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FUNCTIONAL SERVICING REPORT

Millbrook South West Subdivision

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

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1.0 INTRODUCTION

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

1.1 Existing Conditions

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

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

1.2 Proposed Development

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

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

Table 1. Development Statistics

Land Use	**Area** (Ha)	**Residential Units** (No.)	**Equivalent Population** (persons)
Detached Dwellings	15.87	375	1,313
Street Townhomes	3.71	146	511
Medium Density	1.09	90	180
Parkland	2.21		
Natural Heritage Systems	16.31		
Stormwater Management Ponds	2.48		
Roads & Road Widenings	7.45		
Walkways	0.07		
TOTAL	**49.19**	**611**	**2,004**

1.3 Purpose of Report

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

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

1.4 Approving Authorities

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

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

2.0 WATER SERVICING

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

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

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

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

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

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

2.1 Domestic Demand

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

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

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

Table 2. Domestic Water & Fire Flow Demand

Land Use	**Equivalent Population** (Persons)	**Domestic Demand** (L/min)	**Maximum Day Demand** (L/min)	**Peak Hour Demand** (L/min)	**Fire Flow** (L/min)	**Maximum Day Plus Fire Flow** (L/min)
Detached Dwellings	1,313	410.3	820.6	1,230.9	8,000	
Street Townhomes	511	159.7	319.4	479.1	7,000	
Medium Density	180	56.3	112.5	168.8		
TOTAL	**2,004**	**626.3**	**1,252.5**	**1,878.8**	**8,000**	**9,252.5**

2.2 Local Watermains & Service Connections

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

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

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

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

2.3 Fire Protection

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

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

Fire hydrants will be provided along the municipal roads such that a fire hydrant will be available within 90m of the 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. The WWTP has recently been expanded and upgraded to accommodate the additional flow from the urban expansion area which included a high-level tertiary treatment that would be able to provide improved effluent quality to meet the new effluent discharge criteria.

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

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

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

3.1 Wastewater Loading

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

Residential Average Daily Flow: 450 L/person/day

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

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

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

Design Flow, Q = Q x K_H + *I*

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

Table 3. Wastewater Loading Summary

Land Use	Area (Ha)	Equivalent Population (Persons)	Average Daily Flow (L/s)	Harmon Peaking Factor	Peak Daily Flow (L/s)	Infiltration Rate (L/s)	Total Flow (L/s)
Detached Dwellings	15.87	1,313	6.84	3.72	25.43	4.44	29.88
Street Townhomes	3.71	511	2.66	3.97	10.56	1.04	11.60
Medium Density	1.09	180	0.94	4.16	3.90	0.31	4.21
Roads	7.45					2.09	2.09
Total	**28.12**	**2,004**	**10.43**		**39.90**	**7.87**	**47.78**

3.2 External Sanitary Sewers

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

Availability of treatment capacity to service new development in the existing WWTP is currently being reviewed by the Township of Cavan Monaghan. In addition, the Township has been searching for a location to construct a new treatment facility in order to meet its projected growth target over the long term. As mentioned above, based on the Master Servicing Study to date there is sufficient capacity to service an additional population of close to 1,300 and long term plans are to either expand the current treatment capacity in the existing plant or construct a new treatment plant. We are proposing a second treatment on the subject site to service the subject lands which can be phased to also service future development. The treatment plant will be designed in accordance to Ministry requirements. Additional land has been allocated to accommodate future expansion. Treatment capacity will therefore be available either through the existing WWTP or the proposed WWTP and it will be a condition of development that will need to be satisfied for registration and release of building permits. As such it is expected that prior to approval there will be sufficient planned capacity in a centralized waste water treatment facility to service the proposed development. A schematic for the WWTP and the manufactures brochure is included in **Appendix "C"**.

3.3 Local Sanitary Sewers & Service Connections

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

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

4.0 STORM CONVEYANCE SYSTEM

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

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

4.1 Minor System Design

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

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

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

The peak flows are calculated using the following formula:

$Q = R \times A \times I \times 2.778$ where: Q = peak flow (L/s)
A = area in hectares (Ha)
I = rainfall intensity (mm/hr)
R = composite runoff coefficient
t = time of concentration (min)

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

4.2 Major System Design

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

4.3 Foundation Drainage

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

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

4.4 Roof Drainage

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

5.0 STORMWATER MANAGEMENT

5.1 Storm Drainage Areas

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

5.1.1 Pre-Development

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

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

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

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

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

5.1.2 Post-Development

Under proposed conditions, drainage from the subject site will be split between the North and South Tributaries of Baxter Creek to maintain the pre-development drainage patterns. The northern half of the site drains to the North Tributary via the North SWM Pond (*Catchment 1-201*, 17.89 ha). The medium density residential block fronting Fallis Line (*Catchment 1-202*, 1.17 ha) will drain uncontrolled to the North Tributary via the Fallis Line storm sewer, but adequate overcontrol will be provided by the North SWM Pond. The southern half of the site (*Catchment 2-201*, 11.20 ha) drains to the South SWM Pond and then to the South Tributary. The rear of lots along the southern limit (*Catchment 2-202*, 2.59 ha) will drain uncontrolled to the South Tributary, but adequate overcontrol will be provided by the South SWM Pond.

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

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

5.2 Stormwater Management Design Criteria

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

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

5.3 Stormwater Management Pond Design

Two stormwater management wet ponds are proposed to serve the subject site, the North and South SWM Ponds. The North SWM Pond is located in the north-east corner of the site, as illustrated in **Figure 5A**, and services a total drainage area of approximately 22.97 ha. The South SWM Pond is located at the southern limit of the site, as illustrated in **Figure 5B**, and services a total drainage area of approximately 11.20 ha.

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

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

5.3.1 Quality Control

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

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the contributing drainage areas is a SWM facility. The options reviewed are as follows:

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

Permanent Pool Sizing Calculations

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

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

North SWM Pond

The drainage area to the North SWM Pond (22.97 ha) has an average imperviousness of approximately 60% (including external drainage areas). The required permanent pool volume for the North SWM Pond is provided below:

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

The permanent pool storage volume required for the North SWM Pond is 161.7 $m^3/ha \times 22.97\ ha = 3{,}713\ m^3$.

The normal water level of the permanent pool for the North SWM Pond is set at an elevation of 247.00 m. The bottom of the pond in the main cell is set at an elevation of 245.00 m, providing a permanent pool depth of 2.00 m. The actual permanent pool storage volume provided is approximately 4,429 m^3 which is greater than the minimum required volume. The required and provided quality control volume together with the elevation of the normal water level are summarized in **Table 5A**.

South SWM Pond

The drainage area to the South SWM Pond (11.20 ha) has an average imperviousness of approximately 60%. The required permanent pool volume for the South SWM Pond is provided below:

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

The permanent pool storage volume required for the South SWM Pond is 161.7 $m^3/ha \times 11.20\ ha = 1{,}811\ m^3$.

The normal water level of the permanent pool for the South SWM Pond is set at an elevation of 245.50 m. The bottom of the pond in the main cell is set at an elevation of 243.50 m, providing a permanent pool depth of 2.00 m. The actual permanent pool storage volume provided is approximately 2,710 m^3 which is greater than the minimum required volume. The required and provided quality control volume together with the elevation of the normal water level are summarized in **Table 5B**.

Forebay Sizing Calculations

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

North SWM Pond

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

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

where: *Dist* is the forebay length (m)
r is the minimum length-to-width ratio of the forebay (2:1 or r = 2)
Q_p is the pond's peak discharge (0.027 m^3/s, VO5 modelling of 25 mm storm)
V_s is the settling velocity (0.0003 m/s for 150 μm particles)

Solving [1] gives:

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

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 (2.788 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:

$$Dist_w = \frac{8 \times 2.788}{2.00 \times 0.50} = 22.3\ m$$

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

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

$$Width = \frac{Dist}{8} = \frac{22.3}{8} = 2.8\ m$$

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

South SWM Pond

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

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

where: *Dist* is the forebay length (m)
r is the minimum length-to-width ratio of the forebay (2:1 or *r* = 2)
Q_p is the pond's peak discharge (0.012 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:

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

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 (1.519 m^3/s, VO5 modeling of 5-year storm)
d is the depth of the permanent pool in the forebay (2.00 m)
V_f is the desired velocity in the forebay (0.50 m/s)

Solving [2] gives:

$$Dist_w = \frac{8 \times 1.519}{2.00 \times 0.50} = 12.2\ m$$

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

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

$$Width = \frac{Dist}{8} = \frac{12.2}{8} = 1.5\ m$$

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

5.3.2 Erosion Control

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

North SWM Pond

Based on hydrologic modelling of the 25 mm storm using the VO model, the estimated runoff volume is 11.93 mm distributed over the 22.97 ha catchment area draining to the North SWM Pond, for a required extended detention capture volume of 2,740 m^3. The available volume provided in the extended detention storage zone, up to the elevation of 247.85, is approximately 3,336 m^3, which meets the volumetric criterion. The proposed extended detention depth is 0.85 m, which is less than the maximum recommended extended detention depth of 1.00 m.

The required detention time and release rate will be achieved using an orifice plate installed within the pond outlet control structure. Based on the calculations below, the drawdown time for the North SWM Pond is approximately 49.3 hours with a 130 mm diameter orifice, which meets the minimum 24-hour release criteria.

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

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

where: t_d is the drawdown time (s)
h is the maximum water elevation above the orifice (0.7850 m)
A_o is the cross-sectional area of the orifice (0.013273 m^2)
C_2 is the slope coefficient from area-depth linear regression (1412.9)
C_3 is the intercept from area-depth linear regression (3288.0)

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

$$h_1 = HWL_{25mm} - \left[NWL + \frac{D}{2}\right] = 247.85 - \left[247.00 + \frac{0.130}{2}\right] = 0.7850\ m$$

where: HWL_{25mm} is the high water level for the 25 mm rainfall (247.85 m)
NWL is the normal water level (247.00 m)
D is the diameter of the orifice (0.130 m)

Solving [4] yields:

$$t_d = \frac{0.66 \times (1412.9) \times (0.7850)^{1.5} + 2 \times (3288.0) \times (0.7850)^{0.5}}{2.75 \times (0.013273)} = 177{,}389\ s = 49.3\ h$$

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

<u>*South SWM Pond*</u>

Based on hydrologic modelling of the 25 mm storm using the VO model, the estimated runoff volume is 12.16 mm distributed over the 11.20 ha catchment area draining to the South SWM Pond, for a required extended detention capture volume of 1,362 m^3. The available volume provided in the extended detention storage zone, up to the elevation of 246.10, is approximately 1,563 m^3, which meets the volumetric criterion. The proposed extended detention depth is 0.60 m, which is less than the maximum recommended extended detention depth of 1.00 m.

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

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

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

where: t_d is the drawdown time (s)
h is the maximum water elevation above the orifice (0.5525 m)
A_o is the cross-sectional area of the orifice (0.007088 m^2)
C_2 is the slope coefficient from area-depth linear regression (1293.3)
C_3 is the intercept from area-depth linear regression (2217.0)

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

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

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

Solving [4] yields:

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

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

5.3.3 Quantity Control

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

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

Tables 4A and **4B** show the VO simulation results for pre- and post-development drainage to the north and south, respectively. **Tables 5A** and **5B** show the SWM facility performance characteristics for each return period event based on the preliminary rating curve for the North and South SWM Ponds, respectively. As shown in **Tables 4A** and **4B**, the peak discharge rates are equal to or less than the target release rates.

It is to be noted that **Tables 4A &4B** also includes the foundation drainage discharge, estimated at 0.075 L/s/lot. In order to be conservative at the preliminary design stage, no flow reduction has been applied to the foundation drainage discharge in order to demonstrate that the pre-development flow targets will not be exceeded. For the north drainage area, the foundation drainage discharge is estimated at 0.023 m^3/s for 305 lots, and for the south drainage area, the foundation drainage discharge is estimated at 0.016 m^3/s for 214 lots.

Table 4B also includes the discharge from the sanitary treatment plant (0.050 m^3/s per **Table C1** in **Appendix C**), assuming no flow reduction in order to be conservative, to demonstrate that the total peak flow to the south does not exceed the pre-development flow targets.

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

North SWM Pond

The North SWM Pond has been designed with a total active storage volume of 9,165 m^3 at an elevation of 249.00 m. The expected maximum storage required during 100-year storm conditions is approximately 8,157 m^3. The provided active storage for the pond is therefore sufficient.

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

Return Period	**Existing Peak Flows** (m^3/s)	**Discharge to North** (m^3/s)	**Discharge from Foundation Drainage** (m^3/s)	**Proposed Peak Flow** (m^3/s)
25mm Chicago	-	0.155	0.023	0.178
2-year	0.488	0.307		0.330
5-year	0.916	0.587		0.610
10-year	1.241	0.884		0.907
25-year	1.683	1.231		1.254
50-year	2.035	1.457		1.480
100-year	2.401	1.685		1.708

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South SWM Pond

The South SWM Pond has been designed with a total active storage volume of 6,570 m^3 at an elevation of 247.50 m. The expected maximum storage required during 100-year storm conditions is approximately 3,919 m^3. The provided active storage for the pond is therefore sufficient.

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

Return Period	**Existing Peak Flows** (m^3/s)	**Discharge to South** (m^3/s)	**Discharge from Foundation Drainage** (m^3/s)	**Discharge from Sanitary Treatment Plant** (m^3/s)	**Proposed Peak Flow** (m^3/s)
25mm Chicago	-	0.019			0.085
2-year	0.275	0.095			0.161
5-year	0.523	0.276			0.342
10-year	0.713	0.438	0.016	0.050	0.504
25-year	0.975	0.652			0.718
50-year	1.183	0.811			0.877
100-year	1.399	0.930			0.996

5.3.4 Thermal Mitigation Measures

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

Bottom Draw Pipe

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

Planting Strategy

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

5.3.5 SWM Pond Inspection & Maintenance

The SWM ponds should be inspected periodically to determine the frequency of maintenance activities. As such, maintenance activities will be performed on an as-required basis. During the first two years of operation, it is recommended that the stormwater management facility be inspected following significant storm events to determine if and when maintenance activities are required. Subsequently, inspections should be carried out twice per year. The following items should be considered when inspecting the pond:

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

Table 5A: North SWM Pond Performance Summary

Quality Control		
Permanent Pool	Protection Level	Level 1 (Enhanced)
	Permanent Pool Required (m^3)	3,713
	Permanent Pool Provided (m^3)	4,429
	Normal Water Level, NWL (m)	**247.00**

Erosion Control		
25-mm 4-hour Chicago	Orifice Size (mm)	130
	Draw Down Time (hrs)	49.3
	Flow In (m^3/s)	1.028
	Flow Out (m^3/s)	0.027
	Storage Used (m^3)	2,473
	Pond W.S. Elevation (m)	**247.65**

Quantity Control		
2 Year Storm Event	Flow in (m^3/s)	1.915
	Flow Out (m^3/s)	0.109
	Storage Used (m^3)	3,869
	Pond W.S. Elevation (m)	**247.97**
5 Year Storm Event	Flow in (m^3/s)	2.788
	Flow Out (m^3/s)	0.338
	Storage Used (m^3)	4,804
	Pond W.S. Elevation (m)	**248.16**
10 Year Storm Event	Flow in (m^3/s)	3.402
	Flow Out (m^3/s)	0.533
	Storage Used (m^3)	5,497
	Pond W.S. Elevation (m)	**248.31**
25 Year Storm Event	Flow in (m^3/s)	4.203
	Flow Out (m^3/s)	0.745
	Storage Used (m^3)	6,440
	Pond W.S. Elevation (m)	**248.49**
50 Year Storm Event	Flow in (m^3/s)	4.972
	Flow Out (m^3/s)	0.866
	Storage Used (m^3)	7,271
	Pond W.S. Elevation (m)	**248.65**
100 Year Storm Event	Flow in (m^3/s)	5.621
	Flow Out (m^3/s)	0.976
	Storage Used (m^3)	8,157
	Pond W.S. Elevation (m)	**248.82**
Regional (Timmins)	Flow in (m^3/s)	2.303
	Flow Out (m^3/s)	1.945
	Storage Used (m^3)	9,611
	Pond W.S. Elevation (m)	**249.08**

Table 5B: South SWM Pond Performance Summary

Quality Control		
Permanent Pool	Protection Level	Level 1 (Enhanced)
	Permanent Pool Required (m^3)	1,811
	Permanent Pool Provided (m^3)	2,710
	Normal Water Level, NWL (m)	**245.50**

Erosion Control		
25-mm 4-hour Chicago	Orifice Size (mm)	95
	Draw Down Time (hrs)	52.0
	Flow In (m^3/s)	0.554
	Flow Out (m^3/s)	0.012
	Storage Used (m^3)	1,248
	Pond W.S. Elevation (m)	**245.99**

Quantity Control		
2 Year Storm Event	Flow in (m^3/s)	1.036
	Flow Out (m^3/s)	0.072
	Storage Used (m^3)	1,800
	Pond W.S. Elevation (m)	**246.18**
5 Year Storm Event	Flow in (m^3/s)	1.519
	Flow Out (m^3/s)	0.218
	Storage Used (m^3)	2,311
	Pond W.S. Elevation (m)	**246.34**
10 Year Storm Event	Flow in (m^3/s)	1.862
	Flow Out (m^3/s)	0.354
	Storage Used (m^3)	2,636
	Pond W.S. Elevation (m)	**246.44**
25 Year Storm Event	Flow in (m^3/s)	2.411
	Flow Out (m^3/s)	0.543
	Storage Used (m^3)	3,122
	Pond W.S. Elevation (m)	**246.58**
50 Year Storm Event	Flow in (m^3/s)	2.774
	Flow Out (m^3/s)	0.681
	Storage Used (m^3)	3,511
	Pond W.S. Elevation (m)	**246.69**
100 Year Storm Event	Flow in (m^3/s)	3.146
	Flow Out (m^3/s)	0.771
	Storage Used (m^3)	3,919
	Pond W.S. Elevation (m)	**246.81**
Regional (Timmins)	Flow in (m^3/s)	1.131
	Flow Out (m^3/s)	0.819
	Storage Used (m^3)	4,139
	Pond W.S. Elevation (m)	**246.87**

5.4 Site Water Balance

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

5.4.1 Pre-Development Infiltration Volume

For the pre-development condition, a total estimated infiltration of 70,356 m^3/year for the site was determined.

5.4.2 Post-Development Infiltration Volume (Unmitigated)

For the post-development condition, without infiltration enhancements, a total estimated infiltration of 42,674 m^3/year for the site was determined. This corresponds to a total infiltration deficit of 27,682 m^3/year, a 39% decrease in annual infiltration compared to the pre-development condition.

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

5.4.3 Proposed Infiltration BMP – Roof Downspout Disconnection

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

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

  In order to meet this design criteria, houses will be required to direct roof downspouts to a discharge location a minimum distance of 5 m from the road right-of-way or rear-lot catchbasins. It is assumed that all rear-draining roofs, as well as front-draining roofs on rear-draining lots, will achieve the minimum flow path length required.

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

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

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

- *Soils: If the infiltration rate of soils in the pervious area is less than 15 mm/hr (i.e., hydraulic conductivity less than $1x10^{-6}$ cm/s), they should be tilled to a depth of 300 mm and amended with compost to achieve an organic content in the range of 8 to 15% by weight or 30 to 40% by volume.*

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

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

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

  It is assumed that front- and rear-draining roofs will be serviced by separate roof downspouts (i.e. a total of two roof downspouts per lot). For lots in which the roof drainage area to a single downspout is greater than 100 m^2, a maximum roof area of 100 m^2 is considered applicable for the roof downspout disconnection benefit.

Based on the draft plan of subdivision there are a total of 201 residential lots with 10.7 m of frontage (average roof area of 140 m^2, 70 m^2 draining to the rear), 113 lots with 13.7 m of frontage (average roof area of 170 m^2, 85 m^2 draining to the rear), 57 lots with 15.7 m of frontage (average roof area of 190 m^2, maximum assumed area of 95 m^2 draining to the rear) and 148 townhouse lots (average roof area of 120 m^2, 60 m^2 draining to the rear). The total residential roof area draining to the rear is therefore 37,970 m^2 (3.797 ha).

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

Based on an annual precipitation depth of 855 mm (as per the *Hydrogeological Assessment Report*), and assuming 10% evaporation from roofs, the annual surplus from rear-draining roof areas is 29,218 m^3/yr (855 mm/yr x 0.90 x 37,970 m^2 = 29,218 m^3/yr).

Assuming an infiltration rate of 50% (corresponding to a runoff reduction of 50% for HSG B soils), the infiltration volume is therefore 14,609 m^3/yr (29,218 m^3/yr x 0.50 = 14,609 m^3/yr).

Roof downspout disconnection will account for an annual infiltration volume of 14,609 m^3/yr, which will reduce the post-development infiltration deficit from 27,682 m^3/yr to 13,073 m^3/yr.

5.4.4 Proposed Infiltration BMP – Infiltration Facilities

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

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

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

6.0 VEHICULAR & PEDESTRIAN ACCESS

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

6.1 Municipal Roads

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

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

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

Municipal Roads

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

6.2 Driveways

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

Driveways

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.

6.3 Sidewalks, Walkways & Trails

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

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

7.0 GRADING

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

7.1 Grading Criteria

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

7.2 Preliminary Design

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

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

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

7.3 Permitting

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

8.0 EROSION & SEDIMENT CONTROL DURING CONSTRUCTION

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

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

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

8.1 Control Measures

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

- **Temporary Sediment Control Basins** are commonly used to clarify silt-laden stormwater runoff by promoting sedimentation of the suspended particles in the runoff through long detention times. The proposed SWM ponds will be utilized as temporary sediment control basins during construction. The basins are to be sized in accordance with the ESC Guideline based on a required storage volume of 250 m^3 per hectare of disturbed area (125 m^3/ha of permanent pool and 125 m^3/ha of active storage). The basins' outlets are to have a Hickenbottom riser and a minimum 75 mm diameter orifice plate sized to provide a drawdown time in the order of 48 hours.
- **Silt Fences** are to be installed adjacent to all property limits subject to drainage from the development area prior to topsoil stripping and in other locations, such as at the bases of topsoil stockpiles. It is recommended that earthworks not extend immediately adjacent to the silt fence and instead 1m to 2m vegetated buffer be maintained for additional protection. The silt fences are to be constructed with 150 x 150mm wire farm fence fabric to properly support the geotextile. Heavy duty silt fence is recommended to be installed adjacent the South Wetland consisting of two rows of fence with a row of staked straw bales between.
- **Mud Mat** is to be installed at the construction entrance prior to commencing earthworks to minimize the tracking of mud onto municipal roads.
- **Sediment Traps** are to be installed at all catchbasin locations once the storm sewer system has been constructed to prevent silt laden runoff from entering.

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

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

8.2 Construction Sequencing

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

Stage 1 – Subdivision Earthworks

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

Stage 2 – Subdivision Servicing & Road Construction

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

Stage 3 – House Construction

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

8.3 ESC Inspection & Maintenance

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

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

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

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

9.0 UTILITIES

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

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

10.0 SUMMARY

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

Water

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

Waste Water

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

Storm Drainage

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

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

Stormwater Management

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

Vehicular & Pedestrian Access

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

Grading

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

Erosion & Sediment Control During Construction

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

Subdivision Engineering Design

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

11.0 REFERENCES & BIBLIOGRAPHY

- Township of Cavan Monaghan, **Municipal Servicing Standards**, April 2017.
- Ontario Ministry of Environment, **Stormwater Management Planning and Design Manual,** March 2003.
- Ontario Ministry of Transportation, **Drainage Management Manual**, 1997.
- Greater Golden Horseshoe Area Conservation Authorities, **Erosion & Sediment Control Guidelines for Urban Construction**, December 2006.
- Fire Underwriters Survey, Water Supply for Public Fire Protection, 1999.
- Ministry of Municipal Affairs & Housing, **Ontario Building Code**, 2012.
- Toronto and Region Conservation Authority, Credit Valley Conservation, **Low Impact Development Stormwater Management Planning and Design Guide**, 2010.
- GHD Inc., **Geotechnical Investigation Report, Proposed Subdivision Development, 787 and 825 Fallis Line, Millbrook, Ontario**, March 23, 2021.
- GHD Inc., **Hydrogeological Assessment Report, Proposed Subdivision Development, 787 and 825 Fallis Line, Millbrook, Ontario**, March 28, 2021.
- Biglieri Group Ltd., **Draft Plan of Subdivision,787-825 Fallis Line West, Township of Cavan Monaghan**, November 3, 2022.

Respectfully Submitted,

VALDOR ENGINEERING INC.

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

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pzourntos@valdor-engineering.com

Oliver Beaudin, P.Eng.
Project Manager, Water Resources

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MILLBROOK SOUTH WEST SUBDIVISION

LOCATION MAP

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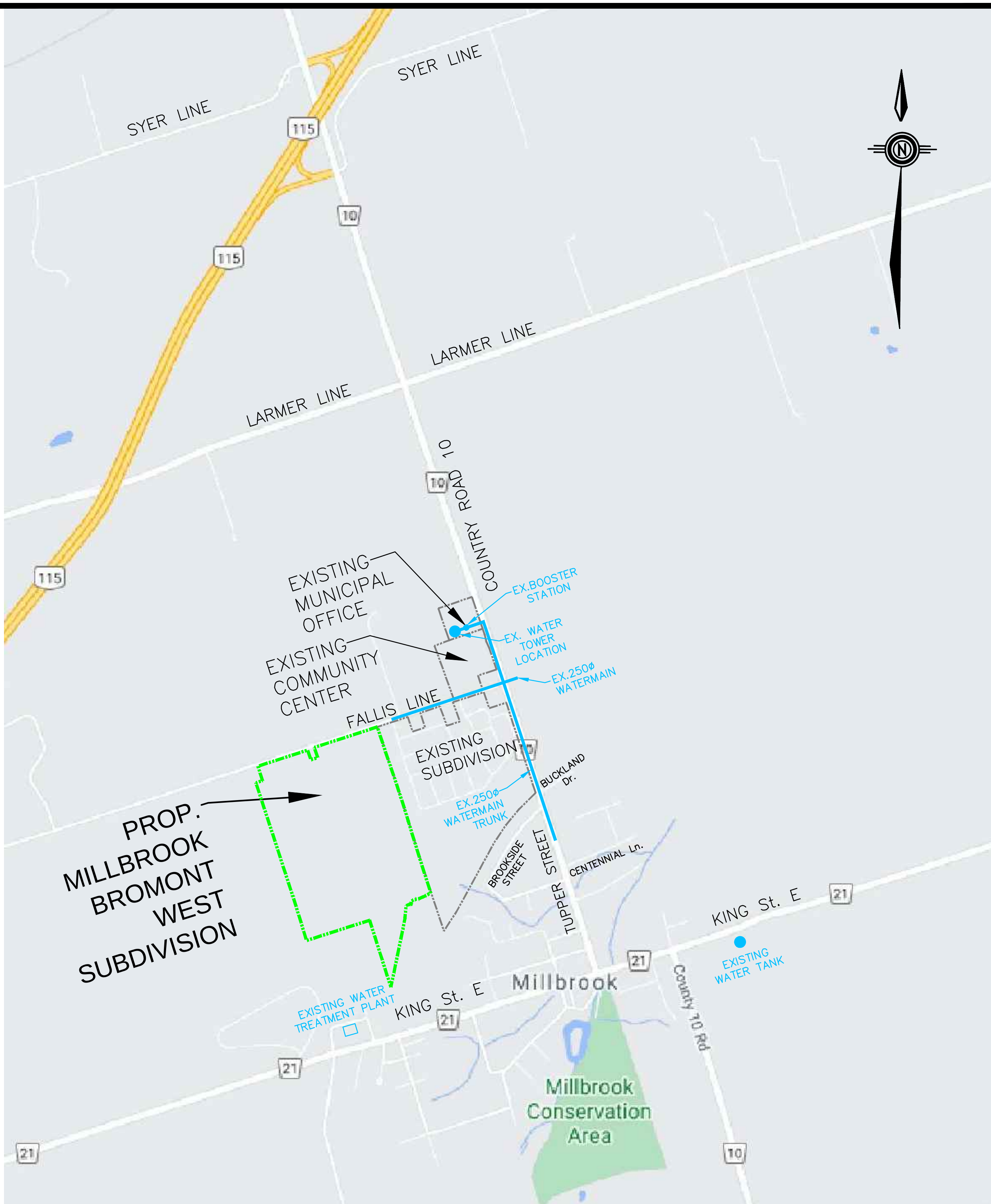
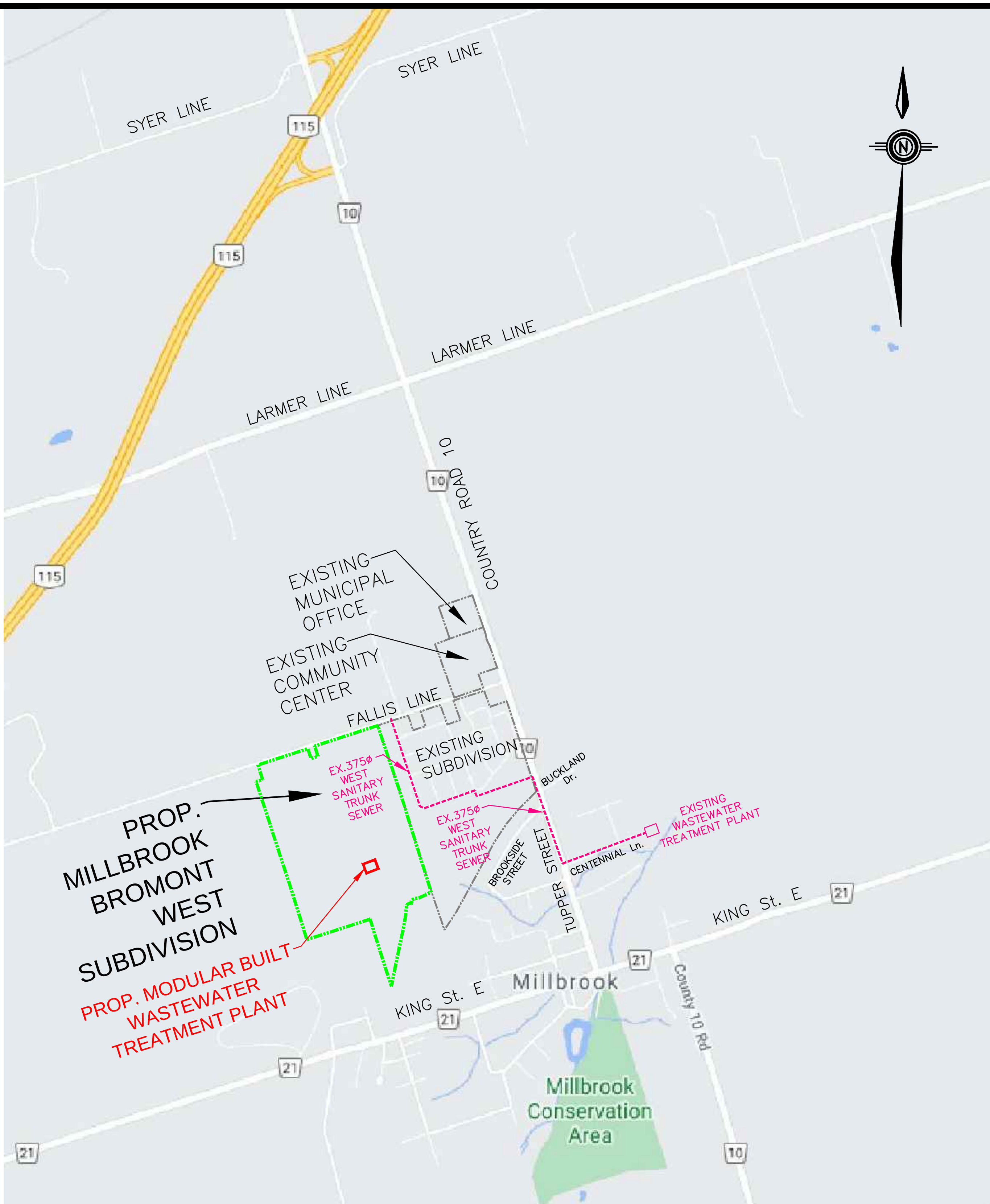
www.valdor-engineering.com

SCALE	N.TS.	PROJECT	16119	FIGURE 1
DATE	Jan, 2022	DRAWN BY	V.L.	



MILLBROOK SOUTH WEST SUBDIVISION	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
WATER SERVICING EXTERNAL	

SCALE	N.TS.	PROJECT	16119	FIGURE 2
DATE	Jan, 2022	DRAWN BY	V.L.	



MILLBROOK SOUTH WEST SUBDIVISION

WASTEWATER SERVICING EXTERNAL

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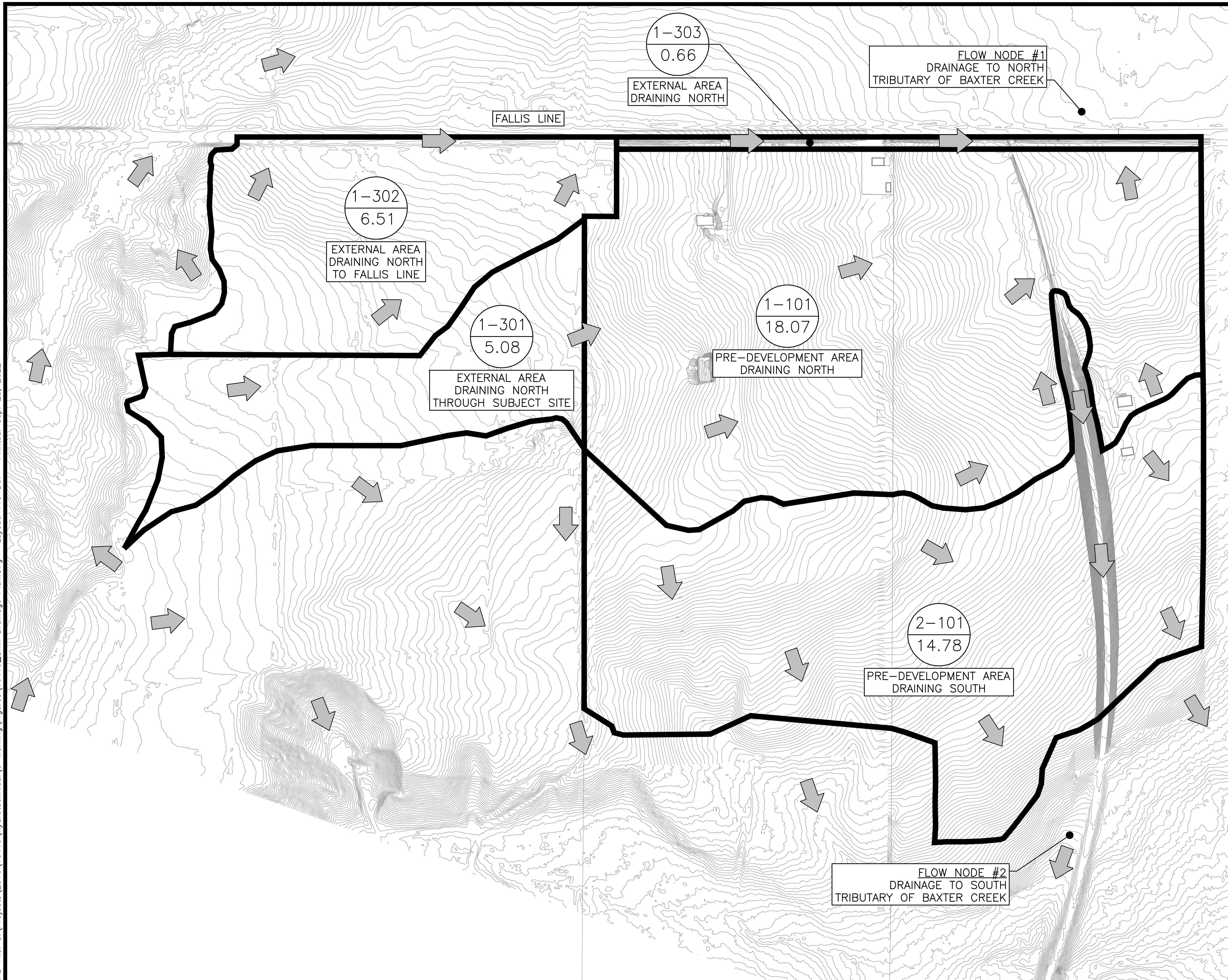
SCALE	N.T.S.	PROJECT	16119	FIGURE 3
DATE	Jan, 2022	DRAWN BY	V.L.	



LEGEND

	EXISTING CONTOUR
	DRAINAGE BOUNDARY
1-101 / 18.07	CATCHMENT ID / AREA (HA)
	OVERLAND FLOW

PROJECT
MILLBROOK SOUTH WEST SUBDIVISION

TITLE
SWM DRAINAGE PLAN PRE-DEVELOPMENT

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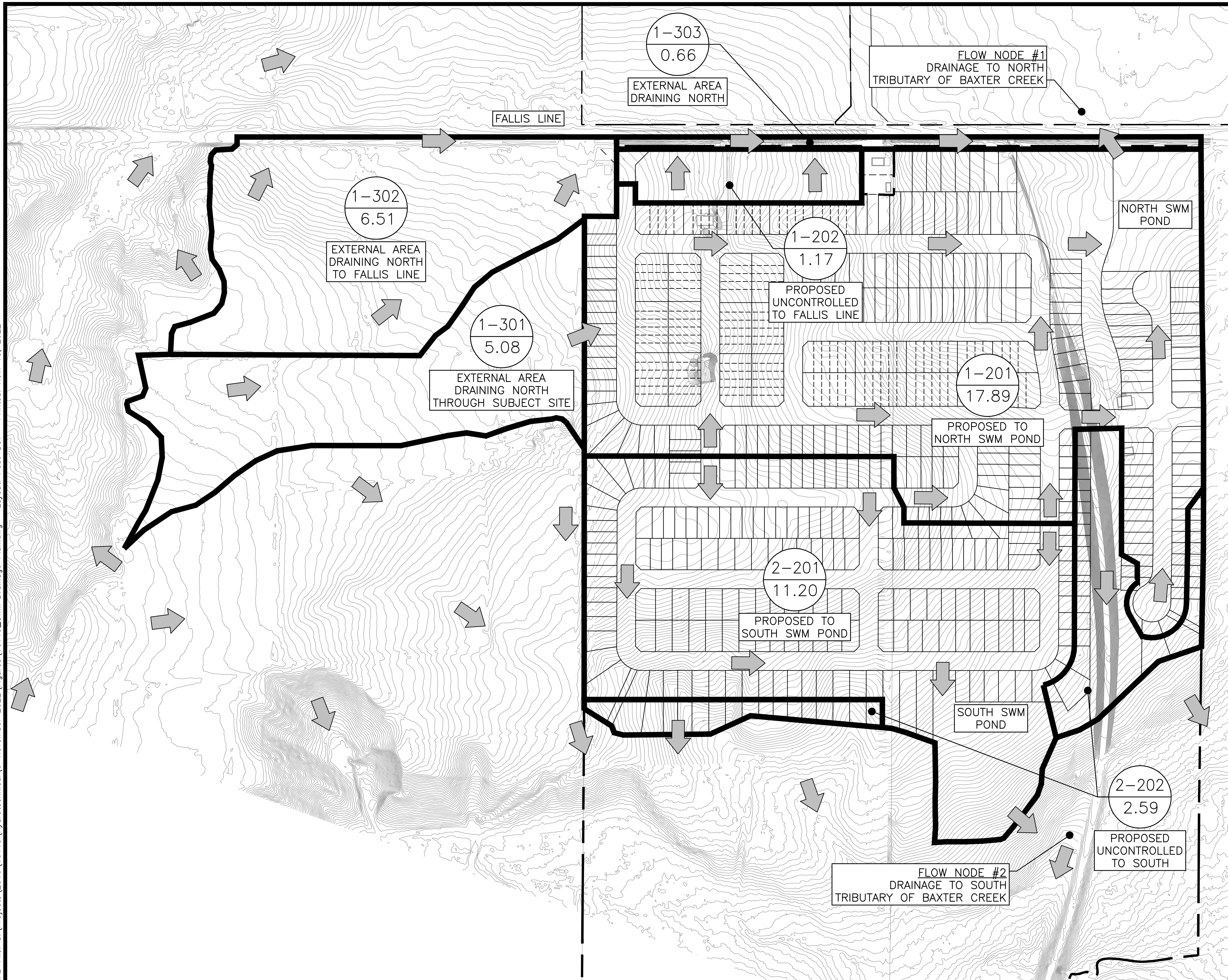
PREPARED BY	O.B.	CKD. BY	O.B.
SCALE	NTS	DATE	SEP. 2022
PROJECT	16119		**FIGURE 4A**

ACAD File: S:\Projects\2016\16119\Hydrotechnical\0-Working\Figures\16119_SWM Drainage Plan.dwg Layout: Pre-Dev Printed: Sep. 28, 2022

ACAD File: S:\Projects\2016\16119\Hydrotechnical\6-November 2022\Figures\16119_SWM Drainage Plan.dwg Layout: Post-Dev Printed: Nov. 10, 2022



LEGEND

EXISTING CONTOUR

DRAINAGE BOUNDARY

1-201 — CATCHMENT ID

19.06 — AREA (HA)

OVERLAND FLOW

PROJECT	**MILLBROOK SOUTH WEST SUBDIVISION**
TITLE	**SWM DRAINAGE PLAN POST-DEVELOPMENT**

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Consulting Engineers - Project Managers
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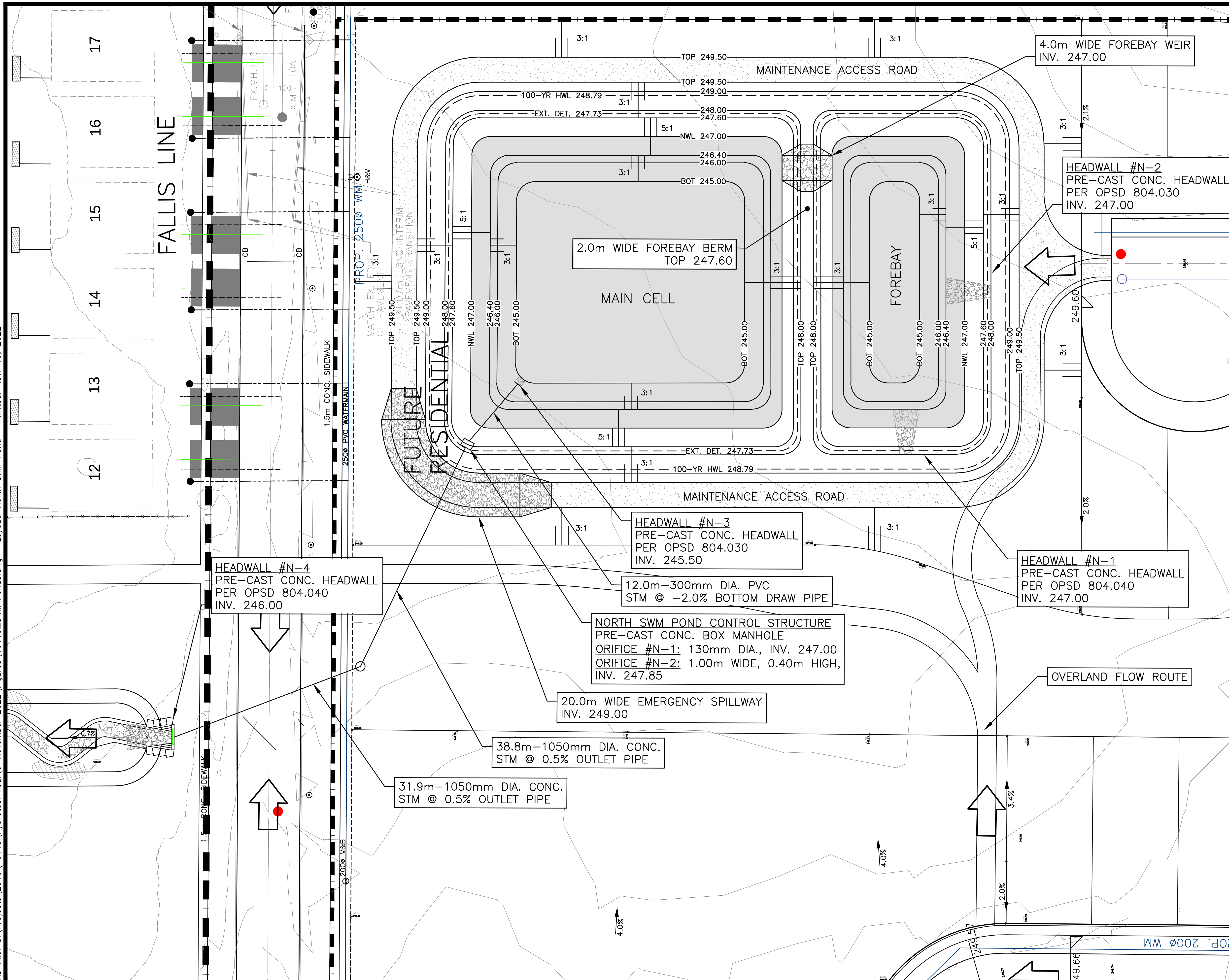
PREPARED BY	O.B.	CKD. BY	O.B.
SCALE	NTS	DATE	NOV. 2022
PROJECT	16119	**FIGURE 4B**	



ACAD File: S:\Projects\2016\16119\Hydrotechnical\6-November 2022\Figures\16119_SWM Ponds.dwg Layout: North SWM Pond Printed: Nov. 10, 2022

LEGEND

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

RETURN PERIOD	POND WSEL (m)
25 mm	247.65
2-YEAR	247.97
5-YEAR	248.16
10-YEAR	248.31
25-YEAR	248.49
50-YEAR	248.65
100-YEAR	248.82
REGIONAL	249.08

PROJECT: **MILLBROOK SOUTH WEST SUBDIVISION**

TITLE: **PRELIMINARY NORTH SWM POND**

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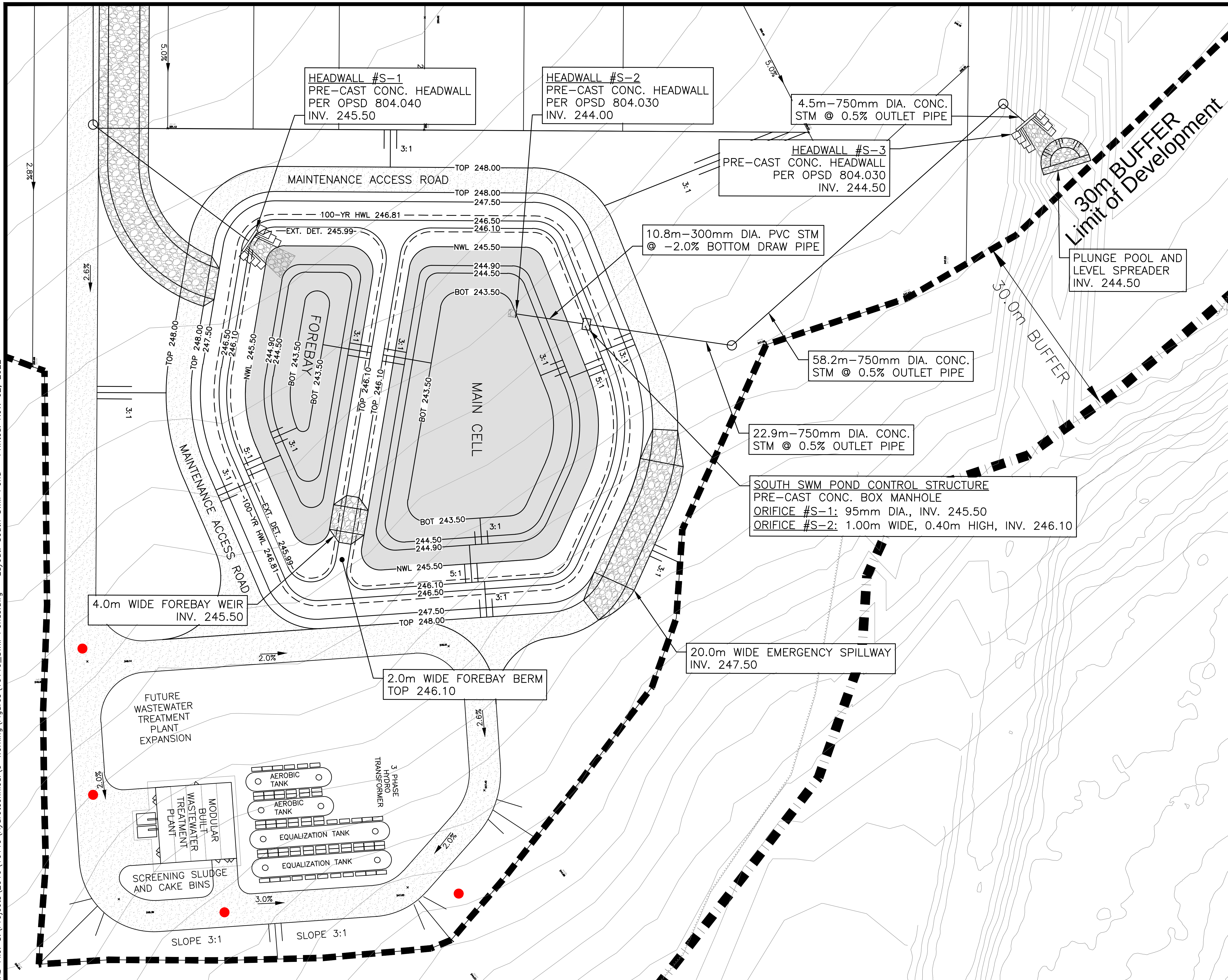
PREPARED BY	O.B.	CKD. BY	O.B.
SCALE	1:600	DATE	NOV. 2022
PROJECT	16119		**FIGURE 5A**



LEGEND

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

RETURN PERIOD	POND WSEL (m)
25 mm	245.99
2-YEAR	246.18
5-YEAR	246.34
10-YEAR	246.44
25-YEAR	246.58
50-YEAR	246.69
100-YEAR	246.81
REGIONAL	246.87

PROJECT
MILLBROOK SOUTH WEST SUBDIVISION

TITLE
PRELIMINARY SOUTH SWM POND

VALDOR ENGINEERING INC.
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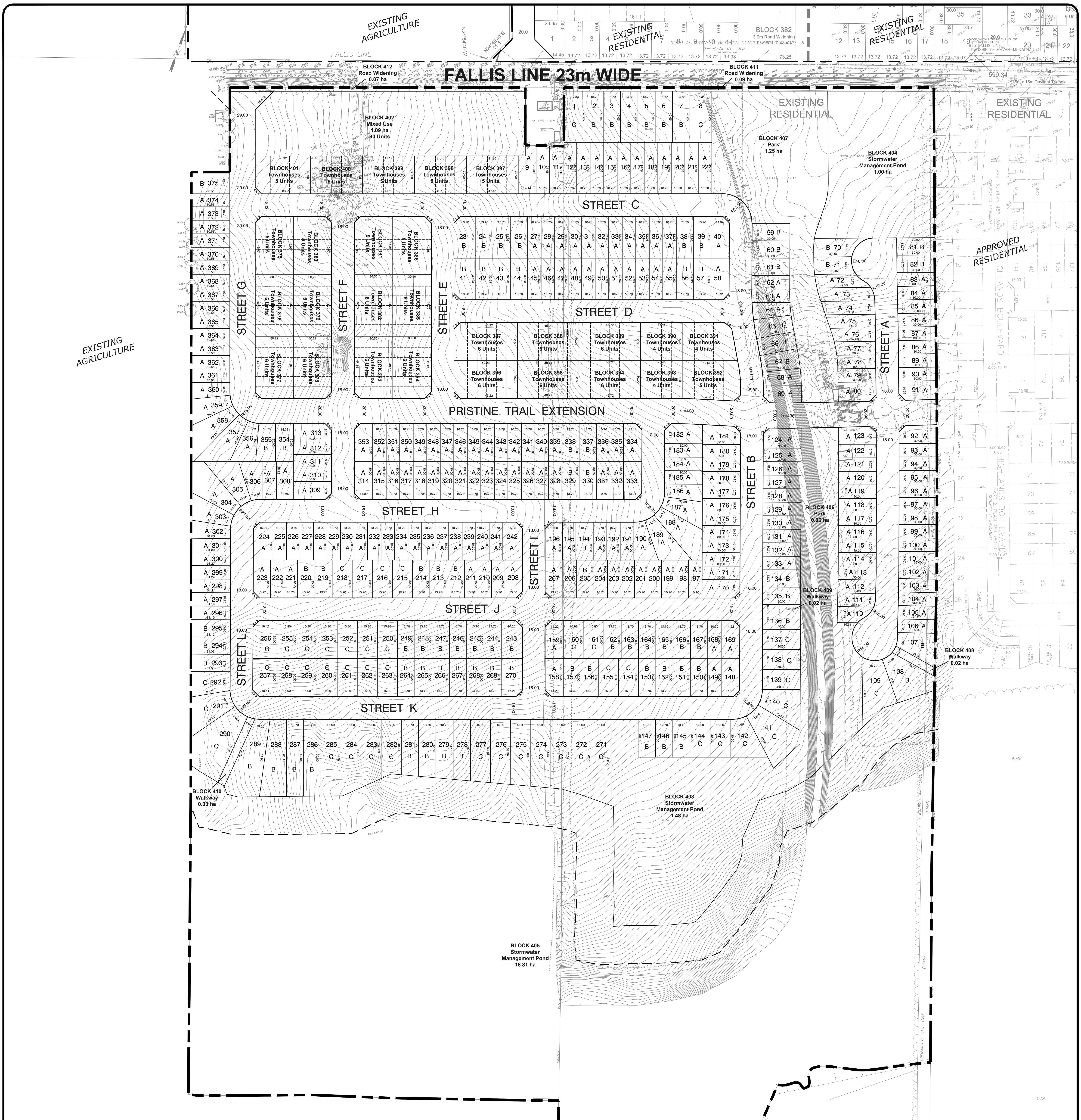
PREPARED BY	O.B.	CKD. BY	O.B.
SCALE	1:600	DATE	OCT. 2022
PROJECT	16119	**FIGURE 5B**	

ACAD File: S:\Projects\2016\16119\Hydrotechnical\0-Working\Figures\16119_SWM Ponds.dwg Layout: South SWM Pond Printed: Nov. 02, 2022

APPENDIX "A"

Draft Plan of Subdivision



Schedule of Land Use

Description		Lot / Block No.	Residential Units	Area (ha)
Minimum Lot Width 10.70m (35')	A	9-22, 27-37, 40, 45-55, 58, 62-64, 68, 69, 72-80, 83-106, 110-133, 148, 149, 158, 159, 168-193, 195-204, 206-211, 221-242, 296-328, 331-336, 339-353, 356-374	241	8.68
Minimum Lot Width 13.70m (45')	B	2-7, 23-26, 38, 39, 41-44, 56, 57, 59-61, 65-67, 70, 71, 81, 82, 107, 108, 134-136, 145-147, 150-153, 156, 157, 162-167, 194, 205, 212-214, 219, 220, 243-249, 264-270, 278-281, 286-289, 293-295, 329, 330, 337, 338, 354, 355, 375	87	4.17
Minimum Lot Width 15.90m (52')	C	1, 8, 109, 137-144, 154, 155, 160, 161, 215-218, 250-263, 271-277, 282-285, 290-292	47	3.02
Total Single Detached			375	15.87
Street Townhouse Minimum Lot Width 7.62m (25')		375-401	146	3.71
Mixed Use		402	90	1.09
Net Developable Total			611	20.67
Stormwater Management Pond		403, 404		2.48
Natural Heritage Systems		405		16.31
Park		406, 407		2.21
Walkway		408-410		0.07
Road Widening		411, 412		0.16
Right of Way				7.29
Total Site Area				**49.19**

TITLE:

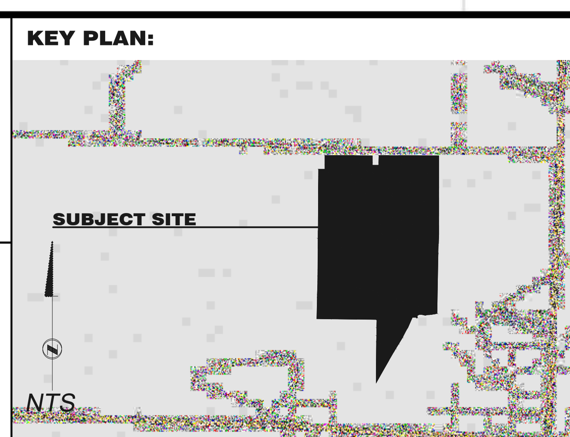
DRAFT PLAN OF SUBDIVISION

LEGAL DESCRIPTION:

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

787 - 825 Fallis Line West
Township of Cavan Monaghan

KEY PLAN:



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

SURVEYOR'S CERTIFICATE

I HEREBY CERTIFY THAT THE BOUNDARIES OF THE LANDS TO BE SUBDIVIDED AS SHOWN ON THIS PLAN AND THEIR RELATIONSHIP TO THE ADJACENT LANDS ARE ACCURATE AND CORRECTLY SHOWN IN ACCORDANCE WITH A PLAN OF SURVEY PREPARED BY:SURVEYOR_COMPANY

DAVID COMERY
IBW SURVEYORS

2022/01/17
DATE

OWNER'S CERTIFICATE

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

SAVERIO MONTEMARANO
CS4 DEVELOPMENT

2022/01/17
DATE

REQUIRED INFORMATION

AS REQUIRED UNDER SECTION 51(17) OF THE PLANNING ACT R.S.O. 1990.

(a) SEE PLAN
(b) SEE PLAN
(c) SEE KEY MAP
(d) SEE SCHEDULE OF LAND USE
(e) SEE PLAN
(f) SEE PLAN
(g) SEE PLAN
(h) MUNICIPAL WATER AND SEWAGE AVAILABLE
(i) SANDY SILT / SILTY SAND TO CLAYEY SILT / SILTY CLAY
(j) SEE PLAN
(k) MUNICIPAL WATER AND SEWAGE AVAILABLE
(l) SEE PLAN

NOTE: CONTOURS RELATE TO CANADIAN GEODETIC DATUM

REVISIONS

No.	Description	Date	Int.
3			
2	Prepared for Second Submission	22/10/03	EC
1	Stormwater Management Pond Revision	21/12/15	JS

PROJECT No.: 20697
DATE: November 3, 2022
SCALE: 1:1500
DRAFTED BY: EC
CHECKED BY: MT
DRAWING No.: **DP-01**

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thebiglierigroup.com

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www.valdor-engineering.com

TABLE: A1

EQUIVALENT POPULATION

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

Land Use	Area (Hectares)	Criteria	No. of Units	Equivalent Population
Detached Dwellings	15.87	3.50 persons per unit	375	1,313
Street Townhomes	3.71	3.50 persons per unit	146	511
Medium Density	1.09	2.00 persons per unit	90	180
Parkland	2.21			
Natural Heritage Systems	16.31			
Stormwater Management Ponds	2.48			
Roads & Road Widenings	7.45			
Walkways	0.07			
Total:	**49.19**		**611**	**2,004**

APPENDIX “B”

Water Demand Calculations & Details

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TABLE: B1

DOMESTIC WATER DEMAND CALCULATION

Project Name: **Millbrook South West Subdivision, Township of Cavan Monaghan**
File: 16119
Date: October 2022

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

Land Use	**Equivalent Population** (persons)	**Domestic Demand** (L/min)	**Maximum Day Demand** (L/min)	**Peak Hour Demand** (L/min)
Detached Dwellings	1,313	410.3	820.6	1,230.9
Street Townhomes	511	159.7	319.4	479.1
Medium Density	180	56.3	112.5	168.8
Total	**2,004**	**626.3**	**1,252.5**	**1,878.8**

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TABLE: B2-1

CALCULATION OF REQUIRED FIRE FLOW

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

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

Notes: **DETACHED DWELLING**
Assume:
- 3,500 sq.ft total floor area
- interior unit for max exposure

Type of Construction - Wood Frame

$C =$ 1.5

Total Floor Area: 325 sq.m
$A =$ 325 sq.m
(Total Floor Area includes all storeys, but excludes basements at least 50 percent below grade)

$F = 220\,C\,\sqrt{A}$
$F =$ 5,949 L/min
$F =$ 6,000 (to nearest 1,000 Lmin)

Occupancy Factor

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

$F' = F \times (1+f_1)$
$F' =$ 4,500 L/min

Sprinkler Credit

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

Exposure Factor

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

$F'' = F' + F' \times f_2 + F' \times f_3$
$F'' =$ 7,875 L/min

REQUIRED FIRE FLOW
$F'' =$ **8,000** **L/min** (to nearest 1,000 L/min)

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www.valdor-engineering.com

TABLE: B2-2

CALCULATION OF REQUIRED FIRE FLOW

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

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

Notes: **STREET TOWNHOMES DWELLING**
Assume:
- 2,500 sq.ft total floor area
- interior unit for max exposure

Type of Construction - Wood Frame

$C =$ 1.5

Total Floor Area: 233 sq.m
$A =$ 233 sq.m

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

$F = 220\,C\,\sqrt{A}$
$F =$ 5,037 L/min
$F =$ 5,000 (to nearest 1,000 Lmin)

Occupancy Factor

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

$F' = F \times (1+f_1)$
$F' =$ 3,750 L/min

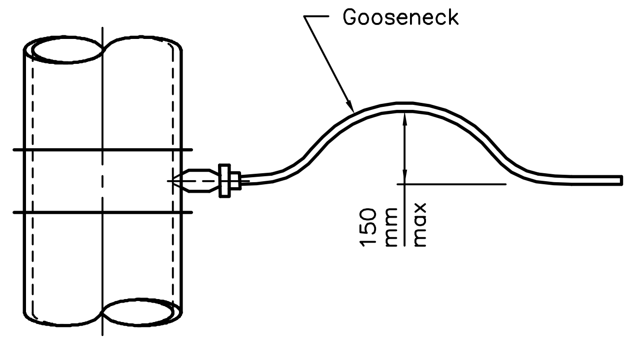
Sprinkler Credit

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

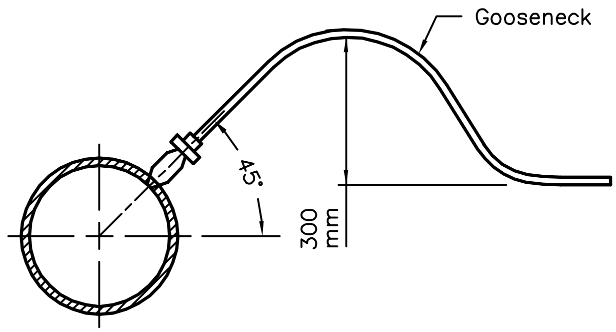
Exposure Factor		Charge
Side 1 - Distance to Building (m):	0 to 3m	25%
Side 2 - Distance to Building (m):	0 to 3m	25%
Side 3 - Distance to Building (m):	3.1 to 10m	20%
Side 4 - Distance to Building (m):	3.1 to 10m	20%
	$f_3 =$	75% (maximum of 75%)

$F'' = F' + F' \times f_2 + F' \times f_3$
$F'' =$ 6,563 L/min

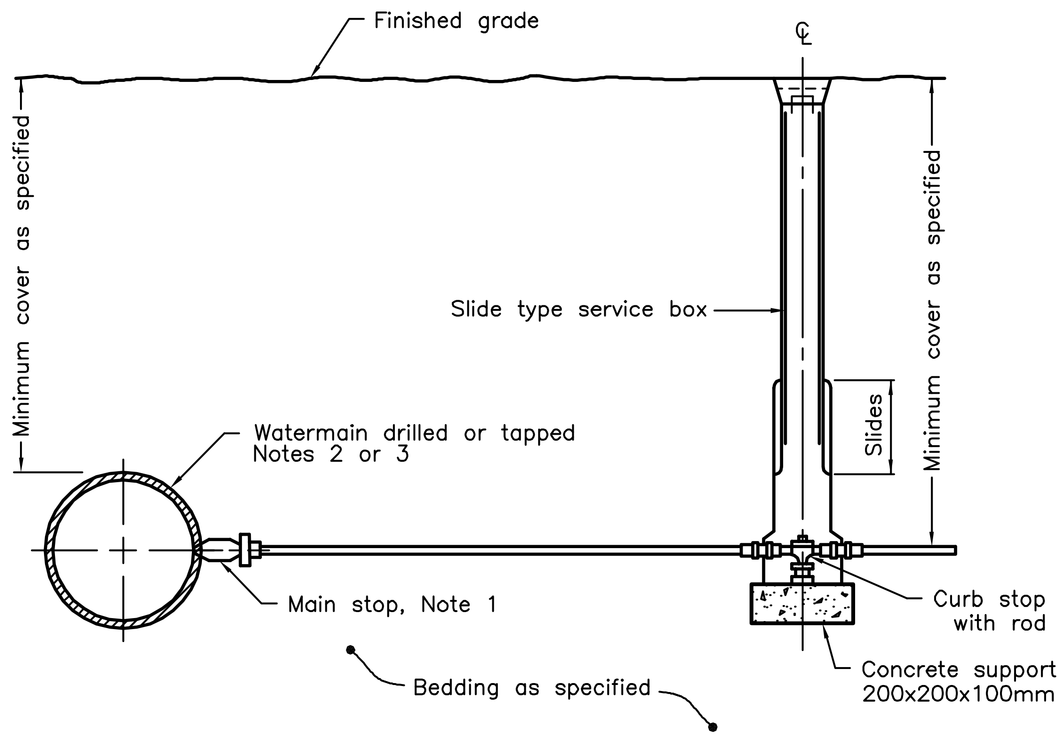
REQUIRED FIRE FLOW
$F'' =$ **7,000** **L/min** (to nearest 1,000 L/min)



HORIZONTAL GOOSENECK



VERTICAL GOOSENECK OPTION



VERTICAL SECTION

NOTES:

1 For plastic service pipes, install main stop at 15° above horizontal with a minimum 1.2m long gooseneck.

2 Direct tap ductile iron pipe with approved tool with standard AWWA inlet thread.

3 Service connections to plastic watermains shall be made using service saddles or factory made tees.

A When specified, the vertical gooseneck option shall be used.

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

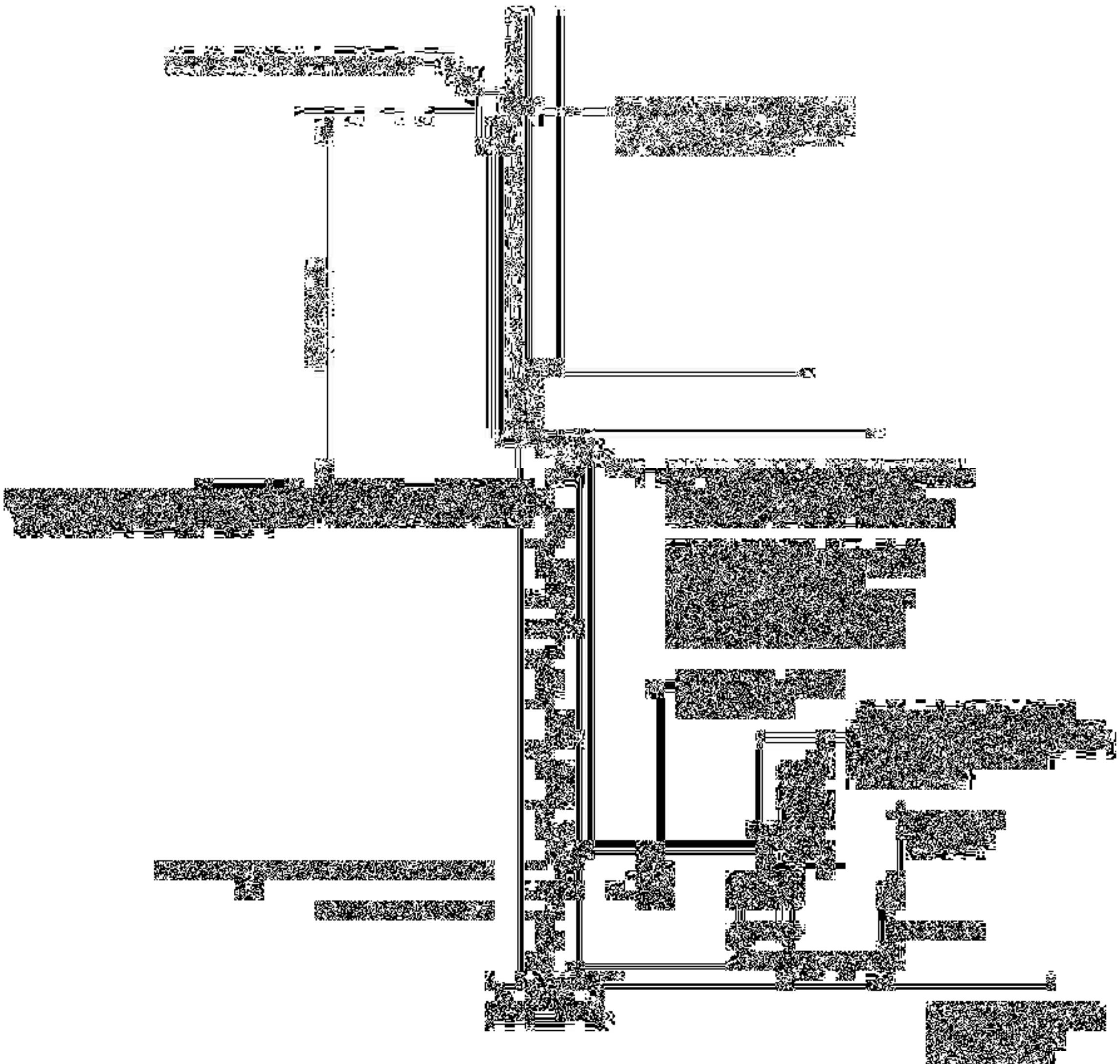
C All water services shall be installed 90° to the longitudinal axis of the watermain.

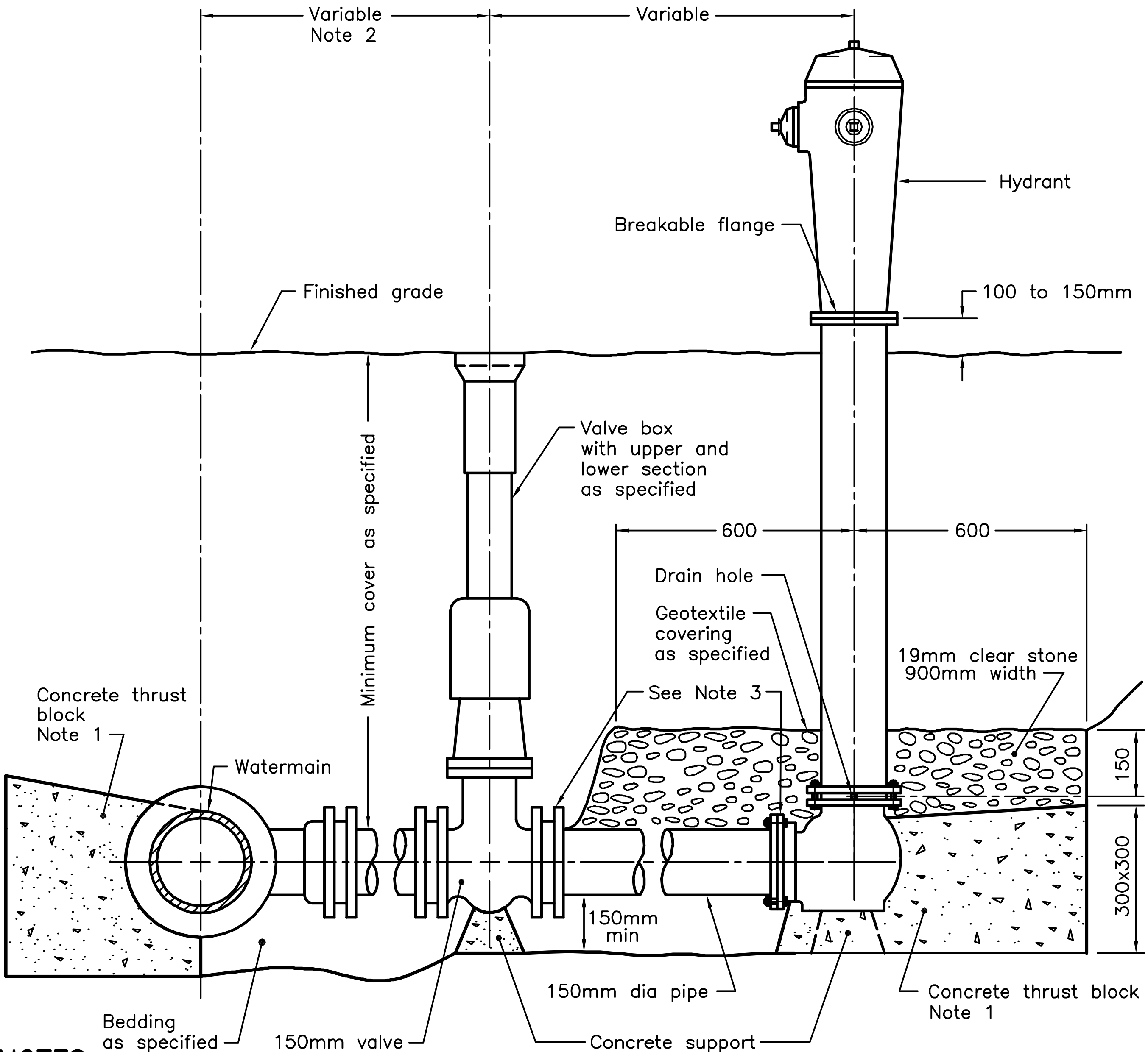
D Backfill material within 500mm of service box shall be native or imported, as specified.

E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2013	Rev 3
WATER SERVICE CONNECTION 19 and 25mm DIAMETER SIZES	**OPSD 1104.010**	

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL





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 Calculations & Details

VALDOR

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

TABLE: C1

WASTEWATER FLOW CALCULATIONS

Project Name: **Millbrook South West Subdivision, Township of Cavan Monaghan**
File: 16119
Date: Nov. 2022

Conditions:

Residential Average Daily Flow: 450 L/person/day

Residential Peaking Factor: $K_H = 1 + \frac{14}{4 + \sqrt{P}}$ where K_H = Harmon Peaking Factor (max. 4.5, min. 2.0)
p = population in thousands

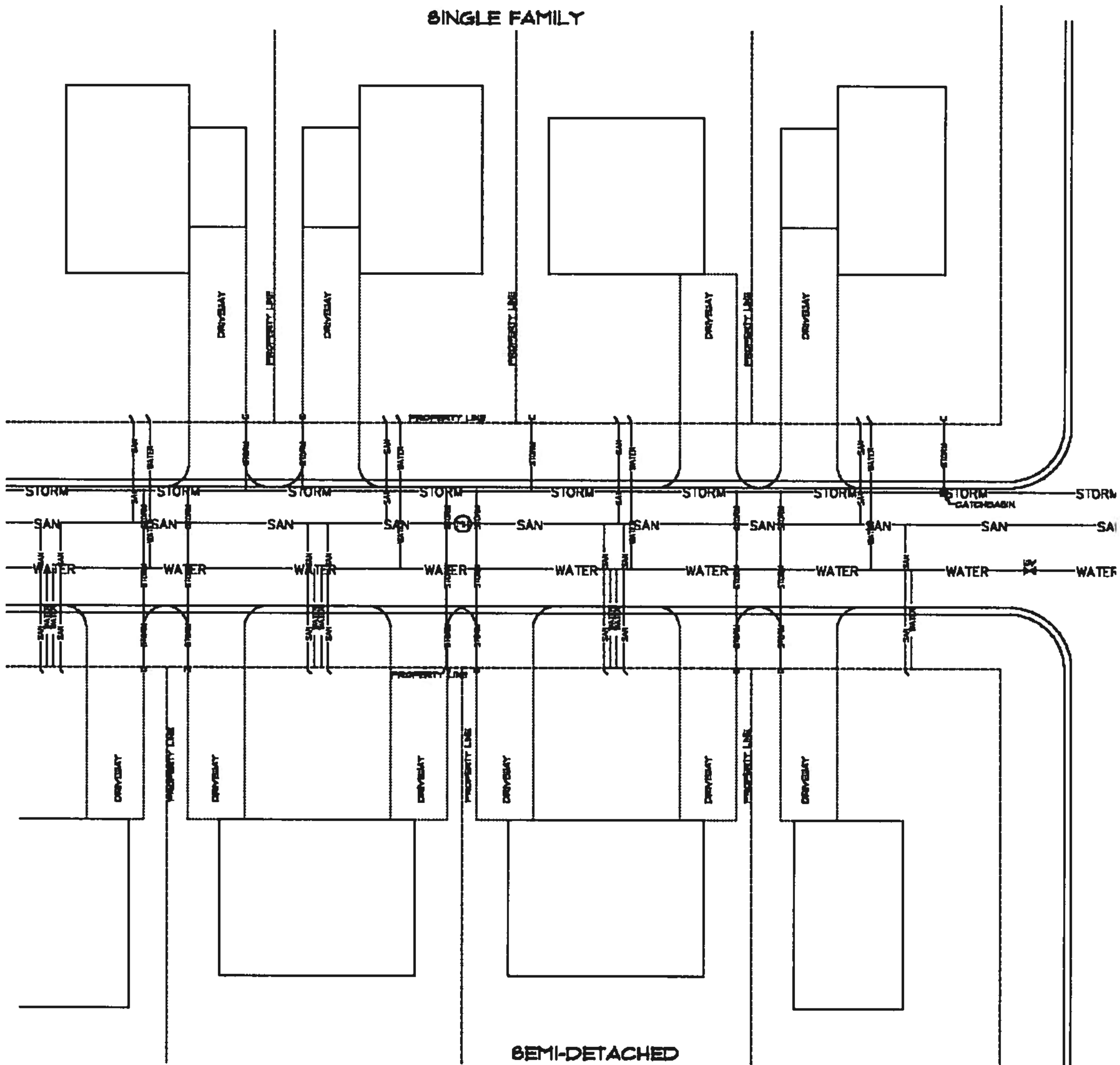
Extraneous Flow (I): 0.28 L/s/ha. (infiltration)

Design Flow (Q_D): Q x $K_H + I$

Commercial/instituational Average Daily Flow: 1.15 L/s/ha

Commercial/Instituational Peaking Factor: 2.5

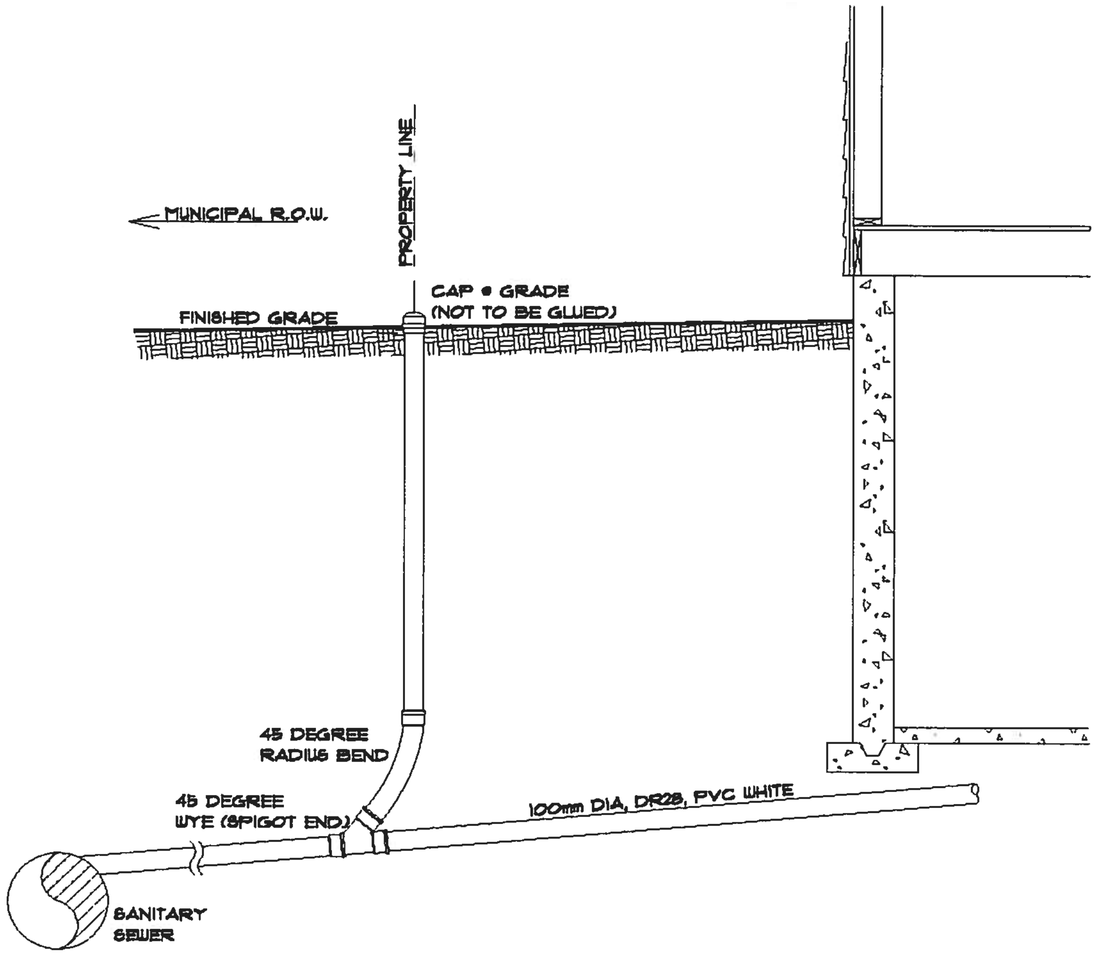
Land Use	Area (ha.)	Equivalent Population (persons)	Average Daily Flow (L/s)	Harmon Peaking Factor	Peak Daily Flow (L/s)	Extraneous Flow (L/s)	Total Flow (L/s)
Detached Dwellings	15.87	1,313	6.84	3.72	25.43	4.44	29.88
Street Townhomes	3.71	511	2.66	3.97	10.56	1.04	11.60
Medium Density	1.09	180	0.94	4.16	3.90	0.31	4.21
Roads	7.45					2.09	2.09
Total	**28.12**	**2,004**	**10.43**		**39.90**	**7.87**	**47.78**



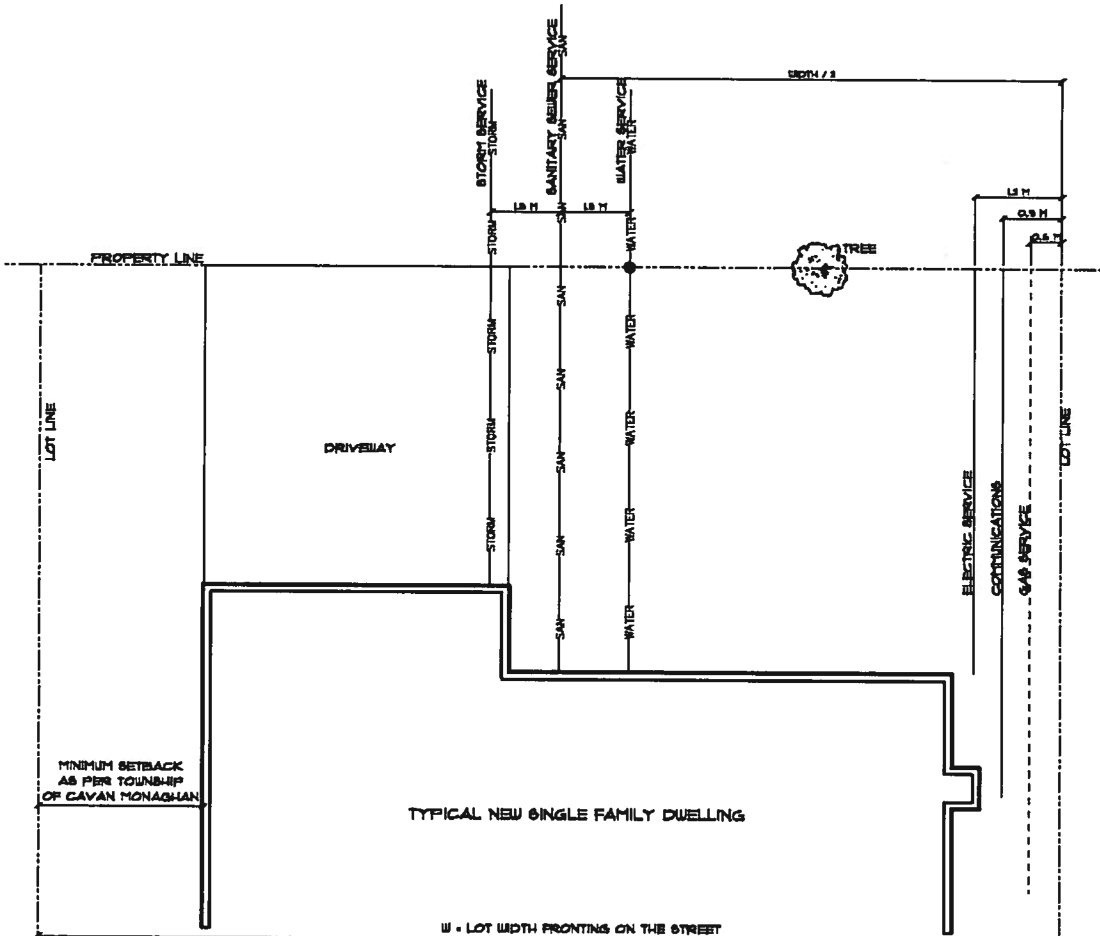
NOTES:

1. 1.5m MIN. BETWEEN SEWER & WATER SERVICE CONNECTIONS AT CENTRE OF LOT.
2. STORM SEWER SERVICES 1.5m MIN. FROM LOT LINE.
3. WATERMAIN VALVES, HYDRANTS & CATCHBASINS NOT TO BE LOCATED IN WALKWAYS OR DRIVEWAYS.
4. ALL SERVICES TO RUN IN A STRAIGHT LINE, PERPENDICULAR TO CENTERLINE OF ROAD FROM MAIN TO PROPERTY LINE.

TOWNSHIP OF CAVAN MONAGHAN	TYPICAL SERVICING LAYOUT	STD. S1
	SCALE: NOT TO SCALE	
	DATE: AUGUST 2013	



TOWNSHIP OF CAVAN MONAGHAN	SANITARY SERVICE CONNECTION WITH CLEAN-OUT	STD. S3
	SCALE: NOT TO SCALE	
	DATE: AUGUST 2013	



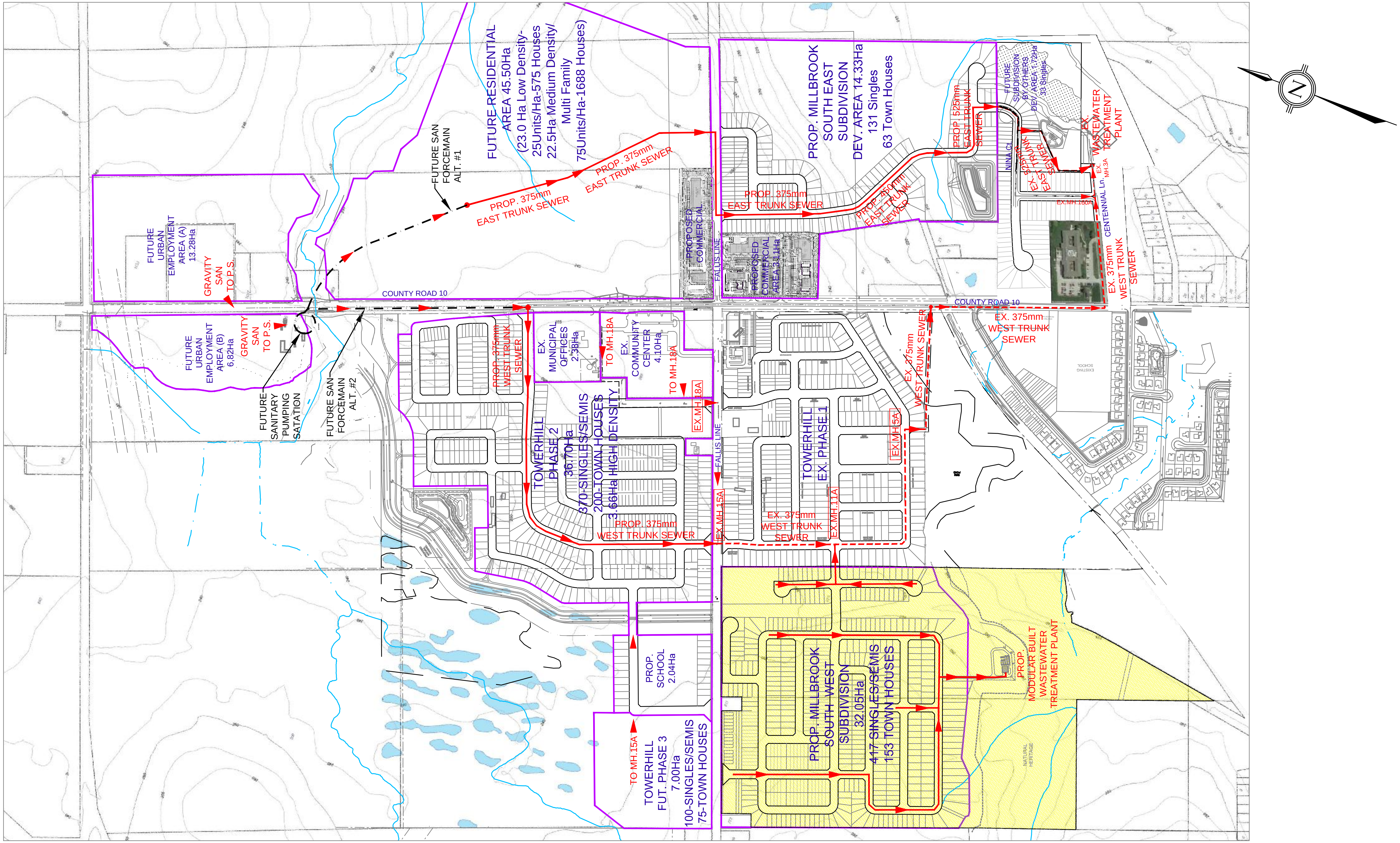
1. SANITARY SEWER CONNECTION LOCATED AT CENTER LINE OF THE LOT (WIDTH / 2)
2. WATER SERVICE LOCATION IS 1.5 M FROM SANITARY SEWER ON OPPOSITE SIDE OF DRIVEWAY.
3. STORM SEWER CONNECTION (IF APPLICABLE) LOCATED 1.5 M FROM SANITARY SEWER ON OPPOSITE SIDE FROM WATER SERVICE.
4. ELECTRIC SERVICE CONNECTION - 1200mm FROM THE LOT LINE.
5. COMMUNICATIONS SERVICE CONNECTION - MINIMUM OF 300mm FROM ELECTRIC SERVICE.
6. GAS SERVICE CONNECTION - 300mm FROM COMMUNICATIONS SERVICE.
7. VARIATIONS FROM THE ABOVE LOCATIONS SHOULD ONLY BE MADE WITH THE APPROVAL OF THE UTILITIES AFFECTED BY THE VARIATION. VARIATIONS IN THE LOCATION OF THE SANITARY SEWER CONNECTION SHALL BE CONFINED TO THE LOWER HALF OF THE LOT AS DETERMINED BY THE DIRECTION OF FLOW OF THE SANITARY SEWER MAIN.

TOWNSHIP OF CAVAN MONAGHAN

TYPICAL SERVICE CONNECTION LOCATIONS FOR SINGLE FAMILY DWELLING

SCALE: NOT TO SCALE

DATE: AUGUST 2013



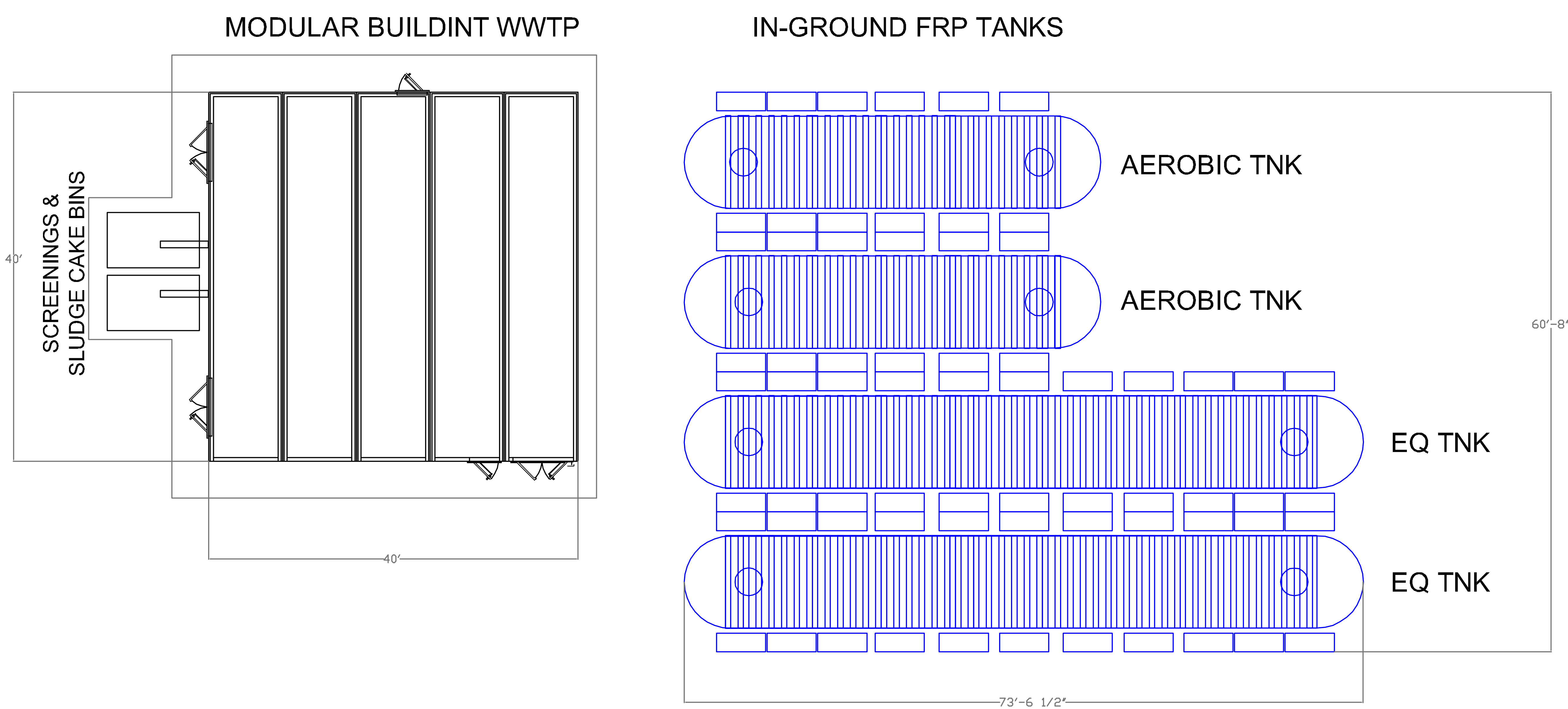
MILLBROOK SOUTH WEST SUBDIVISION

SANITARY DRAINAGE PLAN

DRAWN BY	V.L.
CKD. BY	D.G.
DATE	May, 2021
SCALE	N.T.S.
PROJECT	16119

FIGURE C

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



NOTES

SUPPLY BY OTHERS, INSTALL BY OTHERS

SUPPLY BY NEWTERRA, INSTALL BY NEWTERRA (INSIDE MODULAR BUILDING)

SUPPLY BY NEWTERRA, INSTALL BY OTHERS

INTERCONNECTING PIPING BETWEEN BUILDING AND TANKS, AND BETWEEN TANKS, IS TO BE REQUIRED BY CONTRACTOR.

newterra

PHONE:
(800) 420-4056

www.newterra.com

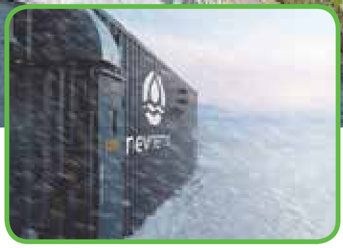
LEVEL	REVISION	DATE (mm/dd/yy)	BY
R0	PRELIMINARY FOR QUOTE		

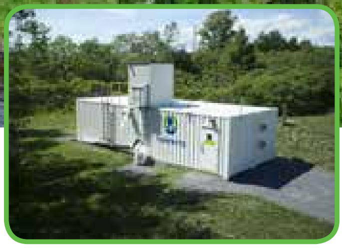
PROJECT NUMBER: MC 500DT

TITLE AND LOCATION: PRELIMINARY LAYOUT

CUSTOMER

DRAWN BY | DATE | SHEET | SHEETS





Modular Decentralized Water & Wastewater Systems

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

newterra
clean water. modular solutions. simple.™

newterra.com

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

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

The Right Solution for a Wide Range of Projects

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

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

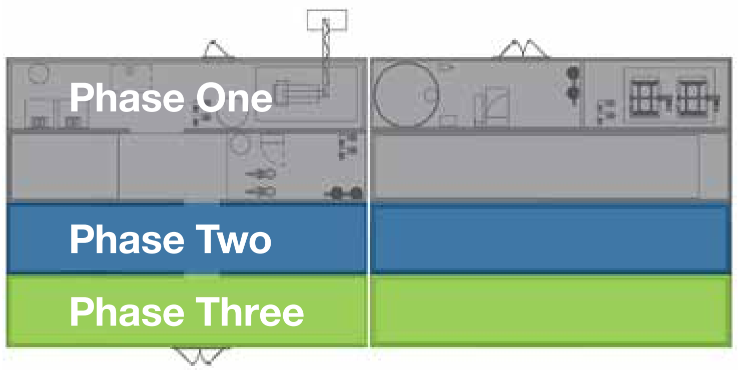
Self-Contained and Enclosed Systems

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

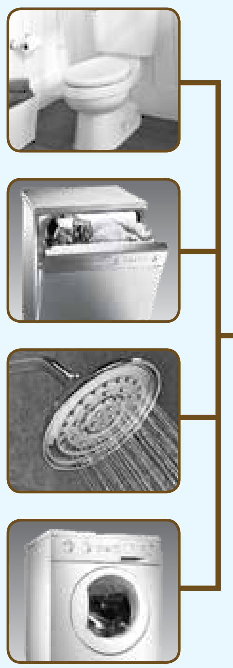
Newterra systems can be clad to blend in with their surroundings *(above)*, or be loose-shipped for use with inground tanks and buildings *(inset, right)*.

Add Infrastructure with Each Phase of a Project

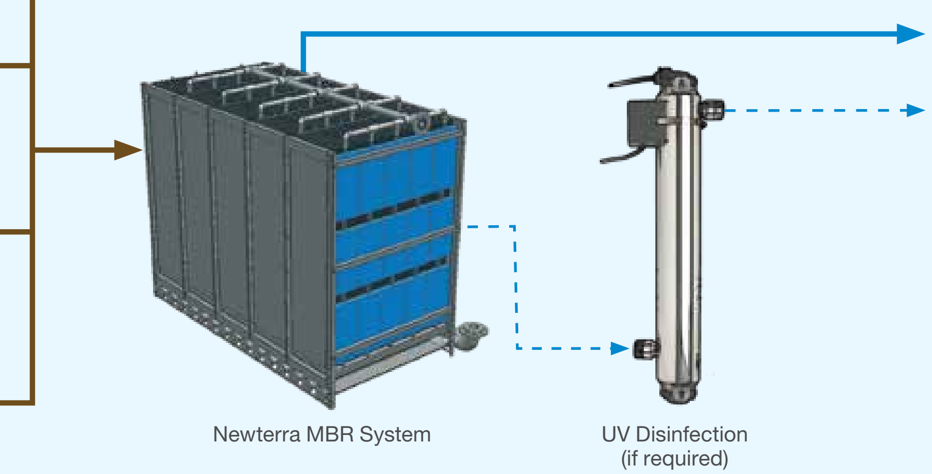
Our modular, scalable treatment technology allows you to phase in wastewater infrastructure in parallel with the treatment demands of your development. Newterra MBR systems can handle high loads, and are very resilient to flow and loading fluctuations. They are also extremely space efficient – reducing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



Sewage Treatment That Offers A Wide Range of Reuse Applications



Newterra sewage treatment systems have been designed to extract clean water from sewage – delivering permeate of such high quality that it can be reused for a wide range of applications. Supplementary technologies, such as activated carbon and ultraviolet (UV) disinfection broaden the reuse opportunities.



Compact, Operator-Friendly & Sustainable

Designed & Built for Minimal Maintenance

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

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

Ambient Temperatures	High Altitudes
-40˚F to +104˚F	13,125 ft.
-40˚C to +40˚C	4,000 m

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

Cost-Effective for New Facilities & Retrofits

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

A Global Water Technology Leader

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

Full Control from Start to Finish

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

200+ Employees

40+ Professional Engineers

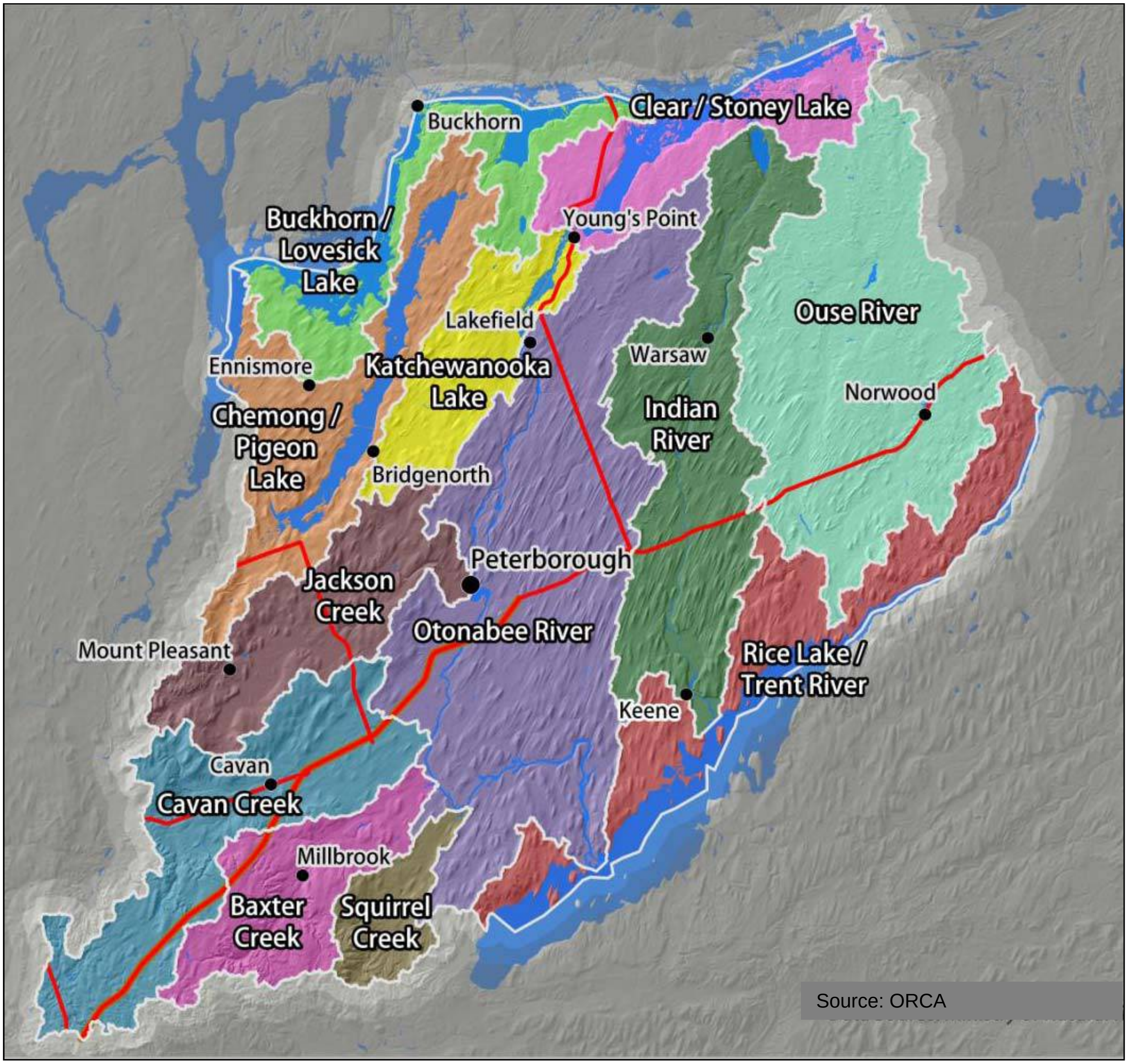
10,000+ Installations Worldwide

newterra®
clean water. modular solutions. *simple.*™

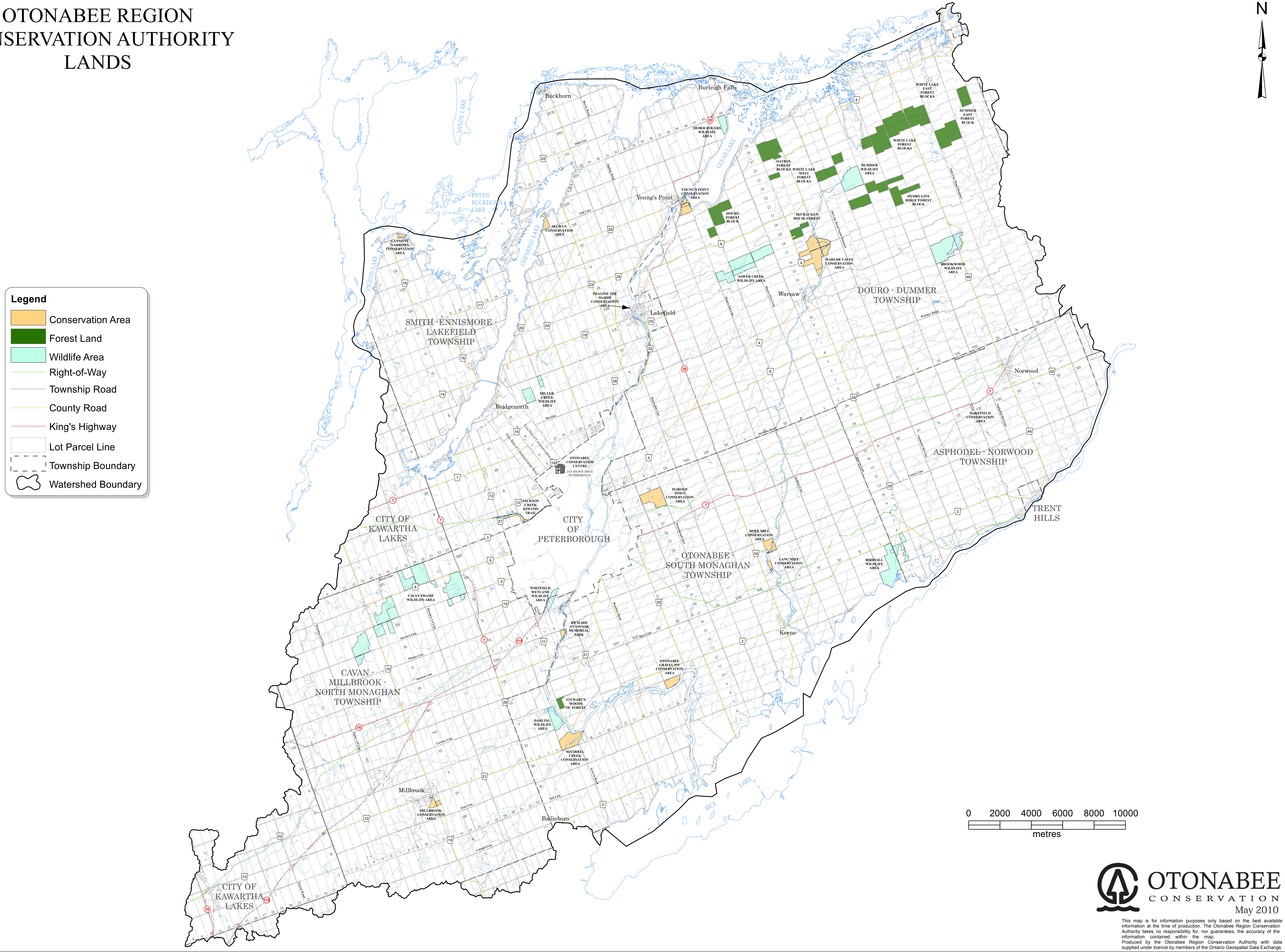
1.800.420.4056 | newterra.com

APPENDIX “D”

Watershed Map & IDF Data


Clear / Stoney Lake
Buckhorn
Buckhorn / Lovesick Lake
Young's Point
Lakefield
Ouse River
Warsaw
Ennismore
Katchewanooka Lake
Norwood
Chemong / Pigeon Lake
Indian River
Bridgenorth
Peterborough
Jackson Creek
Otonabee River
Mount Pleasant
Rice Lake / Trent River
Keene
Cavan
Cavan Creek
Millbrook
Baxter Creek
Squirrel Creek
Source: ORCA

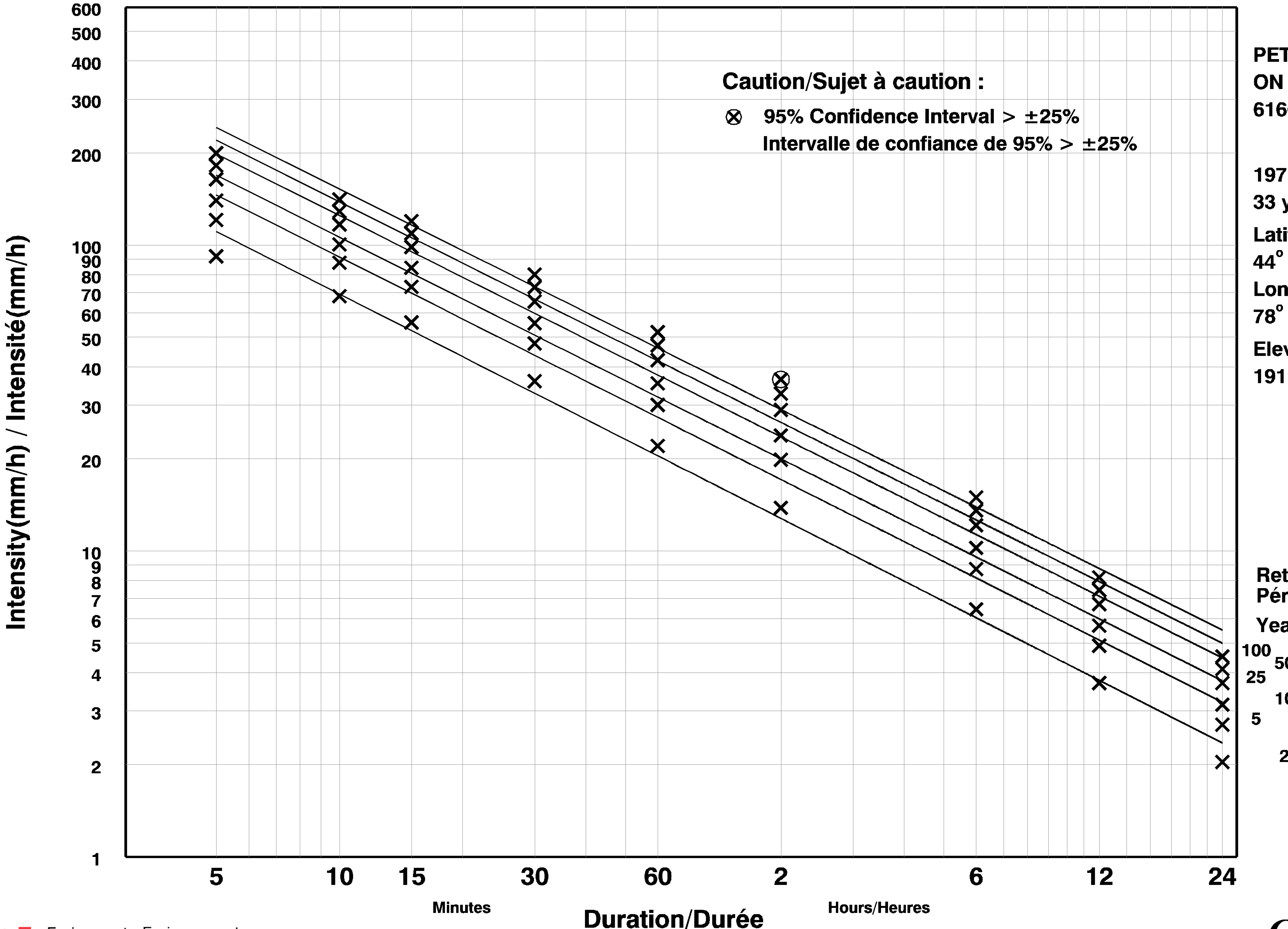
OTONABEE REGION CONSERVATION AUTHORITY LANDS



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

Return Periods/
Périodes de retour
Years / ans

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	

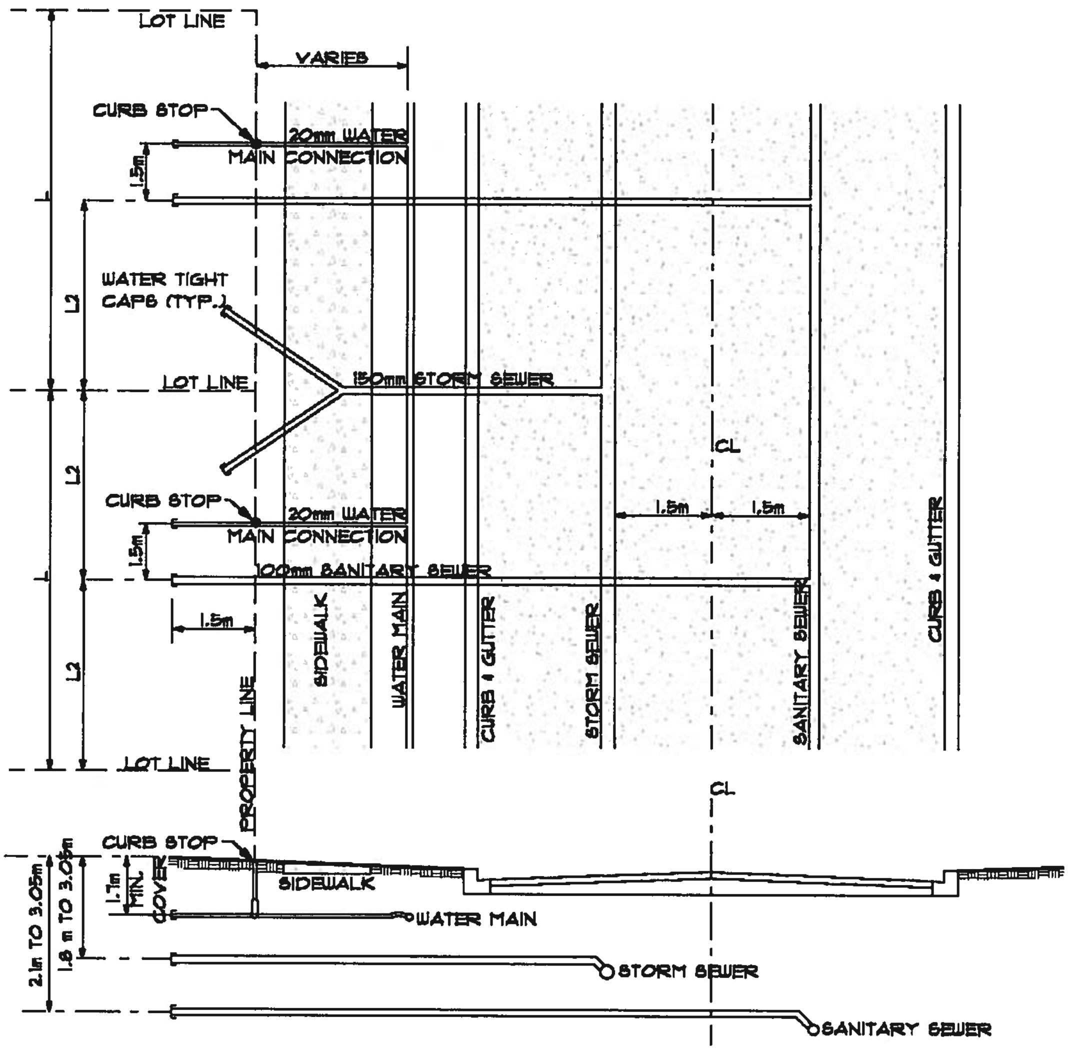
5 Year Return Period		
a	b	c
843.799	7.500	0.783
Duration	**Intensity**	
5	121.0	
10	87.7	
15	73.1	
30	47.8	
60	30.1	
120	19.9	
360	8.7	
720	4.9	
1440	2.7	

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	



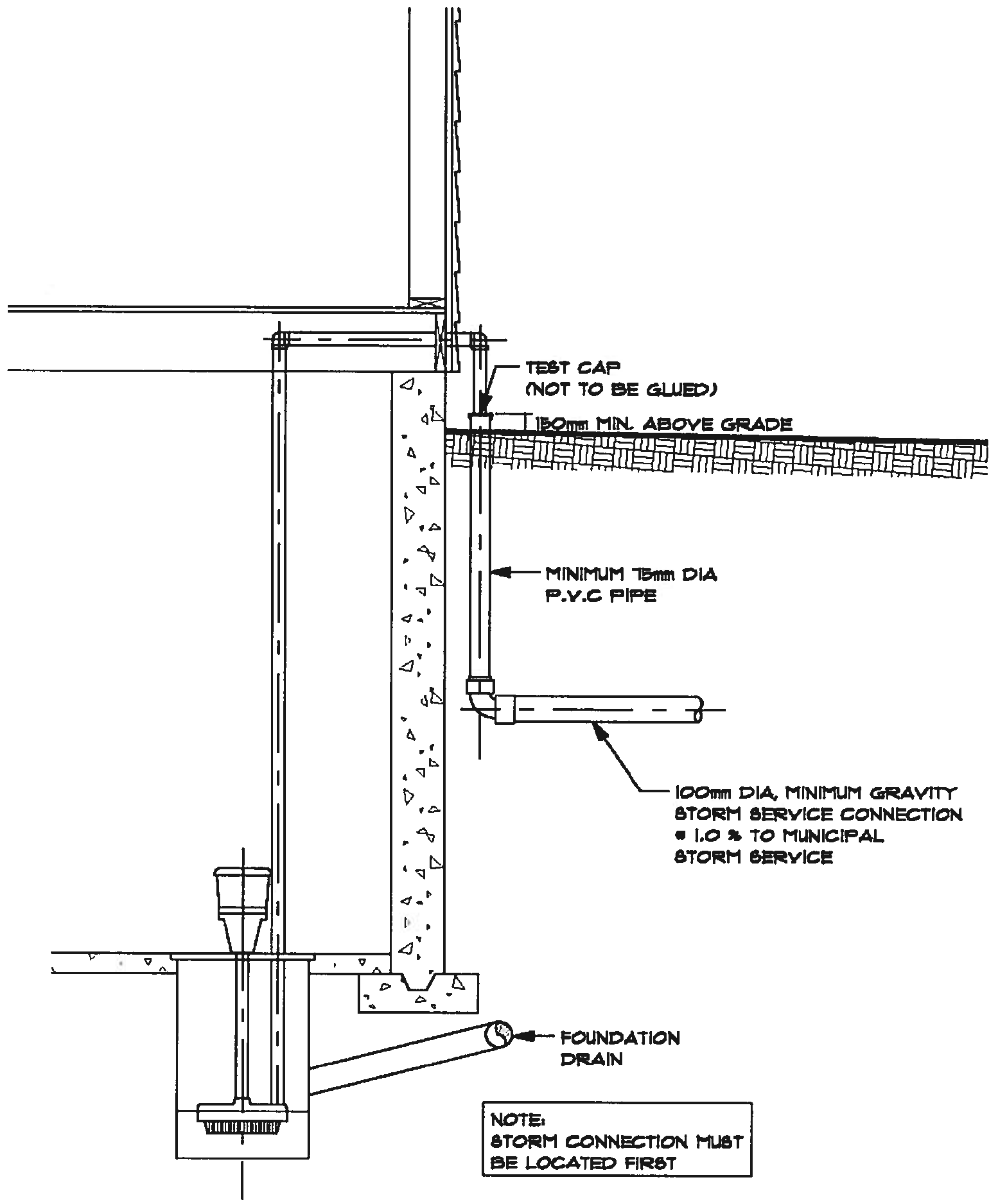
NOTES:
1. WATERTIGHT CAPS ON ALL SERVICES.
2. ALL DIMENSIONS SHOWN ARE CENTRE TO CENTRE.
3. STORM PIPE MATERIALS IS TO BE PVE SDR 28 AND WHITE IN COLOUR
4. L = FRONTAGE OF ONE UNIT

TOWNSHIP OF CAVAN MONAGHAN

STORM SERVICE RESIDENTIAL SERVICE CONNECTION

SCALE: NOT TO SCALE

DATE: AUGUST 2013



TOWNSHIP OF CAVAN MONAGHAN	SUMP PUMP TO STORM SEWER CONNECTION	STD. S2
	SCALE: NOT TO SCALE	
	DATE: AUGUST 2013	

APPENDIX “E”

Stormwater Management Calculations

VALDOR ENGINEERING INC.
File: 16119
Date: November 2022

Table E.1: VO Model Parameters - Pre-Development

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

VALDOR ENGINEERING INC.
File: 16119
Date: November 2022

Table E.2: VO Model Parameters - Post-Development

Subcatchment	Area (ha)	VO Routine	TIMP	XIMP	CN II	IA (mm)	Tp (hr)
Flow Node #1: Drainage to North							
1-201	17.89	StandHyd	0.70	0.55	61	5.0	-
1-202	1.17	StandHyd	0.75	0.60	61	5.0	-
1-301	5.08	NasHyd	-	-	77	6.5	0.49
1-302	6.51	NasHyd	-	-	79	6.7	0.42
1-303	0.66	StandHyd	0.70	0.70	61	5.0	-
Total	**31.31**						
Flow Node #2: Drainage to South							
2-201	11.20	StandHyd	0.60	0.45	61	5.0	-
2-202	2.59	NasHyd	-	-	80	7.6	0.39
Total	**13.79**						

VALDOR ENGINEERING INC.
File: 16119
Date: November 2022

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

Subcatchment	Area (ha)	Land Use and Land Cover		CN II	Area Weighted CN II	IA (mm)	Area Weighted IA (mm)	C-Value	Area Weighted C-Value
		Type	Area (ha)						
1-101	18.07	Forest (HSG 'B')	1.10	55	**75**	**10**	**7.3**	0.25	**0.33**
		Meadow (HSG 'B')	3.14	58		**8**		0.28	
		Row Crops (HSG 'B')	13.13	81		**7**		0.35	
		Open Space (HSG 'B')	0.56	61		**5**		0.11	
		Other Impervious	0.14	98		**2**		0.95	
1-301	5.08	Forest (HSG 'B')	0.00	55	**77**	**10**	**6.5**	0.25	**0.30**
		Meadow (HSG 'B')	0.00	58		**8**		0.28	
		Row Crops (HSG 'B')	3.93	81		**7**		0.35	
		Open Space (HSG 'B')	1.13	61		**5**		0.11	
		Other Impervious	0.02	98		**2**		0.95	
1-302	6.51	Forest (HSG 'B')	0.00	55	**79**	**10**	**6.7**	0.25	**0.33**
		Meadow (HSG 'B')	0.00	58		**8**		0.28	
		Row Crops (HSG 'B')	5.66	81		**7**		0.35	
		Open Space (HSG 'B')	0.80	61		**5**		0.11	
		Other Impervious	0.05	98		**2**		0.95	
2-101	14.78	Forest (HSG 'B')	1.75	55	**77**	**10**	**7.4**	0.25	**0.34**
		Meadow (HSG 'B')	0.31	58		**8**		0.28	
		Row Crops (HSG 'B')	12.70	81		**7**		0.35	
		Open Space (HSG 'B')	0.00	61		**5**		0.11	
		Other Impervious	0.02	98		**2**		0.95	
2-202	2.59	Forest (HSG 'B')	1.14	55	**80**	**10**	**7.6**	0.25	**0.39**
		Meadow (HSG 'B')	0.00	58		**8**		0.28	
		Row Crops (HSG 'B')	0.00	81		**7**		0.35	
		Open Space (HSG 'B')	1.41	61		**5**		0.11	
		Other Impervious	0.61	98		**2**		0.95	

VALDOR ENGINEERING INC.
File: 16119
Date: November 2022

Table E.4: Calculation of Time to Peak (Airport Method)							
Subcatchment	**C Runoff Coefficient (Area Weighted)**	**L(m) Catchment Length**	**Highest Elevation (m)**	**Lowest Elevation (m)**	**S(%) Catchment Slope**	**T_c (min)**	**T_p (hr)**
1-101	0.33	625	265.00	247.20	2.85	44.6	0.50
1-301	0.30	560	280.00	264.00	2.86	43.8	0.49
1-302	0.33	475	276.50	261.00	3.26	37.4	0.42
2-101	0.34	485	261.60	242.00	4.04	34.6	0.39
2-202	0.39	270	247.60	244.00	1.33	34.5	0.39

Note:

1) T_p calculation is based on Airport Method $T_c = \frac{3.26 \times (1.1 - C) \times L^{0.5}}{S_w^{0.33}}$ and $T_P = 0.67 T_c$

VALDOR ENGINEERING INC.
File: 16119
Date: November 2022

Table E.5-A: Calculation of Impervious Area Catchment 1-201			
Land Use	**Area (ha)**	**[1]Runoff Coefficient**	**Imperviousness**
Single Family Lot (9 m width)	0.00	0.75	0.79
Single Family Lot (10.7 m width)	7.75	0.69	0.70
Single Family Lot (12 m width)	0.00	0.65	0.64
Single Family Lot (13.7 m width)	2.90	0.59	0.56
Single Family Lot (15 m width)	0.00	0.55	0.50
Single Family Lot (15.9 m width)	0.32	0.52	0.46
Townhouse	5.18	0.85	0.93
Park	0.76	0.25	0.07
SWM	0.98	0.55	0.50
Total:	**17.89**	**0.69**	**0.70**

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

VALDOR ENGINEERING INC.
File: 16119
Date: November 2022

Table E.5-B: Calculation of Impervious Area
Catchment 2-201

Land Use	Area (ha)	[1]Runoff Coefficient	Imperviousness
Single Family Lot (9 m width)	0.00	0.75	0.79
Single Family Lot (10.7 m width)	2.84	0.69	0.70
Single Family Lot (12 m width)	0.00	0.65	0.64
Single Family Lot (13.7 m width)	3.51	0.59	0.56
Single Family Lot (15 m width)	0.00	0.55	0.50
Single Family Lot (15.9 m width)	3.49	0.52	0.46
Townhouse	0.00	0.85	0.93
Apartment	0.00	0.90	1.00
Park	0.00	0.25	0.07
SWM	1.36	0.75	0.79
Total:	**11.20**	**0.61**	**0.59**

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

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Table E.6-A: Stage-Storage-Discharge Table - North SWM Pond

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 #N-1	Orifice #N-2 (Weir Flow)	Orifice #N-2 (Orifice Flow)	Spillway	Total Flow	Comments:
						Invert Elevation (m)		247.00	247.85	247.85	249.00		
						Diameter (mm)/Length (m)		130	1.00	1.00	20.00		
						Height (m)		-	0.40	0.40			
						Orifice Area (m^2)		0.0133	-	0.4000	-		
													Weir Equation: $Q=1.837xLxH^{1.5}$
Forebay Below NWL													Orifice Eq'n: $Q = 0.6A(2gH)^{0.5}$
245.00	**249**	**-**	**-**	**0**		**Bottom of Forebay**							Spillway Design: $Q=1.67xLxH^{1.5}$
246.00	**526**	**388**	**388**	**388**									
246.40	**657**	**592**	**237**	**624**									
247.00	**980**	**819**	**491**	**1,115**		**NWL**							
Main Cell Below NWL													
245.00	**1,167**	**-**	**-**	**0**		**Bottom of Main Cell**							
246.00	**1,615**	**1,391**	**1,391**	**1,391**									
246.40	**1,815**	**1,715**	**686**	**2,077**									
247.00	**2,308**	**2,062**	**1,237**	**3,314**		**NWL**							
Forebay & Main Cell Above NWL													
247.00	**3,288**	**-**	**-**	**4,429**	**0**	**NWL**	0.00	0.000				**0.000**	
247.20	3,595	3,441	688	5,117	688		0.20	0.013				**0.013**	
247.40	3,902	3,748	750	5,867	1,438		0.40	0.020				**0.020**	
247.60	**4,209**	**4,055**	**811**	**6,678**	**2,249**		0.60	0.026				**0.026**	
247.85	4,489	4,349	1,087	7,765	3,336	**Extended Detention**	0.85	0.031	0.000	-		**0.031**	**Extended Detention Provided**
248.00	**4,657**	**4,573**	**686**	**8,451**	**4,022**		1.00	0.034	0.097	-		**0.131**	
248.20	4,851	4,754	951	9,402	4,973		1.20	0.038	0.346	-		**0.383**	
248.40	5,045	4,948	990	10,392	5,963		1.40	0.041	-	0.629		**0.670**	
248.60	5,240	5,142	1,028	11,420	6,991		1.60	0.044	-	0.788		**0.832**	
248.80	5,434	5,337	1,067	12,488	8,059		1.80	0.046	-	0.921		**0.967**	**100-year Storage Provided**
249.00	**5,628**	**5,531**	**1,106**	**13,594**	**9,165**	**Emergency Spillway**	2.00	0.049	-	1.036	0.000	**1.085**	
249.10	5,718	5,673	567	14,161	9,732		2.10	0.050	-	1.089	1.056	**2.196**	
249.20	5,808	5,763	576	14,737	10,308		2.20	0.052	-	1.140	2.987	**4.179**	
249.50	**6,077**	**5,942**	**1,783**	**16,520**	**12,091**	**Top of Berm**	2.50	0.055	-	1.280	11.809	**13.144**	

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

Protection Level	SWMP Type	Storage Volume (m^3/ha) for Impervious Level			
		35%	55%	70%	85%
Level 1	*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:	60.0 %	
Volume Level:	161.7 m^3/ha	Excluding Extended Detention
Area:	22.97 ha	
Total Required Volume:	**3,713 m^3**	

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

Event	Area (ha)	R.V. (mm)	Required Ext. Det. Volume (m^3)	Provided Ext. Det. Volume (m^3)
25mm 4-hour Chicago Storm	22.97	11.93	2,740	3,336

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

Extended Detention - SWM Pond

Orifice Sizing		
Orifice Size	130	mm
Orifice Inve	247.00	m
Orifice Area	0.013273229	sq. m
[1]$EDL_{erosion}$	247.85	m
NWL	247.00	m
C_2	1412.9	
C_3	3288.0	
h	0.7850	m
Drawdown '	49.3	hr

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

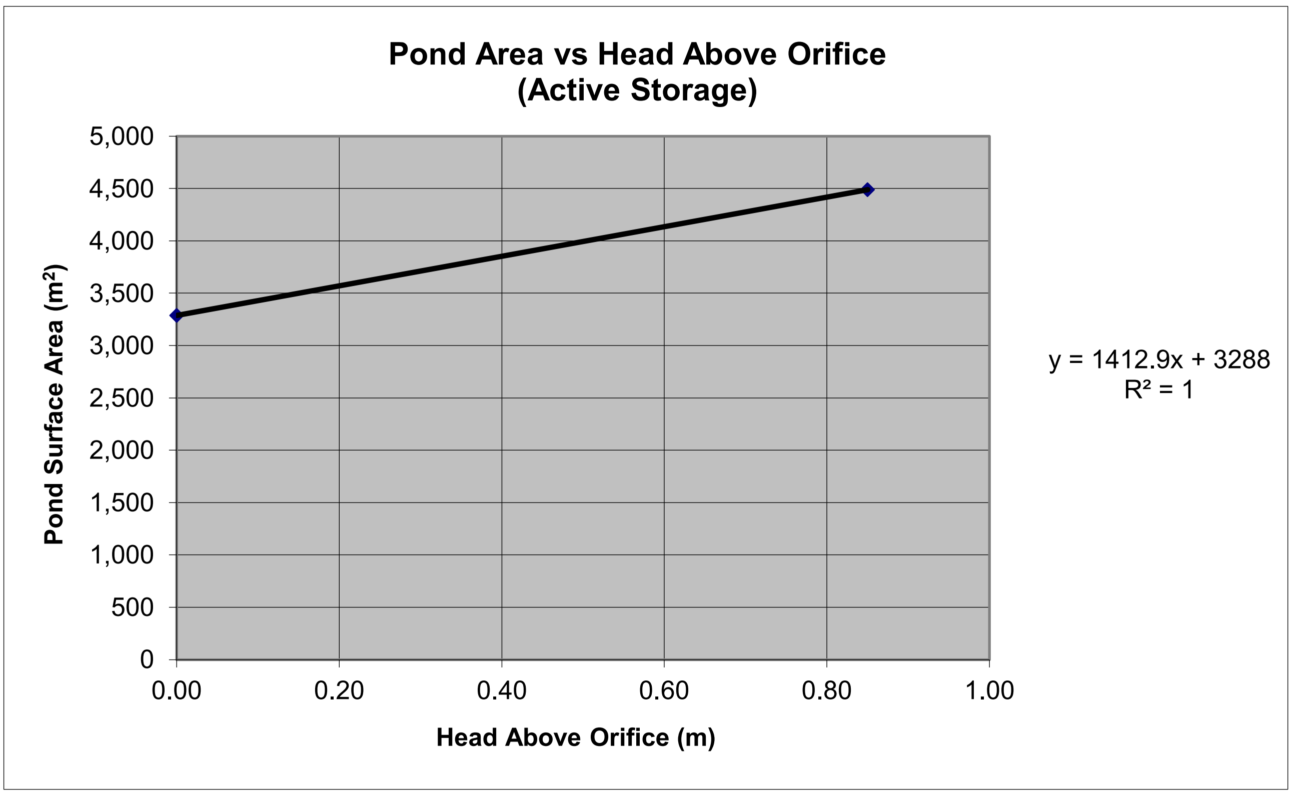

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Table E.10-A: Critical Storm Analysis - North SWM Ponc

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

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

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 #S-1	Orifice #S-2 (Weir Flow)	Orifice #S-2 (Orifice Flow)	Spillway	Total Flow	**Comments:**
						Invert Elevation (m)		245.50	246.10	246.10	247.50		
						Diameter (mm)/Length (m)		95	1.00	1.00	20.00		
						Height (m)		-	0.40	0.40			
						Orifice Area (m^2)		0.0071	-	0.4000	-		
													Weir Equation: $Q=1.837xLxH^{1.5}$
Forebay Below NWL													Orifice Eq'n: $Q = 0.6A(2gH)^{0.5}$
243.50	**82**	**-**	**-**	**0**		**Bottom of Forebay**							Spillway Design: $Q=1.67xLxH^{1.5}$
244.50	**291**	**187**	**187**	**187**									
244.90	**407**	**349**	**140**	**326**									
245.50	**684**	**546**	**327**	**653**		**NWL**							
Main Cell Below NWL													
243.50	**647**	**-**	**-**	**0**		**Bottom of Main Cell**							
244.50	**995**	**821**	**821**	**821**									
244.90	**1,154**	**1,075**	**430**	**1,251**									
245.50	**1,533**	**1,344**	**806**	**2,057**		**NWL**							
Forebay & Main Cell Above NWL													
245.50	**2,217**	**-**	**-**	**2,710**	**0**	**NWL**	0.00	0.000				**0.000**	
245.70	2,476	2,346	469	3,180	469		0.20	0.007				**0.007**	
245.90	2,734	2,605	521	3,701	990		0.40	0.011				**0.011**	
246.10	**2,993**	**2,864**	**573**	**4,273**	**1,563**	**Extended Detention**	0.60	0.014	0.000	-		**0.014**	**Extended Detention Provided**
246.30	3,193	3,093	619	4,892	2,182		0.80	0.016	0.149	-		**0.166**	
246.50	**3,393**	**3,293**	**659**	**5,551**	**2,840**		1.00	0.018	0.422	-		**0.441**	
246.70	3,528	3,460	692	6,243	3,532		1.20	0.020	-	0.672		**0.693**	
246.90	3,662	3,595	719	6,962	4,251		1.40	0.022	-	0.823		**0.845**	**100-year Storage Provided**
247.10	3,797	3,729	746	7,707	4,997		1.60	0.023	-	0.951		**0.974**	
247.30	3,931	3,864	773	8,480	5,770		1.80	0.025	-	1.063		**1.088**	
247.50	**4,066**	**3,999**	**800**	**9,280**	**6,570**	**Emergency Spillway**	2.00	0.026	-	1.165	0.000	**1.191**	
247.75	4,245	4,156	1,039	10,319	7,609		2.25	0.028	-	1.280	4.175	**5.483**	
248.00	**4,424**	**4,335**	**1,084**	**11,403**	**8,692**	**Top of Berm**	2.50	0.030	-	1.386	11.809	**13.224**	

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

Protection Level	SWMP Type	Storage Volume (m^3/ha) for Impervious Level			
		35%	55%	70%	85%
Level 1	*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:	60.0 %	
Volume Level:	161.7 m^3/ha	Excluding Extended Detention
Area:	11.20 ha	
Total Required Volume:	**1,811 m^3**	

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

Event	Area (ha)	R.V. (mm)	Required Ext. Det. Volume (m^3)	Provided Ext. Det. Volume (m^3)
25mm 4-hour Chicago Storm	11.20	12.16	1,362	1,563

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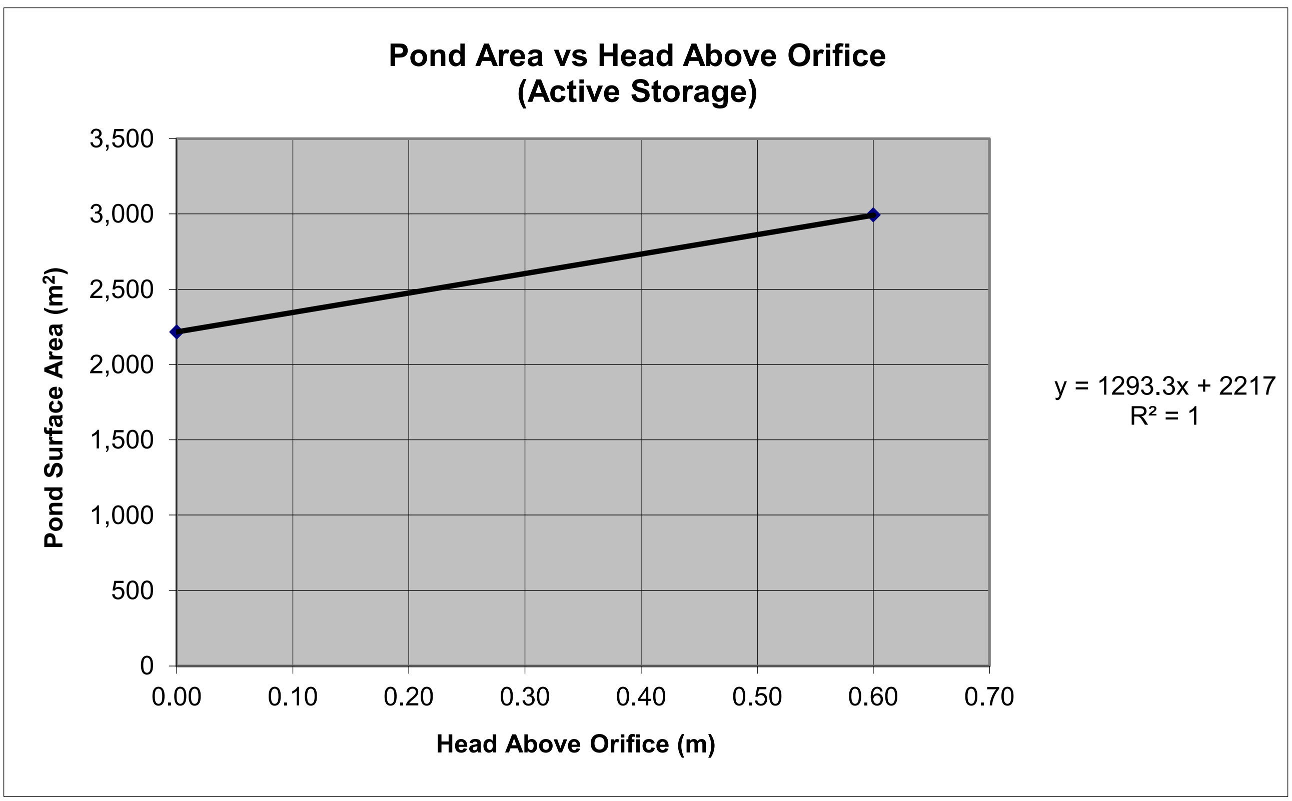
Table E.9-B: Extended Detention Drawdown Time - South SWM Pond

Extended Detention - SWM Pond

Orifice Sizing		
Orifice Size	95	mm
Orifice Inve	245.50	m
Orifice Area	0.007088218	sq. m
[1]$EDL_{erosion}$	246.10	m
NWL	245.50	m
C_2	1293.3	
C_3	2217.0	
h	0.5525	m
Drawdown	52.0	hr

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



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Date: September 2022

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

Storm Distribution	Theoretical 100-year Storage Volume Required (m^3)	Note
6-hour SCS	**2,994**	**Critical**
12-hour SCS	2,782	
24-hour SCS	2,575	
6-hour AES	2,624	
12-hour AES	2,013	
24-hour AES	1,515	
4-hour Chicago	2,616	

North SWM Pond: Forebay Spillway

Project Description

Solve For	Discharge

Input Data

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

Results

Discharge	4.769	m^3/s
Headwater Height Above Crest	0.80	m
Tailwater Height Above Crest	0.00	m
Weir Coefficient	1.67	SI
Submergence Factor	1.00	
Adjusted Weir Coefficient	1.67	SI
Flow Area	3.20	m^2
Velocity	1.49	m/s
Wetted Perimeter	5.60	m
Top Width	4.00	m

South SWM Pond: Forebay Spillway

Project Description

Solve For	Discharge

Input Data

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

Results

Discharge	3.052	m^3/s
Headwater Height Above Crest	0.60	m
Tailwater Height Above Crest	0.00	m
Weir Coefficient	1.64	SI
Submergence Factor	1.00	
Adjusted Weir Coefficient	1.64	SI
Flow Area	2.40	m^2
Velocity	1.27	m/s
Wetted Perimeter	5.20	m
Top Width	4.00	m

Culvert Calculator Report
North SWM Pond: Outlet Pipe, 100yr Controlled

Solve For: Headwater Elevation

Culvert Summary

Allowable HW Elevation	0.00 m	Headwater Depth/Height	0.83
Computed Headwater Elevation	247.24 m	Discharge	0.9760 m³/s
Inlet Control HW Elev.	247.16 m	Tailwater Elevation	246.60 m
Outlet Control HW Elev.	247.24 m	Control Type	Entrance Control

Grades

Upstream Invert	246.35 m	Downstream Invert	246.00 m
Length	70.70 m	Constructed Slope	0.004950 m/m

Hydraulic Profile

Profile	CompositeS1S2	Depth, Downstream	0.60 m
Slope Type	Steep	Normal Depth	0.53 m
Flow Regime	N/A	Critical Depth	0.55 m
Velocity Downstream	1.88 m/s	Critical Slope	0.004117 m/m

Section

Section Shape	Circular	Mannings Coefficient	0.013
Section Material	Concrete	Span	1.07 m
Section Size	1050 mm	Rise	1.07 m
Number Sections	1		

Outlet Control Properties

Outlet Control HW Elev.	247.24 m	Upstream Velocity Head	0.22 m
Ke	0.50	Entrance Loss	0.11 m

Inlet Control Properties

Inlet Control HW Elev.	247.16 m	Flow Control	Unsubmerged
Inlet Type	Square edge w/headwall	Area Full	0.9 m²
K	0.00980	HDS 5 Chart	1
M	2.00000	HDS 5 Scale	1
C	0.03980	Equation Form	1
Y	0.67000		

Culvert Calculator Report
South SWM Pond: Outlet Pipe, 100yr Controlled

Solve For: Headwater Elevation

Culvert Summary

Allowable HW Elevation	0.00 m	Headwater Depth/Height	1.17
Computed Headwater Elevation	245.82 m	Discharge	0.7500 m³/s
Inlet Control HW Elev.	245.80 m	Tailwater Elevation	242.00 m
Outlet Control HW Elev.	245.82 m	Control Type	Outlet Control

Grades

Upstream Invert	244.93 m	Downstream Invert	244.50 m
Length	85.60 m	Constructed Slope	0.005023 m/m

Hydraulic Profile

Profile	M2	Depth, Downstream	0.53 m
Slope Type	Mild	Normal Depth	0.57 m
Flow Regime	Subcritical	Critical Depth	0.53 m
Velocity Downstream	2.19 m/s	Critical Slope	0.005908 m/m

Section

Section Shape	Circular	Mannings Coefficient	0.013
Section Material	Concrete	Span	0.76 m
Section Size	750 mm	Rise	0.76 m
Number Sections	1		

Outlet Control Properties

Outlet Control HW Elev.	245.82 m	Upstream Velocity Head	0.21 m
Ke	0.50	Entrance Loss	0.11 m

Inlet Control Properties

Inlet Control HW Elev.	245.80 m	Flow Control	N/A
Inlet Type	Square edge w/headwall	Area Full	0.5 m²
K	0.00980	HDS 5 Chart	1
M	2.00000	HDS 5 Scale	1
C	0.03980	Equation Form	1
Y	0.67000		

North SWM Pond: Emergency Spillway, 100yr Uncontrolled

Project Description

Solve For	Headwater Elevation

Input Data

Discharge		5.621	m³/s
Crest Elevation		249.00	m
Tailwater Elevation		249.00	m
Crest Surface Type	Gravel		
Crest Breadth		7.00	m
Crest Length		20.00	m

Results

Headwater Elevation	249.32	m
Headwater Height Above Crest	0.32	m
Tailwater Height Above Crest	0.00	m
Weir Coefficient	1.57	SI
Submergence Factor	1.00	
Adjusted Weir Coefficient	1.57	SI
Flow Area	6.36	m²
Velocity	0.88	m/s
Wetted Perimeter	20.64	m
Top Width	20.00	m

South SWM Pond: Emergency Spillway, 100yr Uncontrolled

Project Description

Solve For	Headwater Elevation

Input Data

Discharge	3.146	m^3/s
Crest Elevation	247.50	m
Tailwater Elevation	247.50	m
Crest Surface Type	Gravel	
Crest Breadth	7.00	m
Crest Length	20.00	m

Results

Headwater Elevation	247.72	m
Headwater Height Above Crest	0.22	m
Tailwater Height Above Crest	0.00	m
Weir Coefficient	1.52	SI
Submergence Factor	1.00	
Adjusted Weir Coefficient	1.52	SI
Flow Area	4.40	m^2
Velocity	0.71	m/s
Wetted Perimeter	20.44	m
Top Width	20.00	m

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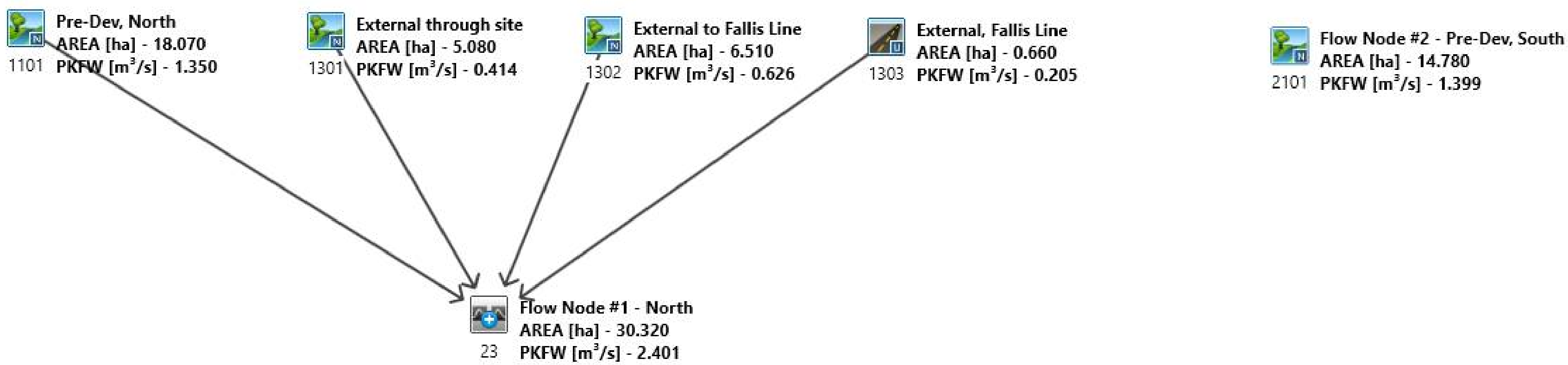
Date: November 2022



VO Model Schematic – Pre-Development

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        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
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       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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| Ptotal= 38.70 mm |    Comments: 2yr/6hr Peterborough A SCS
--------------------
                 TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                 0.00    0.00 |  1.75    3.87 |  3.50    8.51 |  5.25    1.55
                 0.25    1.55 |  2.00    3.87 |  3.75    3.87 |  5.50    1.55
                 0.50    1.55 |  2.25    4.64 |  4.00    3.87 |  5.75    1.55
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                 1.00    2.32 |  2.75   23.22 |  4.50    3.10 |
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                 1.50    2.32 |  3.25    8.51 |  5.00    2.32 |

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

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

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

     Unit Hyd Qpeak  (cms)=   1.447

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

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

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

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


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

     Unit Hyd Qpeak  (cms)=   1.380

     PEAK FLOW      (cms)=   0.262 (i)
```

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

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

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

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


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

     Unit Hyd Qpeak  (cms)=   0.396

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

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

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

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


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

     Unit Hyd Qpeak  (cms)=   0.592

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

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

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| STANDHYD (  1303)|   Area    (ha)=   0.66
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  70.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      0.46         0.20
     Dep. Storage     (mm)=      1.00         5.00
     Average Slope     (%)=      1.00         2.00
     Length            (m)=     66.33        40.00
     Mannings n          =      0.013        0.250

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


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

     Max.Eff.Inten.(mm/hr)=      60.37         8.07
                over (min)       5.00        25.00
     Storage Coeff.  (min)=       2.44 (ii)   21.76 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=       0.30         0.05
                                                         *TOTALS*
     PEAK FLOW       (cms)=       0.08         0.00         0.079 (iii)
     TIME TO PEAK    (hrs)=       3.25         3.58          3.25
```

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

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

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

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

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

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

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

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

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

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

       V    V   I    SSSSS  U   U    A    L             (v 6.2.2007)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         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
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                   *****  D E T A I L E D   O U T P U T *****
```

```
  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\Valdor\AppData\Local\Civica\VH5\c7e9b9dc-2878-4b8a-9d26-
5e475049aa89\6c580b5f-2b37-4cc7-9310-db5ee20083c1\scena
  Summary filename: C:\Users\Valdor\AppData\Local\Civica\VH5\c7e9b9dc-2878-4b8a-9d26-
5e475049aa89\6c580b5f-2b37-4cc7-9310-db5ee20083c1\scena


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

USER:


COMMENTS: ____________________________________________________________


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


--------------------
|    READ STORM     |    Filename: C:\Users\Valdor\AppD
|                   |              ata\Local\Temp\
|                   |              2c180882-d1c1-4096-97ef-d5bb234b912f\3c8faa6e
| Ptotal= 52.40 mm  |    Comments: 5yr/6hr Peterborough A SCS
--------------------
                 TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                 0.00    0.00 |  1.75    5.24 |  3.50   11.53 |  5.25    2.10
                 0.25    2.10 |  2.00    5.24 |  3.75    5.24 |  5.50    2.10
                 0.50    2.10 |  2.25    6.29 |  4.00    5.24 |  5.75    2.10
                 0.75    3.14 |  2.50    6.29 |  4.25    4.19 |  6.00    2.10
                 1.00    3.14 |  2.75   31.44 |  4.50    4.19 |
                 1.25    3.14 |  3.00   81.74 |  4.75    3.14 |
                 1.50    3.14 |  3.25   11.53 |  5.00    3.14 |

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

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

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


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

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

    Unit Hyd Qpeak  (cms)=   1.447

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

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

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

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

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

    Unit Hyd Qpeak  (cms)=   1.380

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

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

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

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

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

    Unit Hyd Qpeak  (cms)=   0.396

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

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

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

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

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

    Unit Hyd Qpeak  (cms)=   0.592

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

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

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--------------------
| CALIB            |
| STANDHYD (  1303)|   Area    (ha)=   0.66
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  70.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.46         0.20
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      66.33        40.00
     Mannings n          =      0.013        0.250

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


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

     Max.Eff.Inten.(mm/hr)=      81.74        18.85
                over (min)        5.00        20.00
     Storage Coeff.  (min)=       2.16 (ii)   15.92 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.31         0.07
                                                           *TOTALS*
     PEAK FLOW       (cms)=       0.10         0.01          0.108 (iii)
     TIME TO PEAK    (hrs)=       3.25         3.42           3.25
     RUNOFF VOLUME    (mm)=      51.40        10.71          39.18
     TOTAL RAINFALL   (mm)=      52.40        52.40          52.40
     RUNOFF COEFFICIENT   =       0.98         0.20           0.75

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

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

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--------------------
| ADD HYD  (  0023)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  1101):    18.07   0.499     3.67    15.67
      + ID2= 2 (  1301):     5.08   0.159     3.67    17.30
        =====================================================
        ID = 3 (  0023):    23.15   0.658     3.67    16.03

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

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

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

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

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
============================================================================================
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       V    V   I    SSSSS  U   U    A    L                (v 6.2.2007)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         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
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                   *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\Valdor\AppData\Local\Civica\VH5\c7e9b9dc-2878-4b8a-9d26-
5e475049aa89\1d125601-d1cd-4f03-8084-036fa7d860ff\scena
  Summary filename: C:\Users\Valdor\AppData\Local\Civica\VH5\c7e9b9dc-2878-4b8a-9d26-
5e475049aa89\1d125601-d1cd-4f03-8084-036fa7d860ff\scena


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

USER:


COMMENTS: ____________________________________________________________


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  **********************************************
  ** SIMULATION : SCS_6H_010Y                 **
  **********************************************
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-------------------
|   READ STORM    |    Filename: C:\Users\Valdor\AppD
|                 |              ata\Local\Temp\
|                 |              2c180882-d1c1-4096-97ef-d5bb234b912f\4d7be5e1
| Ptotal= 61.50 mm |    Comments: 10yr/6hr Peterborough A SCS
-------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.00    0.00 |  1.75    6.15 |  3.50   13.53 |  5.25    2.46
                0.25    2.46 |  2.00    6.15 |  3.75    6.15 |  5.50    2.46
                0.50    2.46 |  2.25    7.38 |  4.00    6.15 |  5.75    2.46
                0.75    3.69 |  2.50    7.38 |  4.25    4.92 |  6.00    2.46
                1.00    3.69 |  2.75   36.90 |  4.50    4.92 |
                1.25    3.69 |  3.00   95.94 |  4.75    3.69 |
                1.50    3.69 |  3.25   13.53 |  5.00    3.69 |

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

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


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

     Unit Hyd Qpeak  (cms)=   1.447

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

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

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

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

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

     Unit Hyd Qpeak  (cms)=   1.380

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

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

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

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


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

     Unit Hyd Qpeak  (cms)=   0.396
```

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

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

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

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


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

     Unit Hyd Qpeak  (cms)=   0.592

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

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

------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD (  1303)|   Area    (ha)=   0.66
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  70.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.46         0.20
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      66.33        40.00
     Mannings n          =      0.013        0.250

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


                               ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
```

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

     Max.Eff.Inten.(mm/hr)=      95.94        25.79
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       2.03 (ii)   14.17 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.31         0.08
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.12         0.01         0.130 (iii)
     TIME TO PEAK    (hrs)=       3.25         3.42          3.25
     RUNOFF VOLUME    (mm)=      60.50        14.58         46.71
     TOTAL RAINFALL   (mm)=      61.50        61.50         61.50
     RUNOFF COEFFICIENT   =       0.98         0.24          0.76

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

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

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

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

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

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

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

--------------------
| ADD HYD  (  0023)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
```

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

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

      V    V   I    SSSSS  U   U    A    L             (v 6.2.2007)
      V    V   I    SS     U   U   A A   L
       V  V    I     SS    U   U  AAAAA  L
       V  V    I      SS   U   U  A   A  L
        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
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                   *****  D E T A I L E D   O U T P U T *****

  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\Valdor\AppData\Local\Civica\VH5\c7e9b9dc-2878-4b8a-9d26-
5e475049aa89\632a0c00-5277-401c-a06c-52dbb365d1d2\scena
  Summary filename: C:\Users\Valdor\AppData\Local\Civica\VH5\c7e9b9dc-2878-4b8a-9d26-
5e475049aa89\632a0c00-5277-401c-a06c-52dbb365d1d2\scena

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

USER:

COMMENTS: ____________________________________________________________

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

--------------------
|    READ STORM    |    Filename: C:\Users\Valdor\AppD
|                  |              ata\Local\Temp\
|                  |              2c180882-d1c1-4096-97ef-d5bb234b912f\fda52cd9
| Ptotal= 72.90 mm |    Comments: 25yr/6hr Peterborough A SCS
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.00    0.00 |  1.75    7.29 |  3.50   16.04 |  5.25    2.92
                0.25    2.92 |  2.00    7.29 |  3.75    7.29 |  5.50    2.92
                0.50    2.92 |  2.25    8.75 |  4.00    7.29 |  5.75    2.92
                0.75    4.37 |  2.50    8.75 |  4.25    5.83 |  6.00    2.92
                1.00    4.37 |  2.75   43.74 |  4.50    5.83 |
                1.25    4.37 |  3.00  113.72 |  4.75    4.37 |
                1.50    4.37 |  3.25   16.04 |  5.00    4.37 |

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

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

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

     Unit Hyd Qpeak  (cms)=   1.447

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

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

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

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

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

```
           1.417    4.37 | 3.000   43.74 | 4.583    5.83 |  6.17    2.92
           1.500    4.37 | 3.083  113.72 | 4.667    5.83 |  6.25    2.92
           1.583    4.37 | 3.167  113.72 | 4.750    5.83 |

     Unit Hyd Qpeak  (cms)=   1.380

     PEAK FLOW       (cms)=   0.937 (i)
     TIME TO PEAK    (hrs)=   3.667
     RUNOFF VOLUME    (mm)=  28.637
     TOTAL RAINFALL   (mm)=  72.900
     RUNOFF COEFFICIENT   =   0.393

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

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

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


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

     Unit Hyd Qpeak  (cms)=   0.396

     PEAK FLOW       (cms)=   0.291 (i)
     TIME TO PEAK    (hrs)=   3.667
     RUNOFF VOLUME    (mm)=  30.988
     TOTAL RAINFALL   (mm)=  72.900
     RUNOFF COEFFICIENT   =   0.425

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

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

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


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

     Unit Hyd Qpeak  (cms)=   0.592

     PEAK FLOW       (cms)=   0.443 (i)
     TIME TO PEAK    (hrs)=   3.583
     RUNOFF VOLUME    (mm)=  32.770
     TOTAL RAINFALL   (mm)=  72.900
     RUNOFF COEFFICIENT   =   0.450

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

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| STANDHYD (  1303)|   Area    (ha)=   0.66
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  70.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.46         0.20
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      66.33        40.00
     Mannings n          =       0.013        0.250

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


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

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

```
           over (min)        5.00        10.00
     Storage Coeff.  (min)=       1.90 (ii)    6.67 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.32         0.14
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.15         0.02          0.163 (iii)
     TIME TO PEAK    (hrs)=       3.25         3.25           3.25
     RUNOFF VOLUME    (mm)=      71.90        20.02          56.33
     TOTAL RAINFALL   (mm)=      72.90        72.90          72.90
     RUNOFF COEFFICIENT   =       0.99         0.27           0.77

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

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

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

--------------------
| ADD HYD  (  0023)|
|  1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  1101):    18.07   0.937     3.67    28.64
      + ID2= 2 (  1301):     5.08   0.291     3.67    30.99
        ==================================================
        ID = 3 (  0023):    23.15   1.228     3.67    29.15

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

--------------------
| ADD HYD  (  0023)|
|  3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0023):    23.15   1.228     3.67    29.15
      + ID2= 2 (  1302):     6.51   0.443     3.58    32.77
        ==================================================
        ID = 1 (  0023):    29.66   1.658     3.67    29.95

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

--------------------
| ADD HYD  (  0023)|
|  1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0023):    29.66   1.658     3.67    29.95
      + ID2= 2 (  1303):     0.66   0.163     3.25    56.33
        ==================================================
        ID = 3 (  0023):    30.32   1.683     3.67    30.52

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

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



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


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\Valdor\AppData\Local\Civica\VH5\c7e9b9dc-2878-4b8a-9d26-
5e475049aa89\bd87c9ab-f3a3-48d2-a78d-93262d2a121d\scena
  Summary filename: C:\Users\Valdor\AppData\Local\Civica\VH5\c7e9b9dc-2878-4b8a-9d26-
5e475049aa89\bd87c9ab-f3a3-48d2-a78d-93262d2a121d\scena


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

USER:


COMMENTS: ____________________________________________________________


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


--------------------
|    READ STORM    |    Filename: C:\Users\Valdor\AppD
|                  |              ata\Local\Temp\
|                  |              2c180882-d1c1-4096-97ef-d5bb234b912f\d8695a31
| Ptotal= 81.40 mm |    Comments: 50yr/6hr Peterborough A SCS
--------------------
                 TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                 0.00    0.00 |  1.75    8.14 |  3.50   17.91 |  5.25    3.26
                 0.25    3.26 |  2.00    8.14 |  3.75    8.14 |  5.50    3.26
                 0.50    3.26 |  2.25    9.77 |  4.00    8.14 |  5.75    3.26
                 0.75    4.88 |  2.50    9.77 |  4.25    6.51 |  6.00    3.26
                 1.00    4.88 |  2.75   48.84 |  4.50    6.51 |
                 1.25    4.88 |  3.00  126.98 |  4.75    4.88 |
                 1.50    4.88 |  3.25   17.91 |  5.00    4.88 |

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

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


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

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

     Unit Hyd Qpeak  (cms)=   1.447

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

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

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

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


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

     Unit Hyd Qpeak  (cms)=   1.380

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

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

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

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


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

     Unit Hyd Qpeak  (cms)=   0.396

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

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

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

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


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

     Unit Hyd Qpeak  (cms)=   0.592
```

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

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

-------------------------------------------------------------------------------
--------------------
| CALIB             |
| STANDHYD (  1303)|   Area    (ha)=   0.66
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  70.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.46         0.20
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      66.33        40.00
     Mannings n          =      0.013        0.250

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


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

     Max.Eff.Inten.(mm/hr)=     126.98        48.04
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       1.81 (ii)    6.39 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.32         0.15
                                                           *TOTALS*
     PEAK FLOW       (cms)=       0.16         0.02         0.184 (iii)
     TIME TO PEAK    (hrs)=       3.25         3.25          3.25
     RUNOFF VOLUME    (mm)=      80.40        24.44         63.61
     TOTAL RAINFALL   (mm)=      81.40        81.40         81.40
     RUNOFF COEFFICIENT   =       0.99         0.30          0.78

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

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

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

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

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

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

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

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

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2007)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         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
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                   *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\Valdor\AppData\Local\Civica\VH5\c7e9b9dc-2878-4b8a-9d26-
5e475049aa89\c5631843-708e-4913-8262-12c9734d26c8\scena
  Summary filename: C:\Users\Valdor\AppData\Local\Civica\VH5\c7e9b9dc-2878-4b8a-9d26-
5e475049aa89\c5631843-708e-4913-8262-12c9734d26c8\scena


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

USER:



COMMENTS: ____________________________________________________________
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  ************************************************
  ** SIMULATION : SCS_6H_100Y                   **
  ************************************************


--------------------
|    READ STORM     |    Filename: C:\Users\Valdor\AppD
|                   |              ata\Local\Temp\
|                   |              2c180882-d1c1-4096-97ef-d5bb234b912f\d3ed2ac6
| Ptotal= 89.90 mm |    Comments: 100yr/6hr Peterborough A SCS
--------------------
                 TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                 0.00    0.00 |  1.75    8.99 |  3.50   19.78 |  5.25    3.60
                 0.25    3.60 |  2.00    8.99 |  3.75    8.99 |  5.50    3.60
                 0.50    3.60 |  2.25   10.79 |  4.00    8.99 |  5.75    3.60
                 0.75    5.39 |  2.50   10.79 |  4.25    7.19 |  6.00    3.60
                 1.00    5.39 |  2.75   53.94 |  4.50    7.19 |
                 1.25    5.39 |  3.00  140.24 |  4.75    5.39 |
                 1.50    5.39 |  3.25   19.78 |  5.00    5.39 |

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


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

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


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

     Unit Hyd Qpeak  (cms)=   1.447

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

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

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

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

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


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

     Unit Hyd Qpeak  (cms)=   1.380

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

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

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

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


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

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

     Unit Hyd Qpeak  (cms)=   0.396

     PEAK FLOW       (cms)=   0.414 (i)
     TIME TO PEAK    (hrs)=   3.667
     RUNOFF VOLUME    (mm)=  43.669
     TOTAL RAINFALL   (mm)=  89.900
     RUNOFF COEFFICIENT   =   0.486

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

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

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


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

     Unit Hyd Qpeak  (cms)=   0.592

     PEAK FLOW       (cms)=   0.626 (i)
     TIME TO PEAK    (hrs)=   3.583
     RUNOFF VOLUME    (mm)=  45.923
     TOTAL RAINFALL   (mm)=  89.900
     RUNOFF COEFFICIENT   =   0.511

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

-------------------------------------------------------------------------------
--------------------
| CALIB             |
| STANDHYD (  1303)|   Area    (ha)=   0.66
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  70.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.46         0.20
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      66.33        40.00
     Mannings n          =      0.013        0.250
```

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


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

     Max.Eff.Inten.(mm/hr)=     140.24        57.18
                over (min)        5.00        10.00
     Storage Coeff.  (min)=       1.74 (ii)    6.14 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.32         0.15
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.18         0.03         0.205 (iii)
     TIME TO PEAK    (hrs)=       3.25         3.25          3.25
     RUNOFF VOLUME    (mm)=      88.90        29.15         70.97
     TOTAL RAINFALL   (mm)=      89.90        89.90         89.90
     RUNOFF COEFFICIENT   =       0.99         0.32          0.79

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

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

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

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

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

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

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

--------------------
| ADD HYD  (  0023)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0023):     29.66   2.370     3.67    42.41
      + ID2= 2 (  1303):      0.66   0.205     3.25    70.97
        ====================================================
        ID = 3 (  0023):     30.32   2.401     3.67    43.03

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

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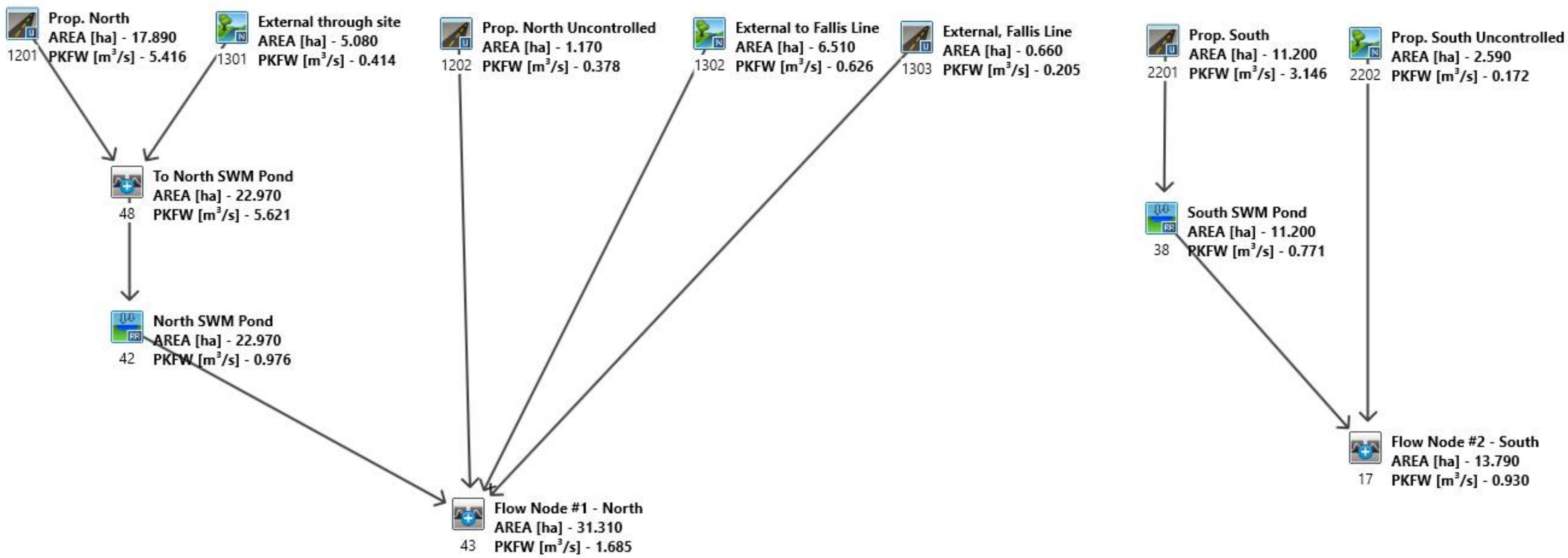

Valdor Engineering Inc.
File: 16119
Date: November 2022



VO Model Schematic – Post-Development

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=========================================================================================
===============

       V    V   I    SSSSS  U    U    A    L             (v 6.2.2009)
       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
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                   *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\Valdor\AppData\Local\Civica\VH5\c7e9b9dc-2878-4b8a-9d26-
5e475049aa89\9aedd227-c1cc-49dd-a183-d84895375be8\scena
  Summary filename: C:\Users\Valdor\AppData\Local\Civica\VH5\c7e9b9dc-2878-4b8a-9d26-
5e475049aa89\9aedd227-c1cc-49dd-a183-d84895375be8\scena


DATE: 11-10-2022                           TIME: 01:44:20

USER:


COMMENTS: ____________________________________________________________


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


--------------------
|    READ STORM    |    Filename: C:\Users\Valdor\AppD
|                  |              ata\Local\Temp\
|                  |              908d5600-a56f-49d0-bccb-864caf61b13f\da349100
| Ptotal= 25.02 mm |    Comments: 25mm CHICAGO Storm
--------------------
                 TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                 0.00    2.17 |  1.00    6.20 |  2.00    5.62 |  3.00    2.95
                 0.17    2.38 |  1.17   12.18 |  2.17    4.80 |  3.17    2.76
                 0.33    2.66 |  1.33   41.67 |  2.33    4.21 |  3.33    2.62
                 0.50    3.03 |  1.50   15.28 |  2.50    3.78 |  3.50    2.47
                 0.67    3.58 |  1.67    9.22 |  2.67    3.45 |  3.67    2.35
                 0.83    4.47 |  1.83    6.88 |  2.83    3.18 |  3.83    2.23

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


--------------------
| CALIB            |
| NASHYD   (  2202)|   Area    (ha)=   2.59   Curve Number   (CN)= 66.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.42

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

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

     Unit Hyd Qpeak  (cms)=   0.236

     PEAK FLOW      (cms)=   0.008 (i)
     TIME TO PEAK   (hrs)=   2.167
     RUNOFF VOLUME   (mm)=   2.367
     TOTAL RAINFALL  (mm)=  25.023
     RUNOFF COEFFICIENT   =   0.095

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

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  2201)|   Area    (ha)=  11.20
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=  45.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area    (ha)=       6.72          4.48
     Dep. Storage    (mm)=       2.00          5.00
     Average Slope    (%)=       2.00          2.00
     Length           (m)=     273.25         20.00
     Mannings n         =       0.013         0.035

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


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

     Max.Eff.Inten.(mm/hr)=      41.67          5.32
                over (min)        5.00         10.00
     Storage Coeff.  (min)=       5.38 (ii)     7.32 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.21          0.13
                                                         *TOTALS*
     PEAK FLOW      (cms)=        0.52          0.05          0.554 (iii)
     TIME TO PEAK   (hrs)=        1.50          1.58           1.50
     RUNOFF VOLUME   (mm)=       23.02          3.28          12.16
     TOTAL RAINFALL  (mm)=       25.02         25.02          25.02
     RUNOFF COEFFICIENT   =       0.92          0.13           0.49
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      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  61.0    Ia = Dep. Storage  (Above)
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  2201)     11.200     0.554      1.50      12.16
   OUTFLOW: ID= 1 (  0038)     11.200     0.012      4.17      12.02

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  2.25
                  TIME SHIFT OF PEAK FLOW         (min)=160.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.1248

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--------------------
| ADD HYD  (  0017)|
|   1 +  2 =  3    |        AREA    QPEAK    TPEAK     R.V.
--------------------        (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  2202):     2.59   0.008     2.17     2.37
      + ID2= 2 (  0038):    11.20   0.012     4.17    12.02
        ==================================================
        ID = 3 (  0017):    13.79   0.019     2.33    10.21

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  1302)|   Area    (ha)=   6.51   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.70   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.42

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


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

     Unit Hyd Qpeak  (cms)=   0.592
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```
     PEAK FLOW      (cms)=   0.034 (i)
     TIME TO PEAK   (hrs)=   2.167
     RUNOFF VOLUME   (mm)=   3.911
     TOTAL RAINFALL  (mm)=  25.023
     RUNOFF COEFFICIENT  =   0.156

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

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

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


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

     Unit Hyd Qpeak  (cms)=   0.396

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

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

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--------------------
| CALIB            |
| STANDHYD (  1201)|   Area    (ha)=  17.89
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  55.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area    (ha)=      12.52         5.37
     Dep. Storage    (mm)=       2.00         5.00
     Average Slope    (%)=       2.00         2.00
     Length           (m)=     345.35        20.00
     Mannings n         =       0.013        0.035

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


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