 2025; Produced by GHD Limited under Licence with the Ontario Ministry of Natural Resources and Forestry© King's Printer for Ontario, 2024.

Appendix B

Test Hole Logs

STRATIGRAPHIC AND INSTRUMENTATION RECORD

(Overburden)

MW01-25

Project Number: 12662438

Client: Vargas P Inc.

Project: Geotechnical and Hydrogeological, Fallis Line

Location: Lot 13, Concession 6, Township of Cavan-Monaghan

Date Range (dd/mm/yyyy): 11/03/2025

Drilling Company: GET

Drilling Method(s): Solid Stem Auger

Hole Diameter(s): 152 mm

Northing: 4894422 m

Easting: 703316 m

Horizontal Datum: NAD83 / UTM zone 17N

Elevation: 241.76 m

Elevation Datum: MAMSL

Coordinates and Elevation Values are Approximate

Logged By: C. Ayrheart

Reviewed By: M. Nieukirk

Final Depth: 6.38 m

Depth Scale (m)	Depth (m) / Elev. (m)	Strata	Description	Sample Number	Recovery %	Blows per 0.15m or Partial Increment	'N'/RQD Value	Grain Size Analysis: Gravel %	Sand %	Silt %	Clay %	Fines %	Moisture Content %	PL% - LL%	Plasticity Index (%)	Water Level(s)	Monitoring Well
	0.00 / 241.76		TOPSOIL (360 mm)	SS1A									35				Cuttings 0.15 / 241.61
	0.36 / 241.40		SANDY SILT, trace clay, loose to dense, brown, moist	SS1B	62	1-2-5-6	7						29				Bentonite
1				SS2	42	6-7-30-13	37						10				1.22 / 240.54 T.O.S.
	1.83 / 239.93		SANDY SILT (Till), some clay, trace gravel, very dense, brown, moist	SS3A	67	9-20-38-44	58						15				1.52 / 240.24
2				SS3B									5				#3 Sand
				SS4	~~100~~	25-43-49-46	92	9	35	37	19		7				
3				SS5	100	19-50/50 mm	R						9				3.05 / 238.71 B.O.S.
			- grey, wet at 4.57m BGS														3.05 / 238.71
4																	
5				SS6	96	38-46-50/125 mm	96						12				
6	6.38 / 235.38		End of Hole at 6.38 m BGS	SS7	100	28-50/125 mm	R						9				
7																	
8																	
9																	

20 40 60 80

● SPT N-Value
▼ DCPT Value (blows 100mm)
Δ Peak Undrained Shear Strength (vane), C_u (kPa)-Peak
□ Remoulded Undrained Shear Strength (Vane), C_u (kPa)-Residual
○ Moisture Content (%)
PL w LL

Legend:

Measuring Point Elevation may change; Refer to Current Elevation Table

▽ **At Time of Drilling:**

▼ **Upon Completion of Drilling:** 3.96 m **on** 11/03/2025

▼ **Last Water Level Taken:** 25/03/2025

N Value: R - Refusal

Well - Reference Elevation(s)	
Location	Elevation (m)
MW01-25	242.76

T.O.S.: Top of Screen
B.O.S.: Bottom of Screen
Screen Diameter: 51 mm
Screen Slot Size:
Material: PVC

Water Readings		
Date (dd/mm/yyyy)	Depth	Unit
25/03/2025	0.38	

STRATIGRAPHIC AND INSTRUMENTATION RECORD

(Overburden)

BH02-25

Project Number: 12662438

Client: Vargas P Inc.

Project: Geotechnical and Hydrogeological, Fallis Line

Location: Lot 13, Concession 6, Township of Cavan-Monaghan

Date Range (dd/mm/yyyy): 11/03/2025

Drilling Company: GET

Drilling Method(s): Solid Stem Auger

Hole Diameter(s): 152 mm

Northing: 4894434 m

Easting: 703482 m

Horizontal Datum: NAD83 / UTM zone 17N

Elevation: 243.44 m

Elevation Datum: MAMSL

Coordinates and Elevation Values are Approximate

Logged By: C. Ayrheart

Reviewed By: M. Nieukirk

Final Depth: 6.23 m

Depth Scale (m)	Depth (m) / Elev. (m)	Strata	Description	Sample Number	Recovery %	Blows per 0.15m or Partial Increment	'N'/RQD Value	Grain Size Analysis (Gravel %, Sand %, Silt %, Clay %, Fines %)	Moisture Content %	PL % - LL %	Plasticity Index (%)	● SPT N-Value ▼ DCPT Value (blows 100mm) Δ Peak Undrained Shear Strength (vane), C_u (kPa)-Peak □ Remoulded Undrained Shear Strength (Vane), C_u (kPa)-Residual ○ Moisture Content (%) PL w LL	Water Level(s)	Backfill Details
0	0.00 243.44										20	40 60 80		
	0.30		TOPSOIL (300 mm)	SS1A					32					
	243.14		SANDY SILT, trace clay, trace gravel, loose to compact, brown, moist	SS1B	21	2-4-5-5	9		24					
1				SS2	75	15-11-16-16	27		11					
				SS3	100	8-15-13-17	28		9					
2	2.13													
	241.31		SANDY SILT (Till), trace clay, trace gravel, very dense, brown, wet - sand seam at 2.44m BGS										▼	
				SS4	92	27-34-32-28	66		10					
3				SS5	85	41-38-46-34	84		9					
4														
				SS6	100	50/125 mm	R		9					
5														
6	6.23			SS7	100	50/125 mm	R		10					
	237.21		End of Hole at 6.23 m BGS											
7														
8														
9														

Legend:

Measuring Point Elevation may change; Refer to Current Elevation Table

▽ **At Time of Drilling:**

▼ **Upon Completion of Drilling:** 2.40 m **on** 11/03/2025

▼ **Last Water Level Taken:**

N Value: R - Refusal

Well - Reference Elevation(s)	
Location	Elevation (m)

Water Readings		
Date (dd/mm/yyyy)	Depth	Unit

Created with OpenGround Template: GHD-CA-GEO-Overburden-Rev02 / Strip Set: GHD-CA-GEO-Overburden-Log-V5 29/4/25

STRATIGRAPHIC AND INSTRUMENTATION RECORD

(Overburden)

MW03-25

Project Number: 12662438

Client: Vargas P Inc.

Project: Geotechnical and Hydrogeological, Fallis Line

Location: Lot 13, Concession 6, Township of Cavan-Monaghan

Date Range (dd/mm/yyyy): 11/03/2025

Drilling Company: GET

Drilling Method(s): Solid Stem Auger

Hole Diameter(s): 152 mm

Northing: 4894308 m

Easting: 703528 m

Horizontal Datum: NAD83 / UTM zone 17N

Elevation: 244.70 m

Elevation Datum: MAMSL

Coordinates and Elevation Values are Approximate

Logged By: C. Ayrheart

Reviewed By: M. Nieukirk

Final Depth: 6.37 m

Depth (m) / Elev. (m)	Description	Sample Number	Recovery %	Blows per 0.15m or Partial Increment	'N'/RQD Value	Moisture Content %	Plasticity Index (%)
0.00 / 244.70							
0.36 / 244.34	TOPSOIL (360 mm)						
	SANDY SILT, trace gravel, trace clay, occasional cobbles, loose to compact, brown, moist	SS1	38	2-2-5-3	7	32	
		SS2	29	5-5-5-8	10	39	
		SS3	67	5-5-4-12	9	9	
2.13 / 242.57	SANDY SILT (Till), trace gravel, trace clay, very dense, brown, wet	SS4	100	21-18-23-50 /75 mm	41	17	
	- compact at 3.00m BGS	SS5	100	17-12-13-17	25	10	
		SS6	100	50/125 mm	R	14	
6.37 / 238.33	End of Hole at 6.37 m BGS	SS7	100	16-50/125 mm	R	15	

Grain Size Analysis: Gravel %, Sand %, Silt %, Clay %, Fines %

PL% - LL%

Plasticity Index (%): 20

● SPT N-Value
▼ DCPT Value (blows 100mm)
Δ Peak Undrained Shear Strength (vane), C_u (kPa)-Peak
□ Remoulded Undrained Shear Strength (Vane), C_u (kPa)-Residual
○ Moisture Content (%)
PL w LL

40 60 80

Water Level(s)

Monitoring Well

Cuttings 0.15 / 244.55
Bentonite
1.22 / 243.48
T.O.S. 1.52 / 243.18
#3 Sand
3.05 / 241.65
B.O.S. 3.05 / 241.65

Legend:

Measuring Point Elevation may change; Refer to Current Elevation Table

▽ **At Time of Drilling:**

▼ **Upon Completion of Drilling:** 0.30 m **on** 11/03/2025

▼ **Last Water Level Taken:** 25/03/2025

N Value: R - Refusal

Well - Reference Elevation(s)	
Location	Elevation (m)
MW03-25	245.70

T.O.S.: Top of Screen
B.O.S.: Bottom of Screen
Screen Diameter: 51 mm
Screen Slot Size:
Material: PVC

Water Readings		
Date (dd/mm/yyyy)	Depth	Unit
25/03/2025	0.52	

Created with OpenGround Template: GHD-CA-GEO-Overburden-Rev02 / Strip Set: GHD-CA-GEO-Overburden-Log-V5 29/4/25

STRATIGRAPHIC AND INSTRUMENTATION RECORD

(Overburden)

MW04-25

Project Number: 12662438

Client: Vargas P Inc.

Project: Geotechnical and Hydrogeological, Fallis Line

Location: Lot 13, Concession 6, Township of Cavan-Monaghan

Date Range (dd/mm/yyyy): 11/03/2025

Drilling Company: GET

Drilling Method(s): Solid Stem Auger

Hole Diameter(s): 152 mm

Northing: 4894130 m

Easting: 703482 m

Horizontal Datum: NAD83 / UTM zone 17N

Elevation: 243.77 m

Elevation Datum: MAMSL

Coordinates and Elevation Values are Approximate

Logged By: C. Ayrheart

Reviewed By: M. Nieukirk

Final Depth: 6.15 m

Depth (m) / Elev. (m)	Description	Sample Number	Recovery %	Blows per 0.15m or Partial Increment	'N'/RQD Value	Moisture Content %	Plasticity Index (%)
0.00 / 243.77							
0.53 / 243.24	TOPSOIL (530 mm)	SS1	67	1-2-2-2	4	29	
	SANDY SILT, some clay, trace gravel, occasional cobbles, compact to very dense, light brown, moist	SS2	100	4-6-9-12	15	14	
1.50 / 242.27	SANDY SILT (Till), with gravel, with clay, occasional cobbles and boulder, light brown, very dense	SS3	100	18-50/25 mm	R	10	
	- very dense, spoon refusal (inferred boulder) at 1.52m BGS - auger grinding at 2.13m BGS - cobble crushed by spoon at 2.29m BGS	SS4	100	50/75 mm	R	3	
	- auger grinding at 3.05m BGS	SS5	100	38-50/75 mm	R	5	
	- wet at 4.57m BGS	SS6	75	8-20-32	52	14	
6.15 / 237.62	End of Hole at 6.15 m BGS	SS7	100	50/50 mm	R	8	

Grain Size Analysis: Gravel %, Sand %, Silt %, Clay %, Fines %

PL% - LL%

Plasticity Index (%): 20

● SPT N-Value
▼ DCPT Value (blows 100mm)
Δ Peak Undrained Shear Strength (vane), C_u (kPa)-Peak
□ Remoulded Undrained Shear Strength (Vane), C_u (kPa)-Residual
○ Moisture Content (%)
PL w LL
40 60 80

Water Level(s)

Monitoring Well

Cuttings 0.15 / 243.62
Bentonite
1.22 / 242.55
T.O.S. 1.52 / 242.25
#3 Sand
3.05 / 240.72
B.O.S. 3.05 / 240.72

Legend:

Measuring Point Elevation may change; Refer to Current Elevation Table

▽ **At Time of Drilling:**

▼ **Upon Completion of Drilling:** 2.90 m **on** 11/03/2025

▼ **Last Water Level Taken:** 25/03/2025

N Value: R - Refusal

Well - Reference Elevation(s)	
Location	Elevation (m)
MW04-25	244.77

T.O.S.: Top of Screen
B.O.S.: Bottom of Screen
Screen Diameter: 51 mm
Screen Slot Size:
Material: PVC

Water Readings		
Date (dd/mm/yyyy)	Depth	Unit
25/03/2025	0.98	

STRATIGRAPHIC AND INSTRUMENTATION RECORD

(Overburden)

BH05-25

Project Number: 12662438

Client: Vargas P Inc.

Project: Geotechnical and Hydrogeological, Fallis Line

Location: Lot 13, Concession 6, Township of Cavan-Monaghan

Date Range (dd/mm/yyyy): 11/03/2025 **Northing:** 4894073 m **Logged By:** C. Ayrheart

Drilling Company: GET **Easting:** 703615 m **Reviewed By:** M. Nieukirk

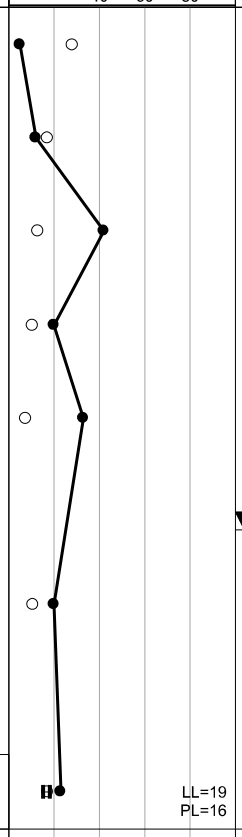
Horizontal Datum: NAD83 / UTM zone 17N

Drilling Method(s): Solid Stem Auger **Elevation:** 238.75 m **Final Depth:** 6.71 m

Hole Diameter(s): 152 mm **Elevation Datum:** MAMSL

Coordinates and Elevation Values are Approximate

Depth (m) / Elev. (m)	Description	Sample Number	Recovery %	Blows per 0.15m or Partial Increment	'N'/RQD Value	Grain Size Analysis: Gravel %	Sand %	Silt %	Clay %	Fines %	Moisture Content %	PL % - LL %	Plasticity Index (%)
0.00 / 238.75													20
0.41 / 238.34	TOPSOIL (410 mm)	SS1	54	1-1-4-4	5						28		
	SANDY SILT, some clay, compact, brown, moist	SS2	100	2-4-8-14	12						17		
1.52 / 237.23	SANDY SILT (Till), with clay, trace gravel, dense to compact, brown, wet	SS3	100	1-25-17-14	42						13		
	- grey at 2.29m BGS	SS4	96	6-8-12-20	20						10		
		SS5	92	14-14-19-22	33						7		
6.10 / 232.65	SILT (Till), with clay, trace sand, trace gravel, grey, wet, very stiff	SS6	100	5-9-11-7	20						11		
6.71 / 232.04	End of Hole at 6.71 m BGS	SS7	83	5-8-15-13	23	5	6	69	20		17	16-19	3



Water Level(s)

Backfill Details

Legend:

Measuring Point Elevation may change; Refer to Current Elevation Table

At Time of Drilling:

Upon Completion of Drilling: 4.27 m **on** 11/03/2025

Last Water Level Taken:

Well - Reference Elevation(s)	
Location	Elevation (m)

Water Readings		
Date (dd/mm/yyyy)	Depth	Unit

STRATIGRAPHIC AND INSTRUMENTATION RECORD

(Overburden)

MW06D-25

Project Number: 12662438

Client: Vargas P Inc.

Project: Geotechnical and Hydrogeological, Fallis Line

Location: Lot 13, Concession 6, Township of Cavan-Monaghan

Date Range (dd/mm/yyyy): 12/03/2025

Drilling Company: GET

Drilling Method(s): Solid Stem Auger

Hole Diameter(s): 152 mm

Northing: 4893929 m

Easting: 703551 m

Horizontal Datum: NAD83 / UTM zone 17N

Elevation: 238.15 m

Elevation Datum: MAMSL

Coordinates and Elevation Values are Approximate

Logged By: C. Ayrheart

Reviewed By: M. Nieukirk

Final Depth: 6.71 m

Depth (m) / Elev. (m)	Strata	Description	Sample Number	Recovery %	Blows per 0.15m or Partial Increment	'N'/RQD Value	Grain Size Analysis: Gravel %	Sand %	Silt %	Clay %	Fines %	Moisture Content %	PL% - LL%	Plasticity Index (%)	Water Level(s)	Monitoring Well
0.00 / 238.15														20		
0.28 / 237.87		TOPSOIL (280 mm)														
		SANDY SILT, trace clay, trace gravel, loose to compact, brown, moist	SS1	42	3-2-4-4	6						32				
			SS2	100	3-2-3-4	5						22				
		- sand seam at 1.22m BGS														
			SS3	52	4-5-6-11	11						11				
			SS4	100	5-6-12-14	18						11				
3.05 / 235.10		SILTY CLAY (Till), with sand, trace gravel, stiff, grey, moist	SS5	100	6-11-15-17	26						13				
			SS6	96	3-6-8-6	14	9	13	34	44		17	18-29	11		
		- very stiff at 6.10m BGS	SS7	100	11-12-17-17	29						10				
6.71 / 231.44		End of Hole at 6.71 m BGS														

● SPT N-Value
▼ DCPT Value (blows 100mm)
Δ Peak Undrained Shear Strength (vane), C_u (kPa)-Peak
□ Remoulded Undrained Shear Strength (Vane), C_u (kPa)-Residual
○ Moisture Content (%)
PL w LL
40 60 80

LL=29
PL=18

Monitoring Well: Cuttings 0.30 / 237.85; Bentonite; 3.05 / 235.10; T.O.S. 4.57 / 233.58; Sand; 6.10 / 232.05; B.O.S. 6.10 / 232.05

Legend:

Measuring Point Elevation may change; Refer to Current Elevation Table

▽ **At Time of Drilling:**

▼ **Upon Completion of Drilling:** Dry

▼ **Last Water Level Taken:** 25/03/2025

Well - Reference Elevation(s)	
Location	Elevation (m)
MW06D-25	239.15

T.O.S.: Top of Screen
B.O.S.: Bottom of Screen
Screen Diameter: 51 mm
Screen Slot Size:
Material: PVC

Water Readings		
Date (dd/mm/yyyy)	Depth	Unit
25/03/2025	0.65	

STRATIGRAPHIC AND INSTRUMENTATION RECORD

(Overburden)

MW06S-25

Project Number: 12662438

Client: Vargas P Inc.

Project: Geotechnical and Hydrogeological, Fallis Line

Location: Lot 13, Concession 6, Township of Cavan-Monaghan

Date Range (dd/mm/yyyy): 12/03/2025

Drilling Company: GET

Drilling Method(s): Solid Stem Auger

Hole Diameter(s): 152 mm

Northing: 4893930 m

Easting: 703553 m

Horizontal Datum: NAD83 / UTM zone 17N

Elevation: 238.17 m

Elevation Datum: MAMSL

Logged By: C. Ayrheart

Reviewed By: M. Nieukirk

Final Depth: 3.05 m

Coordinates and Elevation Values are Approximate

Depth Scale (m)	Depth (m) / Elev. (m)	Strata	Description	Sample Number	Recovery %	Blows per 0.15m or Partial Increment	'N'/RQD Value	Grain Size Analysis (Gravel %, Sand %, Silt %, Clay %, Fines %)	Moisture Content %	PL% - LL%	Plasticity Index (%)	● SPT N-Value ▼ DCPT Value (blows 100mm) Δ Peak Undrained Shear Strength (vane), C_u (kPa)-Peak □ Remoulded Undrained Shear Strength (Vane), C_u (kPa)-Residual ○ Moisture Content (%) PL w LL	Water Level(s)	Monitoring Well
0	0.00 / 238.17										20	40 60 80		
	0.28 / 237.89		TOPSOIL (280 mm)											
			SANDY SILT, trace clay, trace gravel, loose, brown, moist	SS1										
1			- sand seam at 1.22m BGS	SS2										
2				SS3										
				SS4										
3	3.05 / 235.12		End of Hole at 3.05 m BGS											
4														
5														
6														
7														
8														
9														

Monitoring Well: Cuttings 0.30 / 237.87; Bentonite; 1.22 / 236.95; T.O.S. 1.52 / 236.65; #3 Sand; B.O.S. 3.05 / 235.12

Legend:

Measuring Point Elevation may change; Refer to Current Elevation Table

▽ **At Time of Drilling:**

▼ **Upon Completion of Drilling:** Dry

▼ **Last Water Level Taken:** 25/03/2025

Well - Reference Elevation(s)	
Location	Elevation (m)
MW06S-25	239.17

T.O.S.: Top of Screen
B.O.S.: Bottom of Screen
Screen Diameter: 51 mm
Screen Slot Size:
Material: PVC

Water Readings		
Date (dd/mm/yyyy)	Depth	Unit
25/03/2025	0.42	

STRATIGRAPHIC AND INSTRUMENTATION RECORD

(Overburden)

BH07-25

Project Number: 12662438

Client: Vargas P Inc.

Project: Geotechnical and Hydrogeological, Fallis Line

Location: Lot 13, Concession 6, Township of Cavan-Monaghan

Date Range (dd/mm/yyyy): 12/03/2025 **Northing:** 4893877 m **Logged By:** C. Ayrheart

Drilling Company: GET **Easting:** 703677 m **Reviewed By:** M. Nieukirk

Horizontal Datum: NAD83 / UTM zone 17N

Drilling Method(s): Solid Stem Auger **Elevation:** 243.84 m **Final Depth:** 6.30 m

Hole Diameter(s): 152 mm **Elevation Datum:** MAMSL

Coordinates and Elevation Values are Approximate

Depth Scale (m)	Depth (m) / Elev. (m)	Strata	Description	Sample Number	Recovery %	Blows per 0.15m or Partial Increment	'N'/RQD Value	Grain Size Analysis: Gravel %	Sand %	Silt %	Clay %	Fines %	Moisture Content %	PL % - LL %	Plasticity Index (%)	Water Level(s)	Backfill Details
0	0.00 / 243.84														20		
	0.28 / 243.56		TOPSOIL (280 mm)														
			SANDY SILT, trace clay, trace gravel, compact, brown, moist	SS1	38	1-2-3-4	5						30				
1				SS2	54	7-6-8-9	14						18				
	1.37 / 242.47		GRAVELLY SILTY SAND (Till), with clay, compact, brown, moist														
2				SS3	75	11-11-17-22	28	32	33	24	11		7				
			- very dense at 2.30m BGS	SS4	100	22-30-42-42	72						7				
3				SS5	67	10-28-50/75 mm	78						7				
4																▼	
				~~SS6~~	~~100~~	~~50/25 mm~~	R						~~7~~				
5																	
6	6.30 / 237.54			SS7	100	11-50/50 mm	R						11				
			End of Hole at 6.30 m BGS														
7																	
8																	
9																	

● SPT N-Value
▼ DCPT Value (blows 100mm)
Δ Peak Undrained Shear Strength (vane), C_u (kPa)-Peak
□ Remoulded Undrained Shear Strength (Vane), C_u (kPa)-Residual
○ Moisture Content (%)
PL w LL
40 60 80

Legend:

Measuring Point Elevation may change; Refer to Current Elevation Table

▽ **At Time of Drilling:**

▼ **Upon Completion of Drilling:** 3.96 m **on** 12/03/2025

▼ **Last Water Level Taken:**

N Value: R - Refusal

Well - Reference Elevation(s)	
Location	Elevation (m)

Water Readings		
Date (dd/mm/yyyy)	Depth	Unit

STRATIGRAPHIC AND INSTRUMENTATION RECORD

(Overburden)

BH08-25

Project Number: 12662438

Client: Vargas P Inc.

Project: Geotechnical and Hydrogeological, Fallis Line

Location: Lot 13, Concession 6, Township of Cavan-Monaghan

Date Range (dd/mm/yyyy): 12/03/2025

Drilling Company: GET

Drilling Method(s): Solid Stem Auger

Hole Diameter(s): 152 mm

Northing: 4893682 m

Easting: 703556 m

Horizontal Datum: NAD83 / UTM zone 17N

Elevation: 244.99 m

Elevation Datum: MAMSL

Coordinates and Elevation Values are Approximate

Logged By: C. Ayrheart

Reviewed By: M. Nieukirk

Final Depth: 6.71 m

Depth Scale (m)	Depth (m) / Elev. (m)	Strata	Description	Sample Number	Recovery %	Blows per 0.15m or Partial Increment	'N'/RQD Value	Grain Size Analysis (Gravel %, Sand %, Silt %, Clay %, Fines %)	Moisture Content %	PL % - LL %	Plasticity Index (%)	Water Level(s)	Backfill Details
	0.00 / 244.99												
	0.33 / 244.66		TOPSOIL (330 mm)										
			SILTY CLAY (Till), with sand, trace gravel, stiff to very stiff, brown, moist	SS1	54	7-1-2-2	3		44				
1				SS2	100	2-5-6-8	11		25				
2				SS3	100	6-8-15-12	23		22				
				SS4	92	1-5-10-15	15		21				
3	3.05 / 241.94		- sand seam at 2.87m BGS SILTY SAND (Till), trace clay, trace gravel, compact, grey, moist - dense at 3.10m BGS	SS5	100	6-14-18-26	32		8				
4													
5				SS6	100	9-10-15-15	25		8				
6			- dense at 6.10m BGS	SS7	100	13-20-22-21	42		10				
	6.71 / 238.28		End of Hole at 6.71 m BGS										
7													
8													
9													

● SPT N-Value
▼ DCPT Value (blows 100mm)
Δ Peak Undrained Shear Strength (vane), C_u (kPa)-Peak
□ Remoulded Undrained Shear Strength (Vane), C_u (kPa)-Residual
○ Moisture Content (%)
PL w LL

20 40 60 80

Legend:

Measuring Point Elevation may change; Refer to Current Elevation Table

At Time of Drilling:

Upon Completion of Drilling: Dry

Last Water Level Taken:

Well - Reference Elevation(s)	
Location	Elevation (m)

Water Readings		
Date (dd/mm/yyyy)	Depth	Unit

STRATIGRAPHIC AND INSTRUMENTATION RECORD

(Overburden)

MW09-25

Project Number: 12662438

Client: Vargas P Inc.

Project: Geotechnical and Hydrogeological, Fallis Line

Location: Lot 13, Concession 6, Township of Cavan-Monaghan

Date Range (dd/mm/yyyy): 12/03/2025 **Northing:** 4893733 m **Logged By:** C. Ayrheart

Drilling Company: GET **Easting:** 703752 m **Reviewed By:** M. Nieukirk

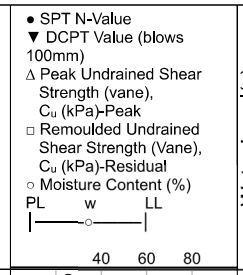
Horizontal Datum: NAD83 / UTM zone 17N

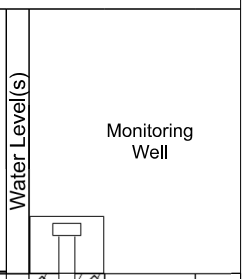
Drilling Method(s): Solid Stem Auger **Elevation:** 242.52 m **Final Depth:** 6.71 m

Hole Diameter(s): 152 mm **Elevation Datum:** MAMSL

Coordinates and Elevation Values are Approximate

Depth Scale (m)	Depth (m) / Elev. (m)	Strata	Description	Sample Number	Recovery %	Blows per 0.15m or Partial Increment	'N'/RQD Value	Grain Size Analysis (Gravel % / Sand % / Silt % / Clay % / Fines %)	Moisture Content %	PL% - LL%	Plasticity Index (%)
0	0.00 / 242.52										
	0.21 / 242.31		TOPSOIL (210 mm)	SS1A					26		
			SILTY CLAY (Till), with sand, trace gravel, stiff to very stiff, brown, moist	SS1B	29	2-2-3-3	5		15		
1				SS2	71	5-5-6-9	11		12		
				SS3	100	4-6-15-10	21		10		
2	2.29 / 240.23										
			SILTY SAND (Till), trace clay, dense, brown, moist	SS4	100	10-15-18-20	33		9		
3				SS5	100	7-35-15-19	50		9		
4											
			- compact, grey at 4.57m BGS	SS6	100	4-9-18-19	27		6		
5											
6			- very dense at 6.10m BGS	SS7	100	12-32-30-45	62		12		
	6.71 / 235.81		End of Hole at 6.71 m BGS								
7											
8											
9											





Legend:

Measuring Point Elevation may change; Refer to Current Elevation Table

At Time of Drilling:

Upon Completion of Drilling: Dry

Last Water Level Taken: 25/03/2025

Well - Reference Elevation(s)	
Location	Elevation (m)
MW09-25	243.52

T.O.S.: Top of Screen
B.O.S.: Bottom of Screen
Screen Diameter: 51 mm
Screen Slot Size:
Material: PVC

Water Readings		
Date (dd/mm/yyyy)	Depth	Unit
25/03/2025	0.41	

STRATIGRAPHIC AND INSTRUMENTATION RECORD

(Overburden)

BH10-25

Project Number: 12662438

Client: Vargas P Inc.

Project: Geotechnical and Hydrogeological, Fallis Line

Location: Lot 13, Concession 6, Township of Cavan-Monaghan

Date Range (dd/mm/yyyy): 12/03/2025

Drilling Company: GET

Drilling Method(s): Solid Stem Auger

Hole Diameter(s): 152 mm

Northing: 4893581 m

Easting: 703652 m

Horizontal Datum: NAD83 / UTM zone 17N

Elevation: 244.73 m

Elevation Datum: MAMSL

Coordinates and Elevation Values are Approximate

Logged By: C. Ayrheart

Reviewed By: M. Nieukirk

Final Depth: 6.38 m

Depth Scale (m)	Depth (m) / Elev. (m)	Strata	Description	Sample Number	Recovery %	Blows per 0.15m or Partial Increment	'N'/RQD Value	Grain Size Analysis: Gravel %	Sand %	Silt %	Clay %	Fines %	Moisture Content %	PL % - LL %	Plasticity Index (%)	Water Level(s)	Backfill Details
	0.00 / 244.73		TOPSOIL (690 mm)	SS1	42	1-1-1-2	2						35				
	0.69 / 244.04		SILTY CLAY (Till), with sand, trace gravel, stiff to very stiff, brown, moist	SS2	100	2-3-5-5	8						25				
				SS3	100	6-8-10-12	18						16				
				SS4	25	6-7-7-9	14	11	18	36	35		21	15-32	17		
				SS5	100	4-6-12-12	18						15				
	4.57 / 240.16		SILTY SAND (Till), trace clay, trace gravel, dense, grey, moist	SS6	83	13-13-19-17	32						11				
	6.38 / 238.35		- very dense at 6.10m BGS End of Hole at 6.38 m BGS	SS7	100	12-50/125 mm	R						12				

● SPT N-Value
▼ DCPT Value (blows 100mm)
Δ Peak Undrained Shear Strength (vane), C_u (kPa)-Peak
□ Remoulded Undrained Shear Strength (Vane), C_u (kPa)-Residual
○ Moisture Content (%)
PL — w — LL
20 40 60 80

LL=32
PL=15

Legend:

Measuring Point Elevation may change; Refer to Current Elevation Table

▽ **At Time of Drilling:**

▼ **Upon Completion of Drilling:** 1.83 m **on** 12/03/2025

▼ **Last Water Level Taken:**

N Value: R - Refusal

Well - Reference Elevation(s)	
Location	Elevation (m)

Water Readings		
Date (dd/mm/yyyy)	Depth	Unit

STRATIGRAPHIC AND INSTRUMENTATION RECORD

(Overburden)

MW11-25

Project Number: 12662438

Client: Vargas P Inc.

Project: Geotechnical and Hydrogeological, Fallis Line

Location: Lot 13, Concession 6, Township of Cavan-Monaghan

Date Range (dd/mm/yyyy): 13/03/2025 **Northing:** 4893460 m **Logged By:** C. Ayrheart

Drilling Company: GET **Easting:** 703611 m **Reviewed By:** M. Nieukirk

Horizontal Datum: NAD83 / UTM zone 17N

Drilling Method(s): Solid Stem Auger **Elevation:** 250.28 m **Final Depth:** 6.51 m

Hole Diameter(s): 152 mm **Elevation Datum:** MAMSL

Coordinates and Elevation Values are Approximate

Depth (m) / Elev. (m)	Description	Sample Number	Recovery %	Blows per 0.15m or Partial Increment	'N'/RQD Value	Grain Size Analysis (Gravel % / Sand % / Silt % / Clay % / Fines %)	Moisture Content %	PL% - LL%	Plasticity Index (%)
0.00 / 250.28									
0.46 / 249.82	TOPSOIL (460 mm)	SS1	33	0-1-1-1	2		30		
	SANDY SILT, trace clay, trace gravel, dense, brown, moist	SS2	100	4-11-20-33	31		10		
1.52 / 248.76	SILTY SAND (Till), with clay, trace gravel, dense to very dense, brown, moist	SS3	100	27-29-32-30	61		8		
		SS4	33	9-17-15-23	32		12		
		SS5	100	27-29-32-30	61		9		
		SS6	100	50/125 mm	R		12		
	- grey at 6.10m BGS	SS7	99	44-49-50/100 mm	99		20		
6.51 / 243.77	End of Hole at 6.51 m BGS								

● SPT N-Value
▼ DCPT Value (blows 100mm)
Δ Peak Undrained Shear Strength (vane), C_u (kPa)-Peak
□ Remoulded Undrained Shear Strength (Vane), C_u (kPa)-Residual
○ Moisture Content (%)
PL w LL

20 40 60 80

Water Level(s)

Monitoring Well

Cuttings 0.15 250.13
Bentonite
1.22 249.06
T.O.S. 1.52 248.76
#3 Sand
3.05 247.23
B.O.S. 3.05 247.23

Legend:

Measuring Point Elevation may change; Refer to Current Elevation Table

▽ **At Time of Drilling:**

▼ **Upon Completion of Drilling:** 4.57 m **on** 13/03/2025

▼ **Last Water Level Taken:** 25/03/2025

N Value: R - Refusal

Well - Reference Elevation(s)	
Location	Elevation (m)
MW11-25	251.28

T.O.S.: Top of Screen
B.O.S.: Bottom of Screen
Screen Diameter: 51 mm
Screen Slot Size:
Material: PVC

Water Readings		
Date (dd/mm/yyyy)	Depth	Unit
25/03/2025	0.63	

Created with OpenGround Template: GHD-CA-GEO-Overburden-Rev02 / Strip Set: GHD-CA-GEO-Overburden-Log-V5 29/4/25

STRATIGRAPHIC AND INSTRUMENTATION RECORD

(Overburden)

BH12-25

Project Number: 12662438

Client: Vargas P Inc.

Project: Geotechnical and Hydrogeological, Fallis Line

Location: Lot 13, Concession 6, Township of Cavan-Monaghan

Date Range (dd/mm/yyyy): 13/03/2025

Drilling Company: GET

Drilling Method(s): Solid Stem Auger

Hole Diameter(s): 152 mm

Northing: 4893489 m

Easting: 703852 m

Horizontal Datum: NAD83 / UTM zone 17N

Elevation: 244.32 m

Elevation Datum: MAMSL

Coordinates and Elevation Values are Approximate

Logged By: C. Ayrheart

Reviewed By: M. Nieukirk

Final Depth: 6.66 m

Depth Scale (m)	Depth (m) / Elev. (m)	Strata	Description	Sample Number	Recovery %	Blows per 0.15m or Partial Increment	'N'/RQD Value	Grain Size Analysis (Gravel %, Sand %, Silt %, Clay %, Fines %)	Moisture Content %	PL % - LL %	Plasticity Index (%)	Water Level(s)	Backfill Details
	0.00 / 244.32												
	0.36 / 243.96		TOPSOIL (360 mm)	SS1A	100	1-2-2-4	4		27				
			SILTY CLAY (Till), with sand, trace gravel, soft to very stiff, brown, moist	SS1B					28				
1				SS2	100	5-6-6-8	12		21				
2				SS3	100	6-7-11-13	18		22				
	2.30 / 242.02		SILTY SAND (Till), with clay, trace gravel, dense to very dense, grey, moist to wet	SS4	100	7-10-33-29	43		25			▼	
3			- sand seam, black at 2.87m BGS	SS5	100	18-33-42-34	75		8				
4													
5				SS6	100	14-32-18-19	50		9				
6				SS7	100	5-26-46-50/ 100 mm	72		7				
	6.66 / 237.66		End of Hole at 6.66 m BGS										
7													
8													
9													

Plasticity Index (%): 20

● SPT N-Value
▼ DCPT Value (blows 100mm)
Δ Peak Undrained Shear Strength (vane), C_u (kPa)-Peak
□ Remoulded Undrained Shear Strength (Vane), C_u (kPa)-Residual
○ Moisture Content (%)
PL — w — LL

Moisture Content %: 40 60 80

Legend:

Measuring Point Elevation may change; Refer to Current Elevation Table

▽ **At Time of Drilling:**

▼ **Upon Completion of Drilling:** 2.44 m **on** 13/03/2025

▼ **Last Water Level Taken:**

Well - Reference Elevation(s)	
Location	Elevation (m)

Water Readings		
Date (dd/mm/yyyy)	Depth	Unit

STRATIGRAPHIC AND INSTRUMENTATION RECORD

(Overburden)

BH13-25

Project Number: 12662438

Client: Vargas P Inc.

Project: Geotechnical and Hydrogeological, Fallis Line

Location: Lot 13, Concession 6, Township of Cavan-Monaghan

Date Range (dd/mm/yyyy): 13/03/2025

Drilling Company: GET

Drilling Method(s): Solid Stem Auger

Hole Diameter(s): 152 mm

Northing: 4893396 m

Easting: 703806 m

Horizontal Datum: NAD83 / UTM zone 17N

Elevation: 243.12 m

Elevation Datum: MAMSL

Coordinates and Elevation Values are Approximate

Logged By: C. Ayrheart

Reviewed By: M. Nieukirk

Final Depth: 6.71 m

Depth Scale (m)	Depth (m) / Elev. (m)	Strata	Description	Sample Number	Recovery %	Blows per 0.15m or Partial Increment	'N'/RQD Value	Grain Size Analysis: Gravel %	Sand %	Silt %	Clay %	Fines %	Moisture Content %	PL % - LL %	Plasticity Index (%)	Water Level(s)	Backfill Details
	0.00 / 243.12																
	0.36 / 242.76		TOPSOIL (360 mm)														
1			SILTY CLAY (Till), with sand, trace gravel, firm, brown, moist	SS1	67	2-1-1-2	2						34				
				SS2	100	0-2-3-6	5						19				
2			- very stiff at 1.52m BGS	SS3	100	7-7-9-11	16						23				
	2.30 / 240.82		SANDY CLAYEY SILT (Till), some gravel, very stiff, grey, wet	SS4	100	7-11-15-16	26						8				
3			- hard at 3.10m BGS	SS5	79	16-19-50/100 mm	69						15				
4																	
5			- very stiff at 4.57m BGS	SS6	58	7-8-13-13	21	11	32	33	24		14	11-18	7		
6																	
	6.71 / 236.41		End of Hole at 6.71 m BGS	SS7	67	4-8-9-10	17						33				
7																	
8																	
9																	

Grain Size Analysis: Gravel %, Sand %, Silt %, Clay %, Fines %

Plasticity Index (%): 20

● SPT N-Value
▼ DCPT Value (blows 100mm)
Δ Peak Undrained Shear Strength (vane), C_u (kPa)-Peak
□ Remoulded Undrained Shear Strength (Vane), C_u (kPa)-Residual
○ Moisture Content (%)
PL w LL

Moisture Content %: 40 60 80

LL=18
PL=11

Legend:

Measuring Point Elevation may change; Refer to Current Elevation Table

▽ **At Time of Drilling:**

▼ **Upon Completion of Drilling:** 0.61 m **on** 13/03/2025

▼ **Last Water Level Taken:**

Well - Reference Elevation(s)	
Location	Elevation (m)

Water Readings		
Date (dd/mm/yyyy)	Depth	Unit

STRATIGRAPHIC AND INSTRUMENTATION RECORD

(Overburden)

BH14-25

Project Number: 12662438

Client: Vargas P Inc.

Project: Geotechnical and Hydrogeological, Fallis Line

Location: Lot 13, Concession 6, Township of Cavan-Monaghan

Date Range (dd/mm/yyyy): 12/03/2025

Drilling Company: GET

Drilling Method(s): Solid Stem Auger

Hole Diameter(s): 152 mm

Northing: 4893218 m

Easting: 703705 m

Horizontal Datum: NAD83 / UTM zone 17N

Elevation: 252.28 m

Elevation Datum: MAMSL

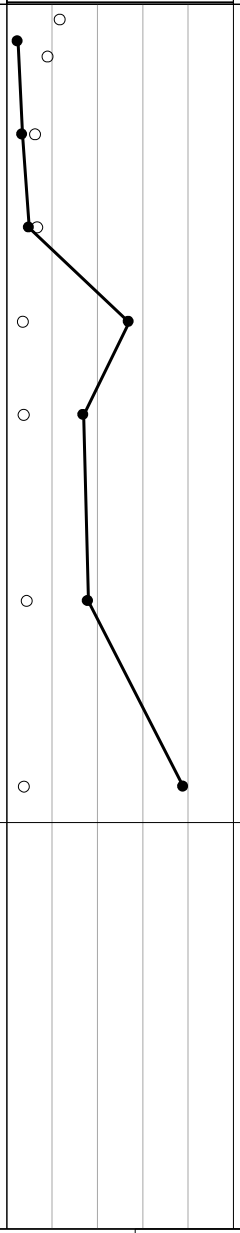
Coordinates and Elevation Values are Approximate

Logged By: C. Ayrheart

Reviewed By: M. Nieukirk

Final Depth: 6.68 m

Depth Scale (m)	Depth (m) / Elev. (m)	Strata	Description	Sample Number	Recovery %	Blows per 0.15m or Partial Increment	'N'/RQD Value	Grain Size Analysis: Gravel %	Sand %	Silt %	Clay %	Fines %	Moisture Content %	PL % - LL %	Plasticity Index (%)	Water Level(s)	Backfill Details
	0.00 / 252.28														20		
	0.23 / 252.05		TOPSOIL (230 mm)	SS1A	62	1-2-3-4	5						24				
			SANDY SILT, trace clay, trace gravel, loose to compact, brown, moist	SS1B									18				
1				SS2	100	4-4-3-6	7						13				
2	2.29 / 249.99			SS3	52	3-4-6-6	10						14				
			SILTY SAND (Till), with clay, with gravel, very dense, brown, moist	SS4	70	17-27-27-24	54	14	38	30	18		7				
3			- dense at 3.10m BGS	SS5	100	15-16-18-19	34						8				
4																	
5				SS6	100	9-17-19-19	36						9				
6			- very dense at 6.10m BGS	SS7	100	19-30-48-50 /125 mm	78						8				
	6.68 / 245.60		End of Hole at 6.68 m BGS														
7																	
8																	
9																	



Legend:

Measuring Point Elevation may change; Refer to Current Elevation Table

At Time of Drilling:

Upon Completion of Drilling: Dry

Last Water Level Taken:

Well - Reference Elevation(s)	
Location	Elevation (m)

Water Readings		
Date (dd/mm/yyyy)	Depth	Unit

TEST PIT STRATIGRAPHIC RECORD

TP01-25

Project Number: 12662438

Client: Vargas P Inc.

Project: Geotechnical and Hydrogeological, Fallis Line

Location: Lot 13, Concession 6, Township of Cavan-Monaghan

Date Range (dd/mm/yyyy): 24/03/2025

Drilling Company: Leahy Excavation

Drilling Method(s): Backhoe

Northing: 4894441 m

Easting: 703346 m

Horizontal Datum: NAD83 / UTM zone 17N

Elevation: 242.01 m

Elevation Datum: MAMSL

Logged By: C. Baggesen

Reviewed By: M. Nieukirk

Final Depth: 3.02 m

Dimension:

Coordinates and Elevation Values are Approximate

Depth Scale (m)	Depth (m) / Elev. (m)	Strata	Description	Remarks	Sample Number	Grain Size Analysis (Gravel %, Sand %, Silt %, Clay %, Fines %)	Moisture Content %	Water Level(s)	Backfill Details
	0.00 / 242.01								
	0.23		TOPSOIL (230 mm)						
	241.78		SANDY SILT, trace gravel, brown, reddish, moist		GS1		32		
	0.67 / 241.34		SANDY SILT (Till), some clay, trace gravel, occasional cobble, light brown, moist		GS2		29		
1									
			- groundwater seepage at 1.74m BGS						
2			- trace clay at 2.13m BGS						
	3.02				GS3		11		
3	238.99		End of Test Pit at 3.02 m BGS						
4									
5									
6									
7									
8									
9									

Moisture Content %: 20 | 40 | 60 | 80

● SPT N-Value
▼ DCPT Value (blows 100mm)
Δ Peak Undrained Shear Strength (vane), C_u (kPa)-Peak
□ Remoulded Undrained Shear Strength (Vane), C_u (kPa)-Residual
○ Moisture Content (%)
PL — w — LL

Legend:

Measuring Point Elevation may change; Refer to Current Elevation Table

▽ **At Time of Excavation:**

▼ **Upon Completion of Excavation:**

Well - Reference Elevation(s)	
Location	Elevation (m)

Water Readings		
Date (dd/mm/yyyy)	Depth	Unit

TEST PIT STRATIGRAPHIC RECORD

TP02-25

Project Number: 12662438

Client: Vargas P Inc.

Project: Geotechnical and Hydrogeological, Fallis Line

Location: Lot 13, Concession 6, Township of Cavan-Monaghan

Date Range (dd/mm/yyyy): 24/03/2025

Drilling Company: Leahy Excavation

Drilling Method(s): Backhoe

Northing: 4894282 m

Easting: 703533 m

Horizontal Datum: NAD83 / UTM zone 17N

Elevation: 245.05 m

Elevation Datum: MAMSL

Logged By: C. Baggesen

Reviewed By: M. Nieukirk

Final Depth: 2.53 m

Dimension:

Coordinates and Elevation Values are Approximate

Depth Scale (m)	Depth (m) / Elev. (m)	Strata	Description	Remarks	Sample Number	Grain Size Analysis (Gravel % / Sand % / Silt % / Clay % / Fines %)	Moisture Content %	Water Level(s)	Backfill Details
	0.00 / 245.05						20		
	0.30		TOPSOIL (300 mm)						
	244.75		SANDY SILT, trace gravel, trace organics, reddish brown, moist		GS1		26		
1	1.01		- water seepage at 0.91m BGS						
	244.04		SANDY SILT (Till), some clay, trace gravel, occasional cobble, light brown, moist		GS2		22		
2			- trace clay at 2.23m BGS						
	2.53				GS3		4		
	242.52		End of Test Pit at 2.53 m BGS						
3									
4									
5									
6									
7									
8									
9									

● SPT N-Value
▼ DCPT Value (blows 100mm)
Δ Peak Undrained Shear Strength (vane), C_u (kPa)-Peak
□ Remoulded Undrained Shear Strength (Vane), C_u (kPa)-Residual
○ Moisture Content (%)
PL — w — LL
20 40 60 80

Legend:

Measuring Point Elevation may change; Refer to Current Elevation Table

▽ **At Time of Excavation:**

▼ **Upon Completion of Excavation:**

Well - Reference Elevation(s)	
Location	Elevation (m)

Water Readings		
Date (dd/mm/yyyy)	Depth	Unit

TEST PIT STRATIGRAPHIC RECORD

TP03-25

Project Number: 12662438

Client: Vargas P Inc.

Project: Geotechnical and Hydrogeological, Fallis Line

Location: Lot 13, Concession 6, Township of Cavan-Monaghan

Date Range (dd/mm/yyyy): 24/03/2025

Drilling Company: Leahy Excavation

Drilling Method(s): Backhoe

Northing: 4894123 m

Easting: 703491 m

Horizontal Datum: NAD83 / UTM zone 17N

Elevation: 243.06 m

Elevation Datum: MAMSL

Logged By: C. Baggesen

Reviewed By: M. Nieukirk

Final Depth: 3.05 m

Dimension:

Coordinates and Elevation Values are Approximate

Depth Scale (m)	Depth (m) / Elev. (m)	Strata	Description	Remarks	Sample Number	Grain Size Analysis (Gravel %, Sand %, Silt %, Clay %, Fines %)	Moisture Content %	Water Level(s)	Backfill Details
	0.00 / 243.06						20		
	0.46		TOPSOIL (460 mm)						
	242.60 / 0.76		SANDY SILT, trace organics, trace gravel, reddish brown		GS1		23		
	242.30		SILTY SAND (Till), with clay, trace gravel, light brown, moist		GS2		12		
1			- groundwater seepage at 1.07m BGS						
2			- trace clay at 1.83m BGS		GS3		21		
3	3.05 / 240.01		End of Test Pit at 3.05 m BGS						
4									
5									
6									
7									
8									
9									

● SPT N-Value
▼ DCPT Value (blows 100mm)
Δ Peak Undrained Shear Strength (vane), C_u (kPa)-Peak
□ Remoulded Undrained Shear Strength (Vane), C_u (kPa)-Residual
○ Moisture Content (%)
PL w LL
40 60 80

Legend:

Measuring Point Elevation may change; Refer to Current Elevation Table

▽ **At Time of Excavation:**

▼ **Upon Completion of Excavation:**

Well - Reference Elevation(s)	
Location	Elevation (m)

Water Readings		
Date (dd/mm/yyyy)	Depth	Unit

TEST PIT STRATIGRAPHIC RECORD

TP04-25

Project Number: 12662438

Client: Vargas P Inc.

Project: Geotechnical and Hydrogeological, Fallis Line

Location: Lot 13, Concession 6, Township of Cavan-Monaghan

Date Range (dd/mm/yyyy): 24/03/2025

Drilling Company: Leahy Excavation

Drilling Method(s): Backhoe

Northing: 4893893 m

Easting: 703589 m

Horizontal Datum: NAD83 / UTM zone 17N

Elevation: 240.66 m

Elevation Datum: MAMSL

Logged By: C. Baggesen

Reviewed By: M. Nieukirk

Final Depth: 3.05 m

Dimension:

Coordinates and Elevation Values are Approximate

Depth Scale (m)	Depth (m) / Elev. (m)	Strata	Description	Remarks	Sample Number	Grain Size Analysis (Gravel %, Sand %, Silt %, Clay %, Fines %)	Moisture Content %	Water Level(s)	Backfill Details
	0.00 / 240.66						20		
	0.27 / 240.39		TOPSOIL (230 mm)						
	0.55 / 240.11		SANDY SILT, trace gravel, trace clay, trace organics, reddish brown, moist		GS1		36		
1			SANDY SILT (Till), with clay, trace gravel, occasional cobbles, light brown, moist		GS2		33		
2									
3	3.05 / 237.61		End of Test Pit at 3.05 m BGS		GS3		30		
4									
5									
6									
7									
8									
9									

Moisture Content % plot: ● SPT N-Value; ▼ DCPT Value (blows 100mm); Δ Peak Undrained Shear Strength (vane), C_u (kPa)-Peak; □ Remoulded Undrained Shear Strength (Vane), C_u (kPa)-Residual; ○ Moisture Content (%); PL — w — LL; 40 60 80

Legend:

Measuring Point Elevation may change; Refer to Current Elevation Table

▽ **At Time of Excavation:**

▼ **Upon Completion of Excavation:**

Well - Reference Elevation(s)	
Location	Elevation (m)

Water Readings		
Date (dd/mm/yyyy)	Depth	Unit

TEST PIT STRATIGRAPHIC RECORD

TP05-25

Project Number: 12662438

Client: Vargas P Inc.

Project: Geotechnical and Hydrogeological, Fallis Line

Location: Lot 13, Concession 6, Township of Cavan-Monaghan

Date Range (dd/mm/yyyy): 24/03/2025

Drilling Company: Leahy Excavation

Drilling Method(s): Backhoe

Northing: 4893645 m

Easting: 703780 m

Horizontal Datum: NAD83 / UTM zone 17N

Elevation: 242.79 m

Elevation Datum: MAMSL

Logged By: C. Baggesen

Reviewed By: M. Nieukirk

Final Depth: 3.05 m

Dimension:

Coordinates and Elevation Values are Approximate

Depth Scale (m)	Depth (m) / Elev. (m)	Strata	Description	Remarks	Sample Number	Grain Size Analysis (Gravel %, Sand %, Silt %, Clay %, Fines %)	Moisture Content %	Water Level(s)	Backfill Details
	0.00 / 242.79								
	0.30		TOPSOIL (300 mm)						
	242.49 / 0.73		SANDY SILT, trace gravel, trace clay, trace organics, reddish brown, moist		GS1		37		
1	242.06		SANDY SILT (Till), with clay, trace gravel, occasional cobbles, light brown, moist		GS2		19		
2									
3	3.05 / 239.74		End of Test Pit at 3.05 m BGS		GS3		13		
4									
5									
6									
7									
8									
9									

Moisture Content %: 20

● SPT N-Value
▼ DCPT Value (blows 100mm)
Δ Peak Undrained Shear Strength (vane), C_u (kPa)-Peak
□ Remoulded Undrained Shear Strength (Vane), C_u (kPa)-Residual
○ Moisture Content (%)
PL w LL
40 60 80

Legend:

Measuring Point Elevation may change; Refer to Current Elevation Table

▽ **At Time of Excavation:**

▼ **Upon Completion of Excavation:**

Well - Reference Elevation(s)	
Location	Elevation (m)

Water Readings		
Date (dd/mm/yyyy)	Depth	Unit

TEST PIT STRATIGRAPHIC RECORD

TP06-25

Project Number: 12662438

Client: Vargas P Inc.

Project: Geotechnical and Hydrogeological, Fallis Line

Location: Lot 13, Concession 6, Township of Cavan-Monaghan

Date Range (dd/mm/yyyy): 24/03/2025

Drilling Company: Leahy Excavation

Drilling Method(s): Backhoe

Northing: 4893381 m

Easting: 703825 m

Horizontal Datum: NAD83 / UTM zone 17N

Elevation: 243.44 m

Elevation Datum: MAMSL

Logged By: C. Baggesen

Reviewed By: M. Nieukirk

Final Depth: 3.02 m

Dimension:

Coordinates and Elevation Values are Approximate

Depth Scale (m)	Depth (m) / Elev. (m)	Strata	Description	Remarks	Sample Number	Grain Size Analysis (Gravel %, Sand %, Silt %, Clay %, Fines %)	Moisture Content %	Water Level(s)	Backfill Details
	0.00 / 243.44								
	0.23		TOPSOIL (200 mm)						
	243.21		SANDY CLAYEY SILT (Till), trace gravel, reddish brown, moist		GS1		28		
1			- light brown at 0.84m BGS						
					GS2		28		
2									
			- trace clay at 2.44m BGS		GS3		9		
3	3.02 / 240.42		End of Test Pit at 3.02 m BGS						
4									
5									
6									
7									
8									
9									

Moisture Content %: 20

● SPT N-Value
▼ DCPT Value (blows 100mm)
Δ Peak Undrained Shear Strength (vane), C_u (kPa)-Peak
□ Remoulded Undrained Shear Strength (Vane), C_u (kPa)-Residual
○ Moisture Content (%)
PL w LL
40 60 80

Legend:

Measuring Point Elevation may change; Refer to Current Elevation Table

▽ **At Time of Excavation:**

▼ **Upon Completion of Excavation:**

Well - Reference Elevation(s)	
Location	Elevation (m)

Water Readings		
Date (dd/mm/yyyy)	Depth	Unit

TEST PIT STRATIGRAPHIC RECORD

TP07-25

Project Number: 12662438

Client: Vargas P Inc.

Project: Geotechnical and Hydrogeological, Fallis Line

Location: Lot 13, Concession 6, Township of Cavan-Monaghan

Date Range (dd/mm/yyyy): 24/03/2025

Drilling Company: Leahy Excavation

Drilling Method(s): Backhoe

Northing: 4893268 m

Easting: 703903 m

Horizontal Datum: NAD83 / UTM zone 17N

Elevation: 246.48 m

Elevation Datum: MAMSL

Logged By: C. Baggesen

Reviewed By: M. Nieukirk

Final Depth: 3.05 m

Dimension:

Coordinates and Elevation Values are Approximate

Depth Scale (m)	Depth (m) / Elev. (m)	Strata	Description	Remarks	Sample Number	Grain Size Analysis (Gravel %, Sand %, Silt %, Clay %, Fines %)	Moisture Content %	Water Level(s)	Backfill Details
	0.00 / 246.48								
	0.30		TOPSOIL (300 mm)						
	246.18		SANDY SILT, with clay, trace organics, trace gravel, reddish brown, moist		GS1		35		
	0.88								
1	245.60		SANDY CLAYEY SILT (Till), trace gravel, light brown, moist - groundwater seepage at 1.01m BGS		GS2		14		
2									
3	3.05				GS3		19		
	243.43		End of Test Pit at 3.05 m BGS						

● SPT N-Value
▼ DCPT Value (blows 100mm)
Δ Peak Undrained Shear Strength (vane), C_u (kPa)-Peak
□ Remoulded Undrained Shear Strength (Vane), C_u (kPa)-Residual
○ Moisture Content (%)
PL w LL

Moisture Content % scale: 20, 40, 60, 80

Legend:

Measuring Point Elevation may change; Refer to Current Elevation Table

▽ **At Time of Excavation:**

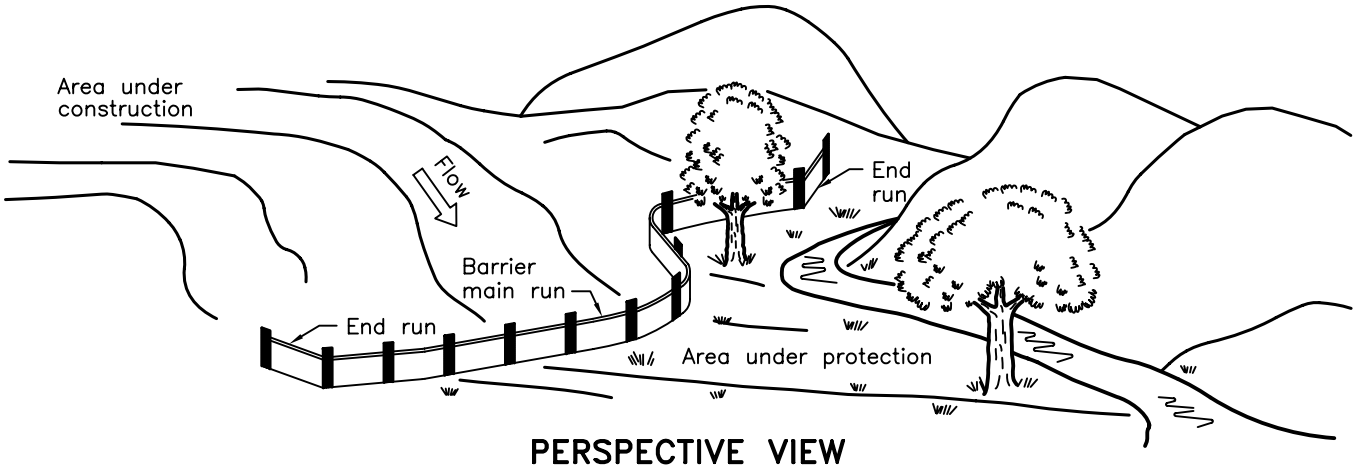
▼ **Upon Completion of Excavation:**

Well - Reference Elevation(s)	
Location	Elevation (m)

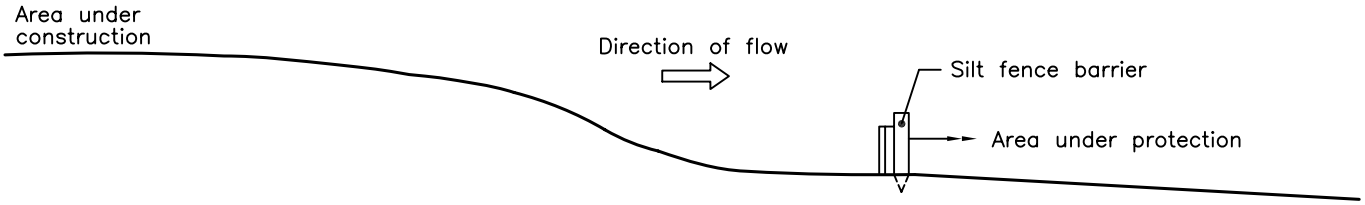
Water Readings		
Date (dd/mm/yyyy)	Depth	Unit

APPENDIX “I”

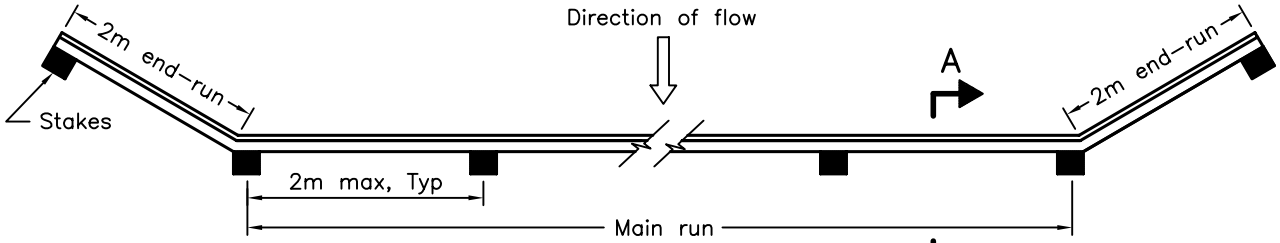
Erosion & Sediment Control Details



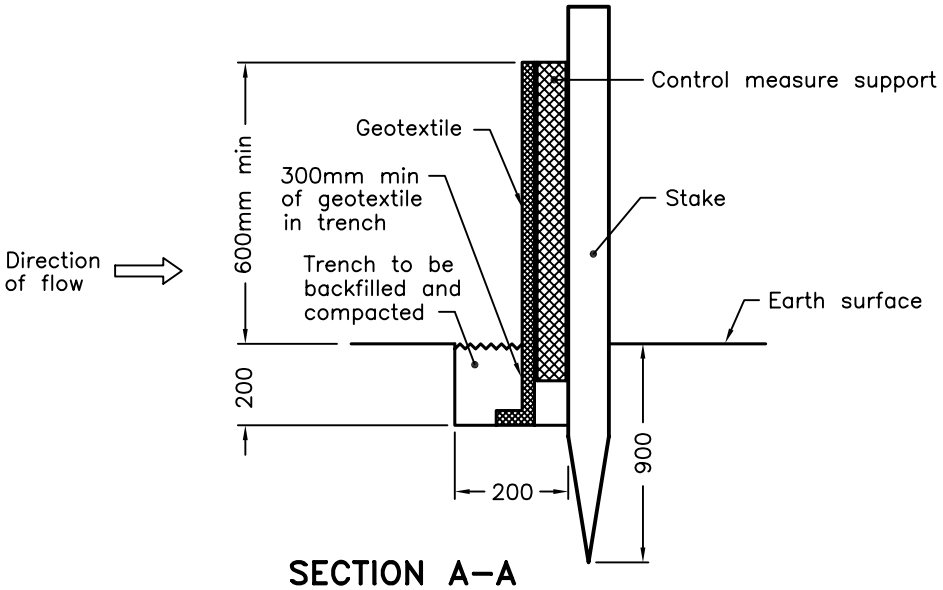
PERSPECTIVE VIEW



SECTION



PLAN

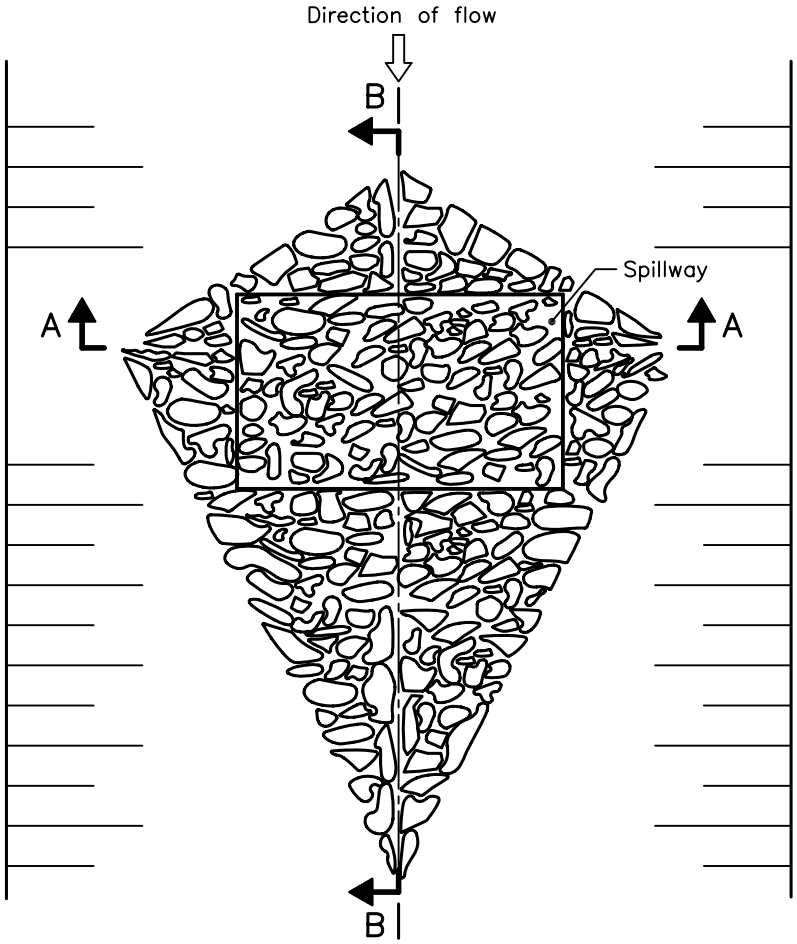


SECTION A–A

NOTE:

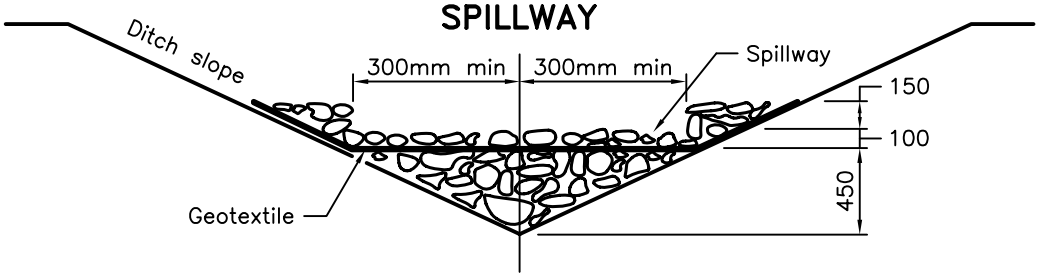
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2006	Rev	1
HEAVY–DUTY SILT FENCE BARRIER			
	OPSD 219.130		

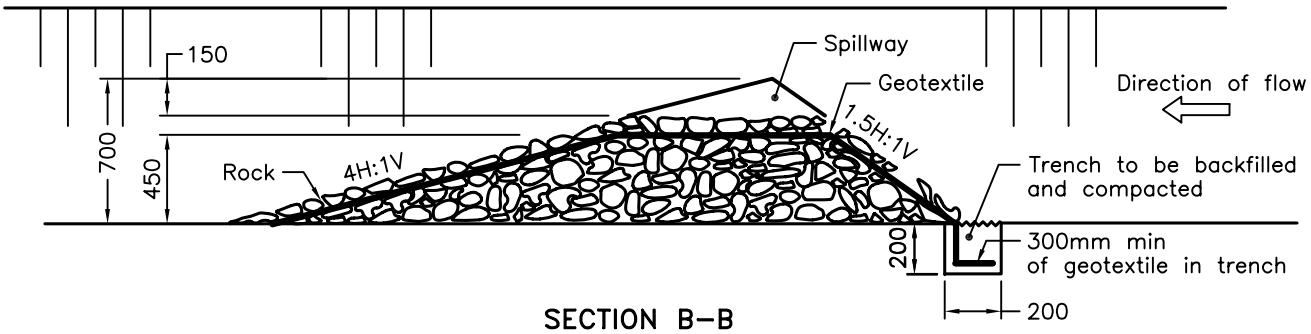


PLAN

SPILLWAY



SECTION A–A



SECTION B–B

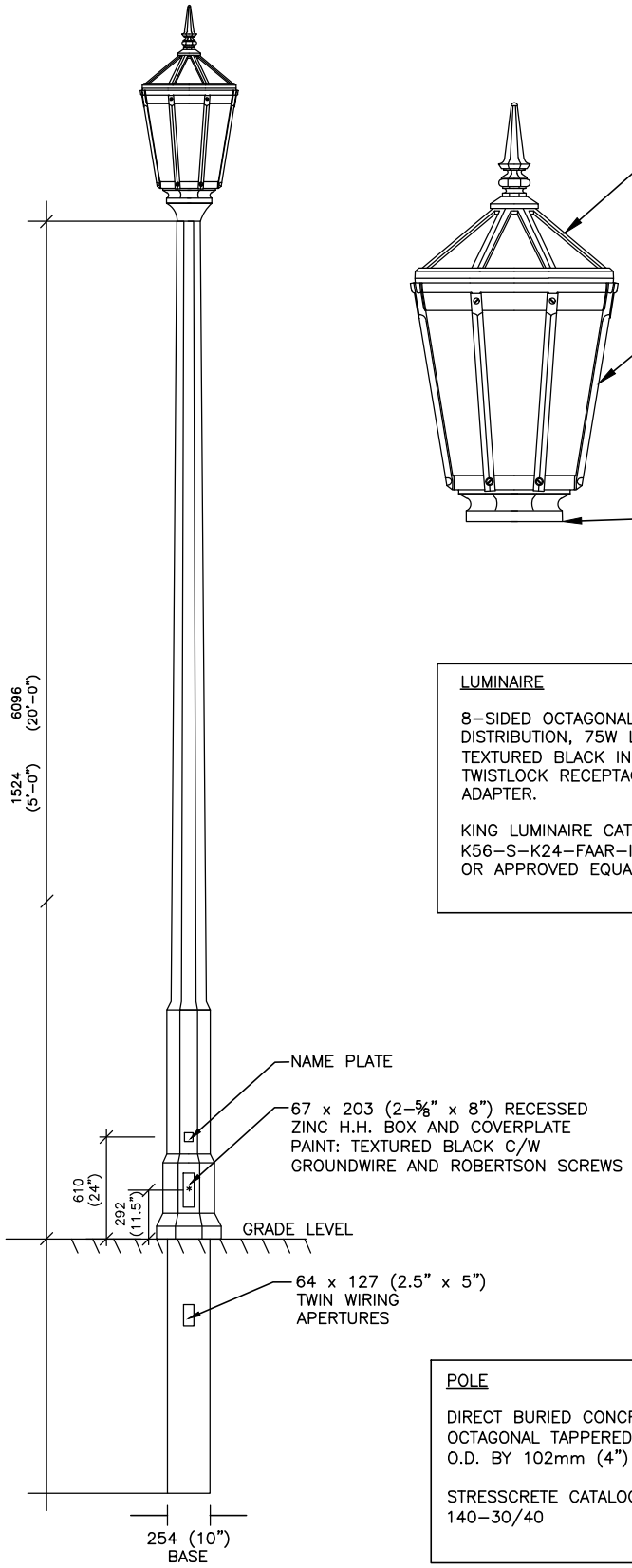
NOTE:

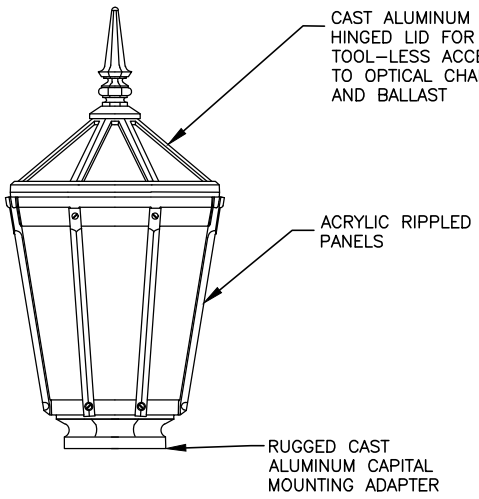
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2006	Rev	1
ROCK FLOW CHECK DAM V–DITCH			
	OPSD 219.210		

APPENDIX “J”

Typical Joint Utility Trench & Street Light Detail





LUMINAIRE

8-SIDED OCTAGONAL POST-TOP LUMINAIRE, TYPE III DISTRIBUTION, 75W LED, RIPPLED ACRYLIC LENS, TEXTURED BLACK IN COLOUR, 120VAC, C/W TWISTLOCK RECEPTACLE AND K24 CAPITAL POLE ADAPTER.

KING LUMINAIRE CATALOGUE NO:
K56-S-K24-FAAR-III-75(SSL)-5000-120-PR-#6
OR APPROVED EQUAL

POLE

DIRECT BURIED CONCRETE POLE, BLACK POLISHED AND, OCTAGONAL TAPPERED SECTION, COMPLETE WITH 76mm (3") O.D. BY 102mm (4") LONG TENON

STRESSCRETE CATALOGUE NO.: KCH20-G-S11-DB C/W 140-30/40

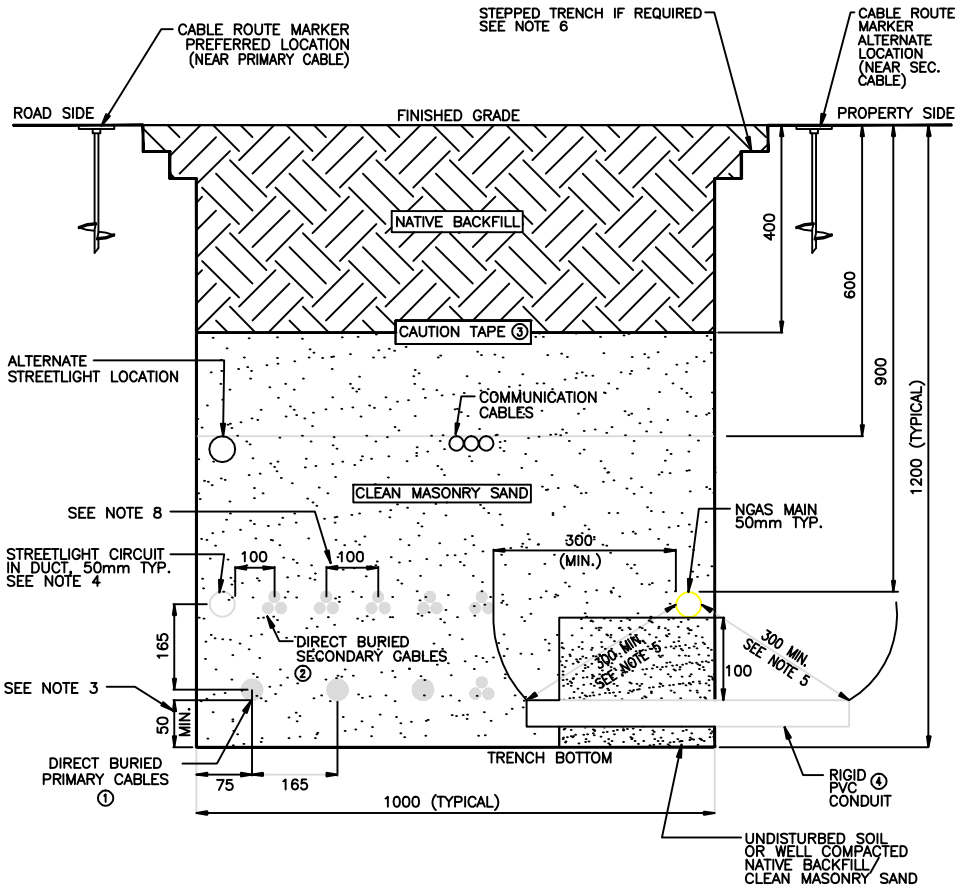
MILLBROOK SOUTH EAST SUBDIVISION

STREET LIGHT DETAIL

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

SCALE	N.TS.	PROJECT	19121
DATE	March, 2022	DRAWN BY	V.L.

FIGURE J1



NOTES:
1. ALL DIMENSIONS ARE IN mm UNLESS STATED OTHERWISE.
2. ALL SEPARATIONS AND DEPTHS OF BURIAL ARE MINIMUM.
3. IN THE PRESENCE OF SHARP ROCK, DEBRIS OR RUBBLE, INCREASE SAND PADDING TO 100mm
4. STREETLIGHT WIRE DUCT MAY BE INSTALLED AT A REDUCED BURIAL DEPTH, UP TO A MINIMUM DEPTH OF 600mm, SEPARATIONS TO SUPPLY CABLE BASED ON MAXIMUM STREETLIGHT DUCT DIAMETER OF 50mm.
5. MUST MAINTAIN 300mm MINIMUM FROM ALL EXPOSED SUPPLY CABLES TO GAS MAIN. WHEN CROSSING GAS MAIN AND IF 300mm OF CLEAR VERTICAL SEPARATION IS NOT ACHIEVABLE, SECONDARY CABLES SHALL BE INSTALLED IN SHORT LENGTH OF RIGID PVC CONDUIT.
6. CONSTRUCTION, STEPPING AND/OR SUPPORTING OF THE TRENCH WALL TO CONFORM TO THE REQUIREMENTS OF THE OCCUPATIONAL HEALTH AND SAFETY ACT.
7. NON-REQUIRED CIRCUITS OR JOINT USE COMPONENTS MAY BE OMITTED PROVIDED THAT CLEARANCES AND SEPARATIONS ARE MAINTAINED. PRIMARY CABLES (IF PRESENT) MUST BE INSTALLED ON THE BOTTOM ROW OF SUPPLY CABLES. SECONDARY CABLE BUNDLES MAY BE SUBSTITUTED IN PLACE OF PRIMARY CABLE(S) WHEN REQUIRED.
8. INTERMITTENT CONTACT IS ALLOWABLE BETWEEN SECONDAY CABLES WHERE REQUIRED.

PART #	MASTER MATERIAL #	DESCRIPTION	QTY.
(1)	30010134 30006080	CABLE PRIMARY, 25kV, UGROUND, 2/0 AWG, AL CABLE PRIMARY, 25kV, UGROUND, 350 KCMIL, CU	
(2)	30005908 30005915	SERVICE CABLE, UGROUND, 3/0AWG, 3 COND, AL SERVICE CABLE, UGROUND, 250KCMIL, 3 COND, AL	
(3)	20002181	CAUTION TAPE	
(4)	30007542	RIGID PVC CONDUIT	

REFERENCES:

SECTION 1 – DEFINITIONS
SECTION 3C – CONSTRUCTION GUIDE
SECTION 16 – MATERIALS

Rev. No.	Issue Date	Revision	Dwn	Approved By
02	JULY 2011	GENERAL REVISIONS	PC	
			Chk	Date

© Copyright Hydro One Networks Inc. All rights reserved. This drawing may not be reproduced or copied, in whole or in part, in any printed, mechanical, electronic, film, or other distribution and storage media or used in any information storage or retrieval system outside of Hydro One Networks Inc., without the written consent of Hydro One Networks Inc.
Information contained in this drawing is considered to be confidential. Recipients shall only use the drawing for its intended purpose and shall take necessary measures to prevent disclosure or transmittal to outside parties.

hydro one **Hydro One Networks Inc.**

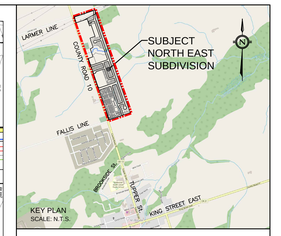
Drawn:	Approved:	Date:
P.CIARMOLI	*	JULY.20,2011

JOINT TRENCH - POWER, COMMUNICATION & GAS DISTRIBUTION LINES - TYPICAL

Dwg. No. **DU-03-206.1** Rev. **02**

APPENDIX “K”

Functional Servicing Plans



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, Watermains, Sewers and Other Underground and Overground Utilities and Structures is Not Necessarily Shown On All Contract Drawing. While Are Shown, The Accuracy Of The Location 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
- 241.14 PROPOSED ELEVATION
- EXISTING ELEVATION
- EXISTING CONTOUR ELEVATION
- PROPOSED OVERLAND FLOW DIRECTION
- PEDESTRIAN NETWORK
- PROP. SANITARY MAINTENANCE HOLE
- PROP. STORM MAINTENANCE HOLE
- PROP. STORM CATCHBASIN MANHOLE
- PROP. SANITARY SEWER
- PROP. STORM SEWER
- PROP. WATERMAIN

NOTE

THIS PLAN HAS BEEN PREPARED TO DEMONSTRATE FEASIBILITY OF THE PROPOSED DEVELOPMENT WITH RESPECT TO GRADING IN CONJUNCTION WITH THE DRAFT PLAN APPROVAL. DETAILED GRADING DESIGN WILL BE PREPARED AT THE SUBDIVISION ENGINEERING STAGE.

No.	Revision	Date	By	Appr'd

CONSULTANT:

PRELIMINARY

MILLBROOK EAST SUBDIVISION

BROMONT HOMES INC.

VALDOR ENGINEERING INC.
Consulting Engineers - Project Managers
741 RONWTREE DAIRY ROAD, UNIT 2, WOODBRIDGE, ONTARIO, L4L 5T9
TEL (905)264-0054, FAX (905)264-0069, E-MAIL info@valdor-engineering.com
www.valdor-engineering.com

CAVAN MONAGHAN

COUNTY OF PETERBOROUGH

PRELIMINARY SITE SERVICING AND GRADING PLAN

Surveyed by:	Checked by: P.S.Z.	Project No.	21101
Drawn by: V.L.	Approved by: D.G.		
Designed by: V.L.	Date: March 3, 2026	Drawing No.	PSG-1
Scale: 1:750		Sheet No.	

N:\Active Projects\Millbrook East\Subdivision\Drawings\PSG\21101 PSG-1 Subdivision.dwg, 2026-03-04 4:07:27 PM, vlafer