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FUNCTIONAL SERVICING REPORT

Millbrook South East Subdivision

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

April 2021
April 2022
Rev. December 2022

Prepared For: **Vargas Properties Inc.**

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VALDOR WATER RESOURCES

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1.0 INTRODUCTION

Valdor Engineering Inc. has been retained by Vargas Properties Inc. to provide consulting engineering services for the proposed Millbrook South East Subdivision located on 29.5 hectare parcel on the east side of County Road 10, south of Fallis Line, in the Community of Millbrook, Township of Cavan Monaghan, County of Peterborough as illustrated in **Figure 1**.

1.1 Existing Conditions

The subject site is bounded to the west by County Road 10 and external lands fronting County Road 10, to the north by agricultural lands and the future Fallis Line extension, to the east by forested lands, and to the south by residential development along Nina Court. The southern portion of the site is traversed by a tributary of Baxter Creek which flows in an easterly direction. The geotechnical and topographical conditions of the site are summarized as follows:

1.1.1 Geotechnical

A Geotechnical Investigation Report prepared by GHD Ltd. (March 8, 2021) for the subject site included thirteen boreholes and six test pits, ranging in depth from 3.0 m to 8.2 m. Based on the investigation it was determined that the site is covered by a topsoil layer having a depth of approximately 150-300mm underlain by silty sand and then glacial till and/or silty clay. The boreholes are included in **Appendix "H"**.

1.1.2 Topography

The surface condition of the subject site can be generally described having a rolling topography. Based on a recent topographic survey of the site, the property generally slopes down from the intersection of County Road 10 and Fallis Line in a southeasterly direction towards the tributary of Baxter Creek. Based on an existing elevation of approximately 255.6 m at the County Road 10 and Fallis Line intersection, and an existing elevation of 209.6 at the south-east limit of the development, the differential of 46.0 m equates to an overall average slope of approximately 6.4% which is considered to be relatively steep.

1.2 Proposed Development

The proposed development consists of a mix of lots for detached dwellings and street townhomes as well a block for medium density housing and a commercial block. The lot frontages for the detached dwellings will range from 10.7m to 15.9m while the townhomes will consist of 7.6m frontages. Access for the subdivision will consist of a road network with a road connection off Fallis Line and a pedestrian access to Nina Court at the south limit of the subdivision. A block of land has been established for a stormwater management facility to control and treat stormwater runoff. The remainder of the site, associated with the tributary of Baxter Creek and the forested lands in the eastern portion of the site, will be retained in environmental protection blocks.

A copy of the Draft Plan of Subdivision as well as the Conceptual Master Plan is contained in **Appendix "A"** together with the calculation of the equivalent population which is summarized in **Table 1**.

Table 1. Development Statistics – Proposed Draft Plan

Land Use	**Area** (Ha)	**Residential Units** (No.)	**Equivalent Population** (persons)
Detached Dwellings	5.97	130	455
Street Townhomes	1.53	56	196
Mixed-Use	1.07	80	280
Stormwater Management Pond	1.36		
Natural Heritage Systems	16.08		
Parkland & Trails	0.34		
Roads & Road Widenings	3.12		
TOTAL	**29.47**	**266**	**931**

1.3 Purpose of Report

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

This report has been prepared based on a review of the topographic survey and background studies, discussions with municipal staff and a visit to the site. This document provides guidance for detailed engineering design of the subdivision. A **Preliminary Servicing & Grading Plan** is included in a pouch at the rear of the report.

1.4 Approving Authorities

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

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

2.0 WATER SERVICING

The existing Millbrook water servicing system consists of a water treatment facility, with water taken from three local wells, a water storage tank and a network of watermains that service most of the existing urban area of the community.
The existing Millbrook Water Treatment Plant (WTP) consists of 3 wells, each with 25 L/s capacity, chlorine disinfection and a chlorine contact tank. The existing water storage tank was built in 1976 and is located on the east end of Millbrook on a local high point of land. The existing 10.4m diameter tank has a useable storage capacity of 1,410m^3 with a top water level at an elevation of 278.0m.

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

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

The Township has recently initiated a Water and Wastewater Master Servicing Study as part of a Municipal Class Environmental Assessment to examine water and wastewater servicing alternatives within the current urban boundary and beyond. This study should consider the proposed draft plan as well as the ultimate development for the subject lands.

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

2.1 Domestic Demand

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

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

A detailed tabulation of the domestic water demand calculation is detailed in **Table B1** of **Appendix "B"**. The domestic demands for the proposed draft plan and the ultimate development are summarized in **Table 2.**

Table 2. Domestic Water & Fire Flow Demand

Land Use	Equivalent Population (Persons)	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	455	142.2	284.4	420	8,000	
Street Townhomes	196	61.3	122.5	157.5	7,000	
Mixed-Use	280	87.5	175.0	4.7		
TOTAL	**931**	**290.9**	**581.9**	**872.8**	**8,000**	**8,872.8**

2.2 External Watermains

The location of the existing Water Treatment Plant, existing water storage tank and the existing water booster station are indicated in **Figure 2**. The subject site will be serviced by an 250mm diameter watermain on Fallis Line which has been stubbed immediately east of County Road 10. To complete a loop, the proposed watermain system will also connect to the existing 150mm diameter watertmain on Nina Court at the south limit of the site,

2.3 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 trunk watermain.

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 Site Servicing & Grading Plan**. A copy of the Township standard water service connection and water meter details is included in **Appendix "B"**.

2.4 Fire Protection

The fire flow required for the proposed dwelling units was calculated using the criteria indicated in the *Water Supply for Public Fire Protection Manual*, 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 are the largest detached dwelling and the largest interior townhouse unit. Based on the calculations, the minimum fire suppression flow required for the detached dwellings and the townhouse units is 8,000 L/min and 7,000 L/min respectively. The detailed fire flow calculation is shown in **Table B2-1** to **Table B2-2** of **Appendix "B"**. In accordance with the Township standards, this flow must be available at the nearest hydrant with a minimum pressure of 140 KPa.

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

The City is currently conducting a master servicing study as part of the Growth Management Plan and based on a Council Meeting held on October 18th 2021 there is unused water treatment capacity available in the system to accommodate this development with further plans to upgrade the current water system to accommodate future growth. Please refer to Appendix 'K' which provides an update to the Growth Management Study.

3.0 WASTEWATER SERVICING

The community of Millbrook is currently serviced by the existing Millbrook Wastewater Treatment Plant (WWTP) located at the east limit of Centennial Lane. This WWTP was built in 1975 and the plant was upgraded in 2004 to improve the treatment quality.

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

The Township has recently initiated a Water and Wastewater Master Servicing Study as part of a Municipal Class Environmental Assessment to examine water and wastewater servicing alternatives within the current urban boundary and beyond. This study should consider the proposed draft plan as well as the ultimate development for the subject lands.

The location of the existing sanitary sewers and the WWTP is indicated in **Figure 3**. The following is a summary of the wastewater servicing analysis for the subject site.

3.1 Wastewater Loading

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

Residential Average Daily Flow:	450 L/person/day
Residential Peaking Factor:	$K_H = 1 + \frac{14}{4 + \sqrt{P}}$
	Where: K_H = Harmon Peaking Factor (Max. 4.0, Min. 2.75)
	p = Population in thousands
Extraneous Flow, *I*:	0.28 L/s/Ha (Infiltration)
Design Flow, Q =	Q x K_H + *I*

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

Table 3. Wastewater Loading Summary

Land Use	Area (Ha)	Equivalent Population (Persons)	Average Daily Flow (L/s)	Peaking Factor	Peak Daily Flow (L/s)	Infiltration Rate (L/s)	Total Flow (L/s)
Detached Dwellings	5.97	455	2.37	3.99	9.47	1.67	11.14
Street Townhomes	1.53	496	2.58	3.98	10.27	0.43	10.70
Mixed Use	1.07	280	1.46	4.09	5.97	0.30	6.27
Roads	3.12					0.87	0.87
Total	**11.69**	**1,231**	**6.41**		**25.70**	**3.27**	**28.98**

The City is currently conducting a master servicing study as part of the Growth Management Plan and based on a Council Meeting held on October 18th 2021 where an update to the Growth Management Plan was presented there is unused wastewater treatment capacity available in the existing plant to accommodate this development with further plans to upgrade the existing wastewater treatment plant to accommodate future growth.

3.2 External Sanitary Sewers

A 525mm diameter trunk sanitary sewer has been constructed to the south limit of the subject lands. This trunk sewer will be extended northerly along Street “A” to the proposed Fallis Line extension and will service the subject lands as well as future development lands north of the proposed Fallis Line extension, east of County Road 10. The alignment of the trunk sanitary sewer is indicated in **Figure 3**. Refer to Appendix ‘K’ which provides an update to the Growth Management Study indicating that there is sufficient reserve capacity in the wastewater treatment plant to accommodate additional development.

An analysis of the downstream sanitary sewer was conducted to confirm that there is sufficient capacity. In this regard, a sanitary sewer design sheet has been prepared which indicates that there is sufficient capacity in the downstream sanitary sewer from the subject site to the WWTP to accommodate the subject lands. The design sheet is included in **Appendix “C”** together with the sanitary sewer drainage plan as delineated in **Figure C-1**.

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 sewer will be designed such that the upstream end of each length will have a minimum 1% slope to assist with self-cleansing. In accordance with standard practice, manholes will be provided for maintenance access at a maximum spacing of 120m.

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

4.0 STORM CONVEYANCE SYSTEM

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

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

4.1 Minor System Design

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

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

The peak flows are calculated using the following formula:

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

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

The proposed storm sewer will discharge to the proposed stormwater management facility (SWM pond) located in the south-west corner of the site.

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

Overland flow from *Catchment 202* will be conveyed to Street "A" via a 3.0 m wide by 0.30 m deep overland flow channel at the south end of Street "D". This channel has been sized to convey the 100- minus 5-year flow from *Catchment 202* (0.686 – 0.342 = 0.344 cms),

with a flow depth of 0.09 m. It is noted that the calculated overland flow velocity of 1.20 m/s will necessitate erosion protection measures, which will be specified at detailed design. The detailed *FlowMaster* calculations are included in **Appendix "D".**

Overland flow from *Catchments 201 & 202* will be conveyed south on Street "A", over the proposed crossing, and to the low point on Street "A", adjacent to the proposed SWM pond. *FlowMaster* calculations have been completed to confirm that the road allowance has adequate capacity to convey the 100- minus 5-year flow (1.793 – 0.930 = 0.863 cms). Based on these calculations, the major storm flows are conveyed along Street "A" with a flow depth of 0.10 m, which is does not exceed the maximum allowable depth of 0.30 m. The detailed *FlowMaster* calculations are included in **Appendix "D".**

4.3 Foundation Drainage

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

4.4 Roof Drainage

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

4.5 Floodplain Analysis

The south part of the subject site is traversed by a tributary of Baxter Creek which flows in an easterly direction under Street "A". The total upstream pre-development drainage area of this tributary is approximately 68.29 ha (*Catchments 401-403*), as shown on **Figure 4A**. The total post-development drainage of this tributary is approximately 75.44 ha (Catchments 401-402, 403A-403B, 201-204), as shown on **Figure 4B**, reflecting the post development site conditions.

In order to determine the extent of the Regulatory floodplain at this location, a HEC-RAS model was prepared and the Regulatory floodplain has been delineated for both the pre-development (**Figure 5**) and post-development (**Figure 6**) conditions. As indicated in **Figure 6**, the Regulatory flood plain will be entirely contained within open space blocks and therefore the proposed lots are protected from flooding. Supporting documentation, VO5 and HEC-RAS modelling output, and hydraulic calculations are provided in **Appendix "E"**.

A 2.4 m wide by 1.5 m high concrete box culvert, embedded by 0.30 m, is proposed at Street "A" to accommodate the watercourse. This culvert has been sized to convey the regional flow.

The May 2022 Baxter Creek HEC-RAS model was provided by ORCA to confirm the downstream boundary conditions used. **Figure E.1**, provided in **Appendix "E"**, overlays the cross-section locations of the May 2022 Baxter Creek hydraulic model in the vicinity of the subject site (taken from Sheets 6 & 7, excerpts included in **Appendix "E"**). As shown on this figure, the tributary through the study area connects to Baxter creek between *Sections 297.64, 407.06 & 553.58*. The highest Regional floodplain elevation is 208.33 m, associated with *Section 553.58*. This is lower than the Regional floodplain elevation of 209.17 m associated with the downstream end of the study area (*Section 1*). There will therefore be no tailwater impacts on the subject site.

5.0 STORMWATER MANAGEMENT

5.1 Storm Drainage Areas

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

5.1.1 Pre-Development

Under pre-development conditions, the subject site north of the Baxter Creek tributary (*Catchment 101*, 11.07 ha) drains in a south-easterly direction to the tributary. The portion of the site located to the south of the tributary (*Catchment* 102, 2.90 ha) generally drains in a north-easterly direction to the tributary.

For the purpose of the pre-development modelling, drainage boundaries were determined based on the post-development limits, except along the northern boundary where a drainage divide was identified.

The existing land uses comprise of forests, meadows and row crops. **Figure 7** illustrates the drainage patterns for the pre-development condition.

5.1.2 Post-Development

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

The majority of the subject site (*Catchment 201*, 6.68 ha, and *Catchment 202* 4.80 ha) will drain to the SWM pond. Drainage will be conveyed to the SWM pond (*Catchment 203*, 1.39 ha) via the storm sewer system, or overland via the road network to the low point on Street “A” adjacent to the SWM pond maintenance access road.

Discharge from the SWM pond will be released to the Baxter Creek tributary downstream of the Street “A” crossing via an outlet pipe under Street “A”. **Figure 8** illustrates the drainage patterns for the post-development condition.

Due to grading constraints, the rear of lots along the perimeter of the development limit will drain uncontrolled (*Catchment 204*, 3.12 ha). Adequate overcontrol will be provided by the SWM pond to account for this uncontrolled drainage.

5.2 Stormwater Management Design Criteria

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

- **Quality control**: The permanent pool shall be sized to provide Enhanced (Level 1) treatment of stormwater runoff for the proposed development.

- **Erosion control**: Stormwater runoff from the 25 mm storm event shall be stored and released over a minimum 24-hour period (48 hours preferred).
- **Flood control**: Flood storage and control shall be provided to maintain peak outflows from the pond at or below pre-development levels for the critical of the 6, 12 & 24-hour SCS, the 6, 12 & 24-hour AES, and the 4-hour Chicago storm distributions, for the 2-yr through 100-yr design storm events.

5.3 Stormwater Management Pond Design

A wet detention pond SWM facility is proposed to serve the subject site. The total service area for the SWM pond is approximately 12.87 ha. The proposed SWM pond is located at the south-west corner of the proposed development, as illustrated in **Figure 9**.

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

5.3.1 Quality Control

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

- 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): Based on discussions with the ORCA, 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.

In accordance with the ORCA requirements for development within the Baxter Creek watershed, Enhanced (Level 1) water quality protection shall be provided by the proposed SWM facility. Based on a total average imperviousness of 65.0%, the required permanent pool volume is provided below.

SWM Pond Permanent Pool Volume Calculation

Volume required for catchment with 65.0% imperviousness:	213.3 m^3/ha
Less 40 m^3/ha of extended detention storage zone:	- 40.0 m^3/ha
Permanent Pool Volume Required:	173.3 m^3/ha

The permanent pool storage volume required for the Pond is 173.3 m^3/ha × 12.87 ha = 2,231 m^3.

In order to maintain a permanent pool of water in the pond and to prevent the mixing of surface water with ground water, the base of the SWM pond will be protected with an appropriate liner. A review of the Geotechnical Investigation Report for the site indicates that the native, undisturbed silty clay, or till with finer-grained gradation (silts and clays) would have a sufficiently low permeability and could substitute for a liner.

The normal water level of the permanent pool for the pond is set at an elevation of 212.50 m. The bottom of the pond is set at an elevation of 210.50 m in the forebay and 211.00 in the main cell, providing a permanent pool depth of 2.00 m and 1.50 m, respectively. The actual permanent pool storage volume provided is approximately 4,544 m^3 which is greater than the minimum required volume (2,231 m^3). The required and provided quality control volume together with the elevation of the normal water level are summarized in **Table 5**.

The forebay has been sized based on MOE design criteria and supporting calculations are provided below. These calculations have been completed based on the more conservative development scenario, which includes the potential future development to the west.

Forebay Sizing Calculations

The proposed forebay is approximately 50 m in length and 25 m in width, on average. The resultant length-to-width ratio is therefore 2.:1. Using the methodology provided in the *Stormwater Management Planning and Design Manual*, the recommended forebay length based on particulate settling is calculated using the following expression:

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

where: *Dist* is the forebay length (m)
r is the length-to-width ratio of the forebay (2.0:1 or *r* = 2.0)
Q_p is the pond's peak discharge (0.015 m^3/s, VO modelling of 25 mm storm)
V_s is the settling velocity (0.0003 m/s for 150 µm particles)

Solving [1] gives:

$$Dist = \sqrt{\frac{2.0 \times 0.015}{0.0003}} = 10.0\ m$$

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

Solving [2] gives:

$$Dist = \frac{8 \times 1.031}{2.00 \times 0.50} = 8.4\ m$$

The distance from the headwall to the forebay berm is 50 m. The proposed design therefore satisfies the minimum forebay length recommendations.

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

$$Width = \frac{Dist}{8} = \frac{8.2}{8} = 1.0\ m$$

The design proposes an average forebay bottom width of approximately 9 m, which satisfies this criterion.

5.3.2 Erosion Control

In accordance with the ORCA guidelines, erosion control shall be provided using an extended detention active storage zone sized to capture the runoff resulting from a 25 mm rainfall event and to release the runoff over a period of at least 24 hours. Based on the VO5 modelling of this storm condition (i.e. the 25 mm 4-hour Chicago storm distribution), the estimated runoff volume is 13.36 mm distributed over the 12.87 ha catchment area draining to the SWM pond, for a required erosion control volume of 1,719 m^3.

Based on the design for the SWM pond, the extended detention volume provided is 1,787 m^3 at an elevation of 212.90 m. This exceeds the required erosion control volume of 1,719 m^3. The proposed extended detention depth is 0.40 m, which is less than the maximum recommended extended detention depth of 1.00 m.

The extended detention function of the pond will be controlled with a 115 mm diameter orifice plate (*Orifice #1*) located in the box manhole control structure to achieve the minimum required drawdown time of 24 hours (48 hours is considered preferable).

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

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

where: t_d is the drawdown time (s)
h is the maximum water elevation above the orifice (0.34 m)
A_o is the cross-sectional area of the orifice (0.010386891 m^2)
C_2 is the slope coefficient from area-depth linear regression (1945.0)
C_3 is the intercept from area-depth linear regression (4078.0)

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):

$$h_1 = HWL_{25mm} - \left[NWL + \frac{D}{2}\right] = 212.90 - \left[212.50 + \frac{0.115}{2}\right] = 0.34\ m$$

where: HWL_{25mm} is the high water level for the 25 mm rainfall (212.90 m)
NWL is the normal water level (212.50 m)
D is the diameter of the orifice (0.115 m)

Solving [3] yields:

$$t_d = \frac{0.66 \times (1945.0) \times (0.34)^{1.5} + 2 \times (4078.0) \times (0.34)^{0.5}}{2.75 \times (0.010386891)} = 176{,}040s = 48.9\ hrs$$

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

5.3.3 Quantity Control

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

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

The preliminary rating curve is provided in **Table F.5** (provided in **Appendix "F"**), and consists of a box manhole control structure with a 1.20 m wide weir (*Weir #1*) cut into the wall of the box manhole.

Table 4 shows the VO5 modelling results based on the 6-hour AES storm distribution, and **Table 5** shows the SWM pond performance characteristics for each return period event.

The SWM pond has been designed with a total active storage volume of 8,279 m^3 at an elevation of 214.00 m. The expected maximum storage required during 100-year storm conditions is approximately 4,380 m^3. The provided active storage is therefore sufficient.

As shown in **Table 4**, the peak discharge rates are equal to or less than the target release rates. Adequate overcontrol has been provided to account for the uncontrolled drainage areas. Supporting documentation (**Tables F.1-9**) and output from the VO5 modelling is provided in **Appendix "F"**.

Table 4. Summary of Storm Drainage Peak Flows

Return Period	Existing Peak Flows (m^3/s)	Proposed Peak Flow (m^3/s)
25mm Chicago	-	0.114
2-year	0.184	0.126
5-year	0.365	0.271
10-year	0.512	0.405
25-year	0.721	0.597
50-year	0.892	0.765
100-year	1.075	0.938
Regional	-	1.199

5.3.4 Thermal Mitigation Measures

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

Bottom Draw Pipe

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

Planting Strategy

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

5.3.5 SWM Pond Inspection & Maintenance

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

- Sediment accumulation to determine cleanout requirements;
- Erosion of side slopes and outfall channel;
- Safety hazards;
- Hydraulic operation of the pond;
- Drawdown time following a rainfall event (extended drawdown time greater than 48 hours may indicate a blocked orifice or intake);
- Condition of terrestrial and aquatic vegetation;
- Trash accumulation near hydraulic structures; and
- Surface sheen indicating possible oil contamination.

Table 5: SWM Facility Performance Summary

Quality Control		
	Protection Level	Level 1 (Enhanced)
	Permanent Pool Required (m^3)	2,231
	Permanent Pool Provided (m^3)	4,544
	Normal Water Level, NWL (m)	**212.50**

Erosion Control		
25mm Chicago	Orifice Size (mm)	115
	Draw Down Time (hrs)	48.9
	Flow In (m^3/s)	0.769
	Flow Out (m^3/s)	0.015
	Storage Used (m^3)	1,566
	Pond W.S. Elevation (m)	**212.85**

Quantity Control (6-hour SCS)		
2-year	Flow in (m^3/s)	0.723
	Flow Out (m^3/s)	0.098
	Storage Used (m^3)	2,235
	Pond W.S. Elevation (m)	**212.99**
5-year	Flow in (m^3/s)	1.031
	Flow Out (m^3/s)	0.211
	Storage Used (m^3)	2,836
	Pond W.S. Elevation (m)	**213.11**
10-year	Flow in (m^3/s)	1.242
	Flow Out (m^3/s)	0.321
	Storage Used (m^3)	3,225
	Pond W.S. Elevation (m)	**213.18**
25-year	Flow in (m^3/s)	1.542
	Flow Out (m^3/s)	0.470
	Storage Used (m^3)	3,705
	Pond W.S. Elevation (m)	**213.27**
50-year	Flow in (m^3/s)	1.763
	Flow Out (m^3/s)	0.587
	Storage Used (m^3)	4,042
	Pond W.S. Elevation (m)	**213.32**
100-year	Flow in (m^3/s)	1.989
	Flow Out (m^3/s)	0.707
	Storage Used (m^3)	4,380
	Pond W.S. Elevation (m)	**213.38**
Regional Storm (Timmins)	Flow in (m^3/s)	1.241
	Flow Out (m^3/s)	0.943
	Storage Used (m^3)	5,010
	Pond W.S. Elevation (m)	**213.49**

5.4 Site Water Balance

In accordance with the requirements of the ORCA, an annual site water balance assessment was completed by GHD for the subject development area to determine the overall infiltration deficit under proposed conditions and to design LID measures as part of an overall mitigation strategy to maintain pre-development infiltration volumes (*Updated Geotechnical Investigation Report; Proposed Residential and Commercial Development – Part Lot 13, Concession 5; Millbrook, Ontario; GHD*, March 2022). Excerpts from the *Geotechnical Investigation Report* regarding the water balance analysis (*Section 6.1.1 – Hydrogeology – Updated Water Balance Evaluation*) are included in **Appendix H**. The findings of the *Hydrogeological Assessment* water balance analysis are summarized below.

Pre-Development Infiltration Volume

For the pre-development condition, a total estimated infiltration volume of 43,579 m³/year was determined. Refer to **Appendix H** for the detailed water balance calculations.

Post-Development Infiltration Volume (Unmitigated)

For the post-development condition, without infiltration enhancements, a total estimated infiltration of 31,665 m³/year was determined. This corresponds to a total infiltration deficit of 11,914 m³/year (43,579 m³/year – 31,665 m³/year = 11,914 m³/year), a 27.3% decrease in annual infiltration compared to the pre-development condition. Refer to **Appendix H** for the detailed water balance calculations.

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

Proposed Infiltration BMP – Roof Downspout Disconnection

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

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

  In order to meet this design criteria, houses will be required to direct roof downspouts to a discharge location a minimum distance of 5 m from the

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

According to the hydrologic modelling completed for this site, the soils generally fall into hydrologic soil group B, which is considered to be acceptable for roof downspout disconnections.

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

  In order to meet this design criteria, lots will generally be graded between 2 and 5%. Grading will be designed to discourage flow from reconnecting with adjacent impervious surfaces for a minimum of 5 m for the downspout discharge location.

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

  As per *Section 4.2.5 – Hydraulic Conductivity* (*Updated Geotechnical Investigation Report; Proposed Residential and Commercial Development – Part Lot 13, Concession 5; Millbrook, Ontario; GHD*, March 2022) the infiltration rate varies between 30 and 75 mm/hr.

  Assuming the lowest measured infiltration rate of 30 mm/hr to be conservative, the infiltration rate of the soils are 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 is to be specified for pervious lot areas, and topsoil is to only be placed after the completion of construction works to minimize the extent of potential compaction within the soil profile. Topsoil shall be inspected for compaction prior to sodding and scarification will be provided as required.

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

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

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

It is assumed that roof area for single detached residential lots is 45% of the total lot, and that all lots have an average minimum depth of 30 m. The average maximum roof area for each lot is therefore 144 m^2, 184 m^2, and 214 m^2, for the proposed 10.70 m, 13.7 m, and 15.90 m frontage single detached residential lots, respectively. Based on the design criteria, it is assumed that only 100 m^2 of roof area per lot can be applied towards infiltration mitigation. As per the draft plan, there are a total of 130 single detached residential lots, each with an applicable roof area of 100 m^2, for a total applicable roof area of 13,000 m^2 (1.30 ha).

It is assumed that the roof area for townhouse lots is 30% of the total lot. All townhouse lots will have 7.62 m of frontage and a depth of 30 m. The maximum roof area is therefore 68 m^2. It is assumed that the townhouse roofs will be split draining, and that roof drainage to the front will not meet the minimum 5 m flow path criteria. Because of this, only half of the roof area, or 34 m^2, is applicable towards infiltration mitigation. As per the draft plan, there are 56 townhouse lots, each with an applicable roof area of 34 m^2, for a total applicable roof area of 1,904 m^2 (0.19 ha).

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

Based on the *Geotechnical Investigation Report*, the total annual site precipitation is 252,823 m^3/yr for a total site area of 29.57 ha. This corresponds to a per hectare precipitation rate of 8,550 m^3/yr/ha. The total roof area applicable to roof downspout disconnection infiltration is 1.49 ha (1.30 ha + 0.19 ha = 1.49 ha). The precipitation to applicable roof areas is therefore 12,740 m^3/yr (1.49 ha x 8,550 m^3/yr/ha). Based on an evaporation rate of 20% of incident precipitation for impervious areas, as per the *Geotechnical Investigation Report*, the surplus for the applicable roof area is therefore 10,192 m^3/yr (12,740 m^3/yr x (1 – 0.2)).

Assuming an infiltration rate of 50%, the infiltration volume due to roof downspout disconnections is therefore 5,096 m^3/yr (10,192 m^3/yr x 0.50).

Proposed Infiltration BMP – Infiltration Facilities

Roof downspout disconnection will account for an annual infiltration volume of 5,096 m^3/yr. The post-development infiltration deficit without infiltration measures is 11,914 m^3/yr. The remaining deficit of 6,818 m^3/yr (11,914 m^3/yr – 5,096 m^3/yr) will be infiltrated through the installation of infiltration trenches.

The areas directed to the infiltration trenches will include the rear yard areas associated with *Catchment 204* (3.12 ha) on **Figure 8**. The infiltration trenches have been designed based on a soil infiltration rate of 30 mm/hr, a drawdown time of 48 hours, a void ratio of 0.4, a width of 1.0 m and a depth of 1.0 m. A total infiltration trench length of 650 m is required, to be distributed among the rear-draining lots. Additional details will be provided at detailed design.

Tables F.10-F.11 provide the preliminary infiltration trench sizing calculations. With the implementation of the proposed infiltration facilities, an additional infiltration capacity of 6,862 m^3/yr is achieved.

Post-Development Infiltration Volume (Mitigated)

With the inclusion of the roof downspout disconnection and infiltration facility LID measures, the total post-development infiltration volume will be 43,623 m^3/yr (31,665 m^3/yr + 5,096 m^3/yr + 6,862 m^3/yr), which is 100.1% of the annual pre-development infiltration volume (43,579 m^3/yr). The pre-development infiltration volumes will therefore be maintained under post-development conditions.

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

The vehicular access to the subdivision will be facilitated by two connections, being the intersections of Street "A" with the proposed Fallis Line extension. Pedestrian access will also be provided to Nina Court at the south limit of the subdivision through a walkway and servicing block.

The streets in the subdivision will be in the form of 20.0m road allowances with Street "A" having 10.0m wide pavement and the rest of the streets will have 8.5m pavement width. The proposed roads will have urban sections having pavement crowned with a 2.0% cross fall and edged with concrete curb and gutter. The longitudinal slope of the road will generally be 0.50% with some length of road ranging up to 6.5% slope. The standard road cross sections are 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 commercial block and the existing community centre. Sidewalks will be generally constructed on one side of each road. The sidewalks will have tactile warning plates at all curb ramps in accordance with Provincial accessibility standards.

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

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 8.0% and that sodded yard areas are to range from 2.0% to 5.0%. For large grade differentials, a maximum slope 3H : 1V can be used for sodded embankments. In areas where space is limited, retaining walls can be utilized to accommodate grade differentials, however, their use should be minimized. Given the relatively steep site, a road grade of 6.5% will be utilized for a length of Street "A".

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.

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. Based on the **Preliminary Servicing & Grading Plan**, given that the site is relatively steep, many basement walk-out type lots will be utilized and some areas will require 3:1 slopes and retaining walls to accommodate the grade differential. With these measures we anticipate that it will be feasible to achieve 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 pond will be utilized as temporary sediment control basins during construction. The basin is to be sized in accordance with the ESC Guideline based on a required storage volume of 250 m^3 per hectare of disturbed area (125 m^3/ha of permanent pool and 125 m^3/ha of active storage). The basin's outlet is to have a Hickenbottom riser and a minimum 75mm diameter orifice plate sized to provide a drawdown time in the order of 48 hours.
- **Silt Fences** are to be installed adjacent to all property limits subject to drainage from the development area prior to topsoil stripping and in other locations, such as at the bases of topsoil stockpiles. It is recommended that earthworks not extend immediately adjacent to the silt fence and instead 1m to 2m vegetated buffer be maintained for additional protection. The silt fences are to be constructed with 150 x 150mm wire farm fence fabric to properly support the geotextile. Heavy duty silt fence is recommended to be installed adjacent the South Wetland consisting of two rows of fence with a row of staked straw bales between.
- **Mud Mat** is to be installed at the construction entrance prior to commencing earthworks to minimize the tracking of mud onto municipal roads.
- **Sediment Traps** are to be installed at all catchbasin locations once the storm sewer system has been constructed to prevent silt laden runoff from entering.

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

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

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 electrical (Hydro One Networks Inc.), natural gas (Enbridge Gas Distribution Inc.) and telecommunications (Nexicom Inc.) will be available to service the subject development. As per standard practice in subdivisions, utilities will be installed underground. Co-ordination with the Hydro One and the various utility companies will be undertaken at the detailed engineering design stage to determine appropriate locations for pedestals, transformers and street lights.

It is recommended that the utility installation be in the form of a joint trench. The process of joint trenching allows all of the utility companies to co-ordinate the placement of their lines in a common trench excavated by a single utility contractor. Joint trenching maximizes the efficiency of the available area in the utility corridor and provides for a safe installation.

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

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

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 300mm diameter trunk watermain was constructed northerly along County Road 10 with a water tower and booster station located on the site of the municipal offices. A 250mm diameter watermain was constructed on Fallis Line to the east side of County Road 10 which will service the subject development. A connection will also be made to the 150mm diameter watermain on Nina Court, to the south of the subject development, to complete a loop.
- A local water distribution system will be constructed along the roads to provide domestic supply and fire protection for the proposed dwellings. This local system will have pipe diameters ranging in size from 150mm to 250mm. Based on the Ontario Building Code (OBC 2012) requirements, the water service connections for the individual townhouse units are to be 25mm diameter.

Waste Water

- A 525mm diameter trunk sanitary sewer has been constructed on Nina Court to the south limit of the subject site. This trunk sewer will be extended northerly through the subject lands to service future development north of Fallis Line and on the east side of County Road 10. An analysis of the downstream sanitary sewer was conducted which confirmed that there is sufficient capacity in the sewer from the subject site to the WWTP.
- A local sanitary sewer system will be constructed along the proposed roads to provide service to the dwellings. In accordance with Township standards, the dwellings will be serviced with individual sanitary connections.

Storm Drainage

- The subject site is located in the Baxter Creek subwatershed. The Baxter Creek drains to the Otonabee River which discharges to Rice Lake.
- In accordance with Township criteria, the subject site will be serviced by minor system comprised of a municipal storm sewer sized for the 5-year storm event. This storm sewer will outlet to the proposed SWM facility.
- The major system will be comprised of an overland flow route which will convey runoff from rainfall events in excess of the capacity of the municipal storm sewer to the SWM facility.
- The Regulatory floodplain of the Baxter Creek tributary is contained entirely within the valley lands and therefore the proposed residential lots and the stormwater management pond are outside the Regulatory floodplain.

Stormwater Management

- A stormwater management facility will be constructed to service the subject property, as well as the potential future development to the west. This facility has been designed as a wet pond to provide Enhanced (Level 1) water quality treatment, extended detention for erosion control and flood control using the calculated pre-development flow targets up to and including the 100-year storm event. The wet pond consists of a sediment forebay and a main cell separated by a forebay berm.
- Thermal mitigation measures are to be incorporated in the design of the pond including bottom draw pipe and a planting strategy to provide shading around the pond perimeter.
- A site water balance assessment has been undertaken to ensure that pre-development infiltration volumes are maintained. Based on the analysis it was determined that mitigation measures are required in the form of infiltration trenches and roof top disconnections.

Vehicular & Pedestrian Access

- Vehicular access to the subject site will be provided by a road connections to the proposed Fallis Line extension.
- The proposed local roads will be constructed to urban standards having 20m wide road allowances. Street “A” will have a 10.0m pavement width and the rest of the streets will have 8.5m pavement width.
- Pedestrian access will be provided by 1.5m wide concrete sidewalks which are to be generally located on one side of each road.

Grading

- As is typical with large subdivision projects, earthmoving will be required to achieve the proposed subdivision grading necessary to meet the criteria of the Township. A detailed analysis of the earthworks will be conducted at the detailed design stage to optimize the cut and fill volumes.
- Given that the site is relatively steep, many basement walk-out type lots will be utilized and some areas will require 3:1 slopes and retaining walls to accommodate the grade differential. With these measures we anticipate that it will be feasible to achieve 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.

Utilities

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

Subdivision Engineering Design

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

11.0 REFERENCES & BIBLIOGRAPHY

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- The Biglieri Group, **Draft Plan of Subdivision**, November 29, 2022.
- GHD Inc., **Updated Geotechnical Investigation Report**, March 11, 2022.

Respectfully Submitted,

VALDOR ENGINEERING INC.

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

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

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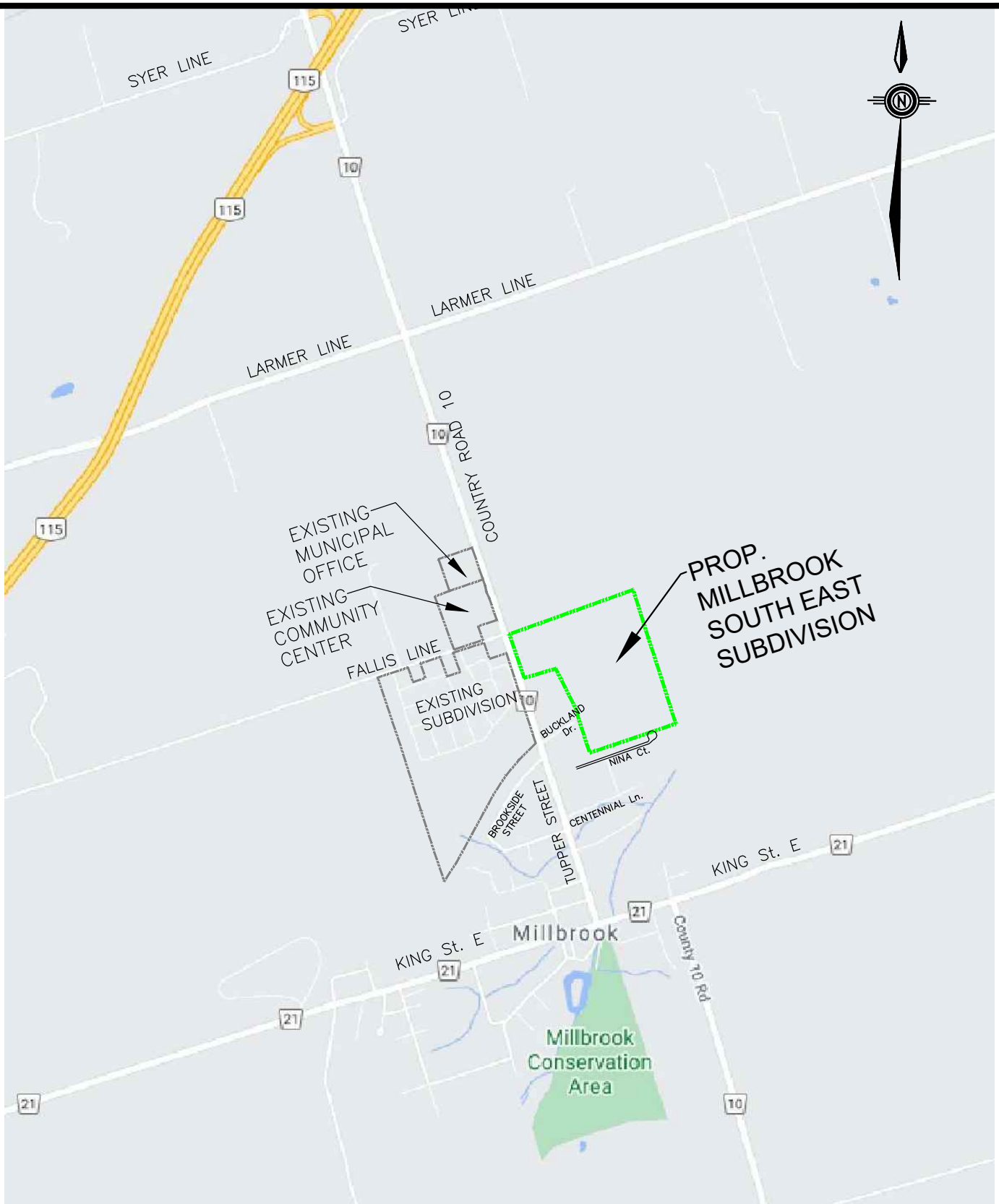

MILLBROOK SOUTH EAST SUBDIVISION

LOCATION MAP

VALDOR ENGINEERING INC.
Consulting Engineers - Project Managers
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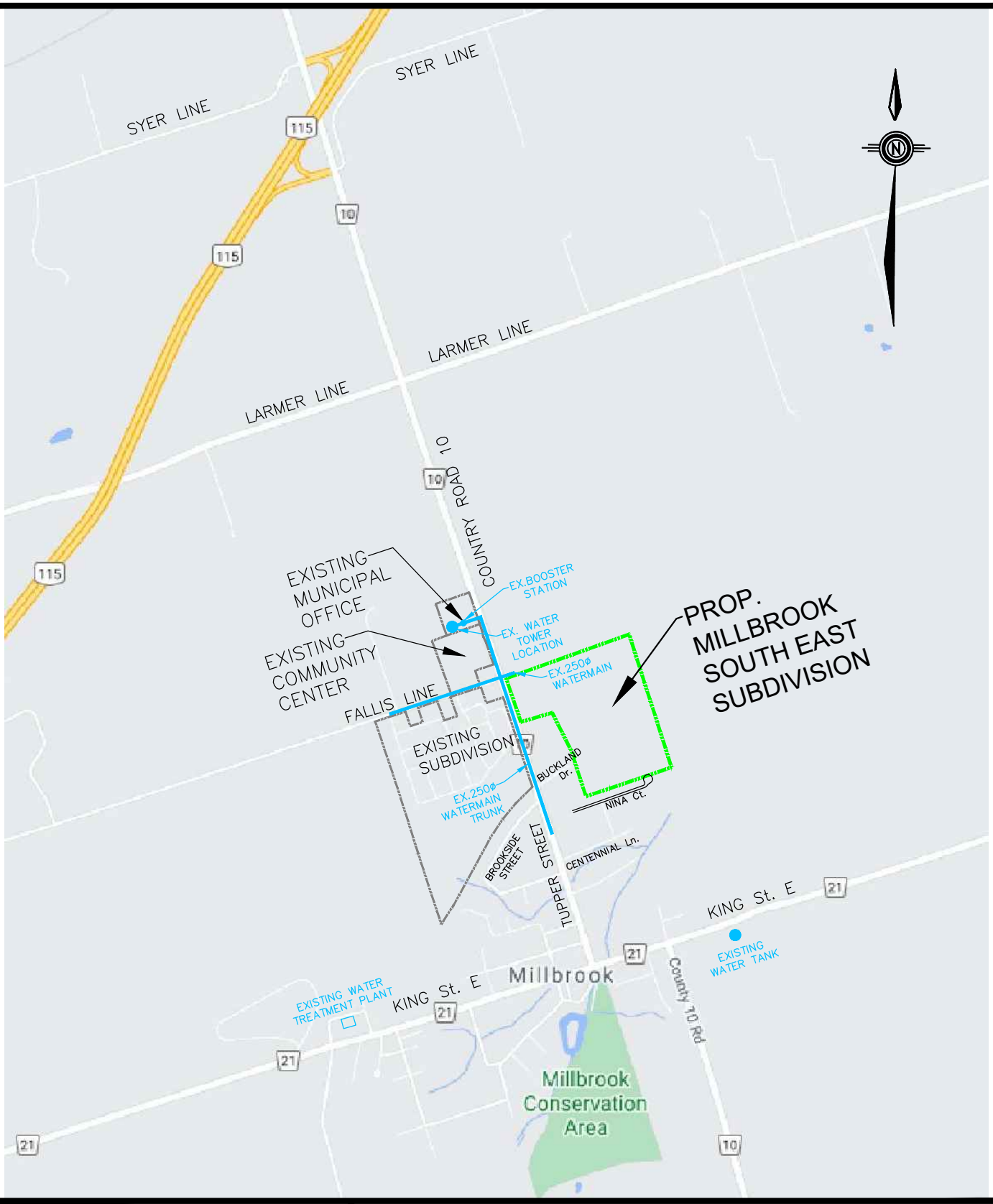
TEL (905)264-0054, FAX (905)264-0069
E-MAIL: info@valdor-engineering.com
www.valdor-engineering.com

SCALE	N.TS.	PROJECT	19121
DATE	March, 2022	DRAWN BY	V.L.

FIGURE 1



MILLBROOK SOUTH EAST SUBDIVISION

WATER SERVICING EXTERNAL

VALDOR ENGINEERING INC.
Consulting Engineers - Project Managers
741 ROWNTREE DAIRY ROAD, SUITE 2, WOODBRIDGE, ONTARIO, L4L 5T9
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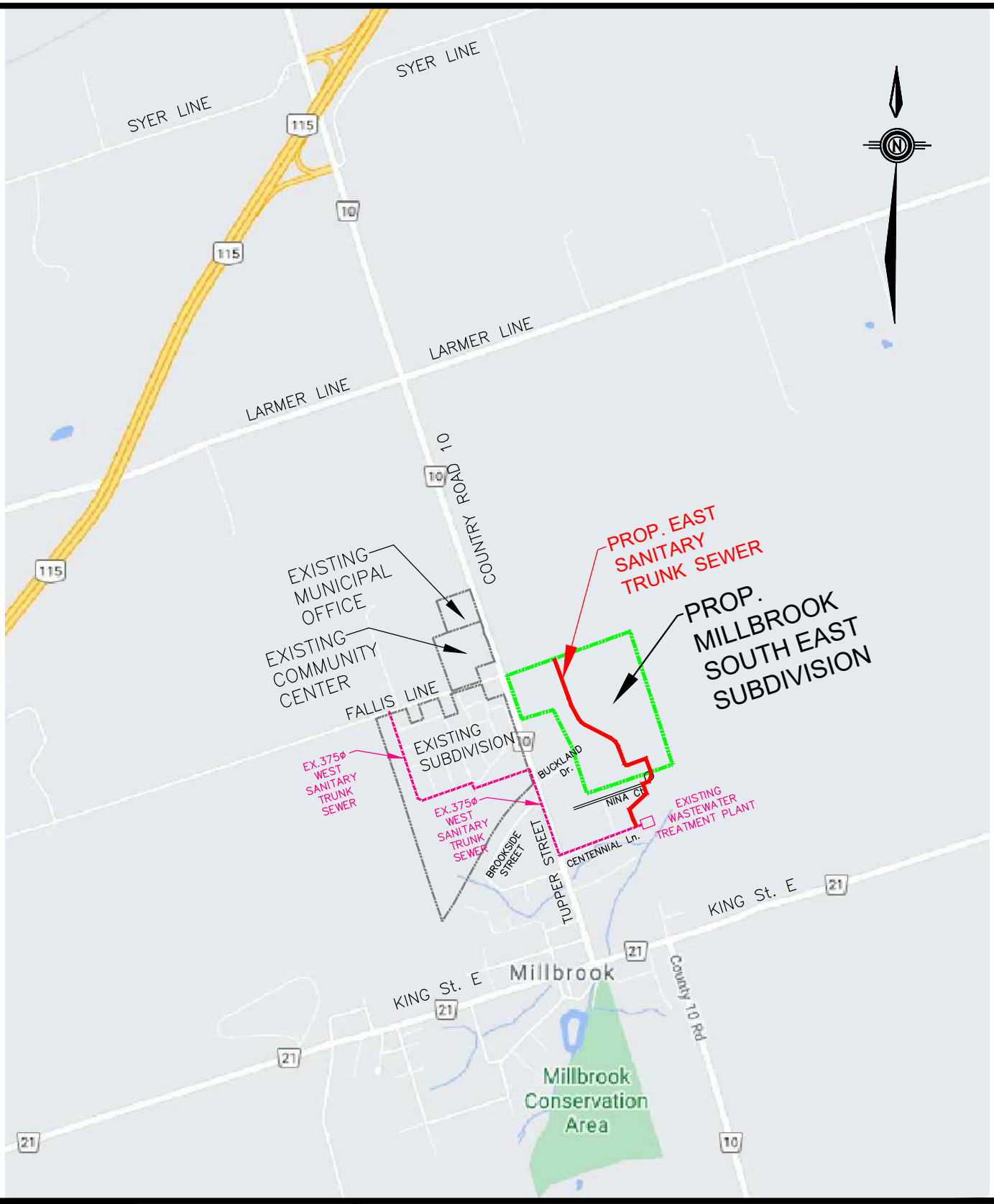
SCALE	N.TS.	PROJECT	19121
DATE	March, 2022	DRAWN BY	V.L.

FIGURE 2



MILLBROOK SOUTH EAST SUBDIVISION

WASTEWATER SERVICING EXTERNAL

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Consulting Engineers - Project Managers
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www.valdor-engineering.com

SCALE	N.TS.	PROJECT	19121
DATE	March, 2022	DRAWN BY	V.L.

FIGURE 3

FALLIS LINE

COUNTY ROAD 10

Fallis Line

Fernridge Hts

Northhill Ave

Highlands Blvd

Pristine Trail

Horizon Ave

Bromont Dr

Melrose Dr

Station Dr

Timber Dr

Highlands Blvd

401
28.90

403
23.90

402
15.49

SUBJECT SITE

EXTENT OF STUDY AREA

SWM POND PROVIDES 100-YEAR CONTROL FOR CATCHMENT 101. REGIONAL FLOW IS UNCONTROLLED.

Buckland Dr

Nina Crt

Century Blvd

Centennial Lane

Brookside St

Baxter Creek

245

250

255

260

235

230

225

220

240

210

LEGEND

401 / 28.90 — CATCHMENT ID / AREA (HA)

DRAINAGE BOUNDARY

WATERCOURSE

OVERLAND FLOW

PROJECT
MILLBROOK SOUTH EAST SUBDIVISION

TITLE
FLOODPLAIN MAPPING PRE-DEVELOPMENT DRAINAGE PLAN

VALDOR ENGINEERING INC.
Consulting Engineers - Project Managers
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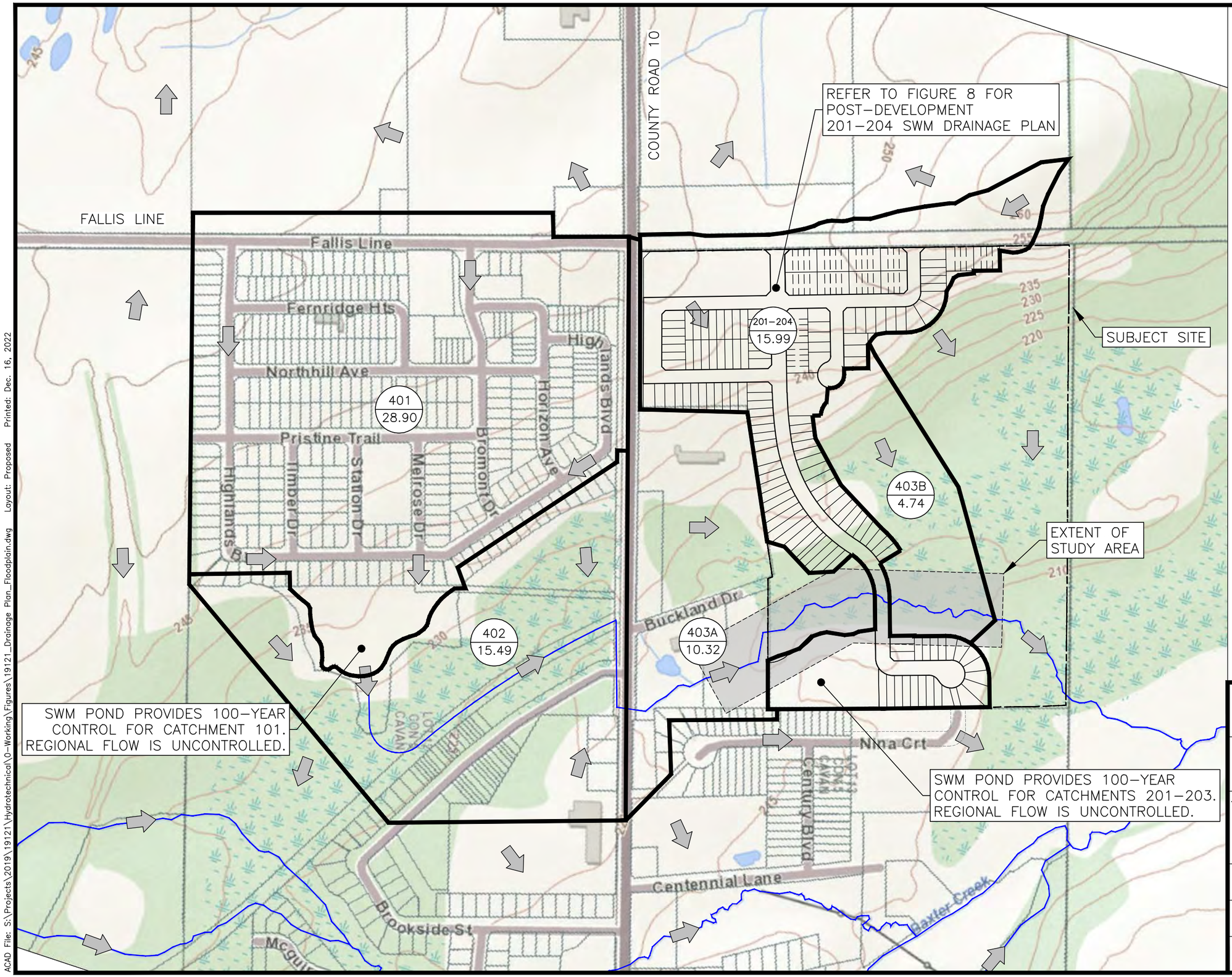
TEL (905)264-0054, FAX (905)264-0069
E-MAIL: info@valdor-engineering.com
www.valdor-engineering.com

PREPARED BY: O.B.	CKD. BY: O.B.
SCALE: 1:5000	DATE: DEC. 2022
PROJECT: 19121	FIGURE 4A

ACAD File: S:\Projects\2019\19121\Hydrotechnical\0-Working\Figures\19121_Drainage Plan_Floodplain.dwg Layout: Existing Printed: Dec. 16, 2022



LEGEND

- 401 / 28.90 — CATCHMENT ID / AREA (HA)
- DRAINAGE BOUNDARY
- WATERCOURSE
- OVERLAND FLOW

PROJECT	**MILLBROOK SOUTH EAST SUBDIVISION**
TITLE	**FLOODPLAIN MAPPING POST-DEVELOPMENT DRAINAGE PLAN**

VALDOR ENGINEERING INC.
Consulting Engineers - Project Managers
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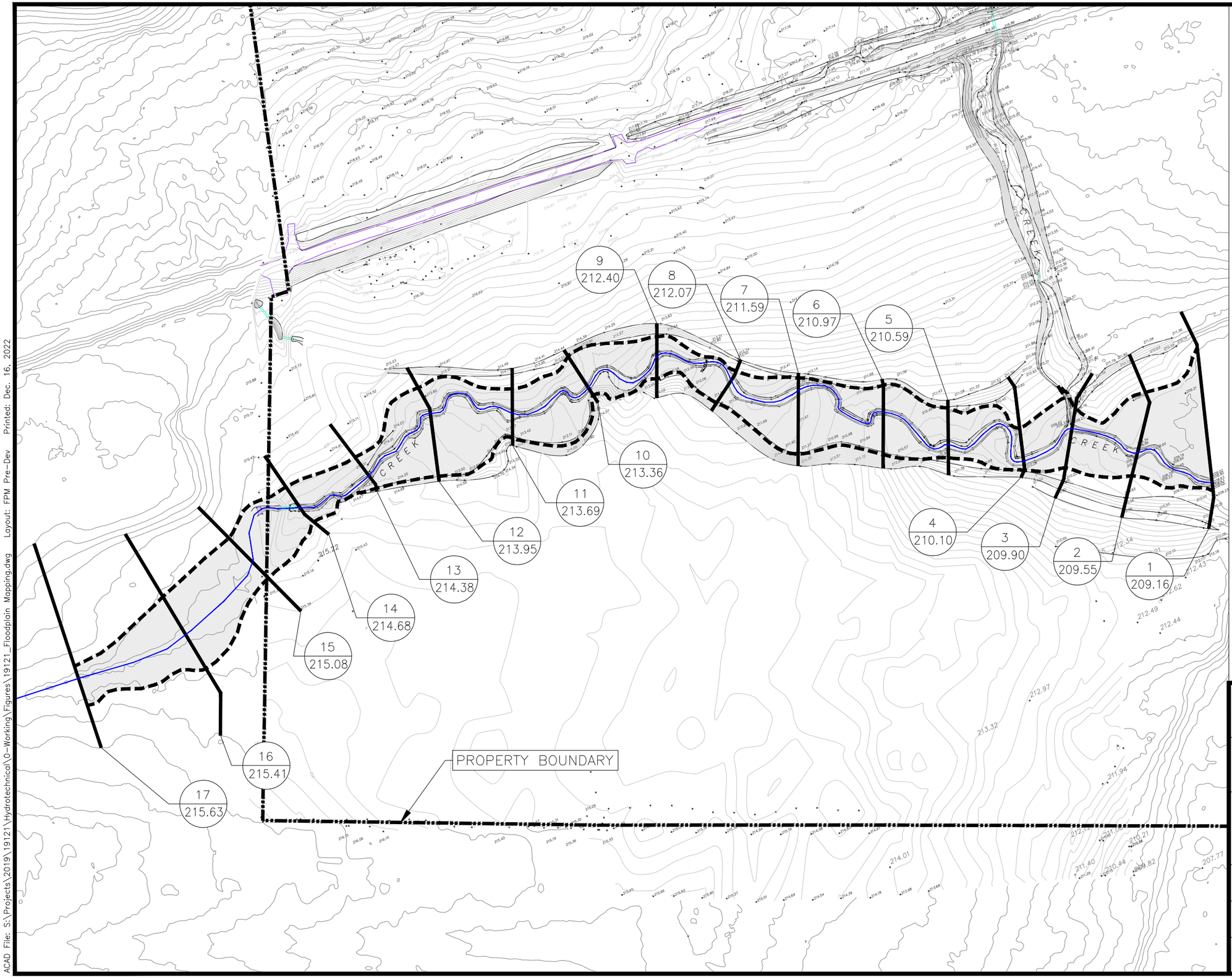
www.valdor-engineering.com

PREPARED BY	P.Y.	CKD. BY	B.C.
SCALE	1:5000	DATE	DEC. 2022
PROJECT	19121		FIGURE 4B

ACAD File: S:\Projects\2019\19121\Hydrotechnical\0-Working\Figures\19121_Drainage Plan_Floodplain.dwg Layout: Proposed Printed: Dec. 16, 2022



LEGEND

- EXISTING REGIONAL FLOODLINE
- PROPERTY BOUNDARY
- HEC–RAS CROSS–SECTION
- 1 / 209.17 — HEC–RAS CROSS–SECTION ID / REGIONAL WATER SURFACE ELEVATION (m)

PROJECT
MILLBROOK SOUTH EAST SUBDIVISION

TITLE
FLOODPLAIN MAPPING PRE-DEVELOPMENT

VALDOR ENGINEERING INC.
Consulting Engineers - Project Managers
571 Chrislea Road, Unit 4, 2nd Floor Vaughan, Ontario, L4L 8A2
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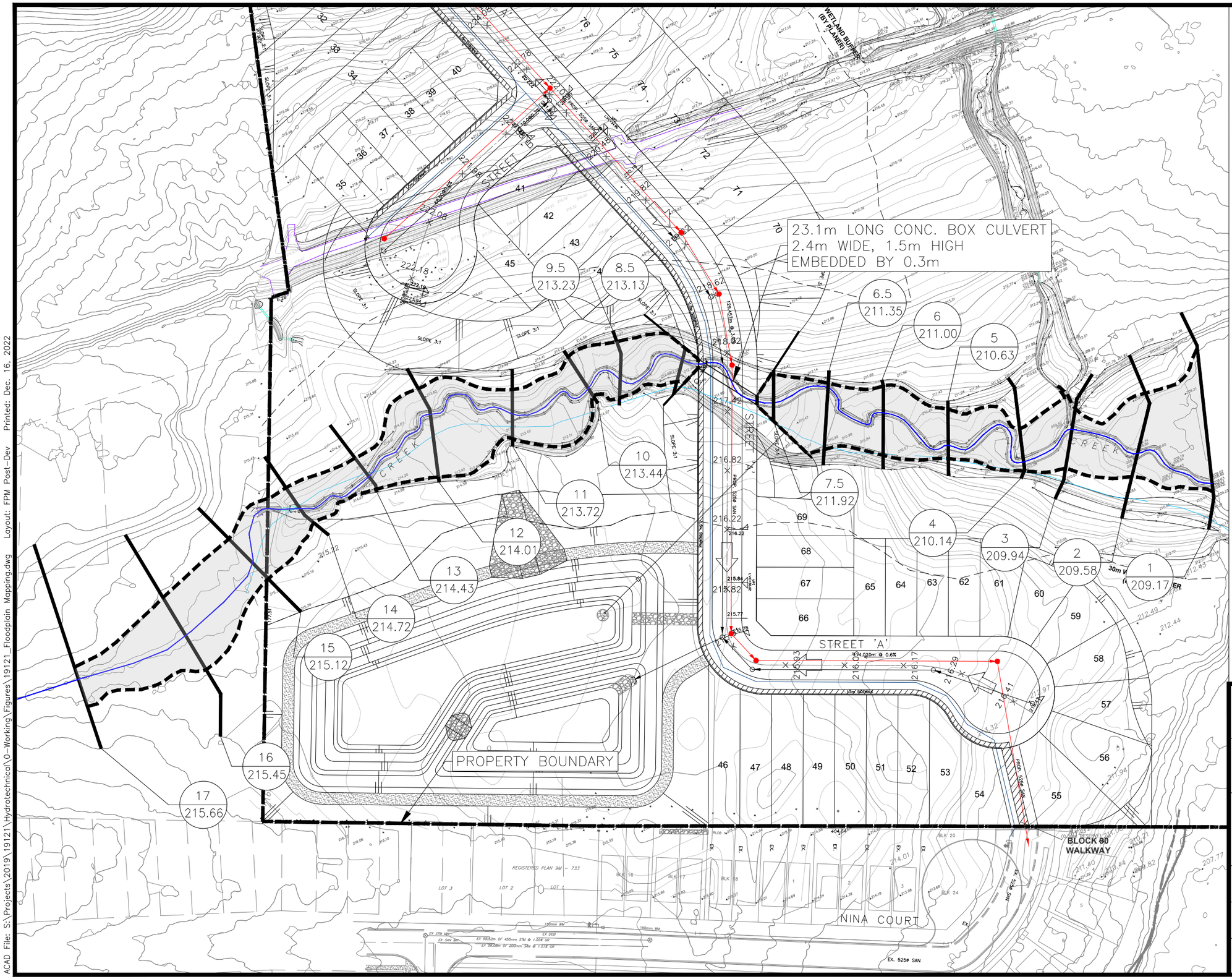
www.valdor-engineering.com

PREPARED BY: O.B.	CKD. BY: O.B.
SCALE: 1:1250	DATE: DEC. 2022
PROJECT: 19121	FIGURE 5



LEGEND

- PROPOSED REGIONAL FLOODLINE
- PROPERTY BOUNDARY
- HEC–RAS CROSS–SECTION
- 1 / 209.18 — HEC–RAS CROSS–SECTION ID / REGIONAL WATER SURFACE ELEVATION (m)

PROJECT
MILLBROOK SOUTH EAST SUBDIVISION

TITLE
FLOODPLAIN MAPPING POST-DEVELOPMENT

VALDOR ENGINEERING INC.
Consulting Engineers - Project Managers
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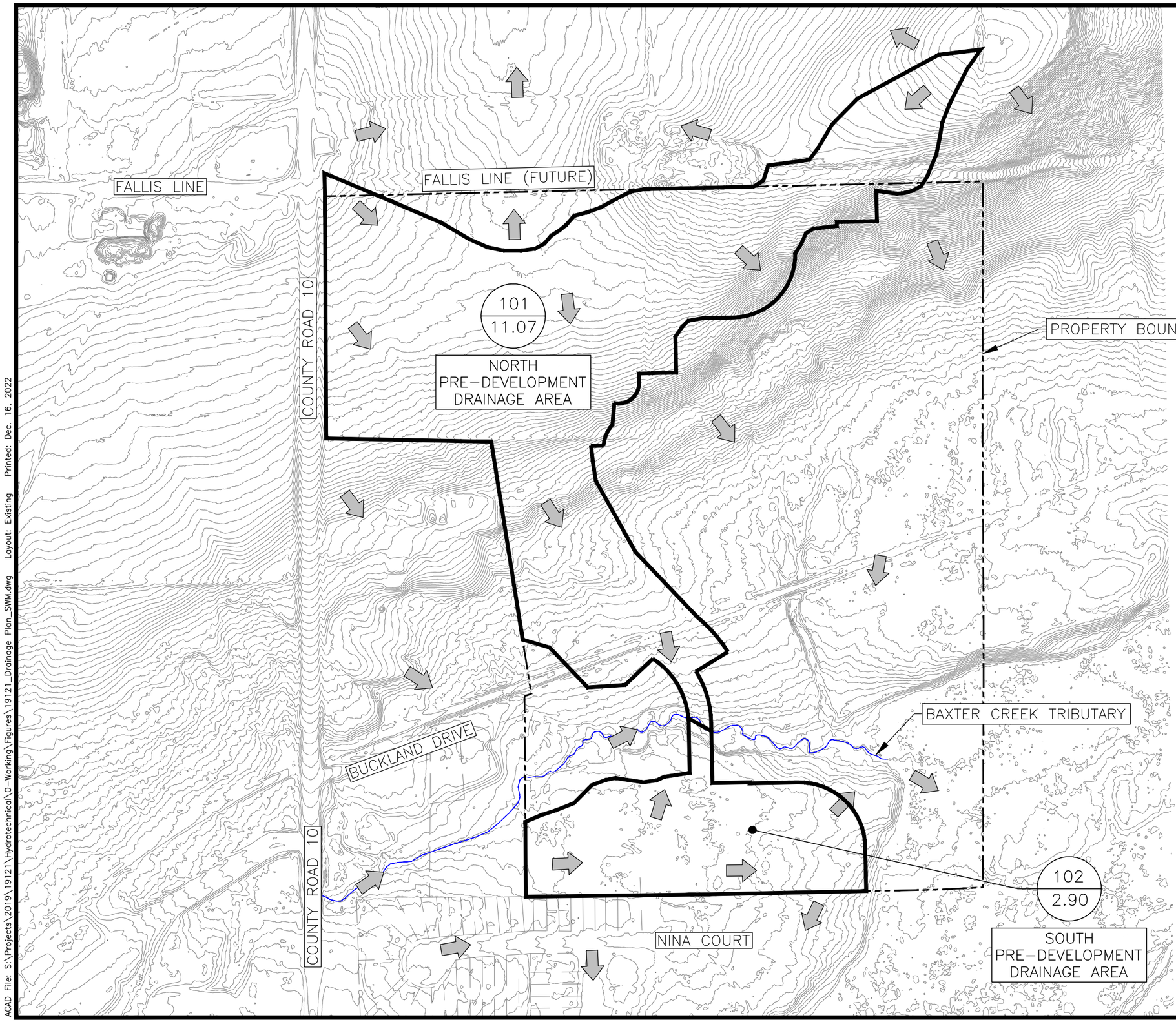
E-MAIL: info@valdor-engineering.com
www.valdor-engineering.com

PREPARED BY P.Y.	CKD. BY B.C.
SCALE 1:1250	DATE DEC. 2022
PROJECT 19121	FIGURE 6

ACAD File: S:\Projects\2019\19121\Hydrotechnical\0-Working\Figures\19121_Floodplain Mapping.dwg Layout: FPM Post-Dev Printed: Dec. 16, 2022



LEGEND

- 101 / 11.77 — CATCHMENT ID / AREA (HA)
- DRAINAGE BOUNDARY
- OVERLAND FLOW

PROJECT
MILLBROOK SOUTH EAST SUBDIVISION

TITLE
SWM DRAINAGE PLAN PRE-DEVELOPMENT

VALDOR ENGINEERING INC.
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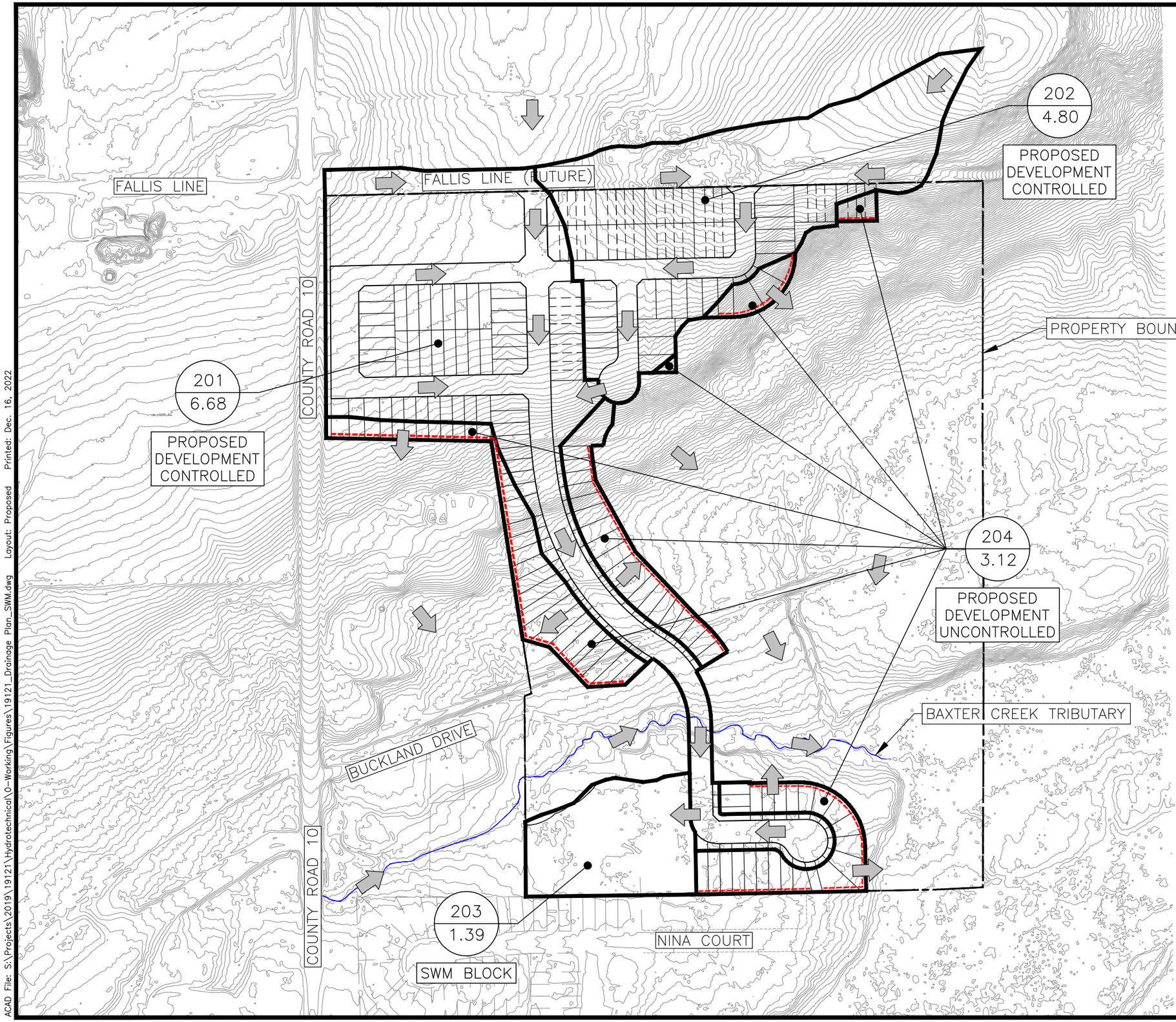
PREPARED BY: O.B.	CKD. BY: O.B.
SCALE: NTS	DATE: DEC. 2022
PROJECT: 19121	FIGURE 7

ACAD File: S:\Projects\2019\19121\Hydrotechnical\0-Working\Figures\19121_Drainage Plan_SWM.dwg Layout: Existing Printed: Dec. 16, 2022



LEGEND

- 201 / 6.68 — CATCHMENT ID / AREA (HA)
- DRAINAGE BOUNDARY
- OVERLAND FLOW
- PROP. INFILTRATION TRENCH

PROJECT
MILLBROOK SOUTH EAST SUBDIVISION

TITLE
SWM DRAINAGE PLAN POST-DEVELOPMENT

VALDOR ENGINEERING INC.
Consulting Engineers - Project Managers
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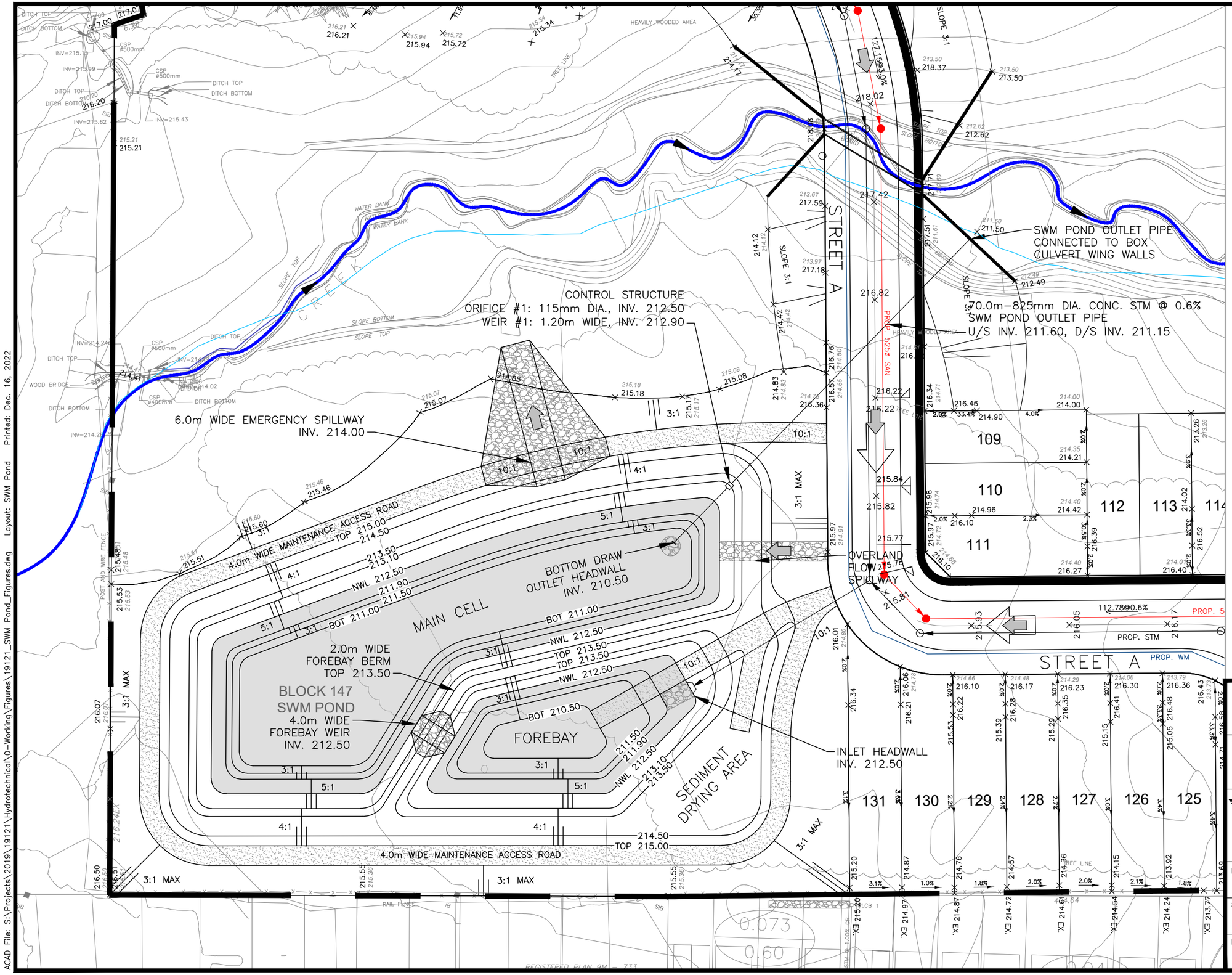
www.valdor-engineering.com

PREPARED BY	CKD. BY
P.Y.	B.C.
SCALE: NTS	DATE: DEC. 2022
PROJECT: 19121	FIGURE 8

ACAD File: S:\Projects\2019\19121\Hydrotechnical\0-Working\Figures\19121_Drainage Plan_SWM.dwg Layout: Proposed Printed: Dec. 16, 2022



LEGEND

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

RETURN PERIOD	POND WSEL (m)
25 mm	212.85
2–YEAR	212.99
5–YEAR	213.11
10–YEAR	213.18
25–YEAR	213.27
50–YEAR	213.32
100–YEAR	213.38
REGIONAL	213.49

PROJECT
MILLBROOK SOUTH EAST SUBDIVISION

TITLE
PRELIMINARY SWM POND

VALDOR ENGINEERING INC.
Consulting Engineers - Project Managers
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E-MAIL: info@valdor-engineering.com
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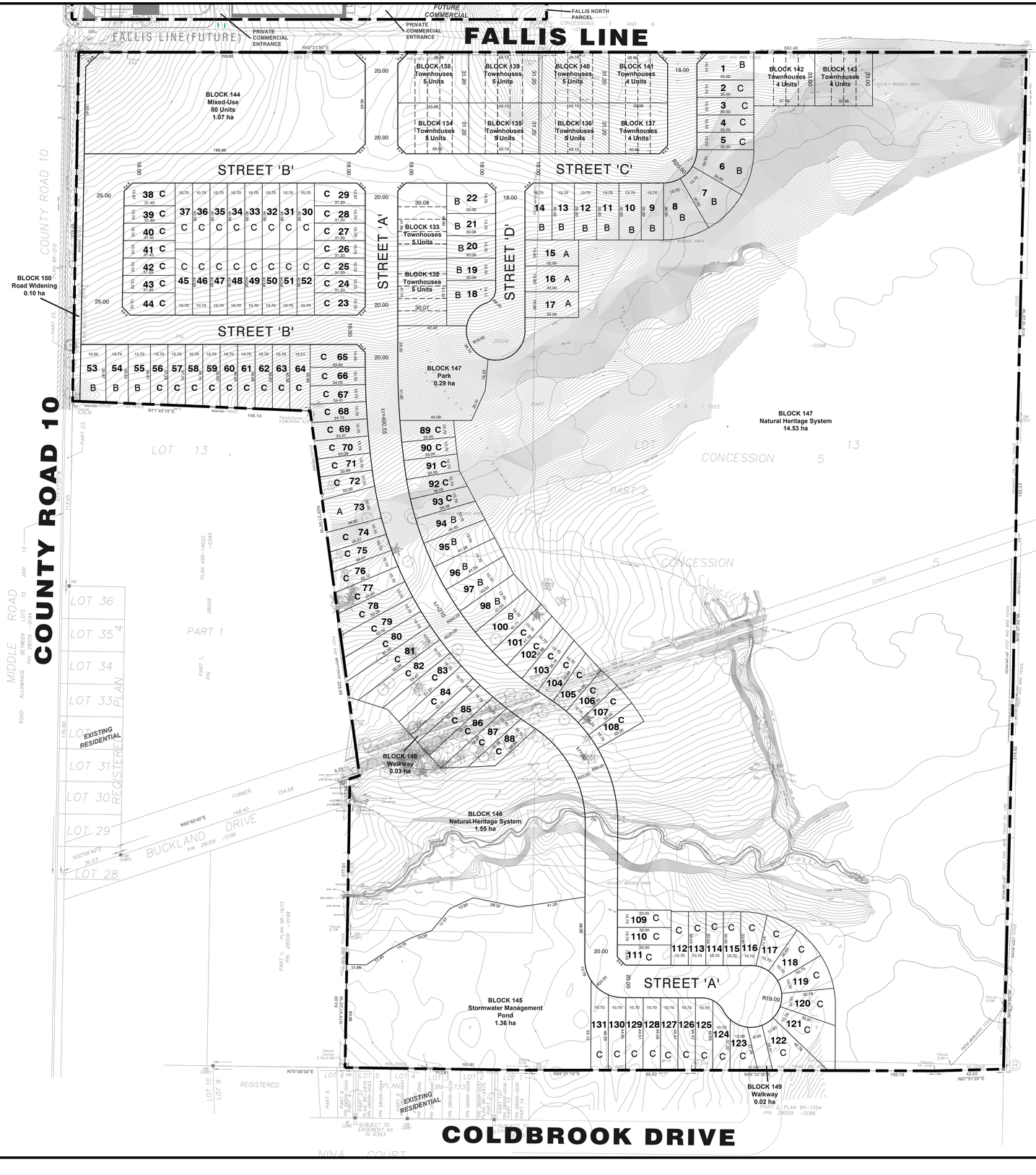
PREPARED BY	CKD. BY
O.B.	O.B.
SCALE 1:750	DATE DEC. 2022
PROJECT 19121	FIGURE 9

ACAD File: S:\Projects\2019\19121\Hydrotechnical\0–Working\Figures\19121_SWM Pond_Figures.dwg Layout: SWM Pond Printed: Dec. 16, 2022

APPENDIX "A"

Draft Plan, Conceptual Master Plan & Equivalent Population Calculation



Schedule of Land Use

Description		Lot / Block No.	Residential Units	Area (ha)
Minimum Lot Width 10.7m (35')	C	2-5, 23-52, 56-72, 74-93, 101-131	102	4.44
Minimum Lot Width 13.7m (45')	B	1, 6-14, 18-22, 94-100	24	1.31
Minimum Lot Width 15.9m (52')	A	15-17, 73	4	0.22
Total Single Detached			130	5.97
Street Townhouse Minimum Lot Width 7.62m (24')		132-143	56	1.53
Mixed-Use		144	80	1.07
Net Developable Total			266	8.57
Stormwater Management Pond		145		1.36
Natural Heritage Systems		146, 147		16.08
Park		147		0.29
Walkway		148, 149		0.05
Road Widening		150		0.10
Right of Way		Streets A-D		3.02
Total Site Area				**29.47**

TITLE:

DRAFT PLAN OF SUBDIVISION

LEGAL DESCRIPTION:

DRAFT PLAN OF SUBDIVISION
PART OF LOT 13
CONCESSION 5
TOWNSHIP OF CAVAN
COUNTY OF PETERBOROUGH

KEY PLAN:

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) PIPED WATER TO BE PROVIDED
(i) CLAY LOAM SOIL
(j) SEE PLAN
(k) SANITARY & STORM SEWERS TO BE PROVIDED
(l) SEE PLAN
NOTE: CONTOURS RELATE TO CANADIAN GEODETIC DATUM

SURVEYOR'S CERTIFICATE:

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

February 8th, 2022
DATE

DAVID COMERY
ONTARIO LAND SURVEYOR

IBW SURVEYORS
71 MEARNS COURT, BOWMANVILLE, ONTARIO, L1C 4N4
IBWSURVEYORS.COM | 1.800.667.0696

OWNER'S CERTIFICATE:

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

February 8th, 2022
DATE

FALLIS LINE
PETERBOUROUGH COUNTY

APPROVAL STAMP:

REVISIONS

No.	Description	Date	Int.
3	Revision	2022 11 29	EC
2	Revision	2022 02 09	JS
1	Issues for DPS Revision	2022 02 09	JS

PROJECT No.:	20699
DATE:	November 29, 2022
SCALE:	1:2500
DRAFTED BY: EC	CHECKED BY: MP
DRAWING No.:	**DP-01**

BIGLIERI GROUP
2472 Kingston Rd, Toronto
126 Catharine Street North, Hamilton
(416) 693-9155
thebiglierigroup.com

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

TABLE: A

EQUIVALENT POPULATION

Project Name: **Millbrook South East Subdivision**
File: 19121
Date: Dec. 2022

PROPOSED DRAFT PLAN

Land Use	Area (Hectares)	Criteria	No. of Units	Equivalent Population
Detached Dwellings	5.97	3.50 persons per unit	130	455
Street Townhomes	1.53	3.50 persons per unit	56	196
Mixed-Use	1.07	3.50 persons per unit	80	280
Stormwater Management Pond	1.36			
Natural Heritage Systems	16.08			
Parkland & Trails	0.34			
Roads & Road Widenings	3.12			
Total:	**29.47**		**266**	**931**

APPENDIX "B"

Water Demand Calculations & Details

VALDOR

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

TABLE: B1

DOMESTIC WATER DEMAND CALCULATION

Project Name: **Millbrook South East Subdivision, Township of Cavan Monaghan**
File: 19121
Date: December 2022

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

PROPOSED DRAFT PLAN

Land Use	**Equivalent Population** (persons)	**Domestic Demand** (L/min)	**Maximum Day Demand** (L/min)	**Peak Hour Demand** (L/min)
Detached Dwellings	455	142.2	284.4	426.6
Street Townhomes	196	61.3	122.5	183.8
Mixed-Use	280	87.5	175.0	262.5
Total	**931**	**290.9**	**581.9**	**872.8**

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www.valdor-engineering.com

TABLE: B2-1

CALCULATION OF REQUIRED FIRE FLOW

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

Project Name: **Millbrook South East Subdivision**
File: 19121
Date: Mar-22

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 East Subdivision**
File: 19121
Date: Mar-22

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)

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www.valdor-engineering.com

TABLE B-3: REQUIRED FIRE FLOW CALCULATION

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

Project Name: **Millbrook Subdivision Phase 1**
File: 13152
Date: August 2014

Notes:

Type of Construction - Fire Resistive

$C =$ 0.6

For fire-resistive buildings with 1-hour fire rating, the area shall be the total area of the largest floor plus 25% of each of the two immediately adjoining floors (assuming vertical openings and exterior vertical communications are properly protected):

Floor	Area (sq.m)	%
Mechanical Penthouse	437	0%
Level 21-22	581	0%
Level 20	600	0%
Level 17-19	663	0%
Level 16	666	0%
Level 13-15	682	0%
Level 12	647	0%
Level 10-11	682	0%
Level 9	666	0%
Level 6-8	663	0%
Level 5	666	0%
Level 4	798	0%
Level 3	681	25%
Level 2	1,178	25%
Ground	1,300	100%
$A =$	1,765	sq.m

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

$F =$ 5,545 L/min

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

Occupancy Factor

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

$$F' = F \text{ x } (1+f_1)$$

$F' =$ 4,500 L/min

Sprinkler Credit

		Charge
NFPA 13 Sprinkler Standard:	YES	-30%
Standard Water Supply:	NO	0%
Fully Supervised System:	NO	0%
Total Charge to Fire Flow:	$f_2 =$	-30%

Exposure Factor

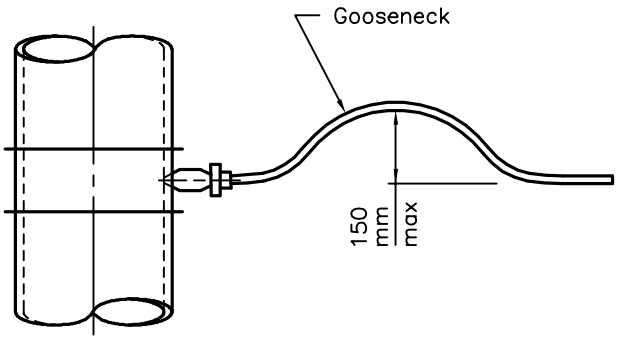
		Charge
North Side - Distance to Building (m):	3 to 10m	20%
East Side - Distance to Building (m):	30 to 45m	5%
South Side - Distance to Building (m):	0 to 3m	25%
West Side - Distance to Building (m):	3 to 10m	20%
	$f_3 =$	70% (maximum of 75%)

$$F'' = F' + F' \text{ x } f_2 + F' \text{ x } f_3$$

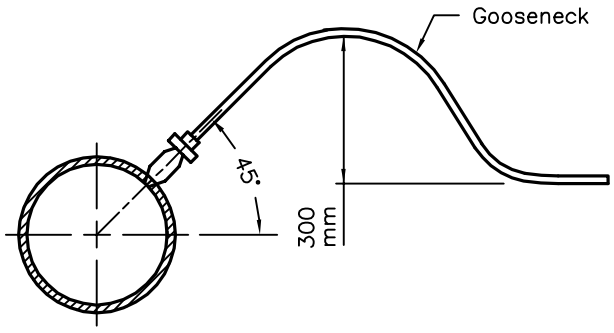
$F'' =$ 6,300 L/min

REQUIRED FIRE FLOW

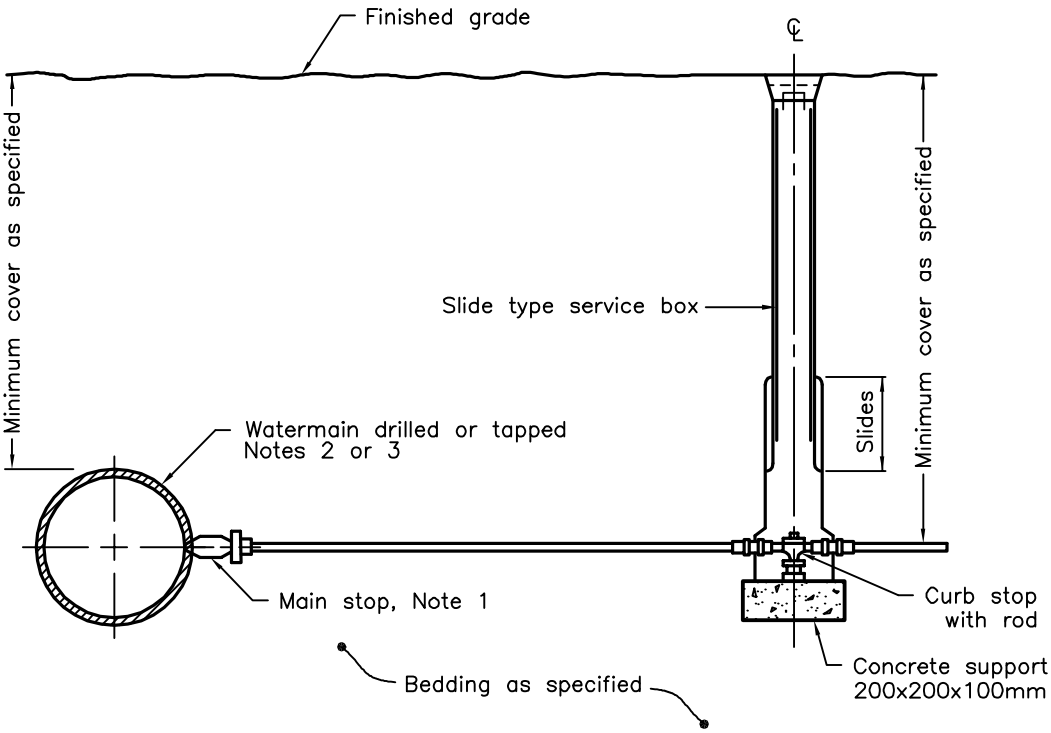
$F'' =$ **6,000** **L/min** (to nearest 1,000 L/min)



HORIZONTAL GOOSENECK



VERTICAL GOOSENECK OPTION



VERTICAL SECTION

NOTES:

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

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

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

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

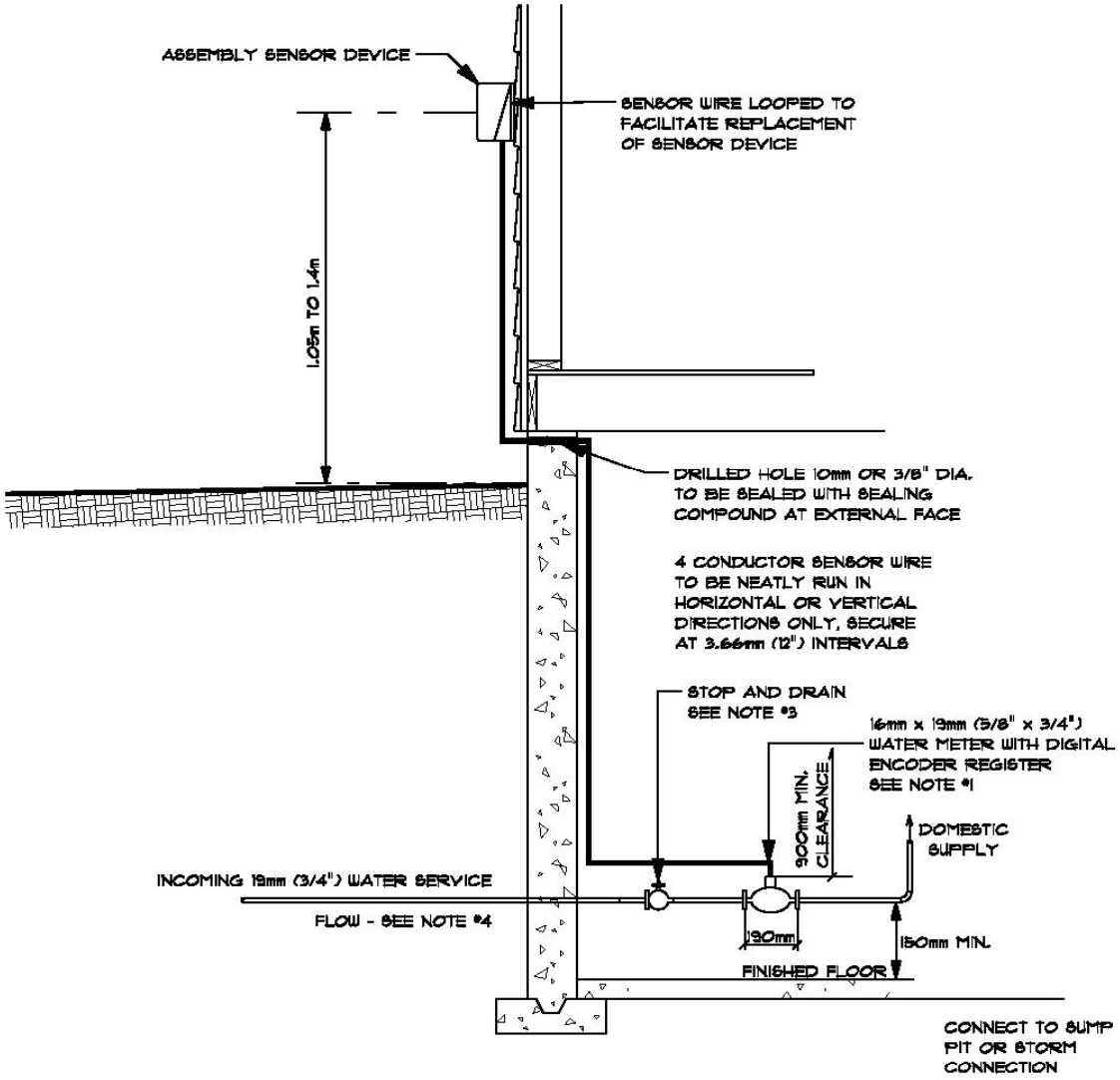
B Couplings shall not be permitted unless the service length exceeds 20m between the main stop and curb stop.

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

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

E All dimensions are in millimetres unless otherwise shown.

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



NOTES:

1 - METER SHALL BE 16mm (5/8") METER, REGISTRATION IN CUBIC METERES. 19mm (3/4") THREADED CONNECTIONS

2 - SUPPLY AND INSTALL REMOTE READOUT DEVICE ON OUTSIDE WALL WITHIN 2.0m OF THE FROST WALL AND IN THE SAME SIDE AS THE HYDRO METER. REMOTE READOUT DEVICE SHALL BE SUITABLE FOR TOUCH READ AUTOMATED READING AND BILLING SYSTEM.

3 - STOP AND DRAIN VALVE TO BE THE SAME SIZE AS INCOMING PIPE

4 - IF HOT WATER TANK IS WITHIN 3.0m OF THE METER, A CHECK VALVE IS REQUIRED BETWEEN THE METER AND THE HOT WATER TANK.

5 - METER SHALL BE INSTALLED USING THREADED CONNECTIONS ONLY

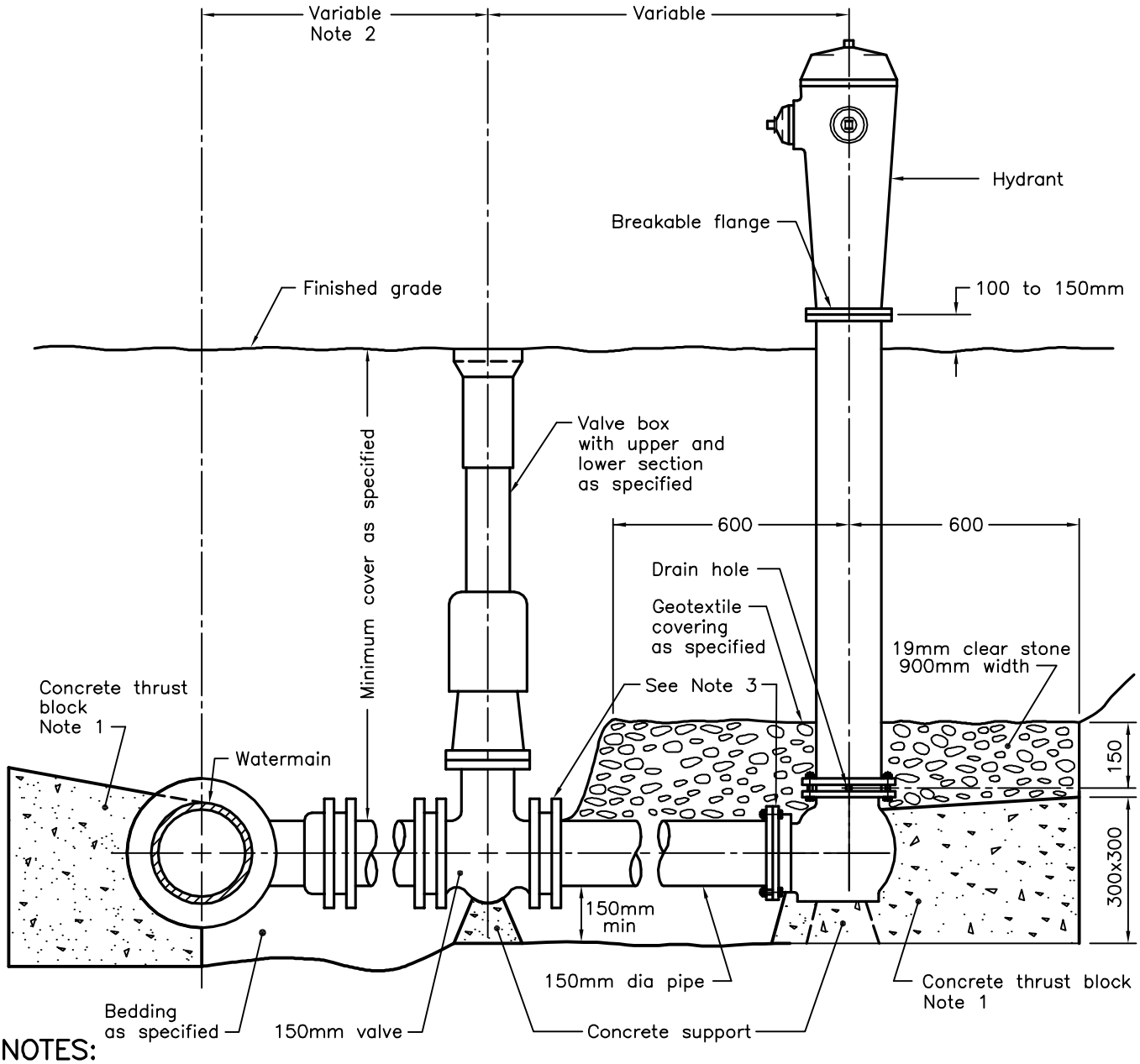
TOWNSHIP OF CAVAN MONAGHAN

TYPICAL WATER METER INSTALLATION

SCALE: NOT TO SCALE

DATE: AUGUST 2013

STD. S7



NOTES:

1 All concrete thrust blocks shall be poured against undisturbed ground.

2 When specified, for watermains 400mm and less, locate valve within 1.0m of centreline of watermain. Retaining and restraining devices shall be utilized. For watermains 600mm and over, bolt valve with flanged end directly to flanged tee.

3 When specified, retaining and restraining devices shall be utilized, in addition to thrust blocks.

A Bond breaker shall be used between the concrete and the fittings and appurtenances.

B Bolts and nuts for buried flange to flange connections shall be stainless steel.

C When required, flange of standpipe extensions shall not be in frost zone.

D This OPSD shall be read in conjunction with OPSD 1103.010 and 1103.020.

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

F All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2013	Rev	2
HYDRANT INSTALLATION			
	OPSD 1105.010		

APPENDIX "C"

Wastewater Servicing Details & Calculations

VALDOR

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

TABLE: C1

WASTEWATER FLOW CALCULATIONS

Project Name: **Millbrook South East Subdivision, Township of Cavan Monaghan**
File: 19121
Date: Dec. 2022

Conditions:

Residential Average Daily Flow: 450 L/person/day

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

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

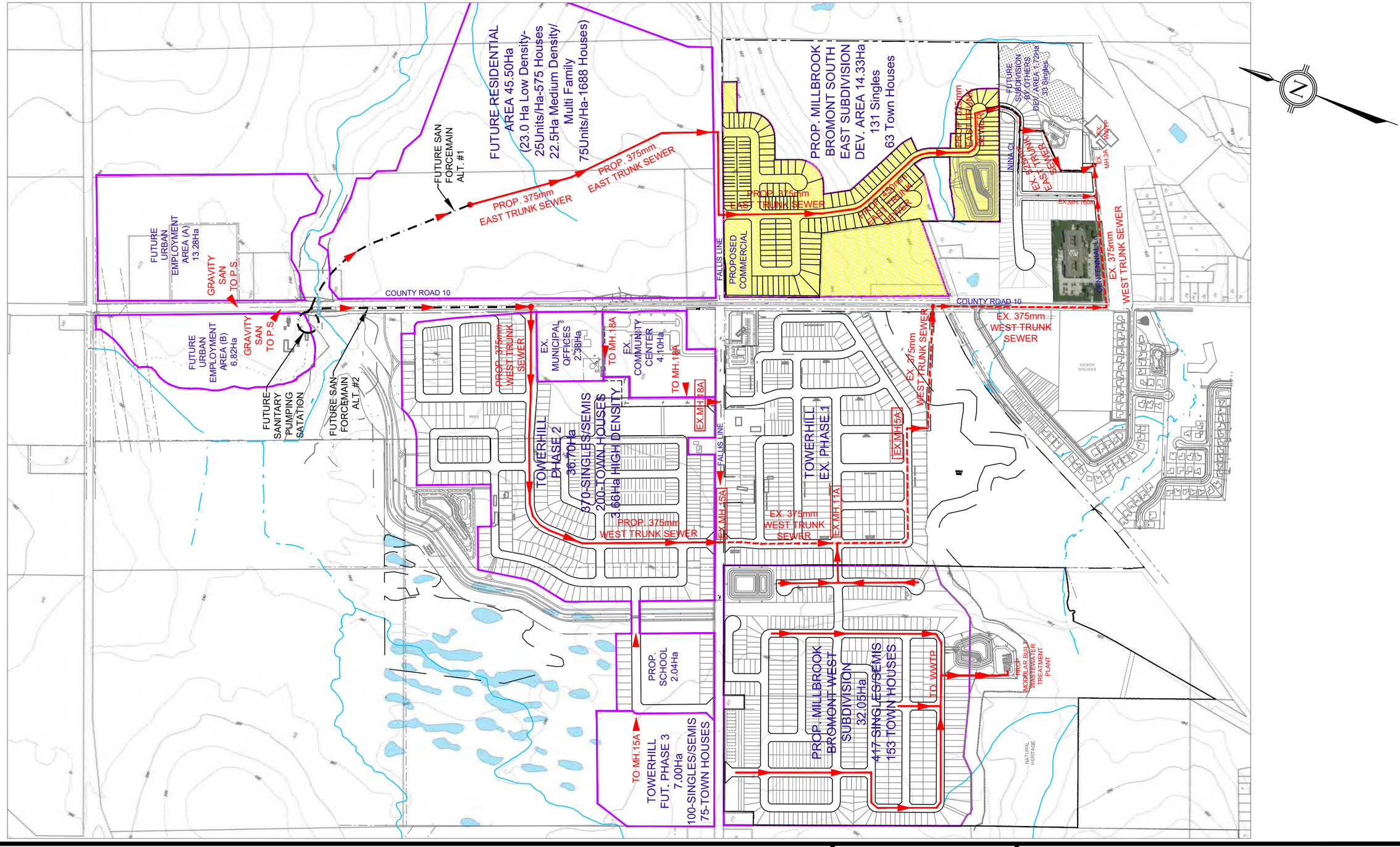
Design Flow (Q_D): $Q \times K_H + I$

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

Commercial/Institutional Peaking Factor: 2.5

PROPOSED DRAFT PLAN

Land Use	Area (ha.)	Equivalent Population (persons)	Average Daily Flow (L/s)	Harmon Peaking Factor	Peak Daily Flow (L/s)	Extraneous Flow (L/s)	Total Flow (L/s)
Detached Dwellings	5.97	455	2.37	3.99	9.47	1.67	11.14
Street Townhomes	1.53	496	2.58	3.98	10.27	0.43	10.70
Mixed Use	1.07	280	1.46	4.09	5.97	0.30	6.27
Roads	3.12					0.87	0.87
Total	**11.69**	**1,231**	**6.41**		**25.70**	**3.27**	**28.98**



MILLBROOK SOUTH EAST SUBDIVISION

SANITARY DRAINAGE PLAN

DRAWN BY	V.L.
CKD. BY	D.G.
DATE	March, 2022

VALDOR ENGINEERING INC.
Consulting Engineers - Project Managers
741 ROWNTREE DAIRY ROAD, SUITE 2, WOODBRIDGE, ONTARIO, L4L 5T9
TEL (905)264-0054, FAX (905)264-0069
E-MAIL: info@valdor-engineering.com
www.valdor-engineering.com

SCALE	PROJECT	
N.T.S.	19121	FIGURE C

Residential			Commercial		
Average Daily Flow	450	l/person/d	Average Daily F	1.15	l/s/ha
Peaking factor, M	2.00	min.	Peaking factor,	2.5	
	4.50	max.			

Infiltration rate,	0.28	l/s/ha
Pipe Velocities	0.75	m/s min
	3.00	m/s max

Township of Cavan Monaghan

SANITARY SEWER DESIGN SHEET

Project Name: Millbrook North Sanitary Trunk Sewer

Project No: 17125

Consultant:

Valdor Engineering Inc.

741 Rowntree Dairy Road, Suite 2, Woodbridge, Ontario, L4L 5T9

Tel: 905-264-0054 Fax: 905-264-0069 info@valdor-engineering.com

Design: **V. Lider** Date: April, 2021

Checked: **D. Giugovaz, P.Eng**

Approved: **P. Zourntos, P.Eng**

Sheet:

Residential		
Density - Detached	3.5	p.p.u.
Density - Townhome	2.4	p.p.u.
Density - Medium	180	p.p.ha.
Density - High	300	p.p.ha.

School		
Average Daily Flow	0.35	l/s/100 students
Peaking factor, M	1.50	

SANITARY FLOW

$$M = 1 + \frac{14}{4 + \sqrt{P}} \quad \text{where P in 1000's}$$

$$Q(p) = \frac{P \times q \times M}{86.4} \quad \text{in (l/s)}$$

$$Q(i) = i \times A \quad \text{in (l/s)}$$

$$Q(d) = Q(p) + Q(i) \quad \text{in (l/s)}$$

Street	from M.H.	to M.H.	Developable Area (ha)	No. of Detached Dwellings (Units)	No. of Street Townhomes (Units)	No. of Medium Density (ha.)	No. of High Density (ha.)	Industrial Commercial Institutional (ha.)	Population (person)	Accum. Population P (person)	Peaking Factor M	Industrial Institutional Commercial Flow (l/s)	Peak Flow Q(p) (l/s)	Accum. Area (ha)	Extraneous Flow Q(i) (l/s)	Design Flow Q(d) (l/s)	Pipe Length L (m)	Pipe Diameter d (mm)	Pipe Slope S (%)	Nominal Pipe Full Flow Cap. Q(f), (l/s)	Pipe Full Flow Vel. V(f) (m/s)	Actual Velocity V(a) (m/s)	Q(d) / Q(f)	COMMENTS
FUT. DEV. NORTH COMMERCIAL	PLUG	MH.15AA	20.10	0	0		0	20.100	0	0	2.50	23.12	50.25	20.100	5.63	55.88	50.0	375	0.3%	96.0	0.87	0.90	0.58	
FUT. TOWERHILL PHASE 2 (Residential)	PLUG	MH.15AA	34.66	370	200		3.660	0.000	2873.0	2873.0	3.46	0.00	51.75	34.66	9.70	61.45	50.0	375	0.3%	96.0	0.87	0.92	0.64	
FUT. TOWERHILL PHASE 2 (School)	PLUG	MH.15AA	2.04	0	0		0.000	2.040	0.0	0.0	1.50	2.80	4.20	2.04	0.57	4.77	50.0	375	0.3%	96.0	0.87	0.45	0.05	
FUT. TOWERHILL PHASE 3	PLUG	MH.15AA	7.00	100	75		0.000	0.000	530.0	530.0	3.96	0.00	10.93	7.00	1.96	12.89	50.0	375	0.3%	96.0	0.87	0.61	0.13	
TOTAL FUT. FLOW to EX.MH.15A (N. Developments)	MH.15AA	EX.MH.15A	63.80	470	275		3.660	22.140	3403.0	3403.0	3.40	25.92	114.63	63.80	17.86	132.49	50.0	375	0.3%	96.0	0.87	0.88	1.38	
EX. Municipality&Community (To MH.18A-OLD Criteria)	EX.MH.24A	EX.MH.18A	6.480	0	0		0	6.480	0	0	2.00	0.75	1.50	6.480	1.81	3.31	80.0	200	1.3%	38.0	1.21	0.74	0.09	
EX. FALLIS LINE (To MH 15A-OLD Criteria)	EX.MH.18A	EX.MH.15A	3.150	30	0		0	0.000	78.0	78.0	4.00	0.00	1.63	3.150	0.88	2.51	60.0	200	1.0%	32.8	1.04	0.62	0.08	
EX. TOWERHILL PHASE 1 (To MH.11A-OLD Criteria)	EX.MH.15A	EX.MH.11A	4.970	87	0		0	0.000	226.2	226.20	4.00	0.00	4.71	14.600	4.09	8.80	60.0	375	0.3%	96.0	0.87	0.54	0.09	
TOTAL FLOW TO EX. MH.11A	EX.MH.15A	EX.MH.11A	78.4	587	275		3.660	28.620	3707.2	3707.2	3.36	26.67	120.88	78.4	21.95	142.83	60.0	375	0.3%	96.0	0.87	0.88	1.49	
FUT. SOUTH WEST SUDIVISION	PLUG	MH.11A	32.050	417	153		0	0	1826.7	1826.7	3.62	0.00	34.40	32.050	8.97	43.38	60.0	250	1.0%	59.5	1.21	1.32	0.73	
TOTAL FUT. FLOW TO EX. MH.10A (Highlands Blvd.)	EX.MH.11A	EX.MH.10A	110.5	1004	428		3.660	28.620	5533.9	5533.9	3.20	26.67	148.29	110.5	30.93	179.22	60.0	375	0.3%	96.0	0.87	0.88	1.87	
EX. TOWERHILL PHASE 1 (To MH 5A-OLD Criteria)	EX.MH.11A	EX.MH.5A	17.400	245	0		0	0.000	637.0	637.00	4.00	0.00	13.27	17.400	4.87	18.14	60.0	375	0.3%	96.0	0.87	0.67	0.19	
TOTAL FUTURE FLOW TO EX. MH.1A	EX.MH.5A	EX.MH.1A	127.9	1249	428		3.660	28.620	6170.9	6170.9	3.16	26.67	157.48	127.9	35.80	193.28	60.0	375	2.7%	288.1	2.61	2.80	0.67	
EX.Tupper St./County Road 10 (Old Criteria)	EX.MH.1A	EX.MH.22A	5.260	51	0		0	0	132.6	132.6	4.00	0.00	2.76	5.260	1.47	4.24	50.0	375	0.9%	166.3	1.51	0.64	0.03	
TOTAL FUTURE FLOW TO EX. MH.22A	EX.MH.1A	EX.MH.22A	133.1	1300	428		3.660	28.620	6303.5	6303.5	3.15	26.67	159.38	133.1	37.27	196.65	60.0	375	0.9%	166.3	1.51	1.53	1.18	
EX.Centennial Lane (Old Criteria)	EX.MH.22A	EX.MH.3A	8.130	241	0		0	0	483.6	483.6	4.00	0.00	10.08	8.130	2.28	12.35	50.0	375	0.61%	136.9	1.24	0.77	0.09	
TOTAL FUTURE FLOW TO EX. MH.3A (WEST DEV.)	EX.MH.22A	EX.MH.3A	141.2	1541	428		3.660	28.620	6787.1	6787.1	3.12	26.67	166.22	141.2	39.55	205.77	60.0	375	0.61%	136.9	1.24	1.26	1.50	
FUTURE NORTH EAST SUBDIVISION (NORTH FALLIS LINE	MH200A	MH.300A	47.700	575	1688		0	0	6063.7	6063.7	3.17	0.00	100.00	47.700	13.36	113.36	60.0	375	1.0%	175.3	1.59	1.69	0.65	
EASTCOMMERCIAL (SOUTH FALLIS LINE)	MH.350A	MH.300A	3.11	0	0		0	3.110	0	0	2.50	3.58	7.78	3.110	0.87	8.65	50.0	200	1.0%	32.8	1.04	0.88	0.26	
SOUTH EAST SUBDIVISION (SOUTH FALLIS LINE)	MH.300A	MH.SA-6A	9.520	108	62		0.000	0.000	526.8	6590.5	3.13	0.00	107.50	60.330	16.89	133.04	60.0	375	1.0%	175.3	1.59	1.75	0.76	
FUTURE SUBDIVISION (BY OTHERS)	MH.SA-6A	EX.MH.3A	1.720	33	0		0.000	0.000	115.5	6706.0	3.12	0.00	109.13	62.050	17.37	135.15	60.0	375	1.0%	175.3	1.59	1.75	0.77	

No.	REVISION	DATE	AUTH
2.000			
1.000			

Township of Cavan Monaghan
Engineering and Public Works Department

SANITARY SEWER DESIGN SHEET

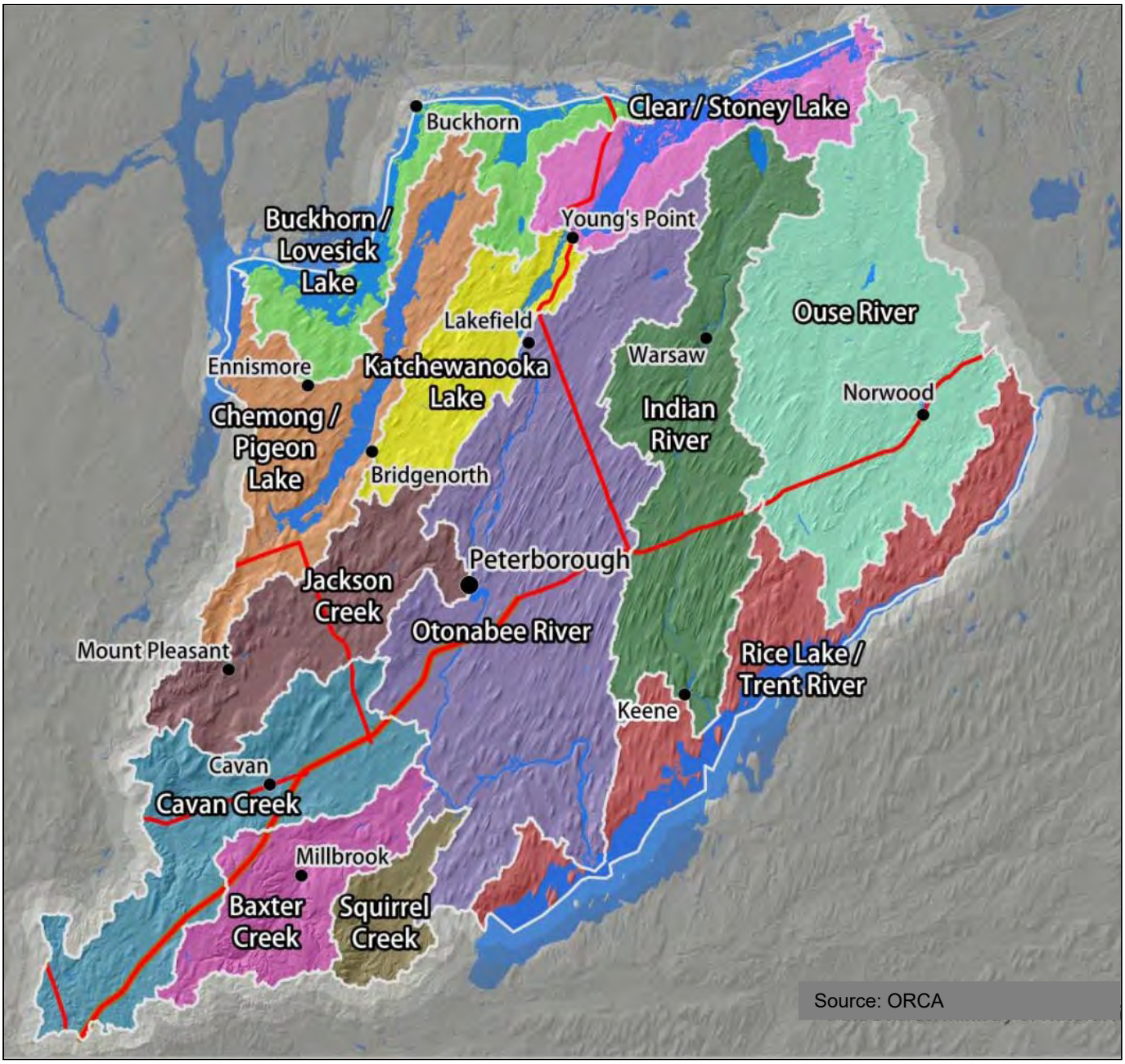
SCALE: N.T.S.

DRAWN BY: DWG.

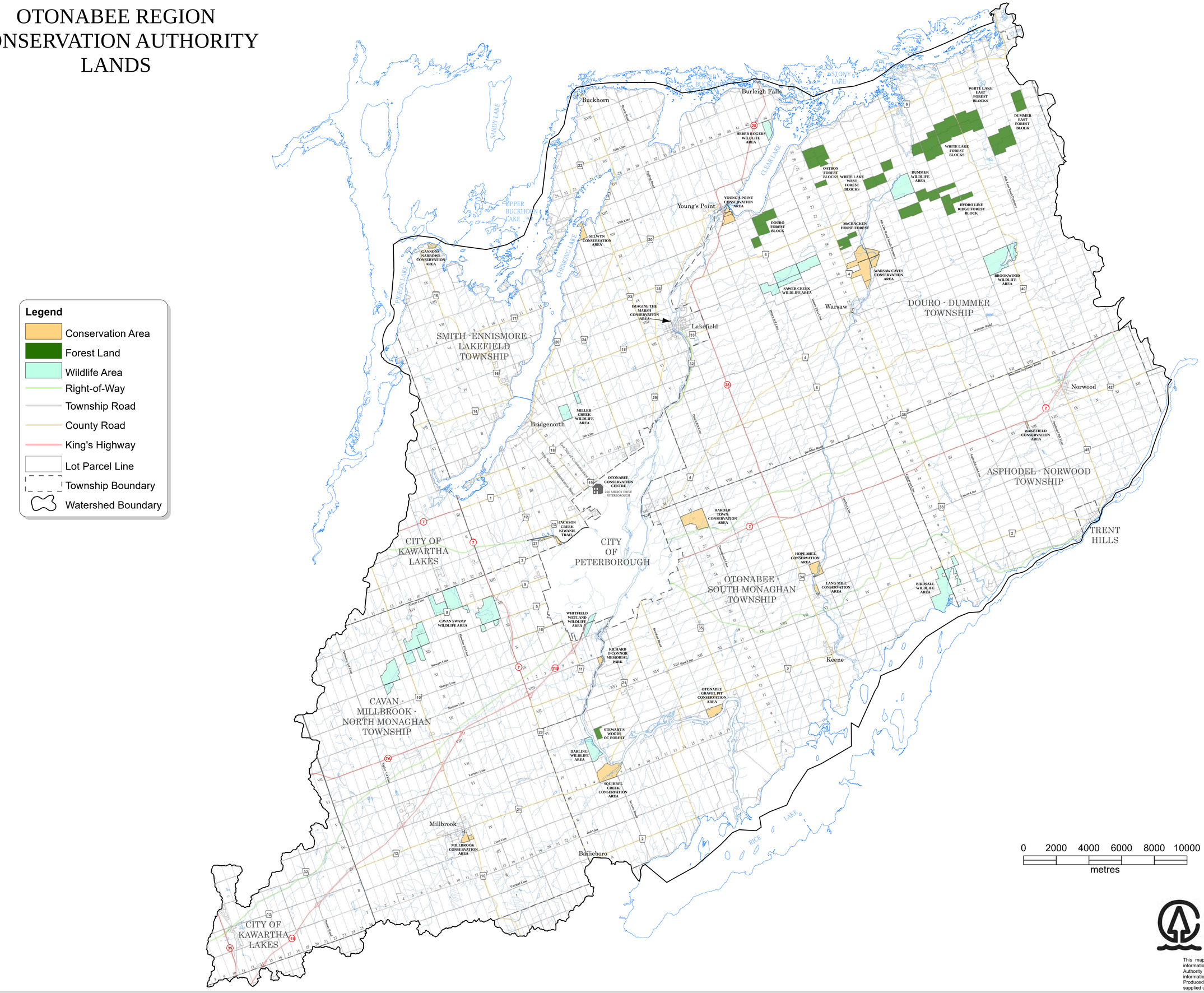
APPENDIX "D"

Storm Drainage Details

VALDOR


Buckhorn
Clear / Stoney Lake
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



OTONABEE CONSERVATION

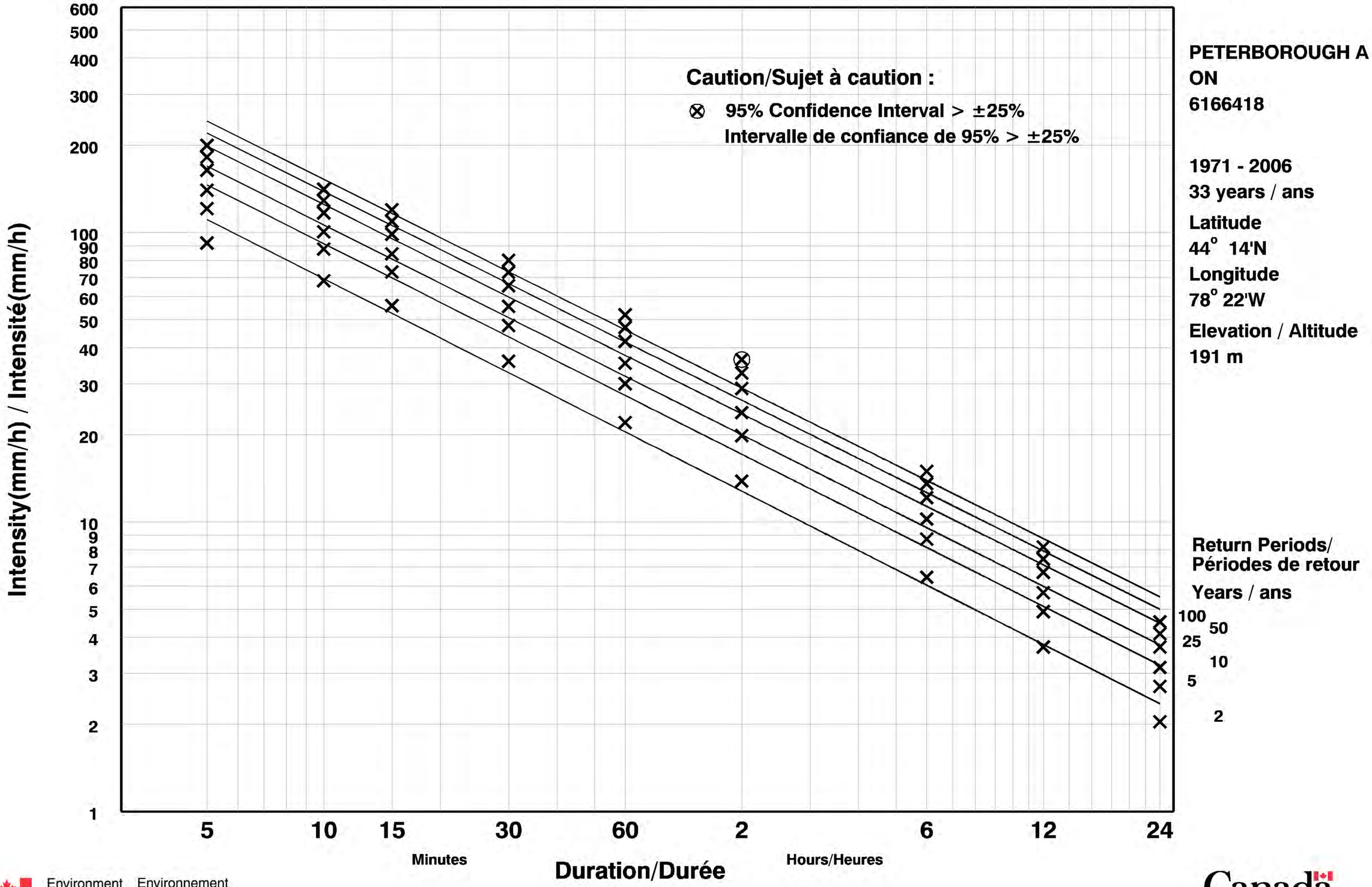
May 2010

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

Short Duration Rainfall Intensity-Duration-Frequency Data

2014/12/21

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



PETERBOROUGH A
ON
6166418

1971 - 2006
33 years / ans

Latitude
44° 14'N
Longitude
78° 22'W
Elevation / Altitude
191 m

Environment Canada Environnement Canada

Canada

Intensity Duration Frequency Statistics for Peterborough

Location - Peterborough Airport 2014 Data

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

Tc = Time of Concentration

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

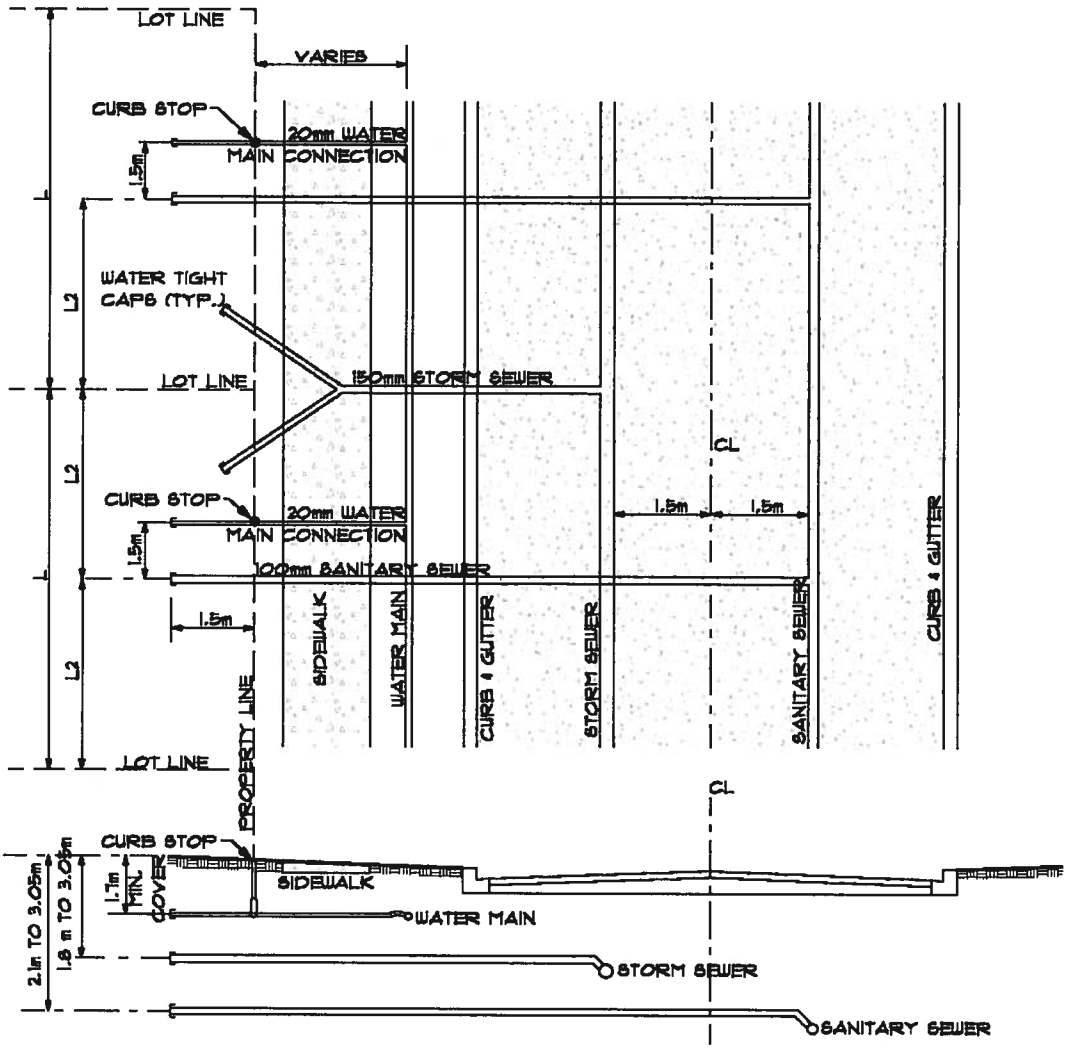
5 Year Return Period		
a	b	c
843.799	7.500	0.783
Duration	**Intensity**	
5	121.0	
10	87.7	
15	73.1	
30	47.8	
60	30.1	
120	19.9	
360	8.7	
720	4.9	
1440	2.7	

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

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

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

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



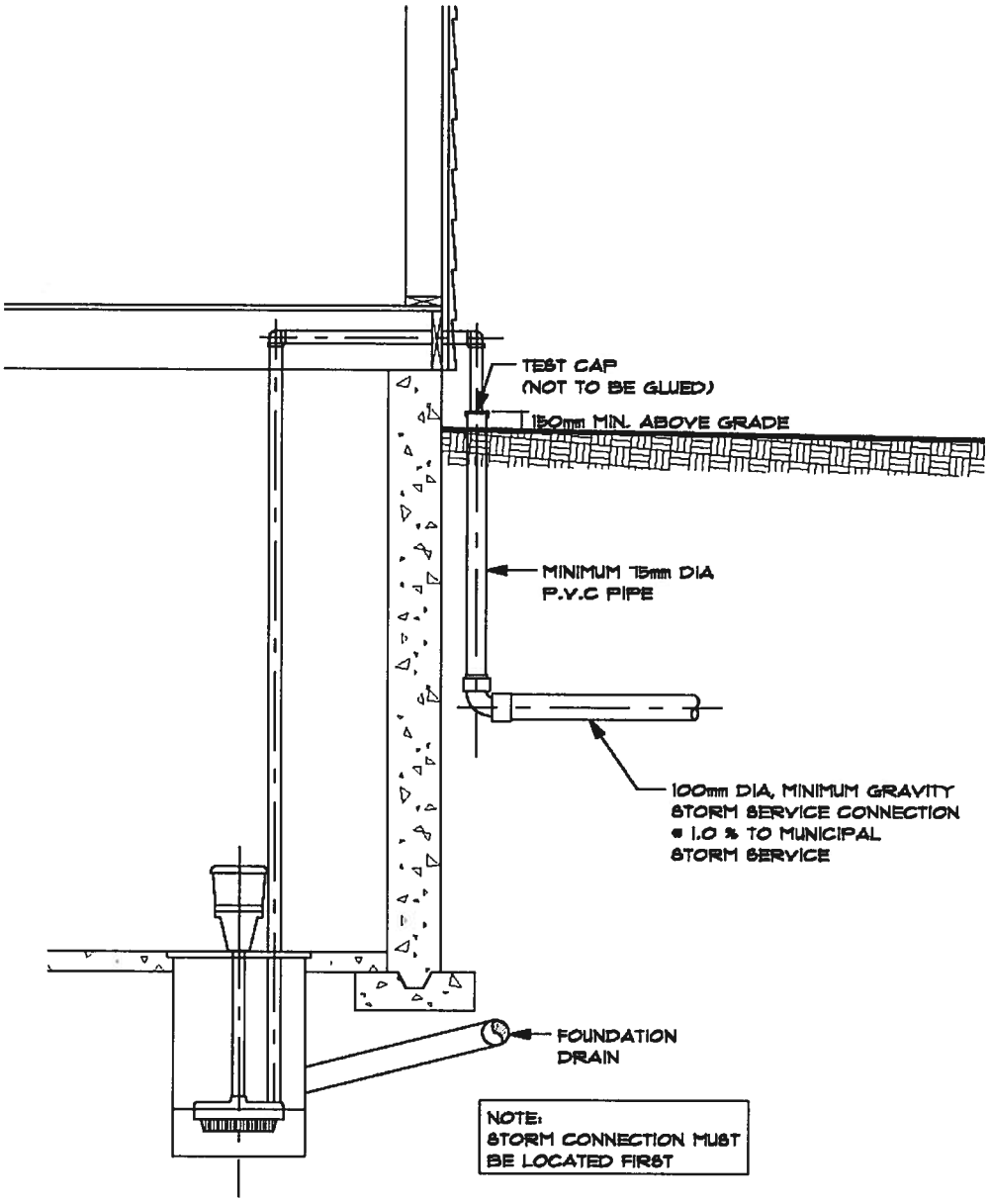
NOTES:
1. WATERTIGHT CAPS ON ALL SERVICES.
2. ALL DIMENSIONS SHOWN ARE CENTRE TO CENTRE.
3. STORM PIPE MATERIALS IS TO BE PVC SDR 28 AND WHITE IN COLOUR
4. L = FRONTAGE OF ONE UNIT

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

SCALE: NOT TO SCALE

DATE: AUGUST 2013

STD. S2

APPENDIX "E"

Flood Plain Analysis

VALDOR

VALDOR ENGINEERING INC.
File: 19121
Date: December 2022

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

Catchment	Area (ha)	VO5 Routine	TIMP	XIMP	CN II	CN*	IA (mm)	Tp (hr)
401	28.90	StandHyd	0.60	0.45	61	53	5.0	-
402	15.49	NasHyd	-	-	62	58	8.6	0.31
403	23.90	NasHyd	-	-	63	59	8.0	0.36
Total	**68.29**							

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

Catchment	Area (ha)	VO5 Routine	TIMP	XIMP	CN II	CN*	IA (mm)	Tp (hr)
401	28.90	StandHyd	0.60	0.45	61	53	5.0	-
402	15.49	NasHyd	-	-	62	58	8.6	0.31
403A	10.32	NasHyd	-	-	59	53	7.3	0.25
403B	4.74	NasHyd	-	-	55	48	9.8	0.27
201	6.68	StandHyd	0.70	0.60	61	53	5.0	-
202	4.80	StandHyd	0.60	0.45	61	53	5.0	-
203	1.39	StandHyd	0.50	0.50	61	53	5.0	-
204	3.12	StandHyd	0.50	0.30	61	53	5.0	-
Total	**75.44**							

VALDOR ENGINEERING INC.
File: 19121
Date: December 2022

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

Catchment	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)						
		Forest (HSG 'B')	12.64	55		**10**		0.30	
		Meadow (HSG 'B')	0.00	58		**8**		0.40	
402	15.49	Row Crops (HSG 'B')	0.00	81	**62**	**7**	**8.6**	0.65	**0.39**
		Open Space (HSG 'B')	0.55	61		**5**		0.25	
		Other Impervious	2.30	98		**2**		0.95	
		Forest (HSG 'B')	9.16	55		**10**		0.30	
		Meadow (HSG 'B')	5.60	58		**8**		0.40	
403	23.90	Row Crops (HSG 'B')	5.99	75	**63**	**7**	**8.0**	0.65	**0.43**
		Open Space (HSG 'B')	2.36	61		**5**		0.25	
		Other Impervious	0.79	98		**2**		0.95	
		Forest (HSG 'B')	3.80	55		**10**		0.30	
		Meadow (HSG 'B')	1.87	58		**8**		0.40	
403A	10.32	Row Crops (HSG 'B')	0.00	81	**59**	**7**	**7.3**	0.65	**0.31**
		Open Space (HSG 'B')	4.39	61		**5**		0.25	
		Other Impervious	0.26	98		**2**		0.95	
		Forest (HSG 'B')	4.20	55		**10**		0.30	
		Meadow (HSG 'B')	0.54	58		**8**		0.40	
403B	4.74	Row Crops (HSG 'B')	0.00	81	**55**	**7**	**9.8**	0.65	**0.31**
		Open Space (HSG 'B')	0.00	61		**5**		0.25	
		Other Impervious	0.00	98		**2**		0.95	

VALDOR ENGINEERING INC.
File: 19121
Date: December 2022

Table E.4: Calculation of Time to Peak - Floodplain

Catchment	A Area (ha)	C Runoff Coefficient (Area Weighted)	L (m) Catchment Length	Highest Elevation (m)	Lowest Elevation (m)	S (%) Catchment Slope	[1,2]T_c Method	T_c (min)	[1,2]T_p (hr)
402	15.49	0.39	830.0	247.00	218.00	3.49	Airport	28.0	0.31
403	23.90	0.43	725.0	255.00	209.50	6.28	Bransby-Williams	32.2	0.36
403A	10.32	0.31	350.0	245.00	209.50	10.14	Airport	22.3	0.25
403B	4.74	0.31	360.0	240.00	209.50	8.47	Airport	24.1	0.27

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

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

$T_P = 0.67 T_c$

3) T_p for Catchment 403A is a combination of uplands method along the road ditch and overland flow for the rest of catchment

VALDOR ENGINEERING INC.
File: 19121
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Table E.5: HEC-RAS Output - Pre-Development

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Watercourse	17	Regional	5.19	215.00	215.63		215.73	0.008964	1.40	3.90	13.46	0.73
Watercourse	16	Regional	5.19	214.60	215.41		215.48	0.004404	1.35	7.45	27.24	0.55
Watercourse	15	Regional	5.19	214.20	215.08	215.08	215.25	0.010378	1.96	4.24	17.79	0.82
Watercourse	14	Regional	5.19	213.80	214.68	214.68	214.87	0.009938	2.21	4.58	14.73	0.82
Watercourse	13	Regional	5.19	213.60	214.38	214.38	214.58	0.011501	2.11	3.76	12.36	0.87
Watercourse	12	Regional	5.19	213.20	213.95	213.95	214.11	0.008896	1.92	5.34	26.72	0.76
Watercourse	11	Regional	5.19	213.00	213.69		213.77	0.004118	1.39	6.38	16.62	0.54
Watercourse	10	Regional	5.19	212.60	213.36	213.36	213.57	0.011143	2.35	4.40	14.13	0.87
Watercourse	9	Regional	5.19	211.80	212.40	212.36	212.56	0.009200	1.88	4.33	13.99	0.79
Watercourse	8	Regional	5.19	211.40	212.07	212.07	212.26	0.010621	2.04	3.71	12.50	0.82
Watercourse	7	Regional	5.19	211.00	211.59	211.59	211.71	0.009557	1.82	6.05	25.63	0.77
Watercourse	6	Regional	5.19	210.20	210.97	210.97	211.10	0.011112	2.17	6.03	22.42	0.82
Watercourse	5	Regional	5.19	210.00	210.59	210.59	210.76	0.010750	2.00	4.53	16.34	0.84
Watercourse	4	Regional	5.19	209.40	210.10	210.06	210.26	0.009256	1.82	4.07	14.03	0.77
Watercourse	3	Regional	5.19	209.20	209.90	209.90	210.06	0.010445	2.03	5.10	19.76	0.81
Watercourse	2	Regional	5.19	209.00	209.55	209.55	209.67	0.011322	1.94	6.29	27.62	0.85
Watercourse	1	Regional	5.19	208.80	209.16	209.16	209.22	0.022181	1.96	7.78	48.67	1.08

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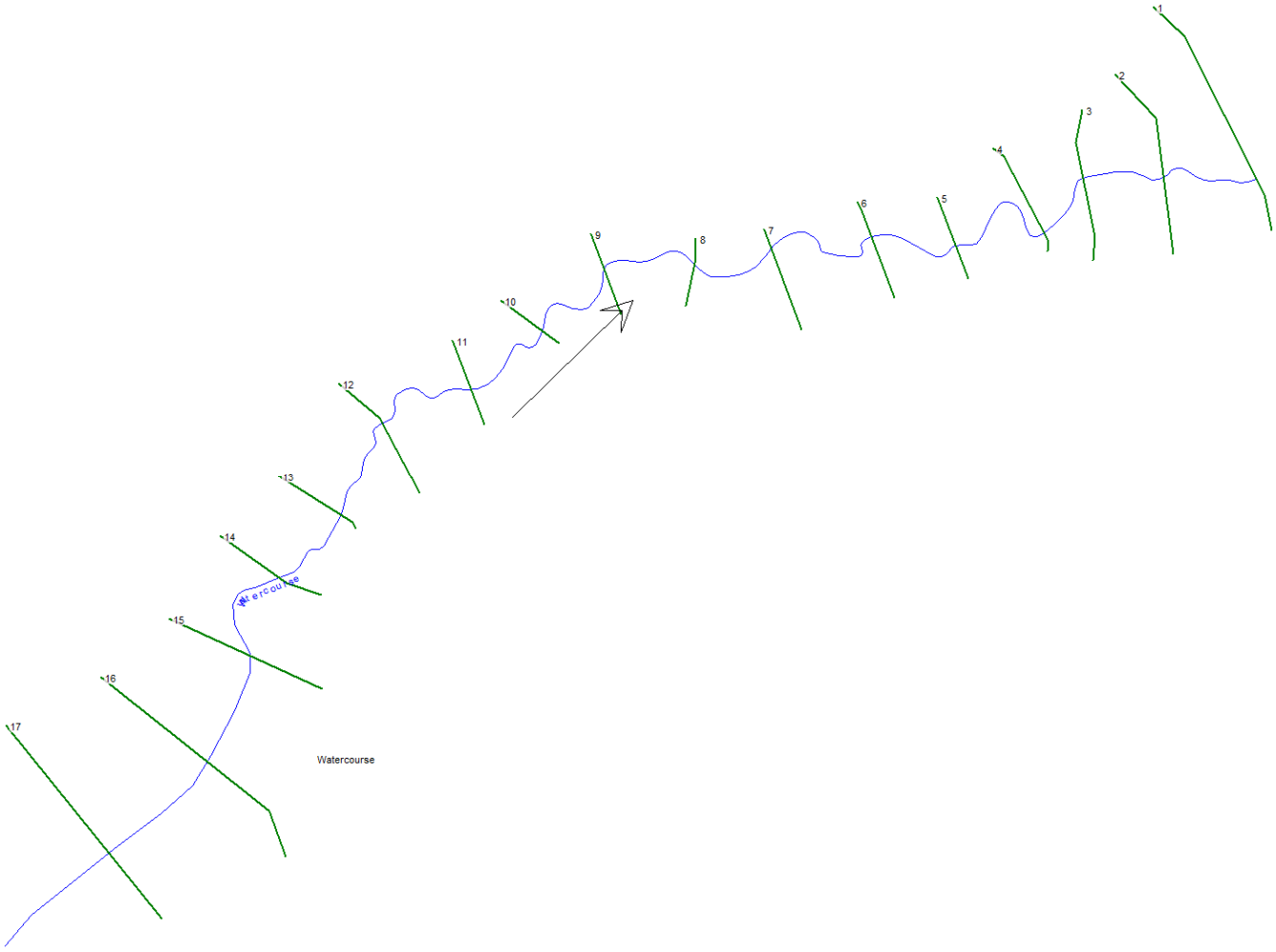
Date: December 2022

Table E.6: HEC-RAS Output - Post-Development

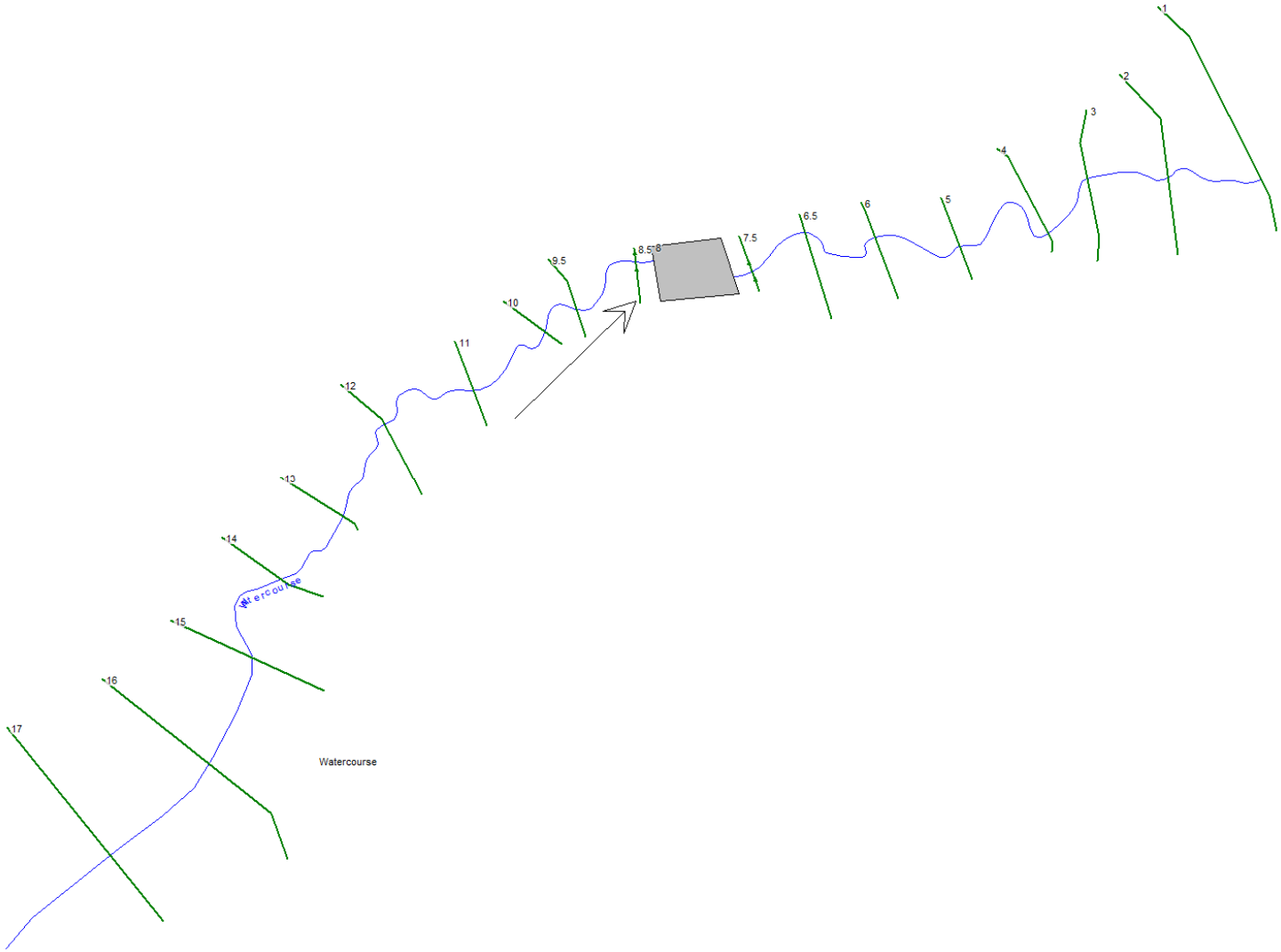
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Watercourse	17	Regional	6.01	215.00	215.66	215.59	215.77	0.008860	1.48	4.39	14.49	0.74
Watercourse	16	Regional	6.01	214.60	215.45		215.52	0.004419	1.41	8.60	29.47	0.56
Watercourse	15	Regional	6.01	214.20	215.12	215.12	215.30	0.009805	2.01	5.16	20.05	0.81
Watercourse	14	Regional	6.01	213.80	214.72	214.72	214.92	0.010056	2.31	5.29	16.01	0.83
Watercourse	13	Regional	6.01	213.60	214.43	214.43	214.63	0.011067	2.18	4.41	13.36	0.86
Watercourse	12	Regional	6.01	213.20	214.01	214.01	214.15	0.007452	1.86	7.12	31.72	0.71
Watercourse	11	Regional	6.01	213.00	213.72		213.81	0.004584	1.51	6.91	17.13	0.57
Watercourse	10	Regional	6.01	212.60	213.44	213.44	213.62	0.009057	2.26	5.62	15.74	0.80
Watercourse	9.5	Regional	6.01	211.99	213.23		213.24	0.000395	0.59	14.78	20.33	0.18
Watercourse	8.5	Regional	6.01	211.80	213.13	212.55	213.21	0.001597	1.28	5.76	12.75	0.36
Watercourse	8		Culvert									
Watercourse	7.5	Regional	6.01	211.20	211.92	211.92	212.21	0.014143	2.51	2.87	14.01	0.97
Watercourse	6.5	Regional	6.01	210.79	211.35		211.44	0.010031	1.79	7.17	22.22	0.79
Watercourse	6	Regional	6.01	210.20	211.00	211.00	211.14	0.011200	2.25	6.83	23.58	0.83
Watercourse	5	Regional	6.01	210.00	210.63	210.63	210.80	0.010585	2.07	5.22	17.04	0.85
Watercourse	4	Regional	6.01	209.40	210.14	210.11	210.31	0.009903	1.95	4.55	14.94	0.80
Watercourse	3	Regional	6.01	209.20	209.94	209.94	210.10	0.010264	2.10	5.97	21.60	0.81
Watercourse	2	Regional	6.01	209.00	209.58	209.58	209.70	0.011723	2.04	7.08	29.18	0.87
Watercourse	1	Regional	6.01	208.80	209.17	209.17	209.24	0.022654	2.05	8.54	48.98	1.10

Valdor Engineering Inc.
File: 19121
Date: March 2022

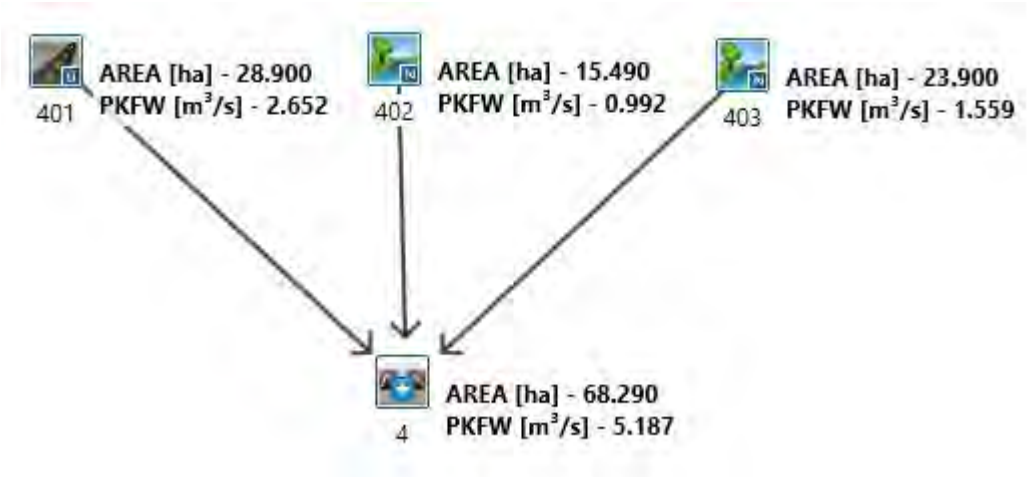


HEC-RAS Model Schematic – Pre-Development

Valdor Engineering Inc.
File: 19121
Date: March 2022



HEC-RAS Model Schematic – Post-Development



VO Model Schematic – Pre-Development Floodplain Drainage Area

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       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 *****


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DATE: 12-15-2022                          TIME: 08:57:05

USER:

COMMENTS: _____________________________________________________________

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  ** SIMULATION : timmins                       **
  ************************************************

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|                  |              ata\Local\Temp\
|                  |              8014f013-34b5-4ed2-bda3-2c74c3695642\e6aa533a
| Ptotal=193.00 mm |    Comments: timmins
--------------------
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                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.00   15.00 |  3.00    3.00 |  6.00   43.00 |  9.00   13.00
                0.25   15.00 |  3.25    3.00 |  6.25   43.00 |  9.25   13.00
                0.50   15.00 |  3.50    3.00 |  6.50   43.00 |  9.50   13.00
                0.75   15.00 |  3.75    3.00 |  6.75   43.00 |  9.75   13.00
                1.00   20.00 |  4.00    5.00 |  7.00   20.00 | 10.00   13.00
                1.25   20.00 |  4.25    5.00 |  7.25   20.00 | 10.25   13.00
                1.50   20.00 |  4.50    5.00 |  7.50   20.00 | 10.50   13.00
                1.75   20.00 |  4.75    5.00 |  7.75   20.00 | 10.75   13.00
                2.00   10.00 |  5.00   20.00 |  8.00   23.00 | 11.00    8.00
                2.25   10.00 |  5.25   20.00 |  8.25   23.00 | 11.25    8.00
                2.50   10.00 |  5.50   20.00 |  8.50   23.00 | 11.50    8.00
                2.75   10.00 |  5.75   20.00 |  8.75   23.00 | 11.75    8.00

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-------------------
| CALIB           |
| NASHYD   (  0402)|   Area    (ha)=  15.49   Curve Number   (CN)= 58.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.60   # of Linear Res.(N)= 3.00
-------------------   U.H. Tp(hrs)=   0.31

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	15.00	3.083	3.00	6.083	43.00	9.08	13.00
0.167	15.00	3.167	3.00	6.167	43.00	9.17	13.00
0.250	15.00	3.250	3.00	6.250	43.00	9.25	13.00
0.333	15.00	3.333	3.00	6.333	43.00	9.33	13.00
0.417	15.00	3.417	3.00	6.417	43.00	9.42	13.00
0.500	15.00	3.500	3.00	6.500	43.00	9.50	13.00
0.583	15.00	3.583	3.00	6.583	43.00	9.58	13.00
0.667	15.00	3.667	3.00	6.667	43.00	9.67	13.00
0.750	15.00	3.750	3.00	6.750	43.00	9.75	13.00
0.833	15.00	3.833	3.00	6.833	43.00	9.83	13.00
0.917	15.00	3.917	3.00	6.917	43.00	9.92	13.00
1.000	15.00	4.000	3.00	7.000	43.00	10.00	13.00
1.083	20.00	4.083	5.00	7.083	20.00	10.08	13.00
1.167	20.00	4.167	5.00	7.167	20.00	10.17	13.00
1.250	20.00	4.250	5.00	7.250	20.00	10.25	13.00
1.333	20.00	4.333	5.00	7.333	20.00	10.33	13.00
1.417	20.00	4.417	5.00	7.417	20.00	10.42	13.00
1.500	20.00	4.500	5.00	7.500	20.00	10.50	13.00
1.583	20.00	4.583	5.00	7.583	20.00	10.58	13.00
1.667	20.00	4.667	5.00	7.667	20.00	10.67	13.00
1.750	20.00	4.750	5.00	7.750	20.00	10.75	13.00
1.833	20.00	4.833	5.00	7.833	20.00	10.83	13.00
1.917	20.00	4.917	5.00	7.917	20.00	10.92	13.00
2.000	20.00	5.000	5.00	8.000	20.00	11.00	13.00
2.083	10.00	5.083	20.00	8.083	23.00	11.08	8.00
2.167	10.00	5.167	20.00	8.167	23.00	11.17	8.00
2.250	10.00	5.250	20.00	8.250	23.00	11.25	8.00
2.333	10.00	5.333	20.00	8.333	23.00	11.33	8.00
2.417	10.00	5.417	20.00	8.417	23.00	11.42	8.00
2.500	10.00	5.500	20.00	8.500	23.00	11.50	8.00
2.583	10.00	5.583	20.00	8.583	23.00	11.58	8.00
2.667	10.00	5.667	20.00	8.667	23.00	11.67	8.00
2.750	10.00	5.750	20.00	8.750	23.00	11.75	8.00
2.833	10.00	5.833	20.00	8.833	23.00	11.83	8.00
2.917	10.00	5.917	20.00	8.917	23.00	11.92	8.00
3.000	10.00	6.000	20.00	9.000	23.00	12.00	8.00

```
     Unit Hyd Qpeak  (cms)=   1.909

     PEAK FLOW       (cms)=   0.992 (i)
     TIME TO PEAK    (hrs)=   7.000
     RUNOFF VOLUME    (mm)=  92.286
     TOTAL RAINFALL   (mm)= 193.000
     RUNOFF COEFFICIENT   =   0.478

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

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-------------------
| CALIB           |
| NASHYD   (  0403)|   Area    (ha)=  23.90   Curve Number   (CN)= 59.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
-------------------   U.H. Tp(hrs)=   0.36

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	15.00	3.083	3.00	6.083	43.00	9.08	13.00
0.167	15.00	3.167	3.00	6.167	43.00	9.17	13.00
0.250	15.00	3.250	3.00	6.250	43.00	9.25	13.00
0.333	15.00	3.333	3.00	6.333	43.00	9.33	13.00
0.417	15.00	3.417	3.00	6.417	43.00	9.42	13.00

0.500	15.00	3.500	3.00	6.500	43.00	9.50	13.00
0.583	15.00	3.583	3.00	6.583	43.00	9.58	13.00
0.667	15.00	3.667	3.00	6.667	43.00	9.67	13.00
0.750	15.00	3.750	3.00	6.750	43.00	9.75	13.00
0.833	15.00	3.833	3.00	6.833	43.00	9.83	13.00
0.917	15.00	3.917	3.00	6.917	43.00	9.92	13.00
1.000	15.00	4.000	3.00	7.000	43.00	10.00	13.00
1.083	20.00	4.083	5.00	7.083	20.00	10.08	13.00
1.167	20.00	4.167	5.00	7.167	20.00	10.17	13.00
1.250	20.00	4.250	5.00	7.250	20.00	10.25	13.00
1.333	20.00	4.333	5.00	7.333	20.00	10.33	13.00
1.417	20.00	4.417	5.00	7.417	20.00	10.42	13.00
1.500	20.00	4.500	5.00	7.500	20.00	10.50	13.00
1.583	20.00	4.583	5.00	7.583	20.00	10.58	13.00
1.667	20.00	4.667	5.00	7.667	20.00	10.67	13.00
1.750	20.00	4.750	5.00	7.750	20.00	10.75	13.00
1.833	20.00	4.833	5.00	7.833	20.00	10.83	13.00
1.917	20.00	4.917	5.00	7.917	20.00	10.92	13.00
2.000	20.00	5.000	5.00	8.000	20.00	11.00	13.00
2.083	10.00	5.083	20.00	8.083	23.00	11.08	8.00
2.167	10.00	5.167	20.00	8.167	23.00	11.17	8.00
2.250	10.00	5.250	20.00	8.250	23.00	11.25	8.00
2.333	10.00	5.333	20.00	8.333	23.00	11.33	8.00
2.417	10.00	5.417	20.00	8.417	23.00	11.42	8.00
2.500	10.00	5.500	20.00	8.500	23.00	11.50	8.00
2.583	10.00	5.583	20.00	8.583	23.00	11.58	8.00
2.667	10.00	5.667	20.00	8.667	23.00	11.67	8.00
2.750	10.00	5.750	20.00	8.750	23.00	11.75	8.00
2.833	10.00	5.833	20.00	8.833	23.00	11.83	8.00
2.917	10.00	5.917	20.00	8.917	23.00	11.92	8.00
3.000	10.00	6.000	20.00	9.000	23.00	12.00	8.00

Unit Hyd Qpeak (cms)= 2.536

PEAK FLOW (cms)= 1.559 (i)
TIME TO PEAK (hrs)= 7.083
RUNOFF VOLUME (mm)= 96.945
TOTAL RAINFALL (mm)= 193.000
RUNOFF COEFFICIENT = 0.502

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

CALIB	
STANDHYD (0401)	Area (ha)= 28.90
ID= 1 DT= 5.0 min	Total Imp(%)= 60.00 Dir. Conn.(%)= 45.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	17.34	11.56
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	2.00	2.00
Length	(m)=	438.94	40.00
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	15.00	3.083	3.00	6.083	43.00	9.08	13.00
0.167	15.00	3.167	3.00	6.167	43.00	9.17	13.00
0.250	15.00	3.250	3.00	6.250	43.00	9.25	13.00
0.333	15.00	3.333	3.00	6.333	43.00	9.33	13.00
0.417	15.00	3.417	3.00	6.417	43.00	9.42	13.00
0.500	15.00	3.500	3.00	6.500	43.00	9.50	13.00
0.583	15.00	3.583	3.00	6.583	43.00	9.58	13.00
0.667	15.00	3.667	3.00	6.667	43.00	9.67	13.00
0.750	15.00	3.750	3.00	6.750	43.00	9.75	13.00
0.833	15.00	3.833	3.00	6.833	43.00	9.83	13.00
0.917	15.00	3.917	3.00	6.917	43.00	9.92	13.00
1.000	15.00	4.000	3.00	7.000	43.00	10.00	13.00
1.083	20.00	4.083	5.00	7.083	20.00	10.08	13.00
1.167	20.00	4.167	5.00	7.167	20.00	10.17	13.00
1.250	20.00	4.250	5.00	7.250	20.00	10.25	13.00
1.333	20.00	4.333	5.00	7.333	20.00	10.33	13.00
1.417	20.00	4.417	5.00	7.417	20.00	10.42	13.00
1.500	20.00	4.500	5.00	7.500	20.00	10.50	13.00
1.583	20.00	4.583	5.00	7.583	20.00	10.58	13.00
1.667	20.00	4.667	5.00	7.667	20.00	10.67	13.00
1.750	20.00	4.750	5.00	7.750	20.00	10.75	13.00
1.833	20.00	4.833	5.00	7.833	20.00	10.83	13.00
1.917	20.00	4.917	5.00	7.917	20.00	10.92	13.00
2.000	20.00	5.000	5.00	8.000	20.00	11.00	13.00
2.083	10.00	5.083	20.00	8.083	23.00	11.08	8.00
2.167	10.00	5.167	20.00	8.167	23.00	11.17	8.00
2.250	10.00	5.250	20.00	8.250	23.00	11.25	8.00
2.333	10.00	5.333	20.00	8.333	23.00	11.33	8.00
2.417	10.00	5.417	20.00	8.417	23.00	11.42	8.00
2.500	10.00	5.500	20.00	8.500	23.00	11.50	8.00
2.583	10.00	5.583	20.00	8.583	23.00	11.58	8.00
2.667	10.00	5.667	20.00	8.667	23.00	11.67	8.00
2.750	10.00	5.750	20.00	8.750	23.00	11.75	8.00
2.833	10.00	5.833	20.00	8.833	23.00	11.83	8.00
2.917	10.00	5.917	20.00	8.917	23.00	11.92	8.00
3.000	10.00	6.000	20.00	9.000	23.00	12.00	8.00

			TOTALS
Max.Eff.Inten.(mm/hr)=	43.00	37.48	
over (min)	5.00	20.00	
Storage Coeff. (min)=	7.06 (ii)	17.52 (ii)	
Unit Hyd. Tpeak (min)=	5.00	20.00	
Unit Hyd. peak (cms)=	0.17	0.06	
PEAK FLOW (cms)=	1.55	1.10	2.652 (iii)
TIME TO PEAK (hrs)=	7.00	7.00	7.00
RUNOFF VOLUME (mm)=	191.00	101.53	141.79
TOTAL RAINFALL (mm)=	193.00	193.00	193.00
RUNOFF COEFFICIENT =	0.99	0.53	0.73

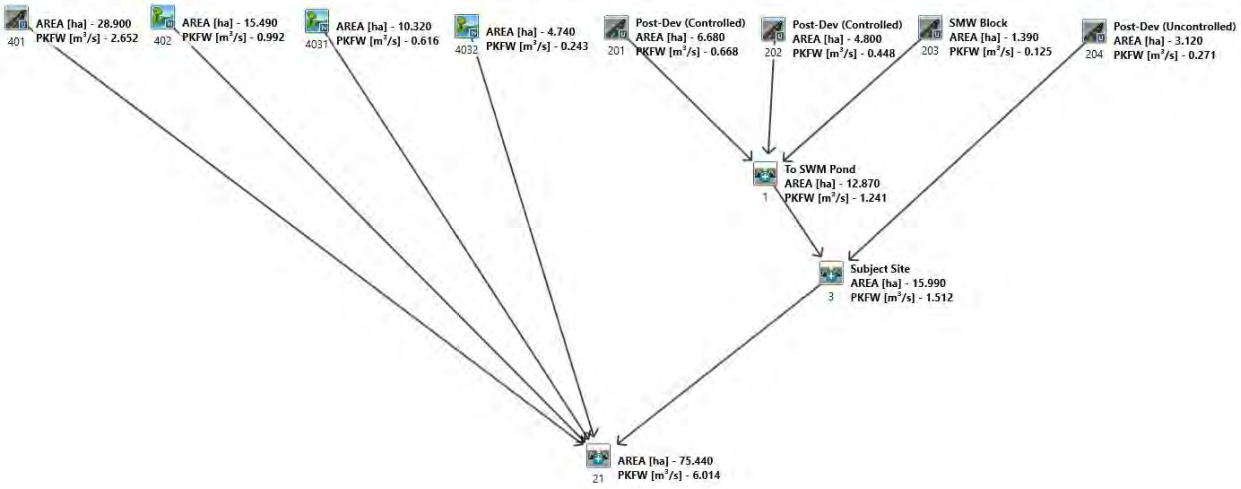
(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 53.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0004)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0401):	28.90	2.652	7.00	141.79
+ ID2= 2 (0402):	15.49	0.992	7.00	92.29
ID = 3 (0004):	44.39	3.644	7.00	124.52

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0004)				
3 + 2 = 1	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 3 (0004):	44.39	3.644	7.00	124.52
+ ID2= 2 (0403):	23.90	1.559	7.08	96.95
ID = 1 (0004):	68.29	5.187	7.00	114.87

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.



VO Model Schematic – Post-Development Floodplain Drainage Area

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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\531e1913-0e12-4e2e-9684-
e2ef03acaa05\208daafe-36d4-4518-98d6-47f6b0b7ec8b\scena
  Summary filename: C:\Users\Valdor\AppData\Local\Civica\VH5\531e1913-0e12-4e2e-9684-
e2ef03acaa05\208daafe-36d4-4518-98d6-47f6b0b7ec8b\scena


DATE: 12-16-2022                          TIME: 01:58:58

USER:



COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------------------------
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  ************************************************
  ** SIMULATION : timmins                       **
  ************************************************


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|    READ STORM    |    Filename: C:\Users\Valdor\AppD
|                  |              ata\Local\Temp\
|                  |              d0794a59-6f39-4ca5-8d32-0e85e28df7db\e6aa533a
| Ptotal=193.00 mm |    Comments: timmins
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.00   15.00 |  3.00    3.00 |  6.00   43.00 |  9.00   13.00
                0.25   15.00 |  3.25    3.00 |  6.25   43.00 |  9.25   13.00
                0.50   15.00 |  3.50    3.00 |  6.50   43.00 |  9.50   13.00
                0.75   15.00 |  3.75    3.00 |  6.75   43.00 |  9.75   13.00
                1.00   20.00 |  4.00    5.00 |  7.00   20.00 | 10.00   13.00
                1.25   20.00 |  4.25    5.00 |  7.25   20.00 | 10.25   13.00
                1.50   20.00 |  4.50    5.00 |  7.50   20.00 | 10.50   13.00
                1.75   20.00 |  4.75    5.00 |  7.75   20.00 | 10.75   13.00
                2.00   10.00 |  5.00   20.00 |  8.00   23.00 | 11.00    8.00
                2.25   10.00 |  5.25   20.00 |  8.25   23.00 | 11.25    8.00
                2.50   10.00 |  5.50   20.00 |  8.50   23.00 | 11.50    8.00
                2.75   10.00 |  5.75   20.00 |  8.75   23.00 | 11.75    8.00

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| CALIB            |
| NASHYD   (  0402)|   Area    (ha)=  15.49   Curve Number   (CN)= 58.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.60   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.31

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


                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083   15.00 | 3.083    3.00 | 6.083   43.00 |  9.08   13.00
               0.167   15.00 | 3.167    3.00 | 6.167   43.00 |  9.17   13.00
               0.250   15.00 | 3.250    3.00 | 6.250   43.00 |  9.25   13.00
               0.333   15.00 | 3.333    3.00 | 6.333   43.00 |  9.33   13.00
               0.417   15.00 | 3.417    3.00 | 6.417   43.00 |  9.42   13.00
               0.500   15.00 | 3.500    3.00 | 6.500   43.00 |  9.50   13.00
               0.583   15.00 | 3.583    3.00 | 6.583   43.00 |  9.58   13.00
               0.667   15.00 | 3.667    3.00 | 6.667   43.00 |  9.67   13.00
               0.750   15.00 | 3.750    3.00 | 6.750   43.00 |  9.75   13.00
               0.833   15.00 | 3.833    3.00 | 6.833   43.00 |  9.83   13.00
               0.917   15.00 | 3.917    3.00 | 6.917   43.00 |  9.92   13.00
               1.000   15.00 | 4.000    3.00 | 7.000   43.00 | 10.00   13.00
               1.083   20.00 | 4.083    5.00 | 7.083   20.00 | 10.08   13.00
               1.167   20.00 | 4.167    5.00 | 7.167   20.00 | 10.17   13.00
               1.250   20.00 | 4.250    5.00 | 7.250   20.00 | 10.25   13.00
               1.333   20.00 | 4.333    5.00 | 7.333   20.00 | 10.33   13.00
               1.417   20.00 | 4.417    5.00 | 7.417   20.00 | 10.42   13.00
               1.500   20.00 | 4.500    5.00 | 7.500   20.00 | 10.50   13.00
               1.583   20.00 | 4.583    5.00 | 7.583   20.00 | 10.58   13.00
               1.667   20.00 | 4.667    5.00 | 7.667   20.00 | 10.67   13.00
               1.750   20.00 | 4.750    5.00 | 7.750   20.00 | 10.75   13.00
               1.833   20.00 | 4.833    5.00 | 7.833   20.00 | 10.83   13.00
               1.917   20.00 | 4.917    5.00 | 7.917   20.00 | 10.92   13.00
               2.000   20.00 | 5.000    5.00 | 8.000   20.00 | 11.00   13.00
               2.083   10.00 | 5.083   20.00 | 8.083   23.00 | 11.08    8.00
               2.167   10.00 | 5.167   20.00 | 8.167   23.00 | 11.17    8.00
               2.250   10.00 | 5.250   20.00 | 8.250   23.00 | 11.25    8.00
               2.333   10.00 | 5.333   20.00 | 8.333   23.00 | 11.33    8.00
               2.417   10.00 | 5.417   20.00 | 8.417   23.00 | 11.42    8.00
               2.500   10.00 | 5.500   20.00 | 8.500   23.00 | 11.50    8.00
               2.583   10.00 | 5.583   20.00 | 8.583   23.00 | 11.58    8.00
               2.667   10.00 | 5.667   20.00 | 8.667   23.00 | 11.67    8.00
               2.750   10.00 | 5.750   20.00 | 8.750   23.00 | 11.75    8.00
               2.833   10.00 | 5.833   20.00 | 8.833   23.00 | 11.83    8.00
               2.917   10.00 | 5.917   20.00 | 8.917   23.00 | 11.92    8.00
               3.000   10.00 | 6.000   20.00 | 9.000   23.00 | 12.00    8.00

     Unit Hyd Qpeak  (cms)=   1.909

     PEAK FLOW       (cms)=   0.992 (i)
     TIME TO PEAK    (hrs)=   7.000
     RUNOFF VOLUME    (mm)=  92.286
     TOTAL RAINFALL   (mm)= 193.000
     RUNOFF COEFFICIENT   =   0.478

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

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--------------------
| CALIB            |
| NASHYD   (  4031)|   Area    (ha)=  10.32   Curve Number   (CN)= 53.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.25

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


                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083   15.00 | 3.083    3.00 | 6.083   43.00 |  9.08   13.00
```

0.167	15.00	3.167	3.00	6.167	43.00	9.17	13.00
0.250	15.00	3.250	3.00	6.250	43.00	9.25	13.00
0.333	15.00	3.333	3.00	6.333	43.00	9.33	13.00
0.417	15.00	3.417	3.00	6.417	43.00	9.42	13.00
0.500	15.00	3.500	3.00	6.500	43.00	9.50	13.00
0.583	15.00	3.583	3.00	6.583	43.00	9.58	13.00
0.667	15.00	3.667	3.00	6.667	43.00	9.67	13.00
0.750	15.00	3.750	3.00	6.750	43.00	9.75	13.00
0.833	15.00	3.833	3.00	6.833	43.00	9.83	13.00
0.917	15.00	3.917	3.00	6.917	43.00	9.92	13.00
1.000	15.00	4.000	3.00	7.000	43.00	10.00	13.00
1.083	20.00	4.083	5.00	7.083	20.00	10.08	13.00
1.167	20.00	4.167	5.00	7.167	20.00	10.17	13.00
1.250	20.00	4.250	5.00	7.250	20.00	10.25	13.00
1.333	20.00	4.333	5.00	7.333	20.00	10.33	13.00
1.417	20.00	4.417	5.00	7.417	20.00	10.42	13.00
1.500	20.00	4.500	5.00	7.500	20.00	10.50	13.00
1.583	20.00	4.583	5.00	7.583	20.00	10.58	13.00
1.667	20.00	4.667	5.00	7.667	20.00	10.67	13.00
1.750	20.00	4.750	5.00	7.750	20.00	10.75	13.00
1.833	20.00	4.833	5.00	7.833	20.00	10.83	13.00
1.917	20.00	4.917	5.00	7.917	20.00	10.92	13.00
2.000	20.00	5.000	5.00	8.000	20.00	11.00	13.00
2.083	10.00	5.083	20.00	8.083	23.00	11.08	8.00
2.167	10.00	5.167	20.00	8.167	23.00	11.17	8.00
2.250	10.00	5.250	20.00	8.250	23.00	11.25	8.00
2.333	10.00	5.333	20.00	8.333	23.00	11.33	8.00
2.417	10.00	5.417	20.00	8.417	23.00	11.42	8.00
2.500	10.00	5.500	20.00	8.500	23.00	11.50	8.00
2.583	10.00	5.583	20.00	8.583	23.00	11.58	8.00
2.667	10.00	5.667	20.00	8.667	23.00	11.67	8.00
2.750	10.00	5.750	20.00	8.750	23.00	11.75	8.00
2.833	10.00	5.833	20.00	8.833	23.00	11.83	8.00
2.917	10.00	5.917	20.00	8.917	23.00	11.92	8.00
3.000	10.00	6.000	20.00	9.000	23.00	12.00	8.00

Unit Hyd Qpeak (cms)= 1.577

PEAK FLOW (cms)= 0.616 (i)
TIME TO PEAK (hrs)= 7.000
RUNOFF VOLUME (mm)= 83.848
TOTAL RAINFALL (mm)= 193.000
RUNOFF COEFFICIENT = 0.434

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

CALIB					
NASHYD (4032)	Area (ha)= 4.74	Curve Number (CN)= 48.0			
ID= 1 DT= 5.0 min	Ia (mm)= 9.80	# of Linear Res.(N)= 3.00			
	U.H. Tp(hrs)= 0.27				

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	15.00	3.083	3.00	6.083	43.00	9.08	13.00
0.167	15.00	3.167	3.00	6.167	43.00	9.17	13.00
0.250	15.00	3.250	3.00	6.250	43.00	9.25	13.00
0.333	15.00	3.333	3.00	6.333	43.00	9.33	13.00
0.417	15.00	3.417	3.00	6.417	43.00	9.42	13.00
0.500	15.00	3.500	3.00	6.500	43.00	9.50	13.00
0.583	15.00	3.583	3.00	6.583	43.00	9.58	13.00
0.667	15.00	3.667	3.00	6.667	43.00	9.67	13.00
0.750	15.00	3.750	3.00	6.750	43.00	9.75	13.00
0.833	15.00	3.833	3.00	6.833	43.00	9.83	13.00
0.917	15.00	3.917	3.00	6.917	43.00	9.92	13.00
1.000	15.00	4.000	3.00	7.000	43.00	10.00	13.00
1.083	20.00	4.083	5.00	7.083	20.00	10.08	13.00
1.167	20.00	4.167	5.00	7.167	20.00	10.17	13.00
1.250	20.00	4.250	5.00	7.250	20.00	10.25	13.00
1.333	20.00	4.333	5.00	7.333	20.00	10.33	13.00
1.417	20.00	4.417	5.00	7.417	20.00	10.42	13.00
1.500	20.00	4.500	5.00	7.500	20.00	10.50	13.00
1.583	20.00	4.583	5.00	7.583	20.00	10.58	13.00
1.667	20.00	4.667	5.00	7.667	20.00	10.67	13.00
1.750	20.00	4.750	5.00	7.750	20.00	10.75	13.00
1.833	20.00	4.833	5.00	7.833	20.00	10.83	13.00
1.917	20.00	4.917	5.00	7.917	20.00	10.92	13.00
2.000	20.00	5.000	5.00	8.000	20.00	11.00	13.00
2.083	10.00	5.083	20.00	8.083	23.00	11.08	8.00
2.167	10.00	5.167	20.00	8.167	23.00	11.17	8.00
2.250	10.00	5.250	20.00	8.250	23.00	11.25	8.00
2.333	10.00	5.333	20.00	8.333	23.00	11.33	8.00
2.417	10.00	5.417	20.00	8.417	23.00	11.42	8.00
2.500	10.00	5.500	20.00	8.500	23.00	11.50	8.00
2.583	10.00	5.583	20.00	8.583	23.00	11.58	8.00
2.667	10.00	5.667	20.00	8.667	23.00	11.67	8.00
2.750	10.00	5.750	20.00	8.750	23.00	11.75	8.00
2.833	10.00	5.833	20.00	8.833	23.00	11.83	8.00
2.917	10.00	5.917	20.00	8.917	23.00	11.92	8.00
3.000	10.00	6.000	20.00	9.000	23.00	12.00	8.00

Unit Hyd Qpeak (cms)= 0.671

PEAK FLOW (cms)= 0.243 (i)
TIME TO PEAK (hrs)= 7.000
RUNOFF VOLUME (mm)= 73.178
TOTAL RAINFALL (mm)= 193.000
RUNOFF COEFFICIENT = 0.379

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

CALIB			
STANDHYD (0201)	Area (ha)= 6.68		
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 60.00	
	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	4.68	2.00	
Dep. Storage (mm)=	2.00	5.00	
Average Slope (%)=	5.00	2.00	
Length (m)=	211.03	40.00	
Mannings n =	0.013	0.250	

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	15.00	3.083	3.00	6.083	43.00	9.08	13.00
0.167	15.00	3.167	3.00	6.167	43.00	9.17	13.00
0.250	15.00	3.250	3.00	6.250	43.00	9.25	13.00
0.333	15.00	3.333	3.00	6.333	43.00	9.33	13.00
0.417	15.00	3.417	3.00	6.417	43.00	9.42	13.00
0.500	15.00	3.500	3.00	6.500	43.00	9.50	13.00
0.583	15.00	3.583	3.00	6.583	43.00	9.58	13.00
0.667	15.00	3.667	3.00	6.667	43.00	9.67	13.00
0.750	15.00	3.750	3.00	6.750	43.00	9.75	13.00
0.833	15.00	3.833	3.00	6.833	43.00	9.92	13.00
0.917	15.00	3.917	3.00	6.917	43.00	9.92	13.00
1.000	15.00	4.000	3.00	7.000	43.00	10.00	13.00
1.083	20.00	4.083	5.00	7.083	20.00	10.08	13.00
1.167	20.00	4.167	5.00	7.167	20.00	10.17	13.00
1.250	20.00	4.250	5.00	7.250	20.00	10.25	13.00

1.333	20.00	4.333	5.00	7.333	20.00	10.33	13.00
1.417	20.00	4.417	5.00	7.417	20.00	10.42	13.00
1.500	20.00	4.500	5.00	7.500	20.00	10.50	13.00
1.583	20.00	4.583	5.00	7.583	20.00	10.58	13.00
1.667	20.00	4.667	5.00	7.667	20.00	10.67	13.00
1.750	20.00	4.750	5.00	7.750	20.00	10.75	13.00
1.833	20.00	4.833	5.00	7.833	20.00	10.83	13.00
1.917	20.00	4.917	5.00	7.917	20.00	10.92	13.00
2.000	20.00	5.000	5.00	8.000	20.00	11.00	13.00
2.083	10.00	5.083	20.00	8.083	23.00	11.08	8.00
2.167	10.00	5.167	20.00	8.167	23.00	11.17	8.00
2.250	10.00	5.250	20.00	8.250	23.00	11.25	8.00
2.333	10.00	5.333	20.00	8.333	23.00	11.33	8.00
2.417	10.00	5.417	20.00	8.417	23.00	11.42	8.00
2.500	10.00	5.500	20.00	8.500	23.00	11.50	8.00
2.583	10.00	5.583	20.00	8.583	23.00	11.58	8.00
2.667	10.00	5.667	20.00	8.667	23.00	11.67	8.00
2.750	10.00	5.750	20.00	8.750	23.00	11.75	8.00
2.833	10.00	5.833	20.00	8.833	23.00	11.83	8.00
2.917	10.00	5.917	20.00	8.917	23.00	11.92	8.00
3.000	10.00	6.000	20.00	9.000	23.00	12.00	8.00

Max.Eff.Inten.(mm/hr)=	43.00	35.82		
over (min)	5.00	15.00		
Storage Coeff. (min)=	3.46 (ii)	14.10 (ii)		
Unit Hyd. Tpeak (min)=	5.00	15.00		
Unit Hyd. peak (cms)=	0.26	0.08		
			TOTALS	
PEAK FLOW (cms)=	0.48	0.19	0.668 (iii)	
TIME TO PEAK (hrs)=	6.75	7.00	7.00	
RUNOFF VOLUME (mm)=	191.00	99.99	154.60	
TOTAL RAINFALL (mm)=	193.00	193.00	193.00	
RUNOFF COEFFICIENT =	0.99	0.52	0.80	

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 53.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0202)	Area (ha)=	4.80	
ID= 1 DT= 5.0 min	Total Imp(%)=	60.00	Dir. Conn.(%)= 45.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	2.88	1.92
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	5.00	2.00
Length	(m)=	178.89	40.00
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	15.00	3.083	3.00	6.083	43.00	9.08	13.00
0.167	15.00	3.167	3.00	6.167	43.00	9.17	13.00
0.250	15.00	3.250	3.00	6.250	43.00	9.25	13.00
0.333	15.00	3.333	3.00	6.333	43.00	9.33	13.00
0.417	15.00	3.417	3.00	6.417	43.00	9.42	13.00
0.500	15.00	3.500	3.00	6.500	43.00	9.50	13.00
0.583	15.00	3.583	3.00	6.583	43.00	9.58	13.00
0.667	15.00	3.667	3.00	6.667	43.00	9.67	13.00
0.750	15.00	3.750	3.00	6.750	43.00	9.75	13.00
0.833	15.00	3.833	3.00	6.833	43.00	9.83	13.00
0.917	15.00	3.917	3.00	6.917	43.00	9.92	13.00
1.000	15.00	4.000	3.00	7.000	43.00	10.00	13.00
1.083	20.00	4.083	5.00	7.083	20.00	10.08	13.00
1.167	20.00	4.167	5.00	7.167	20.00	10.17	13.00
1.250	20.00	4.250	5.00	7.250	20.00	10.25	13.00
1.333	20.00	4.333	5.00	7.333	20.00	10.33	13.00
1.417	20.00	4.417	5.00	7.417	20.00	10.42	13.00
1.500	20.00	4.500	5.00	7.500	20.00	10.50	13.00
1.583	20.00	4.583	5.00	7.583	20.00	10.58	13.00
1.667	20.00	4.667	5.00	7.667	20.00	10.67	13.00
1.750	20.00	4.750	5.00	7.750	20.00	10.75	13.00
1.833	20.00	4.833	5.00	7.833	20.00	10.83	13.00
1.917	20.00	4.917	5.00	7.917	20.00	10.92	13.00
2.000	20.00	5.000	5.00	8.000	20.00	11.00	13.00
2.083	10.00	5.083	20.00	8.083	23.00	11.08	8.00
2.167	10.00	5.167	20.00	8.167	23.00	11.17	8.00
2.250	10.00	5.250	20.00	8.250	23.00	11.25	8.00
2.333	10.00	5.333	20.00	8.333	23.00	11.33	8.00
2.417	10.00	5.417	20.00	8.417	23.00	11.42	8.00
2.500	10.00	5.500	20.00	8.500	23.00	11.50	8.00
2.583	10.00	5.583	20.00	8.583	23.00	11.58	8.00
2.667	10.00	5.667	20.00	8.667	23.00	11.67	8.00
2.750	10.00	5.750	20.00	8.750	23.00	11.75	8.00
2.833	10.00	5.833	20.00	8.833	23.00	11.83	8.00
2.917	10.00	5.917	20.00	8.917	23.00	11.92	8.00
3.000	10.00	6.000	20.00	9.000	23.00	12.00	8.00

Max.Eff.Inten.(mm/hr)=	43.00	37.48		
over (min)	5.00	15.00		
Storage Coeff. (min)=	3.13 (ii)	13.58 (ii)		
Unit Hyd. Tpeak (min)=	5.00	15.00		
Unit Hyd. peak (cms)=	0.27	0.08		
			TOTALS	
PEAK FLOW (cms)=	0.26	0.19	0.448 (iii)	
TIME TO PEAK (hrs)=	6.75	7.00	7.00	
RUNOFF VOLUME (mm)=	191.00	101.53	141.79	
TOTAL RAINFALL (mm)=	193.00	193.00	193.00	
RUNOFF COEFFICIENT =	0.99	0.53	0.73	

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 53.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0203)	Area (ha)=	1.39	
ID= 1 DT= 5.0 min	Total Imp(%)=	50.00	Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.69	0.69
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	5.00	2.00
Length	(m)=	96.26	40.00
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	15.00	3.083	3.00	6.083	43.00	9.08	13.00
0.167	15.00	3.167	3.00	6.167	43.00	9.17	13.00
0.250	15.00	3.250	3.00	6.250	43.00	9.25	13.00

0.333	15.00	3.333	3.00	6.333	43.00	9.33	13.00
0.417	15.00	3.417	3.00	6.417	43.00	9.42	13.00
0.500	15.00	3.500	3.00	6.500	43.00	9.50	13.00
0.583	15.00	3.583	3.00	6.583	43.00	9.58	13.00
0.667	15.00	3.667	3.00	6.667	43.00	9.67	13.00
0.750	15.00	3.750	3.00	6.750	43.00	9.75	13.00
0.833	15.00	3.833	3.00	6.833	43.00	9.83	13.00
0.917	15.00	3.917	3.00	6.917	43.00	9.92	13.00
1.000	15.00	4.000	3.00	7.000	43.00	10.00	13.00
1.083	20.00	4.083	5.00	7.083	20.00	10.08	13.00
1.167	20.00	4.167	5.00	7.167	20.00	10.17	13.00
1.250	20.00	4.250	5.00	7.250	20.00	10.25	13.00
1.333	20.00	4.333	5.00	7.333	20.00	10.33	13.00
1.417	20.00	4.417	5.00	7.417	20.00	10.42	13.00
1.500	20.00	4.500	5.00	7.500	20.00	10.50	13.00
1.583	20.00	4.583	5.00	7.583	20.00	10.58	13.00
1.667	20.00	4.667	5.00	7.667	20.00	10.67	13.00
1.750	20.00	4.750	5.00	7.750	20.00	10.75	13.00
1.833	20.00	4.833	5.00	7.833	20.00	10.83	13.00
1.917	20.00	4.917	5.00	7.917	20.00	10.92	13.00
2.000	20.00	5.000	5.00	8.000	20.00	11.00	13.00
2.083	10.00	5.083	20.00	8.083	23.00	11.08	8.00
2.167	10.00	5.167	20.00	8.167	23.00	11.17	8.00
2.250	10.00	5.250	20.00	8.250	23.00	11.25	8.00
2.333	10.00	5.333	20.00	8.333	23.00	11.33	8.00
2.417	10.00	5.417	20.00	8.417	23.00	11.42	8.00
2.500	10.00	5.500	20.00	8.500	23.00	11.50	8.00
2.583	10.00	5.583	20.00	8.583	23.00	11.58	8.00
2.667	10.00	5.667	20.00	8.667	23.00	11.67	8.00
2.750	10.00	5.750	20.00	8.750	23.00	11.75	8.00
2.833	10.00	5.833	20.00	8.833	23.00	11.83	8.00
2.917	10.00	5.917	20.00	8.917	23.00	11.92	8.00
3.000	10.00	6.000	20.00	9.000	23.00	12.00	8.00

Max.Eff.Inten.(mm/hr)=	43.00	23.07	
over (min)	5.00	15.00	
Storage Coeff. (min)=	2.16 (ii)	14.85 (ii)	
Unit Hyd. Tpeak (min)=	5.00	15.00	
Unit Hyd. peak (cms)=	0.31	0.08	
			TOTALS
PEAK FLOW (cms)=	0.08	0.04	0.125 (iii)
TIME TO PEAK (hrs)=	6.75	7.00	7.00
RUNOFF VOLUME (mm)=	191.00	85.53	138.26
TOTAL RAINFALL (mm)=	193.00	193.00	193.00
RUNOFF COEFFICIENT =	0.99	0.44	0.72

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 53.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0001)					
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0201):	6.68	0.668	7.00	154.60
+ ID2= 2 (0202):	4.80	0.448	7.00	141.79
ID = 3 (0001):	11.48	1.116	7.00	149.24

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0001)				
3 + 2 = 1	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 3 (0001):	11.48	1.116	7.00	149.24
+ ID2= 2 (0203):	1.39	0.125	7.00	138.26
ID = 1 (0001):	12.87	1.241	7.00	148.06

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB	
STANDHYD (0204)	Area (ha)= 3.12
ID= 1 DT= 5.0 min	Total Imp(%)= 50.00 Dir. Conn.(%)= 30.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.56	1.56
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	5.00	2.00
Length	(m)=	144.22	40.00
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	15.00	3.083	3.00	6.083	43.00	9.08	13.00
0.167	15.00	3.167	3.00	6.167	43.00	9.17	13.00
0.250	15.00	3.250	3.00	6.250	43.00	9.25	13.00
0.333	15.00	3.333	3.00	6.333	43.00	9.33	13.00
0.417	15.00	3.417	3.00	6.417	43.00	9.42	13.00
0.500	15.00	3.500	3.00	6.500	43.00	9.50	13.00
0.583	15.00	3.583	3.00	6.583	43.00	9.58	13.00
0.667	15.00	3.667	3.00	6.667	43.00	9.67	13.00
0.750	15.00	3.750	3.00	6.750	43.00	9.75	13.00
0.833	15.00	3.833	3.00	6.833	43.00	9.83	13.00
0.917	15.00	3.917	3.00	6.917	43.00	9.92	13.00
1.000	15.00	4.000	3.00	7.000	43.00	10.00	13.00
1.083	20.00	4.083	5.00	7.083	20.00	10.08	13.00
1.167	20.00	4.167	5.00	7.167	20.00	10.17	13.00
1.250	20.00	4.250	5.00	7.250	20.00	10.25	13.00
1.333	20.00	4.333	5.00	7.333	20.00	10.33	13.00
1.417	20.00	4.417	5.00	7.417	20.00	10.42	13.00
1.500	20.00	4.500	5.00	7.500	20.00	10.50	13.00
1.583	20.00	4.583	5.00	7.583	20.00	10.58	13.00
1.667	20.00	4.667	5.00	7.667	20.00	10.67	13.00
1.750	20.00	4.750	5.00	7.750	20.00	10.75	13.00
1.833	20.00	4.833	5.00	7.833	20.00	10.83	13.00
1.917	20.00	4.917	5.00	7.917	20.00	10.92	13.00
2.000	20.00	5.000	5.00	8.000	20.00	11.00	13.00
2.083	10.00	5.083	20.00	8.083	23.00	11.08	8.00
2.167	10.00	5.167	20.00	8.167	23.00	11.17	8.00
2.250	10.00	5.250	20.00	8.250	23.00	11.25	8.00
2.333	10.00	5.333	20.00	8.333	23.00	11.33	8.00
2.417	10.00	5.417	20.00	8.417	23.00	11.42	8.00
2.500	10.00	5.500	20.00	8.500	23.00	11.50	8.00
2.583	10.00	5.583	20.00	8.583	23.00	11.58	8.00
2.667	10.00	5.667	20.00	8.667	23.00	11.67	8.00
2.750	10.00	5.750	20.00	8.750	23.00	11.75	8.00
2.833	10.00	5.833	20.00	8.833	23.00	11.83	8.00
2.917	10.00	5.917	20.00	8.917	23.00	11.92	8.00
3.000	10.00	6.000	20.00	9.000	23.00	12.00	8.00

Max.Eff.Inten.(mm/hr)=	43.00	38.49	
over (min)	5.00	15.00	
Storage Coeff. (min)=	2.75 (ii)	13.09 (ii)	
Unit Hyd. Tpeak (min)=	5.00	15.00	
Unit Hyd. peak (cms)=	0.28	0.08	
			TOTALS

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     PEAK FLOW      (cms)=       0.11         0.16          0.271 (iii)
     TIME TO PEAK   (hrs)=       6.75         7.00           7.00
     RUNOFF VOLUME   (mm)=     191.00       102.43         129.00
     TOTAL RAINFALL  (mm)=     193.00       193.00         193.00
     RUNOFF COEFFICIENT  =       0.99         0.53           0.67

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  53.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| ADD HYD  (  0003)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0001):    12.87   1.241     7.00   148.06
     + ID2= 2 (  0204):     3.12   0.271     7.00   129.00
       ================================================
       ID = 3 (  0003):    15.99   1.512     7.00   144.34

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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| CALIB            |
| STANDHYD (  0401)|   Area    (ha)=  28.90
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=  45.00
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                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=     17.34        11.56
     Dep. Storage     (mm)=      2.00         5.00
     Average Slope     (%)=      2.00         2.00
     Length            (m)=    438.94        40.00
     Mannings n           =     0.013        0.250

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

                        ---- TRANSFORMED HYETOGRAPH ----
  TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
   hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
 0.083   15.00 | 3.083    3.00 | 6.083   43.00 |  9.08   13.00
 0.167   15.00 | 3.167    3.00 | 6.167   43.00 |  9.17   13.00
 0.250   15.00 | 3.250    3.00 | 6.250   43.00 |  9.25   13.00
 0.333   15.00 | 3.333    3.00 | 6.333   43.00 |  9.33   13.00
 0.417   15.00 | 3.417    3.00 | 6.417   43.00 |  9.42   13.00
 0.500   15.00 | 3.500    3.00 | 6.500   43.00 |  9.50   13.00
 0.583   15.00 | 3.583    3.00 | 6.583   43.00 |  9.58   13.00
 0.667   15.00 | 3.667    3.00 | 6.667   43.00 |  9.67   13.00
 0.750   15.00 | 3.750    3.00 | 6.750   43.00 |  9.75   13.00
 0.833   15.00 | 3.833    3.00 | 6.833   43.00 |  9.83   13.00
 0.917   15.00 | 3.917    3.00 | 6.917   43.00 |  9.92   13.00
 1.000   15.00 | 4.000    3.00 | 7.000   43.00 | 10.00   13.00
 1.083   20.00 | 4.083    5.00 | 7.083   20.00 | 10.08   13.00
 1.167   20.00 | 4.167    5.00 | 7.167   20.00 | 10.17   13.00
 1.250   20.00 | 4.250    5.00 | 7.250   20.00 | 10.25   13.00
 1.333   20.00 | 4.333    5.00 | 7.333   20.00 | 10.33   13.00
 1.417   20.00 | 4.417    5.00 | 7.417   20.00 | 10.42   13.00
 1.500   20.00 | 4.500    5.00 | 7.500   20.00 | 10.50   13.00
 1.583   20.00 | 4.583    5.00 | 7.583   20.00 | 10.58   13.00
 1.667   20.00 | 4.667    5.00 | 7.667   20.00 | 10.67   13.00
 1.750   20.00 | 4.750    5.00 | 7.750   20.00 | 10.75   13.00
 1.833   20.00 | 4.833    5.00 | 7.833   20.00 | 10.83   13.00
 1.917   20.00 | 4.917    5.00 | 7.917   20.00 | 10.92   13.00
 2.000   20.00 | 5.000    5.00 | 8.000   20.00 | 11.00   13.00
 2.083   10.00 | 5.083   20.00 | 8.083   23.00 | 11.08    8.00
 2.167   10.00 | 5.167   20.00 | 8.167   23.00 | 11.17    8.00
 2.250   10.00 | 5.250   20.00 | 8.250   23.00 | 11.25    8.00
 2.333   10.00 | 5.333   20.00 | 8.333   23.00 | 11.33    8.00
 2.417   10.00 | 5.417   20.00 | 8.417   23.00 | 11.42    8.00
 2.500   10.00 | 5.500   20.00 | 8.500   23.00 | 11.50    8.00
 2.583   10.00 | 5.583   20.00 | 8.583   23.00 | 11.58    8.00
 2.667   10.00 | 5.667   20.00 | 8.667   23.00 | 11.67    8.00
 2.750   10.00 | 5.750   20.00 | 8.750   23.00 | 11.75    8.00
 2.833   10.00 | 5.833   20.00 | 8.833   23.00 | 11.83    8.00
 2.917   10.00 | 5.917   20.00 | 8.917   23.00 | 11.92    8.00
 3.000   10.00 | 6.000   20.00 | 9.000   23.00 | 12.00    8.00

     Max.Eff.Inten.(mm/hr)=      43.00        37.48
               over (min)        5.00        20.00
     Storage Coeff.  (min)=      7.06 (ii)   17.52 (ii)
     Unit Hyd. Tpeak (min)=      5.00        20.00
     Unit Hyd. peak  (cms)=      0.17         0.06
                                                      *TOTALS*
     PEAK FLOW      (cms)=       1.55         1.10      2.652 (iii)
     TIME TO PEAK   (hrs)=       7.00         7.00        7.00
     RUNOFF VOLUME   (mm)=     191.00       101.53      141.79
     TOTAL RAINFALL  (mm)=     193.00       193.00      193.00
     RUNOFF COEFFICIENT  =       0.99         0.53        0.73

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  53.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| ADD HYD  (  0021)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0003):    15.99   1.512     7.00   144.34
     + ID2= 2 (  0401):    28.90   2.652     7.00   141.79
       ================================================
       ID = 3 (  0021):    44.89   4.163     7.00   142.70

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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-------------------
| ADD HYD  (  0021)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0021):    44.89   4.163     7.00   142.70
     + ID2= 2 (  0402):    15.49   0.992     7.00    92.29
       ================================================
       ID = 1 (  0021):    60.38   5.155     7.00   129.77

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

-------------------
| ADD HYD  (  0021)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0021):    60.38   5.155     7.00   129.77
     + ID2= 2 (  4031):    10.32   0.616     7.00    83.85
       ================================================
       ID = 3 (  0021):    70.70   5.771     7.00   123.06

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

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

```
| ADD HYD  (  0021)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
------------------           (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0021):    70.70   5.771     7.00   123.06
      + ID2= 2 (  4032):     4.74   0.243     7.00    73.18
        ==================================================
        ID = 1 (  0021):    75.44   6.014     7.00   119.93

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

APPENDIX "F"

Stormwater Management Calculations

VALDOR

VALDOR ENGINEERING INC.
Project: Millbrook East
File: 19121
Date: December 2022

Table F.1: Existing Condition - VO Model Parameters

Catchment	Area (ha)	VO5 Routine	TIMP	XIMP	CN II	CN*	IA (mm)	Tp (hr)
101	11.07	NasHyd	-	-	67	64	7.6	0.18
102	2.90	NasHyd	-	-	56	50	9.5	0.15
Total	**13.97**							

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Project: Millbrook East
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Table F.2: Proposed Condition - VO Model Parameters

Catchment	Area (ha)	VO5 Routine	TIMP	XIMP	CN II	CN*	IA (mm)	Tp (hr)
201	6.68	StandHyd	0.70	0.60	61	53	5.0	-
202	4.80	StandHyd	0.60	0.45	61	53	5.0	-
203	1.39	StandHyd	0.50	0.50	61	53	5.0	-
204	3.12	StandHyd	0.50	0.30	61	53	5.0	-
Total	**15.99**							

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

Catchment	Area (ha)	Land Use and Land Cover		CN II	Area Weighted CN II	CN*	IA (mm)	Area Weighted IA (mm)	C-Value	Area Weighted C-Value
		Type	Area (ha)							
		Forest (HSG 'B')	0.91	55			**10**		0.30	
		Meadow (HSG 'B')	3.86	58			**8**		0.40	
101	11.07	Row Crops (HSG 'B')	6.28	75	**67**	**64**	**7**	**7.6**	0.45	**0.42**
		Open Space (HSG 'B')	0.00	61			**5**		0.25	
		Other Impervious	0.02	98			**2**		0.95	
		Forest (HSG 'B')	2.16	55			**10**		0.30	
		Meadow (HSG 'B')	0.74	58			**8**		0.40	
102	2.90	Row Crops (HSG 'B')	0.00	75	**56**	**50**	**7**	**9.5**	0.45	**0.33**
		Open Space (HSG 'B')	0.00	61			**5**		0.25	
		Other Impervious	0.00	98			**2**		0.95	

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

Catchment	A Area (ha)	C Runoff Coefficient (Area Weighted)	L (m) Catchment Length	Highest Elevation (m)	Lowest Elevation (m)	S (%) Catchment Slope	[1,2]T_c Method	T_c (min)	[1,2]T_p (hr)
101	11.07	0.42	540	254.50	215.00	7.31	Bransby-Williams	16.3	0.18
102	2.90	0.33	300	216.50	211.00	1.83	Airport	13.6	0.15

Notes:
1) T_p calculation for catchments with C < 0.40 is based on the Airport Formula:

$$T_c = 3.26 \times (1.1 - C) \times L^{0.5} / S_w^{0.33}$$

2) T_p calculation for catchments with C > 0.40 is based on the Bransby-Williams Formula:

$$T_c = (0.057)(L) / (S_w)^{0.2} (A)^{0.1}$$

$$T_P = 0.67 T_c$$

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

Stage Storage Curve						Outlet Structure						
Elevation (m)	Sec Area (m^2)	Avg Area (m^2)	Sec Volume (m^3)	Cumulative Volume (m^3)	Volume Above NWL (m^3)		Stage Active (m)	[1]Discharge m^3/s Orifice #1	Weir #1	Spillway	Total	Comments:
						Invert Elevation (m)		212.50	212.90	214.00	Flow	
						Diameter (mm)/Length (m)		115	1.20	6.00		
						Height (m)		-	-			
						Orifice Area (m^2)		0.0104	-	-		
Forebay Below NWL												Weir Equation: $Q=1.837xLxH^{1.5}$
210.50	**200**	**-**	**-**	**0**		**Bottom of Forebay**						Orifice Eq'n: $Q = 0.6A(2gH)^{0.5}$
211.50	**513**	**357**	**357**	**357**								Spillway Design: $Q=1.67xLxH^{1.5}$
211.90	**668**	**591**	**236**	**593**								
212.50	**1,012**	**840**	**504**	**1,097**		**NWL**						
Main Cell Below NWL												
211.00	**1,692**	**-**	**-**	**0**		**Bottom of Main Cell**						
211.50	**2,055**	**1,874**	**937**	**937**								
211.90	**2,359**	**2,207**	**883**	**1,820**								
212.50	**3,066**	**2,713**	**1,627**	**3,447**		**NWL**						
Forebay & Main Cell Above NWL												
212.50	**4,078**	**-**	**-**	**4,544**	**0**	**NWL**	0.00	0.000			**0.000**	**Permanent Pool Provided**
212.70	4,467	4,272	854	5,398	854		0.20	0.010			**0.010**	
212.90	4,856	4,661	932	6,331	1,787		0.40	0.016	0.000		**0.016**	
213.10	**5,245**	**5,050**	**1,010**	**7,341**	**2,797**		0.60	0.020	0.179		**0.200**	
213.20	5,429	5,337	534	7,874	3,331		0.70	0.022	0.329		**0.351**	
213.30	5,613	5,521	552	8,426	3,883		0.80	0.024	0.507		**0.531**	
213.40	5,797	5,705	570	8,997	4,453		0.90	0.025	0.709		**0.734**	
213.50	**5,981**	**5,889**	**589**	**9,586**	**5,042**		1.00	0.027	0.931		**0.958**	
213.60	6,178	6,079	608	10,194	5,650		1.10	0.028	1.174		**1.202**	
213.70	6,375	6,276	628	10,821	6,278		1.20	0.030	1.434		**1.463**	
213.80	6,571	6,473	647	11,469	6,925		1.30	0.031	1.711		**1.742**	
213.90	6,768	6,670	667	12,136	7,592		1.40	0.032	2.004		**2.036**	
214.00	6,965	6,867	687	12,822	8,279	**Emergency Spillway**	1.50	0.033	2.312	0.000	**2.345**	**100-year Storage Provided**
214.10	7,162	7,063	706	13,529	8,985		1.60	0.034	2.634	0.317	**2.985**	
214.20	7,359	7,260	726	14,255	9,711		1.70	0.035	2.970	0.896	**3.902**	
214.30	7,555	7,457	746	15,000	10,457		1.80	0.036	3.320	1.646	**5.003**	
214.40	7,752	7,654	765	15,766	11,222		1.90	0.037	3.682	2.535	**6.254**	
214.50	**7,949**	**7,851**	**785**	**16,551**	**12,007**		2.00	0.038	4.056	3.543	**7.637**	
214.70	8,253	8,101	1,620	18,171	13,627		2.20	0.040	4.840	5.868	**10.748**	
215.00	**8,710**	**8,482**	**2,545**	**20,716**	**16,172**	**Top of Berm**	2.50	0.043	6.099	10.020	**16.162**	**Top of Berm**

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Table F.6: Permanent Pool Volume Requirements

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

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

1. Table 3.2 was based on specific design parameters (depth, length to width ratio) for each type of end-of-pipe stormwater management facility. The values of these parameters are provided in Appendix I of the Manual. All values in Table 4.1 are based on a 24 hour detention.
2. For wetlands, wet ponds and hybrid ponds, all of the storage, except 40 m^3/ha, in Table 3.2 represents the permanent pool volume. The 40 m^3/ha represents the extended detention storage.
3. For hybrid ponds, 50% to 60% of the permanent pool volume shall be contained in deeper portions of the facility.

PERMANENT POOL VOLUME CALCULATOR

SWMP Type:	WET POND	(IN - infiltration, WET - wetlands, WP - wet pond, HYB - hybrid wet pond/wetland, DP - dry pond)
Protection Level:	1	(1 - 80% TSS, 2 - 70% TSS, 3 - 60% TSS)
Average Imperviousness:	65.0 %	
Volume Level:	173.3 m^3/ha	Excluding Extended Detention
Area:	12.87 ha	
Total Required Volume:	**2,231 m^3**	

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Table F.7: Extended Detention Requirements

Event	Area (ha)	R.V. (mm)	Required Ext. Det. Volume (m^3)	Provided Ext. Det. Volume (m^3)
25mm 4-hour Chicago Storm	12.87	13.36	1,719	1,787

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Table F.8: Extended Detention Drawdown Time

Extended Detention - SWM Pond

Orifice Sizing		
Orifice Size	115	mm
Orifice Inve	212.50	m
Orifice Area	0.010386891	sq. m
[1]$EDL_{erosion}$	212.90	m
NWL	212.50	m
C_2	1945.0	
C_3	4078.0	
h	0.3425	m
Drawdown T	48.9	hr

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

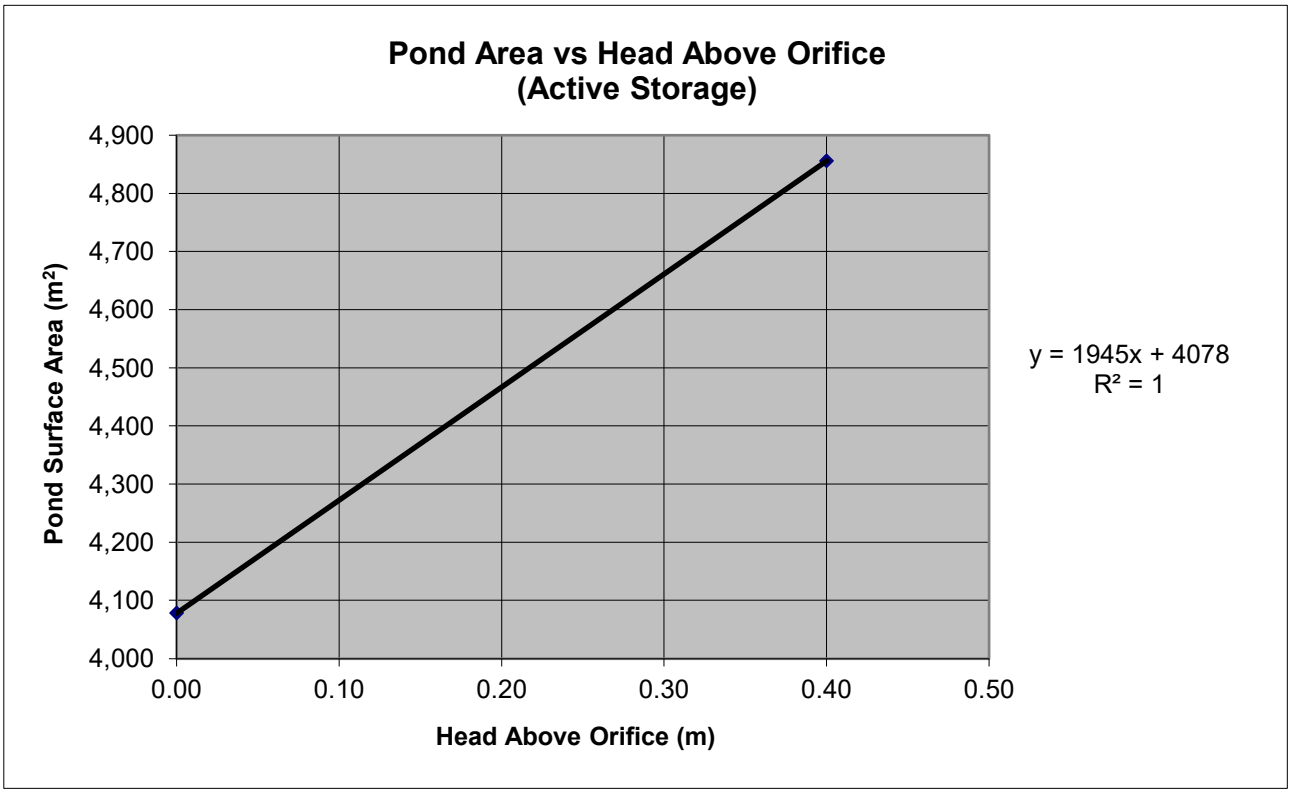

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Table F.9: Critical Storm Analysis

Storm Distribution	Theoretical 100-year Storage Volume Required (m^3)	Note
6-hour AES	**7,145**	**Critical Storm**
12-hour AES	7,000	
24-hour AES	6,373	
6-hour SCS	7,137	
12-hour SCS	6,590	
24-hour SCS	6,004	
4-hour Chicago	7,105	

Table F.10: Infiltration Trench Calculation

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Project No: 19121
Date: December 2022

Total Req'd Annual Infiltration Volume to Achieve Target (m^3)	*Total Actual Annual Infiltration Volume per Design (m^3)*	*Soil Infiltration Rate (mm/h)*	*Equivalent Drainage Area (ha)*	*Maximum Trench Length per Site Plan (m)*	*Initial Abstraction (Trench Drainage Area) (mm)*	*Retention Time (hr)*	*Total Annual Rainfall Depth (Per 1981-2010 Climate Normals for Peterborough Airport) (mm)*	*Total Rainfall Depth Available for Infiltration Per Rainfall Analysis Assuming Ia=3.0mm (Refer to Table F.5) (mm)*	*Annual Rainfall Depth Needed to Achieve Target Infiltration (mm)*	*[1] Req'd Design Storm Depth to Achieve Annual Infiltration Requirements*	*Req'd Event-Based Runoff Volume to be Infiltrated (Based on Req'd Design Storm Depth) (m^3)*
6,818	6,862	30	2.60	-	5.0	48	712.5	263.94	262.2	15.0	260.0

Total annual infiltration volume provided (m^3/yr): 6,862

Maximum Allowable Depth	
P, Soil Infiltration Rate (mm/h):	**30**
T, Drawdown Time (hr):	**48**
d, Maximum Allowable Depth (m):	**1.44**

Minimum Bottom Area	
V, Runoff Volume to Infiltrated (m^3):	**260**
P, Soil Infiltration Rate (mm/h):	**30.0**
n, Void Ratio (clear stone):	**0.40**
Δt, Drawdown Time (hr):	**48**
A, Minimum Bottom Area (m^2):	**451**

$$d = \frac{P \cdot T}{1000}$$ *Equation 4.2, Stormwater Management Planning and Design Manual, MOE, 2003*

$$A = \frac{1000 \cdot V}{P \cdot n \cdot \Delta t}$$ *Equation 4.3, Stormwater Management Planning and Design Manual, MOE, 2003*

Infiltration Trench Design

Infiltration Trench Location	Drainage Area (ha)	Available Infiltration Volume (m^3)	Total Length (m)	Width (m)	[3]Design Depth (m)	Bottom Area (m^2)	Void Ratio	Storage Volume Provided (m^3)	Lesser of Available Infiltration Volume or Storage Volume Provided (m^3)
PHASE 1A									
Infiltration Trench	3.12	312.0	650.0	1.0	1.00	650	0.40	260.0	260.0

Total Drainage Area (ha):	**3.12**		
Total Bottom Area Provided (m^2):	**650**	Total:	260.00
Total Infiltration Volume Used (m^3):	**260.0**		

Notes:

Infiltration facilities are sized based on the following criteria (SWMPDM, MOE, 2003) and/or assumptions:

(1) Infiltration trench volume should be sized based on the runoff generated by a 4-hr 15-mm event or smaller.
(2) The drainage area to each infiltration trench should be sufficient to provide required runoff quantity.
(3) The maximum allowable depth of the infiltration facility is based on the soil infiltrate rate and the retention time.
(4) It is feasible to convey the runoff to the infiltration facility.
(5) The seasonal high water table should be at least 1 m below the infiltration trench.

Table F.11: Rainfall Analysis

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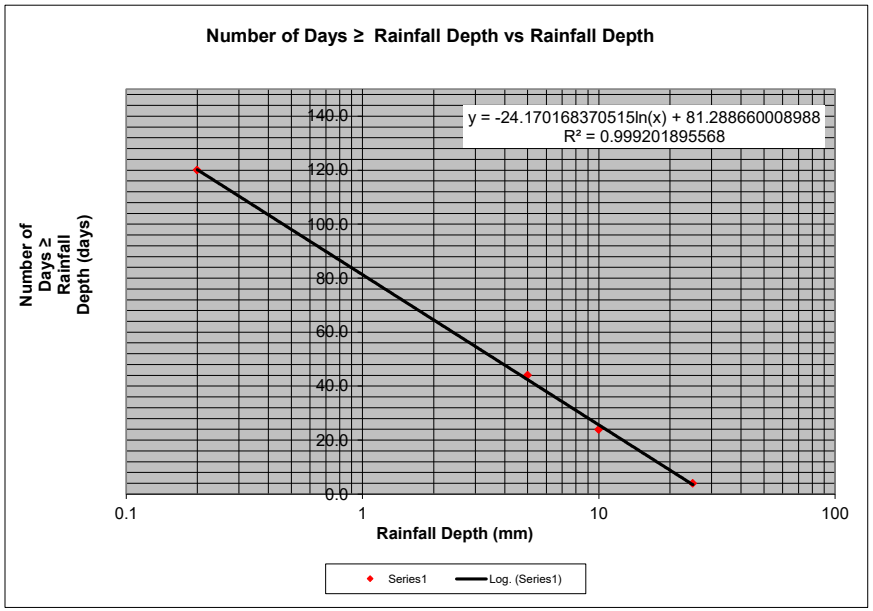

Normal Rainfall Depth (mm)	Normal Days ≥ Rainfall Depth (days)
0.2	120.0
5	44.0
10	23.8
25	3.9

Peterborough A Climate Normals (1981 - 2010)
712.5 Normal Annual Rainfall Depth (mm)
120 Normal Annual Days with Rainfall (≥ 0.2 mm)
855.3 Normal Annual Precipitation Depth (mm)

Simulated Depth (mm)	Simulated Days ≥ Sim Depth (days)	Average Event Depth (mm)	Simulated Days Equal to Avg Depth (days)	Assumed IA (mm)	Runoff (Rain - IA) (mm)	INF Design Storm (mm)	Event Based Maximum Design INF Depth (mm)	Event Based Design INF Depth (mm)	Annual Incremental Design INF Depth (mm)	Annual Cumulative Design INF Depth (mm)	Annual Incremental Total Rain Depth (mm)	Annual Percent of Total Rain (%)	Annual Cumulative Total Rain Depth (mm)	Annual Cumulative Percent of Total Depth (%)
0.2	120.19													
0.5	98.04	0.2 - 0.5	22.15	5.00	0.00	15.00	10.00	0.00	0.00	**0.00**		0.000	0.0	0.000
1.5	71.49	1	26.55	5.00	0.00	15.00	10.00	0.00	0.00	**0.00**	26.55	0.037	26.6	0.037
2.5	59.14	2	12.35	5.00	0.00	15.00	10.00	0.00	0.00	**0.00**	24.69	0.035	51.2	0.072
3.5	51.01	3	8.13	5.00	0.00	15.00	10.00	0.00	0.00	**0.00**	24.40	0.034	75.6	0.106
4.5	44.93	4	6.07	5.00	0.00	15.00	10.00	0.00	0.00	**0.00**	24.30	0.034	99.9	0.140
5.5	40.08	5	4.85	5.00	0.00	15.00	10.00	0.00	0.00	**0.00**	24.25	0.034	124.2	0.174
6.5	36.05	6	4.04	5.00	1.00	15.00	10.00	1.00	4.04	**4.04**	24.23	0.034	148.4	0.208
7.5	32.59	7	3.46	5.00	2.00	15.00	10.00	2.00	6.92	**10.96**	24.21	0.034	172.6	0.242
8.5	29.56	8	3.03	5.00	3.00	15.00	10.00	3.00	9.08	**20.03**	24.20	0.034	196.8	0.276
9.5	26.87	9	2.69	5.00	4.00	15.00	10.00	4.00	10.75	**30.78**	24.20	0.034	221.0	0.310
10.5	24.46	10	2.42	5.00	5.00	15.00	10.00	5.00	12.10	**42.88**	24.19	0.034	245.2	0.344
11.5	22.26	11	2.20	5.00	6.00	15.00	10.00	6.00	13.19	**56.07**	24.19	0.034	269.4	0.378
12.5	20.24	12	2.02	5.00	7.00	15.00	10.00	7.00	14.11	**70.18**	24.18	0.034	293.6	0.412
13.5	18.38	13	1.86	5.00	8.00	15.00	10.00	8.00	14.88	**85.06**	24.18	0.034	317.8	0.446
14.5	16.65	14	1.73	5.00	9.00	15.00	10.00	9.00	15.54	**100.61**	24.18	0.034	342.0	0.480
15.5	15.04	15	1.61	5.00	10.00	15.00	10.00	10.00	16.12	**116.72**	24.18	0.034	366.1	0.514
16.5	13.53	16	1.51	5.00	11.00	15.00	10.00	10.00	15.11	**131.84**	24.18	0.034	390.3	0.548
17.5	12.11	17	1.42	5.00	12.00	15.00	10.00	10.00	14.22	**146.06**	24.18	0.034	414.5	0.582
18.5	10.77	18	1.34	5.00	13.00	15.00	10.00	10.00	13.43	**159.49**	24.18	0.034	438.7	0.616
19.5	9.49	19	1.27	5.00	14.00	15.00	10.00	10.00	12.72	**172.21**	24.18	0.034	462.8	0.650
20.5	8.28	20	1.21	5.00	15.00	15.00	10.00	10.00	12.09	**184.30**	24.18	0.034	487.0	0.684
21.5	7.13	21	1.15	5.00	16.00	15.00	10.00	10.00	11.51	**195.81**	24.17	0.034	511.2	0.717
22.5	6.03	22	1.10	5.00	17.00	15.00	10.00	10.00	10.99	**206.80**	24.17	0.034	535.4	0.751
23.5	4.98	23	1.05	5.00	18.00	15.00	10.00	10.00	10.51	**217.31**	24.17	0.034	559.5	0.785
24.5	3.98	24	1.01	5.00	19.00	15.00	10.00	10.00	10.07	**227.38**	24.17	0.034	583.7	0.819
25.5	3.01	25	0.97	5.00	20.00	15.00	10.00	10.00	9.67	**237.05**	24.17	0.034	607.9	0.853
26.5	2.08	26	0.93	5.00	21.00	15.00	10.00	10.00	9.30	**246.35**	24.17	0.034	632.1	0.887
27.5	1.18	27	0.90	5.00	22.00	15.00	10.00	10.00	8.95	**255.30**	24.17	0.034	656.2	0.921
28.5	0.32	28	0.86	5.00	23.00	15.00	10.00	10.00	8.63	**263.94**	24.17	0.034	680.4	0.955
29	0.00	≥ 29	0.00	5.00	24.00	15.00	10.00	10.00	0.00	**263.94**	32.10	0.045	712.5	1.000

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CN* Sample Calculation (Catchment 101)

CN II:	67	Area-weighted CN II calculated for *Catchment 101* as per **Table F.3**
CN III:	83	
P:	98.4	100yr 12hr Rainfall Depth (mm) for Lindsay Filtration Plant IDF Station
Ia*:	7.6	Area-weighted initial abstraction (mm) calculated for *Catchment 101* as per **Table F.3**
S:	52.02	$S = \left(\frac{25400}{CN\ III}\right)$-254
Ia:	10.40	$Ia = 0.2S$
Q:	55.30	$Q = \frac{(P - Ia)^2}{(P - Ia + S)}$
S*:	58.29	$S* = \frac{(P - Ia*)^2}{Q} - \mathrm{P} + \mathrm{Ia}*$
CN III*:	81	$CN\ III* = \frac{25400}{(254 + S*)}$
CN II*:	**64**	

Overland Flow Channel, Street D to Street A, 100-5 year flow

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.05000	m/m
Left Side Slope	3.00	m/m (H:V)
Right Side Slope	3.00	m/m (H:V)
Bottom Width	3.00	m
Discharge	0.344	m³/s

Results

Normal Depth	0.09	m
Flow Area	0.29	m²
Wetted Perimeter	3.56	m
Hydraulic Radius	0.08	m
Top Width	3.53	m
Critical Depth	0.11	m
Critical Slope	0.02648	m/m
Velocity	1.20	m/s
Velocity Head	0.07	m
Specific Energy	0.16	m
Froude Number	1.34	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	m
Length	0.00	m
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	m
Profile Description		
Profile Headloss	0.00	m
Downstream Velocity	Infinity	m/s
Upstream Velocity	Infinity	m/s
Normal Depth	0.09	m
Critical Depth	0.11	m
Channel Slope	0.05000	m/m

Street A Overland Flow Route, 100-5 year flow

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.03000	m/m
Discharge	0.863	m³/s

Section Definitions

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

Roughness Segment Definitions

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

Options

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

Results

Normal Depth		0.10	m
Elevation Range	0.00 to 0.25 m		
Flow Area		0.49	m²
Wetted Perimeter		10.07	m

Street A Overland Flow Route, 100-5 year flow

Results

Hydraulic Radius		0.05	m
Top Width		9.87	m
Normal Depth		0.10	m
Critical Depth		0.14	m
Critical Slope		0.00390	m/m
Velocity		1.77	m/s
Velocity Head		0.16	m
Specific Energy		0.26	m
Froude Number		2.55	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	m
Length	0.00	m
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	m
Profile Description		
Profile Headloss	0.00	m
Downstream Velocity	Infinity	m/s
Upstream Velocity	Infinity	m/s
Normal Depth	0.10	m
Critical Depth	0.14	m
Channel Slope	0.03000	m/m
Critical Slope	0.00390	m/m

SWM Pond: Forebay Weir

Project Description

Solve For	Discharge

Input Data

Headwater Elevation		212.90	m
Crest Elevation		212.50	m
Tailwater Elevation		212.50	m
Crest Surface Type	Gravel		
Crest Breadth		8.00	m
Crest Length		4.00	m

Results

Discharge	1.614	m^3/s
Headwater Height Above Crest	0.40	m
Tailwater Height Above Crest	0.00	m
Weir Coefficient	1.60	SI
Submergence Factor	1.00	
Adjusted Weir Coefficient	1.60	SI
Flow Area	1.60	m^2
Velocity	1.01	m/s
Wetted Perimeter	4.80	m
Top Width	4.00	m

Culvert Calculator Report
SWM Pond: Outlet Pipe, 100yr Cont.

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	0.00	m	Headwater Depth/Height	0.98	
Computed Headwater Elevation	212.42	m	Discharge	0.7070	m³/s
Inlet Control HW Elev.	212.37	m	Tailwater Elevation	211.93	m
Outlet Control HW Elev.	212.42	m	Control Type	Entrance Control	

Grades					
Upstream Invert	211.60	m	Downstream Invert	211.15	m
Length	70.00	m	Constructed Slope	0.006429	m/m

Hydraulic Profile					
Profile	CompositeS1S2		Depth, Downstream	0.78	m
Slope Type	Steep		Normal Depth	0.46	m
Flow Regime	N/A		Critical Depth	0.50	m
Velocity Downstream	1.32	m/s	Critical Slope	0.004885	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.013	
Section Material	Concrete		Span	0.84	m
Section Size	825 mm		Rise	0.84	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	212.42	m	Upstream Velocity Head	0.21	m
Ke	0.50		Entrance Loss	0.11	m

Inlet Control Properties					
Inlet Control HW Elev.	212.37	m	Flow Control	N/A	
Inlet Type	Square edge w/headwall		Area Full	0.6	m²
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

SWM Pond: Emergency Spillway, 100yr Uncont.

Project Description

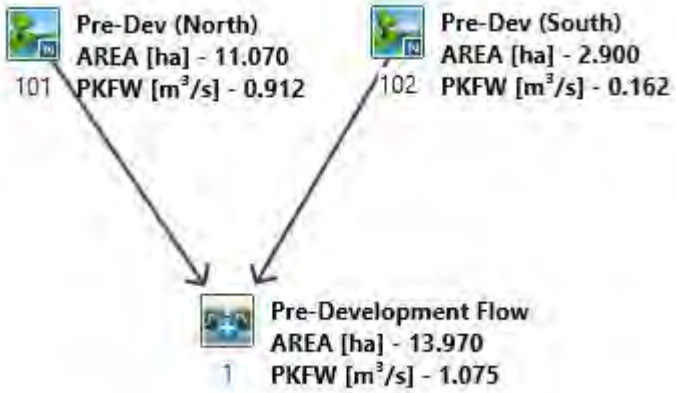
Solve For	Headwater Elevation

Input Data

Discharge		2.989	m³/s
Crest Elevation		214.00	m
Tailwater Elevation		214.00	m
Crest Surface Type	Gravel		
Crest Breadth		40.00	m
Crest Length		6.00	m

Results

Headwater Elevation	214.46	m
Headwater Height Above Crest	0.46	m
Tailwater Height Above Crest	0.00	m
Weir Coefficient	1.61	SI
Submergence Factor	1.00	
Adjusted Weir Coefficient	1.61	SI
Flow Area	2.74	m²
Velocity	1.09	m/s
Wetted Perimeter	6.91	m
Top Width	6.00	m



VO Model Schematic – Pre-Development

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

       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\531e1913-0e12-4e2e-9684-
e2ef03acaa05\04637ea8-636a-43b2-9e52-0cb577eed906\scena
  Summary filename: C:\Users\Valdor\AppData\Local\Civica\VH5\531e1913-0e12-4e2e-9684-
e2ef03acaa05\04637ea8-636a-43b2-9e52-0cb577eed906\scena


DATE: 12-16-2022                          TIME: 12:35:43

USER:


COMMENTS: _____________________________________________________________


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  ***********************************************
  ** SIMULATION : AES_06hr_002yr               **
  ***********************************************


--------------------
|    READ STORM    |    Filename: C:\Users\Valdor\AppD
|                  |              ata\Local\Temp\
|                  |              1f1afd49-c837-4afa-bd03-efa22e6c0833\69f2813f
| Ptotal= 38.69 mm |    Comments: AES_06hr_002yr
--------------------
                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   13.16 |  3.50    5.42 |  5.25    0.77
                0.25    0.77 |  2.00   13.16 |  3.75    3.10 |  5.50    0.77
                0.50    0.77 |  2.25   35.60 |  4.00    3.10 |  5.75    0.77
                0.75    0.77 |  2.50   35.60 |  4.25    1.55 |  6.00    0.77
                1.00    0.77 |  2.75   10.06 |  4.50    1.55 |
                1.25    4.64 |  3.00   10.06 |  4.75    0.77 |
                1.50    4.64 |  3.25    5.42 |  5.00    0.77 |

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

--------------------
| CALIB            |
| NASHYD   (  0101)|   Area    (ha)=  11.07   Curve Number   (CN)= 64.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.60   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.18

        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    4.64 | 3.250   10.06 |  4.83    0.77
               0.167    0.00 | 1.750    4.64 | 3.333    5.42 |  4.92    0.77
               0.250    0.00 | 1.833   13.16 | 3.417    5.42 |  5.00    0.77
               0.333    0.77 | 1.917   13.16 | 3.500    5.42 |  5.08    0.77
               0.417    0.77 | 2.000   13.16 | 3.583    5.42 |  5.17    0.77
               0.500    0.77 | 2.083   13.16 | 3.667    5.42 |  5.25    0.77
               0.583    0.77 | 2.167   13.16 | 3.750    5.42 |  5.33    0.77
               0.667    0.77 | 2.250   13.16 | 3.833    3.10 |  5.42    0.77
               0.750    0.77 | 2.333   35.60 | 3.917    3.10 |  5.50    0.77
               0.833    0.77 | 2.417   35.60 | 4.000    3.10 |  5.58    0.77
               0.917    0.77 | 2.500   35.60 | 4.083    3.10 |  5.67    0.77
               1.000    0.77 | 2.583   35.60 | 4.167    3.10 |  5.75    0.77
               1.083    0.77 | 2.667   35.60 | 4.250    3.10 |  5.83    0.77
               1.167    0.77 | 2.750   35.60 | 4.333    1.55 |  5.92    0.77
               1.250    0.77 | 2.833   10.06 | 4.417    1.55 |  6.00    0.77
               1.333    4.64 | 2.917   10.06 | 4.500    1.55 |  6.08    0.77
               1.417    4.64 | 3.000   10.06 | 4.583    1.55 |  6.17    0.77
               1.500    4.64 | 3.083   10.06 | 4.667    1.55 |  6.25    0.77
               1.583    4.64 | 3.167   10.06 | 4.750    1.55 |

     Unit Hyd Qpeak  (cms)=   2.349

     PEAK FLOW       (cms)=   0.161 (i)
     TIME TO PEAK    (hrs)=   2.833
     RUNOFF VOLUME    (mm)=   5.540
     TOTAL RAINFALL   (mm)=  38.690
     RUNOFF COEFFICIENT   =   0.143

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0102)|   Area    (ha)=   2.90   Curve Number   (CN)= 50.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   9.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.15

        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    4.64 | 3.250   10.06 |  4.83    0.77
               0.167    0.00 | 1.750    4.64 | 3.333    5.42 |  4.92    0.77
               0.250    0.00 | 1.833   13.16 | 3.417    5.42 |  5.00    0.77
               0.333    0.77 | 1.917   13.16 | 3.500    5.42 |  5.08    0.77
               0.417    0.77 | 2.000   13.16 | 3.583    5.42 |  5.17    0.77
               0.500    0.77 | 2.083   13.16 | 3.667    5.42 |  5.25    0.77
               0.583    0.77 | 2.167   13.16 | 3.750    5.42 |  5.33    0.77
               0.667    0.77 | 2.250   13.16 | 3.833    3.10 |  5.42    0.77
               0.750    0.77 | 2.333   35.60 | 3.917    3.10 |  5.50    0.77
               0.833    0.77 | 2.417   35.60 | 4.000    3.10 |  5.58    0.77
               0.917    0.77 | 2.500   35.60 | 4.083    3.10 |  5.67    0.77
               1.000    0.77 | 2.583   35.60 | 4.167    3.10 |  5.75    0.77
               1.083    0.77 | 2.667   35.60 | 4.250    3.10 |  5.83    0.77
               1.167    0.77 | 2.750   35.60 | 4.333    1.55 |  5.92    0.77
               1.250    0.77 | 2.833   10.06 | 4.417    1.55 |  6.00    0.77
               1.333    4.64 | 2.917   10.06 | 4.500    1.55 |  6.08    0.77
               1.417    4.64 | 3.000   10.06 | 4.583    1.55 |  6.17    0.77
               1.500    4.64 | 3.083   10.06 | 4.667    1.55 |  6.25    0.77
               1.583    4.64 | 3.167   10.06 | 4.750    1.55 |

     Unit Hyd Qpeak  (cms)=   0.738

     PEAK FLOW       (cms)=   0.024 (i)
```

```
     TIME TO PEAK    (hrs)=   2.750
     RUNOFF VOLUME    (mm)=   2.991
     TOTAL RAINFALL   (mm)=  38.690
     RUNOFF COEFFICIENT   =   0.077

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

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

-------------------
| ADD HYD  (  0001)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0101):    11.07   0.161     2.83     5.54
      + ID2= 2 (  0102):     2.90   0.024     2.75     2.99
        ================================================
        ID = 3 (  0001):    13.97   0.184     2.83     5.01

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

       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\531e1913-0e12-4e2e-9684-
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  Summary filename: C:\Users\Valdor\AppData\Local\Civica\VH5\531e1913-0e12-4e2e-9684-
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DATE: 12-16-2022                          TIME: 12:35:43

USER:


COMMENTS: _____________________________________________________________

--------------------------------------------------------------------------------------------
--------------
  ***********************************************
  ** SIMULATION : AES_06hr_005yr                **
  ***********************************************


-------------------
|    READ STORM    |    Filename: C:\Users\Valdor\AppD
|                  |              ata\Local\Temp\
|                  |              1f1afd49-c837-4afa-bd03-efa22e6c0833\a3f7ed82
| Ptotal= 52.41 mm |    Comments: AES_06hr_005yr
-------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	0.00	1.75	17.82	3.50	7.34	5.25	1.05
0.25	1.05	2.00	17.82	3.75	4.19	5.50	1.05
0.50	1.05	2.25	48.21	4.00	4.19	5.75	1.05
0.75	1.05	2.50	48.21	4.25	2.10	6.00	1.05
1.00	1.05	2.75	13.62	4.50	2.10		
1.25	6.29	3.00	13.62	4.75	1.05		
1.50	6.29	3.25	7.34	5.00	1.05		

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

-------------------
| CALIB            |
| NASHYD   (  0101)|   Area    (ha)=  11.07   Curve Number   (CN)= 64.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.60   # of Linear Res.(N)= 3.00
-------------------   U.H. Tp(hrs)=   0.18

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	1.667	6.29	3.250	13.62	4.83	1.05
0.167	0.00	1.750	6.29	3.333	7.34	4.92	1.05
0.250	0.00	1.833	17.82	3.417	7.34	5.00	1.05
0.333	1.05	1.917	17.82	3.500	7.34	5.08	1.05
0.417	1.05	2.000	17.82	3.583	7.34	5.17	1.05
0.500	1.05	2.083	17.82	3.667	7.34	5.25	1.05
0.583	1.05	2.167	17.82	3.750	7.34	5.33	1.05
0.667	1.05	2.250	17.82	3.833	4.19	5.42	1.05
0.750	1.05	2.333	48.21	3.917	4.19	5.50	1.05
0.833	1.05	2.417	48.21	4.000	4.19	5.58	1.05
0.917	1.05	2.500	48.21	4.083	4.19	5.67	1.05
1.000	1.05	2.583	48.21	4.167	4.19	5.75	1.05
1.083	1.05	2.667	48.21	4.250	4.19	5.83	1.05
1.167	1.05	2.750	48.21	4.333	2.10	5.92	1.05
1.250	1.05	2.833	13.62	4.417	2.10	6.00	1.05
1.333	6.29	2.917	13.62	4.500	2.10	6.08	1.05
1.417	6.29	3.000	13.62	4.583	2.10	6.17	1.05
1.500	6.29	3.083	13.62	4.667	2.10	6.25	1.05
1.583	6.29	3.167	13.62	4.750	2.10		

```
     Unit Hyd Qpeak  (cms)=   2.349

     PEAK FLOW       (cms)=   0.314 (i)
     TIME TO PEAK    (hrs)=   2.750
     RUNOFF VOLUME    (mm)=  10.668
     TOTAL RAINFALL   (mm)=  52.410
     RUNOFF COEFFICIENT   =   0.204

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

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

-------------------
| CALIB            |
| NASHYD   (  0102)|   Area    (ha)=   2.90   Curve Number   (CN)= 50.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   9.50   # of Linear Res.(N)= 3.00
-------------------   U.H. Tp(hrs)=   0.15

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	1.667	6.29	3.250	13.62	4.83	1.05
0.167	0.00	1.750	6.29	3.333	7.34	4.92	1.05
0.250	0.00	1.833	17.82	3.417	7.34	5.00	1.05

```
                0.333    1.05 | 1.917   17.82 | 3.500    7.34 |  5.08    1.05
                0.417    1.05 | 2.000   17.82 | 3.583    7.34 |  5.17    1.05
                0.500    1.05 | 2.083   17.82 | 3.667    7.34 |  5.25    1.05
                0.583    1.05 | 2.167   17.82 | 3.750    7.34 |  5.33    1.05
                0.667    1.05 | 2.250   17.82 | 3.833    4.19 |  5.42    1.05
                0.750    1.05 | 2.333   48.21 | 3.917    4.19 |  5.50    1.05
                0.833    1.05 | 2.417   48.21 | 4.000    4.19 |  5.58    1.05
                0.917    1.05 | 2.500   48.21 | 4.083    4.19 |  5.67    1.05
                1.000    1.05 | 2.583   48.21 | 4.167    4.19 |  5.75    1.05
                1.083    1.05 | 2.667   48.21 | 4.250    4.19 |  5.83    1.05
                1.167    1.05 | 2.750   48.21 | 4.333    2.10 |  5.92    1.05
                1.250    1.05 | 2.833   13.62 | 4.417    2.10 |  6.00    1.05
                1.333    6.29 | 2.917   13.62 | 4.500    2.10 |  6.08    1.05
                1.417    6.29 | 3.000   13.62 | 4.583    2.10 |  6.17    1.05
                1.500    6.29 | 3.083   13.62 | 4.667    2.10 |  6.25    1.05
                1.583    6.29 | 3.167   13.62 | 4.750    2.10 |

     Unit Hyd Qpeak  (cms)=   0.738

     PEAK FLOW       (cms)=   0.051 (i)
     TIME TO PEAK    (hrs)=   2.750
     RUNOFF VOLUME    (mm)=   6.166
     TOTAL RAINFALL   (mm)=  52.410
     RUNOFF COEFFICIENT   =   0.118

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

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

--------------------
| ADD HYD  (  0001)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0101):    11.07   0.314     2.75    10.67
     + ID2= 2 (  0102):     2.90   0.051     2.75     6.17
       ================================================
       ID = 3 (  0001):    13.97   0.365     2.75     9.73

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

 FINISH
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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\531e1913-0e12-4e2e-9684-
e2ef03acaa05\c20ecb39-822c-4776-b17e-5502bc06d379\scena

  Summary filename: C:\Users\Valdor\AppData\Local\Civica\VH5\531e1913-0e12-4e2e-9684-
e2ef03acaa05\c20ecb39-822c-4776-b17e-5502bc06d379\scena


DATE: 12-16-2022                          TIME: 12:35:43

USER:


COMMENTS: _____________________________________________________


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  **********************************************
  ** SIMULATION : AES_06hr_010yr               **
  **********************************************


--------------------
|    READ STORM    |    Filename: C:\Users\Valdor\AppD
|                  |              ata\Local\Temp\
|                  |              1f1afd49-c837-4afa-bd03-efa22e6c0833\b0a61c61
| Ptotal= 61.50 mm |    Comments: AES_06hr_010yr
--------------------
                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   20.91 |  3.50    8.61 |  5.25    1.23
                0.25    1.23 |  2.00   20.91 |  3.75    4.92 |  5.50    1.23
                0.50    1.23 |  2.25   56.58 |  4.00    4.92 |  5.75    1.23
                0.75    1.23 |  2.50   56.58 |  4.25    2.46 |  6.00    1.23
                1.00    1.23 |  2.75   15.99 |  4.50    2.46 |
                1.25    7.38 |  3.00   15.99 |  4.75    1.23 |
                1.50    7.38 |  3.25    8.61 |  5.00    1.23 |

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

--------------------
| CALIB            |
| NASHYD   (  0101)|   Area    (ha)=  11.07   Curve Number   (CN)= 64.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.60   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.18

       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    7.38 | 3.250   15.99 |  4.83    1.23
               0.167    0.00 | 1.750    7.38 | 3.333    8.61 |  4.92    1.23
               0.250    0.00 | 1.833   20.91 | 3.417    8.61 |  5.00    1.23
               0.333    1.23 | 1.917   20.91 | 3.500    8.61 |  5.08    1.23
               0.417    1.23 | 2.000   20.91 | 3.583    8.61 |  5.17    1.23
               0.500    1.23 | 2.083   20.91 | 3.667    8.61 |  5.25    1.23
               0.583    1.23 | 2.167   20.91 | 3.750    8.61 |  5.33    1.23
               0.667    1.23 | 2.250   20.91 | 3.833    4.92 |  5.42    1.23
               0.750    1.23 | 2.333   56.58 | 3.917    4.92 |  5.50    1.23
               0.833    1.23 | 2.417   56.58 | 4.000    4.92 |  5.58    1.23
               0.917    1.23 | 2.500   56.58 | 4.083    4.92 |  5.67    1.23
               1.000    1.23 | 2.583   56.58 | 4.167    4.92 |  5.75    1.23
               1.083    1.23 | 2.667   56.58 | 4.250    4.92 |  5.83    1.23
               1.167    1.23 | 2.750   56.58 | 4.333    2.46 |  5.92    1.23
               1.250    1.23 | 2.833   15.99 | 4.417    2.46 |  6.00    1.23
               1.333    7.38 | 2.917   15.99 | 4.500    2.46 |  6.08    1.23
               1.417    7.38 | 3.000   15.99 | 4.583    2.46 |  6.17    1.23
               1.500    7.38 | 3.083   15.99 | 4.667    2.46 |  6.25    1.23
               1.583    7.38 | 3.167   15.99 | 4.750    2.46 |
```

```
     Unit Hyd Qpeak  (cms)=   2.349

     PEAK FLOW       (cms)=   0.439 (i)
     TIME TO PEAK    (hrs)=   2.750
     RUNOFF VOLUME    (mm)=  14.722
     TOTAL RAINFALL   (mm)=  61.500
     RUNOFF COEFFICIENT   =   0.239

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

--------------------------------------------------------------------------------
-------------------
| CALIB             |
| NASHYD   (  0102)|   Area    (ha)=   2.90   Curve Number   (CN)= 50.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   9.50   # of Linear Res.(N)= 3.00
-------------------   U.H. Tp(hrs)=   0.15

         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    7.38 | 3.250   15.99 |  4.83    1.23
               0.167    0.00 | 1.750    7.38 | 3.333    8.61 |  4.92    1.23
               0.250    0.00 | 1.833   20.91 | 3.417    8.61 |  5.00    1.23
               0.333    1.23 | 1.917   20.91 | 3.500    8.61 |  5.08    1.23
               0.417    1.23 | 2.000   20.91 | 3.583    8.61 |  5.17    1.23
               0.500    1.23 | 2.083   20.91 | 3.667    8.61 |  5.25    1.23
               0.583    1.23 | 2.167   20.91 | 3.750    8.61 |  5.33    1.23
               0.667    1.23 | 2.250   20.91 | 3.833    4.92 |  5.42    1.23
               0.750    1.23 | 2.333   56.58 | 3.917    4.92 |  5.50    1.23
               0.833    1.23 | 2.417   56.58 | 4.000    4.92 |  5.58    1.23
               0.917    1.23 | 2.500   56.58 | 4.083    4.92 |  5.67    1.23
               1.000    1.23 | 2.583   56.58 | 4.167    4.92 |  5.75    1.23
               1.083    1.23 | 2.667   56.58 | 4.250    4.92 |  5.83    1.23
               1.167    1.23 | 2.750   56.58 | 4.333    2.46 |  5.92    1.23
               1.250    1.23 | 2.833   15.99 | 4.417    2.46 |  6.00    1.23
               1.333    7.38 | 2.917   15.99 | 4.500    2.46 |  6.08    1.23
               1.417    7.38 | 3.000   15.99 | 4.583    2.46 |  6.17    1.23
               1.500    7.38 | 3.083   15.99 | 4.667    2.46 |  6.25    1.23
               1.583    7.38 | 3.167   15.99 | 4.750    2.46 |

     Unit Hyd Qpeak  (cms)=   0.738

     PEAK FLOW       (cms)=   0.073 (i)
     TIME TO PEAK    (hrs)=   2.750
     RUNOFF VOLUME    (mm)=   8.786
     TOTAL RAINFALL   (mm)=  61.500
     RUNOFF COEFFICIENT   =   0.143

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

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

-------------------
| ADD HYD  (  0001)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0101):    11.07   0.439     2.75    14.72
     + ID2= 2 (  0102):     2.90   0.073     2.75     8.79
       ================================================
       ID = 3 (  0001):    13.97   0.512     2.75    13.49

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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================================================================================
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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\531e1913-0e12-4e2e-9684-
e2ef03acaa05\50fd2681-1f64-4a49-8197-7f7a552026a4\scena
  Summary filename: C:\Users\Valdor\AppData\Local\Civica\VH5\531e1913-0e12-4e2e-9684-
e2ef03acaa05\50fd2681-1f64-4a49-8197-7f7a552026a4\scena


DATE: 12-16-2022                          TIME: 12:35:43

USER:



COMMENTS: _____________________________________________________


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  ***********************************************
  ** SIMULATION : AES_06hr_025yr                **
  ***********************************************


--------------------
|    READ STORM    |    Filename: C:\Users\Valdor\AppD
|                  |              ata\Local\Temp\
|                  |              1f1afd49-c837-4afa-bd03-efa22e6c0833\ea9f6f15
| Ptotal= 72.91 mm |    Comments: AES_06hr_025yr
--------------------
                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   24.79 |  3.50   10.21 |  5.25    1.46
                0.25    1.46 |  2.00   24.79 |  3.75    5.83 |  5.50    1.46
                0.50    1.46 |  2.25   67.07 |  4.00    5.83 |  5.75    1.46
                0.75    1.46 |  2.50   67.07 |  4.25    2.92 |  6.00    1.46
                1.00    1.46 |  2.75   18.95 |  4.50    2.92 |
                1.25    8.75 |  3.00   18.95 |  4.75    1.46 |
                1.50    8.75 |  3.25   10.21 |  5.00    1.46 |

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

-------------------
| CALIB             |
| NASHYD   (  0101)|   Area    (ha)=  11.07   Curve Number   (CN)= 64.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.60   # of Linear Res.(N)= 3.00
-------------------   U.H. Tp(hrs)=   0.18

         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	8.75	3.250	18.95	4.83	1.46
0.167	0.00	1.750	8.75	3.333	10.21	4.92	1.46
0.250	0.00	1.833	24.79	3.417	10.21	5.00	1.46
0.333	1.46	1.917	24.79	3.500	10.21	5.08	1.46
0.417	1.46	2.000	24.79	3.583	10.21	5.17	1.46
0.500	1.46	2.083	24.79	3.667	10.21	5.25	1.46
0.583	1.46	2.167	24.79	3.750	10.21	5.33	1.46
0.667	1.46	2.250	24.79	3.833	5.83	5.42	1.46
0.750	1.46	2.333	67.07	3.917	5.83	5.50	1.46
0.833	1.46	2.417	67.07	4.000	5.83	5.58	1.46
0.917	1.46	2.500	67.07	4.083	5.83	5.67	1.46
1.000	1.46	2.583	67.07	4.167	5.83	5.75	1.46
1.083	1.46	2.667	67.07	4.250	5.83	5.83	1.46
1.167	1.46	2.750	67.07	4.333	2.92	5.92	1.46
1.250	1.46	2.833	18.95	4.417	2.92	6.00	1.46
1.333	8.75	2.917	18.95	4.500	2.92	6.08	1.46
1.417	8.75	3.000	18.95	4.583	2.92	6.17	1.46
1.500	8.75	3.083	18.95	4.667	2.92	6.25	1.46
1.583	8.75	3.167	18.95	4.750	2.92		

Unit Hyd Qpeak (cms)= 2.349

PEAK FLOW (cms)= 0.615 (i)
TIME TO PEAK (hrs)= 2.750
RUNOFF VOLUME (mm)= 20.430
TOTAL RAINFALL (mm)= 72.910
RUNOFF COEFFICIENT = 0.280

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

CALIB					
NASHYD (0102)	Area	(ha)= 2.90	Curve Number	(CN)= 50.0	
ID= 1 DT= 5.0 min	Ia	(mm)= 9.50	# of Linear Res.(N)= 3.00		
	U.H. Tp(hrs)= 0.15				

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	1.667	8.75	3.250	18.95	4.83	1.46
0.167	0.00	1.750	8.75	3.333	10.21	4.92	1.46
0.250	0.00	1.833	24.79	3.417	10.21	5.00	1.46
0.333	1.46	1.917	24.79	3.500	10.21	5.08	1.46
0.417	1.46	2.000	24.79	3.583	10.21	5.17	1.46
0.500	1.46	2.083	24.79	3.667	10.21	5.25	1.46
0.583	1.46	2.167	24.79	3.750	10.21	5.33	1.46
0.667	1.46	2.250	24.79	3.833	5.83	5.42	1.46
0.750	1.46	2.333	67.07	3.917	5.83	5.50	1.46
0.833	1.46	2.417	67.07	4.000	5.83	5.58	1.46
0.917	1.46	2.500	67.07	4.083	5.83	5.67	1.46
1.000	1.46	2.583	67.07	4.167	5.83	5.75	1.46
1.083	1.46	2.667	67.07	4.250	5.83	5.83	1.46
1.167	1.46	2.750	67.07	4.333	2.92	5.92	1.46
1.250	1.46	2.833	18.95	4.417	2.92	6.00	1.46
1.333	8.75	2.917	18.95	4.500	2.92	6.08	1.46
1.417	8.75	3.000	18.95	4.583	2.92	6.17	1.46
1.500	8.75	3.083	18.95	4.667	2.92	6.25	1.46
1.583	8.75	3.167	18.95	4.750	2.92		

Unit Hyd Qpeak (cms)= 0.738

PEAK FLOW (cms)= 0.106 (i)
TIME TO PEAK (hrs)= 2.750
RUNOFF VOLUME (mm)= 12.594
TOTAL RAINFALL (mm)= 72.910
RUNOFF COEFFICIENT = 0.173

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

ADD HYD (0001)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0101):	11.07	0.615	2.75	20.43
+ ID2= 2 (0102):	2.90	0.106	2.75	12.59
ID = 3 (0001):	13.97	0.721	2.75	18.80

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

==========

```
      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
```


***** 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\531e1913-0e12-4e2e-9684-e2ef03acaa05\8f90c0da-2c51-41af-bf26-0b08f13e6b04\scena
Summary filename: C:\Users\Valdor\AppData\Local\Civica\VH5\531e1913-0e12-4e2e-9684-e2ef03acaa05\8f90c0da-2c51-41af-bf26-0b08f13e6b04\scena

DATE: 12-16-2022 TIME: 12:35:43

USER:

COMMENTS: _____

```
  ************************************************
  ** SIMULATION : AES_06hr_050yr                **
  ************************************************
```

READ STORM	Filename: C:\Users\Valdor\AppData\Local\Temp\1f1afd49-c837-4afa-bd03-efa22e6c0833\12dd90ee
Ptotal= 81.41 mm	Comments: AES_06hr_050yr

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	0.00	1.75	27.68	3.50	11.40	5.25	1.63
0.25	1.63	2.00	27.68	3.75	6.51	5.50	1.63

```
                0.50    1.63 |  2.25   74.89 |  4.00    6.51 |  5.75    1.63
                0.75    1.63 |  2.50   74.89 |  4.25    3.26 |  6.00    1.63
                1.00    1.63 |  2.75   21.16 |  4.50    3.26 |
                1.25    9.77 |  3.00   21.16 |  4.75    1.63 |
                1.50    9.77 |  3.25   11.40 |  5.00    1.63 |

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

--------------------
| CALIB            |
| NASHYD   (  0101)|   Area    (ha)=  11.07   Curve Number   (CN)= 64.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.60   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.18

        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    9.77 | 3.250   21.16 |  4.83    1.63
                0.167    0.00 | 1.750    9.77 | 3.333   11.40 |  4.92    1.63
                0.250    0.00 | 1.833   27.68 | 3.417   11.40 |  5.00    1.63
                0.333    1.63 | 1.917   27.68 | 3.500   11.40 |  5.08    1.63
                0.417    1.63 | 2.000   27.68 | 3.583   11.40 |  5.17    1.63
                0.500    1.63 | 2.083   27.68 | 3.667   11.40 |  5.25    1.63
                0.583    1.63 | 2.167   27.68 | 3.750   11.40 |  5.33    1.63
                0.667    1.63 | 2.250   27.68 | 3.833    6.51 |  5.42    1.63
                0.750    1.63 | 2.333   74.89 | 3.917    6.51 |  5.50    1.63
                0.833    1.63 | 2.417   74.89 | 4.000    6.51 |  5.58    1.63
                0.917    1.63 | 2.500   74.89 | 4.083    6.51 |  5.67    1.63
                1.000    1.63 | 2.583   74.89 | 4.167    6.51 |  5.75    1.63
                1.083    1.63 | 2.667   74.89 | 4.250    6.51 |  5.83    1.63
                1.167    1.63 | 2.750   74.89 | 4.333    3.26 |  5.92    1.63
                1.250    1.63 | 2.833   21.16 | 4.417    3.26 |  6.00    1.63
                1.333    9.77 | 2.917   21.16 | 4.500    3.26 |  6.08    1.63
                1.417    9.77 | 3.000   21.16 | 4.583    3.26 |  6.17    1.63
                1.500    9.77 | 3.083   21.16 | 4.667    3.26 |  6.25    1.63
                1.583    9.77 | 3.167   21.16 | 4.750    3.26 |

     Unit Hyd Qpeak  (cms)=   2.349

     PEAK FLOW       (cms)=   0.759 (i)
     TIME TO PEAK    (hrs)=   2.750
     RUNOFF VOLUME    (mm)=  25.070
     TOTAL RAINFALL   (mm)=  81.410
     RUNOFF COEFFICIENT   =   0.308

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0102)|   Area    (ha)=   2.90   Curve Number   (CN)= 50.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   9.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.15

        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    9.77 | 3.250   21.16 |  4.83    1.63
                0.167    0.00 | 1.750    9.77 | 3.333   11.40 |  4.92    1.63
                0.250    0.00 | 1.833   27.68 | 3.417   11.40 |  5.00    1.63
                0.333    1.63 | 1.917   27.68 | 3.500   11.40 |  5.08    1.63
                0.417    1.63 | 2.000   27.68 | 3.583   11.40 |  5.17    1.63
                0.500    1.63 | 2.083   27.68 | 3.667   11.40 |  5.25    1.63
                0.583    1.63 | 2.167   27.68 | 3.750   11.40 |  5.33    1.63
                0.667    1.63 | 2.250   27.68 | 3.833    6.51 |  5.42    1.63
                0.750    1.63 | 2.333   74.89 | 3.917    6.51 |  5.50    1.63
                0.833    1.63 | 2.417   74.89 | 4.000    6.51 |  5.58    1.63
                0.917    1.63 | 2.500   74.89 | 4.083    6.51 |  5.67    1.63
                1.000    1.63 | 2.583   74.89 | 4.167    6.51 |  5.75    1.63
                1.083    1.63 | 2.667   74.89 | 4.250    6.51 |  5.83    1.63
                1.167    1.63 | 2.750   74.89 | 4.333    3.26 |  5.92    1.63
                1.250    1.63 | 2.833   21.16 | 4.417    3.26 |  6.00    1.63
                1.333    9.77 | 2.917   21.16 | 4.500    3.26 |  6.08    1.63
                1.417    9.77 | 3.000   21.16 | 4.583    3.26 |  6.17    1.63
                1.500    9.77 | 3.083   21.16 | 4.667    3.26 |  6.25    1.63
                1.583    9.77 | 3.167   21.16 | 4.750    3.26 |

     Unit Hyd Qpeak  (cms)=   0.738

     PEAK FLOW       (cms)=   0.133 (i)
     TIME TO PEAK    (hrs)=   2.750
     RUNOFF VOLUME    (mm)=  15.775
     TOTAL RAINFALL   (mm)=  81.410
     RUNOFF COEFFICIENT   =   0.194

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

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

--------------------
| ADD HYD  (  0001)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------           (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0101):    11.07   0.759     2.75    25.07
     + ID2= 2 (  0102):     2.90   0.133     2.75    15.77
       ================================================
       ID = 3 (  0001):    13.97   0.892     2.75    23.14

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

      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\531e1913-0e12-4e2e-9684-
e2ef03acaa05\bf469b88-6845-4a25-8bd3-1abf8d15d0ba\scena
  Summary filename: C:\Users\Valdor\AppData\Local\Civica\VH5\531e1913-0e12-4e2e-9684-
e2ef03acaa05\bf469b88-6845-4a25-8bd3-1abf8d15d0ba\scena


DATE: 12-16-2022                          TIME: 12:35:43

USER:
```

```
COMMENTS: _____________________________________________________

--------------------------------------------------------------------------------------------
--------------
  ************************************************
  ** SIMULATION : AES_06hr_100yr                **
  ************************************************


--------------------
|    READ STORM    |    Filename: C:\Users\Valdor\AppD
|                  |              ata\Local\Temp\
|                  |              1f1afd49-c837-4afa-bd03-efa22e6c0833\1ec3a0e5
| Ptotal= 89.91 mm |    Comments: AES_06hr_100yr
--------------------
                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   30.57 |  3.50   12.59 |  5.25    1.80
                0.25    1.80 |  2.00   30.57 |  3.75    7.19 |  5.50    1.80
                0.50    1.80 |  2.25   82.71 |  4.00    7.19 |  5.75    1.80
                0.75    1.80 |  2.50   82.71 |  4.25    3.60 |  6.00    1.80
                1.00    1.80 |  2.75   23.37 |  4.50    3.60 |
                1.25   10.79 |  3.00   23.37 |  4.75    1.80 |
                1.50   10.79 |  3.25   12.59 |  5.00    1.80 |

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

--------------------
| CALIB            |
| NASHYD   (  0101)|   Area    (ha)=  11.07   Curve Number   (CN)= 64.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.60   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.18

        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   10.79 | 3.250   23.37 |  4.83    1.80
               0.167    0.00 | 1.750   10.79 | 3.333   12.59 |  4.92    1.80
               0.250    0.00 | 1.833   30.57 | 3.417   12.59 |  5.00    1.80
               0.333    1.80 | 1.917   30.57 | 3.500   12.59 |  5.08    1.80
               0.417    1.80 | 2.000   30.57 | 3.583   12.59 |  5.17    1.80
               0.500    1.80 | 2.083   30.57 | 3.667   12.59 |  5.25    1.80
               0.583    1.80 | 2.167   30.57 | 3.750   12.59 |  5.33    1.80
               0.667    1.80 | 2.250   30.57 | 3.833    7.19 |  5.42    1.80
               0.750    1.80 | 2.333   82.71 | 3.917    7.19 |  5.50    1.80
               0.833    1.80 | 2.417   82.71 | 4.000    7.19 |  5.58    1.80
               0.917    1.80 | 2.500   82.71 | 4.083    7.19 |  5.67    1.80
               1.000    1.80 | 2.583   82.71 | 4.167    7.19 |  5.75    1.80
               1.083    1.80 | 2.667   82.71 | 4.250    7.19 |  5.83    1.80
               1.167    1.80 | 2.750   82.71 | 4.333    3.60 |  5.92    1.80
               1.250    1.80 | 2.833   23.37 | 4.417    3.60 |  6.00    1.80
               1.333   10.79 | 2.917   23.37 | 4.500    3.60 |  6.08    1.80
               1.417   10.79 | 3.000   23.37 | 4.583    3.60 |  6.17    1.80
               1.500   10.79 | 3.083   23.37 | 4.667    3.60 |  6.25    1.80
               1.583   10.79 | 3.167   23.37 | 4.750    3.60 |

    Unit Hyd Qpeak  (cms)=   2.349

    PEAK FLOW       (cms)=   0.912 (i)
    TIME TO PEAK    (hrs)=   2.750
    RUNOFF VOLUME    (mm)=  30.000
    TOTAL RAINFALL   (mm)=  89.910
    RUNOFF COEFFICIENT   =   0.334

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0102)|   Area    (ha)=   2.90   Curve Number   (CN)= 50.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   9.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.15

        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   10.79 | 3.250   23.37 |  4.83    1.80
               0.167    0.00 | 1.750   10.79 | 3.333   12.59 |  4.92    1.80
               0.250    0.00 | 1.833   30.57 | 3.417   12.59 |  5.00    1.80
               0.333    1.80 | 1.917   30.57 | 3.500   12.59 |  5.08    1.80
               0.417    1.80 | 2.000   30.57 | 3.583   12.59 |  5.17    1.80
               0.500    1.80 | 2.083   30.57 | 3.667   12.59 |  5.25    1.80
               0.583    1.80 | 2.167   30.57 | 3.750   12.59 |  5.33    1.80
               0.667    1.80 | 2.250   30.57 | 3.833    7.19 |  5.42    1.80
               0.750    1.80 | 2.333   82.71 | 3.917    7.19 |  5.50    1.80
               0.833    1.80 | 2.417   82.71 | 4.000    7.19 |  5.58    1.80
               0.917    1.80 | 2.500   82.71 | 4.083    7.19 |  5.67    1.80
               1.000    1.80 | 2.583   82.71 | 4.167    7.19 |  5.75    1.80
               1.083    1.80 | 2.667   82.71 | 4.250    7.19 |  5.83    1.80
               1.167    1.80 | 2.750   82.71 | 4.333    3.60 |  5.92    1.80
               1.250    1.80 | 2.833   23.37 | 4.417    3.60 |  6.00    1.80
               1.333   10.79 | 2.917   23.37 | 4.500    3.60 |  6.08    1.80
               1.417   10.79 | 3.000   23.37 | 4.583    3.60 |  6.17    1.80
               1.500   10.79 | 3.083   23.37 | 4.667    3.60 |  6.25    1.80
               1.583   10.79 | 3.167   23.37 | 4.750    3.60 |

    Unit Hyd Qpeak  (cms)=   0.738

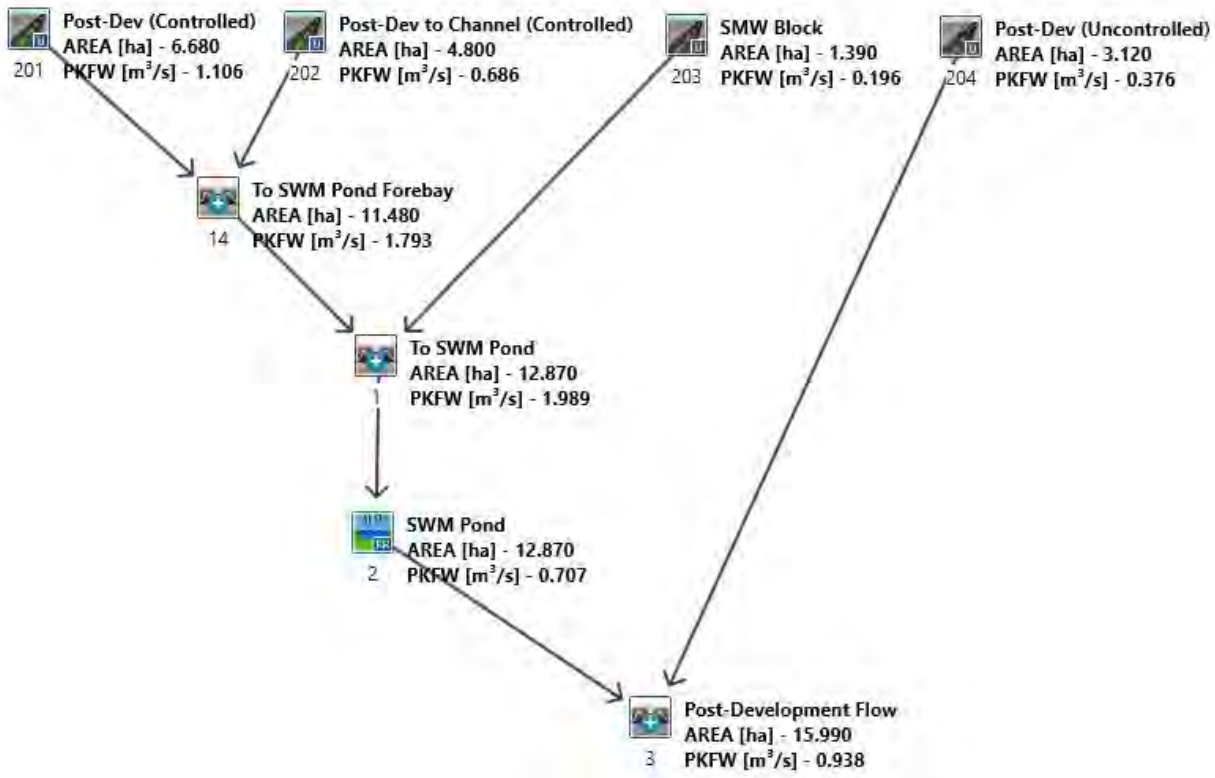
    PEAK FLOW       (cms)=   0.162 (i)
    TIME TO PEAK    (hrs)=   2.750
    RUNOFF VOLUME    (mm)=  19.223
    TOTAL RAINFALL   (mm)=  89.910
    RUNOFF COEFFICIENT   =   0.214

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

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

--------------------
| ADD HYD  (  0001)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0101):    11.07   0.912     2.75    30.00
     + ID2= 2 (  0102):     2.90   0.162     2.75    19.22
       ================================================
       ID = 3 (  0001):    13.97   1.075     2.75    27.76

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



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\531e1913-0e12-4e2e-9684-
e2ef03acaa05\f1d7867a-3ea6-4a2c-88c8-033814afaac7\scena
  Summary filename: C:\Users\Valdor\AppData\Local\Civica\VH5\531e1913-0e12-4e2e-9684-
e2ef03acaa05\f1d7867a-3ea6-4a2c-88c8-033814afaac7\scena


DATE: 12-16-2022                          TIME: 12:36:45

USER:


COMMENTS: _____________________________________________________


--------------------------------------------------------------------------------
--------------
  ************************************************
  ** SIMULATION : 1-Chicago_25mm                 **
  ************************************************


--------------------
|    READ STORM    |    Filename: C:\Users\Valdor\AppD
|                  |              ata\Local\Temp\
|                  |              cb3b72dc-5cab-43c3-b388-d70a01008f1d\d5485b0b
| Ptotal= 25.02 mm |    Comments: Chicago_25mm
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.00    2.17 |  1.00    6.20 |  2.00    5.62 |  3.00    2.95
                0.17    2.38 |  1.17   12.18 |  2.17    4.80 |  3.17    2.76
                0.33    2.66 |  1.33   41.67 |  2.33    4.21 |  3.33    2.62
                0.50    3.03 |  1.50   15.28 |  2.50    3.78 |  3.50    2.47
                0.67    3.58 |  1.67    9.22 |  2.67    3.45 |  3.67    2.35
                0.83    4.47 |  1.83    6.88 |  2.83    3.18 |  3.83    2.23

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

--------------------
| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=   6.68
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  60.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.68         2.00
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       5.00         2.00
     Length            (m)=     211.03        40.00
     Mannings n           =      0.013        0.250

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


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

     Max.Eff.Inten.(mm/hr)=      41.67         2.36
                 over (min)        5.00        40.00
     Storage Coeff.  (min)=       3.50 (ii)   35.08 (ii)
     Unit Hyd. Tpeak (min)=       5.00        40.00
     Unit Hyd. peak  (cms)=       0.26         0.03
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.44         0.01         0.446 (iii)
     TIME TO PEAK    (hrs)=       1.50         2.25          1.50
     RUNOFF VOLUME    (mm)=      23.02         2.38         14.76
     TOTAL RAINFALL   (mm)=      25.02        25.02         25.02
     RUNOFF COEFFICIENT   =       0.92         0.10          0.59

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

      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  53.0    Ia = Dep. Storage  (Above)
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0202)|   Area    (ha)=   4.80
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=  45.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.88         1.92
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       5.00         2.00
     Length            (m)=     178.89        40.00
     Mannings n           =      0.013        0.250

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


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

```
              0.833    3.58 | 1.833    9.22 | 2.833    3.45 |  3.83    2.35
              0.917    4.47 | 1.917    6.88 | 2.917    3.18 |  3.92    2.23
              1.000    4.47 | 2.000    6.88 | 3.000    3.18 |  4.00    2.23

     Max.Eff.Inten.(mm/hr)=      41.67         2.73
               over (min)        5.00        35.00
     Storage Coeff.  (min)=       3.17 (ii)   32.98 (ii)
     Unit Hyd. Tpeak (min)=       5.00        35.00
     Unit Hyd. peak  (cms)=       0.27         0.03
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.24         0.01          0.243 (iii)
     TIME TO PEAK    (hrs)=       1.50         2.17           1.50
     RUNOFF VOLUME    (mm)=      23.02         2.47          11.72
     TOTAL RAINFALL   (mm)=      25.02        25.02          25.02
     RUNOFF COEFFICIENT   =       0.92         0.10           0.47

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  53.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-------------------
| ADD HYD  (  0014)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0201):     6.68   0.446     1.50    14.76
      + ID2= 2 (  0202):     4.80   0.243     1.50    11.72
        ================================================
        ID = 3 (  0014):    11.48   0.689     1.50    13.49

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
-------------------
| CALIB           |
| STANDHYD (  0203)|   Area    (ha)=   1.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  50.00
-------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.69         0.69
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       5.00         2.00
     Length            (m)=      96.26        40.00
     Mannings n           =      0.013        0.250

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

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

     Max.Eff.Inten.(mm/hr)=      41.67         1.05
               over (min)        5.00        50.00
     Storage Coeff.  (min)=       2.19 (ii)   45.89 (ii)
     Unit Hyd. Tpeak (min)=       5.00        50.00
     Unit Hyd. peak  (cms)=       0.31         0.02
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.08         0.00          0.080 (iii)
     TIME TO PEAK    (hrs)=       1.50         2.67           1.50
     RUNOFF VOLUME    (mm)=      23.02         1.63          12.31
     TOTAL RAINFALL   (mm)=      25.02        25.02          25.02
     RUNOFF COEFFICIENT   =       0.92         0.07           0.49

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  53.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| ADD HYD  (  0001)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0014):    11.48   0.689     1.50    13.49
      + ID2= 2 (  0203):     1.39   0.080     1.50    12.31
        ================================================
        ID = 3 (  0001):    12.87   0.769     1.50    13.36

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
-------------------
| RESERVOIR(  0002)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
-------------------       (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   1.7418     0.6925
                          0.0104     0.0854   |   2.0360     0.7592
                          0.0162     0.1787   |   2.3451     0.8279
                          0.1996     0.2797   |   2.9855     0.8985
                          0.3514     0.3331   |   3.9020     0.9711
                          0.5308     0.3883   |   5.0025     1.0457
                          0.7339     0.4453   |   6.2539     1.1222
                          0.9582     0.5042   |   7.6369     1.2007
                          1.2019     0.5650   |  10.7483     1.3627
                          1.4635     0.6278   |  16.1617     1.6172

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0001)     12.870      0.769      1.50      13.36
   OUTFLOW: ID= 1 (  0002)     12.870      0.015      4.08      13.20

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  1.93
                  TIME SHIFT OF PEAK FLOW         (min)=155.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.1566

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-------------------
| CALIB           |
| STANDHYD (  0204)|   Area    (ha)=   3.12
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  30.00
-------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.56         1.56
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       5.00         2.00
     Length            (m)=     144.22        40.00
     Mannings n           =      0.013        0.250

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

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

     Max.Eff.Inten.(mm/hr)=      41.67         2.84
                  over (min)        5.00        35.00
     Storage Coeff.  (min)=       2.79 (ii)   32.10 (ii)
     Unit Hyd. Tpeak (min)=       5.00        35.00
     Unit Hyd. peak  (cms)=       0.28         0.03
                                                *TOTALS*
     PEAK FLOW       (cms)=       0.11         0.01          0.107 (iii)
     TIME TO PEAK    (hrs)=       1.50         2.17           1.50
     RUNOFF VOLUME    (mm)=      23.02         2.52           8.67
     TOTAL RAINFALL   (mm)=      25.02        25.02          25.02
     RUNOFF COEFFICIENT   =       0.92         0.10           0.35

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  53.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0003)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0002):    12.87   0.015     4.08    13.20
     + ID2= 2 (  0204):     3.12   0.107     1.50     8.67
       ========================================================
       ID = 3 (  0003):    15.99   0.114     1.50    12.31

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

       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\531e1913-0e12-4e2e-9684-
e2ef03acaa05\23f44255-71e9-48cb-a278-a505d53fe45d\scena
  Summary filename: C:\Users\Valdor\AppData\Local\Civica\VH5\531e1913-0e12-4e2e-9684-
e2ef03acaa05\23f44255-71e9-48cb-a278-a505d53fe45d\scena


DATE: 12-16-2022                          TIME: 12:36:45

USER:


COMMENTS: _____________________________________________________

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  ***********************************************
  ** SIMULATION : AES_06hr_002yr                **
  ***********************************************


-------------------
|    READ STORM    |    Filename: C:\Users\Valdor\AppD
|                  |              ata\Local\Temp\
|                  |              cb3b72dc-5cab-43c3-b388-d70a01008f1d\69f2813f
| Ptotal= 38.69 mm |    Comments: AES_06hr_002yr
-------------------
    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   13.16 |  3.50    5.42 |  5.25    0.77
   0.25    0.77 |  2.00   13.16 |  3.75    3.10 |  5.50    0.77
   0.50    0.77 |  2.25   35.60 |  4.00    3.10 |  5.75    0.77
   0.75    0.77 |  2.50   35.60 |  4.25    1.55 |  6.00    0.77
   1.00    0.77 |  2.75   10.06 |  4.50    1.55 |
   1.25    4.64 |  3.00   10.06 |  4.75    0.77 |
   1.50    4.64 |  3.25    5.42 |  5.00    0.77 |

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| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=   6.68
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  60.00
-------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        4.68          2.00
     Dep. Storage     (mm)=        2.00          5.00
     Average Slope     (%)=        5.00          2.00
     Length            (m)=      211.03         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    4.64 | 3.250   10.06 |  4.83    0.77
   0.167    0.00 | 1.750    4.64 | 3.333    5.42 |  4.92    0.77
   0.250    0.00 | 1.833   13.16 | 3.417    5.42 |  5.00    0.77
   0.333    0.77 | 1.917   13.16 | 3.500    5.42 |  5.08    0.77
   0.417    0.77 | 2.000   13.16 | 3.583    5.42 |  5.17    0.77
   0.500    0.77 | 2.083   13.16 | 3.667    5.42 |  5.25    0.77
   0.583    0.77 | 2.167   13.16 | 3.750    5.42 |  5.33    0.77
   0.667    0.77 | 2.250   13.16 | 3.833    3.10 |  5.42    0.77
   0.750    0.77 | 2.333   35.60 | 3.917    3.10 |  5.50    0.77
```

0.833	0.77	2.417	35.60	4.000	3.10	5.58	0.77
0.917	0.77	2.500	35.60	4.083	3.10	5.67	0.77
1.000	0.77	2.583	35.60	4.167	3.10	5.75	0.77
1.083	0.77	2.667	35.60	4.250	3.10	5.83	0.77
1.167	0.77	2.750	35.60	4.333	1.55	5.92	0.77
1.250	0.77	2.833	10.06	4.417	1.55	6.00	0.77
1.333	4.64	2.917	10.06	4.500	1.55	6.08	0.77
1.417	4.64	3.000	10.06	4.583	1.55	6.17	0.77
1.500	4.64	3.083	10.06	4.667	1.55	6.25	0.77
1.583	4.64	3.167	10.06	4.750	1.55		

				TOTALS
Max.Eff.Inten.(mm/hr)=	35.60	8.57		
over (min)	5.00	25.00		
Storage Coeff. (min)=	3.73 (ii)	22.58 (ii)		
Unit Hyd. Tpeak (min)=	5.00	25.00		
Unit Hyd. peak (cms)=	0.25	0.05		
PEAK FLOW (cms)=	0.40	0.03		0.417 (iii)
TIME TO PEAK (hrs)=	2.75	3.00		2.75
RUNOFF VOLUME (mm)=	36.69	5.99		24.41
TOTAL RAINFALL (mm)=	38.69	38.69		38.69
RUNOFF COEFFICIENT =	0.95	0.15		0.63

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 53.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB				
STANDHYD (0202)	Area (ha)=	4.80		
ID= 1 DT= 5.0 min	Total Imp(%)=	60.00	Dir. Conn.(%)=	45.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	2.88	1.92
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	5.00	2.00
Length	(m)=	178.89	40.00
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	1.667	4.64	3.250	10.06	4.83	0.77
0.167	0.00	1.750	4.64	3.333	5.42	4.92	0.77
0.250	0.00	1.833	13.16	3.417	5.42	5.00	0.77
0.333	0.77	1.917	13.16	3.500	5.42	5.08	0.77
0.417	0.77	2.000	13.16	3.583	5.42	5.17	0.77
0.500	0.77	2.083	13.16	3.667	5.42	5.25	0.77
0.583	0.77	2.167	13.16	3.750	5.42	5.33	0.77
0.667	0.77	2.250	13.16	3.833	3.10	5.42	0.77
0.750	0.77	2.333	35.60	3.917	3.10	5.50	0.77
0.833	0.77	2.417	35.60	4.000	3.10	5.58	0.77
0.917	0.77	2.500	35.60	4.083	3.10	5.67	0.77
1.000	0.77	2.583	35.60	4.167	3.10	5.75	0.77
1.083	0.77	2.667	35.60	4.250	3.10	5.83	0.77
1.167	0.77	2.750	35.60	4.333	1.55	5.92	0.77
1.250	0.77	2.833	10.06	4.417	1.55	6.00	0.77
1.333	4.64	2.917	10.06	4.500	1.55	6.08	0.77
1.417	4.64	3.000	10.06	4.583	1.55	6.17	0.77
1.500	4.64	3.083	10.06	4.667	1.55	6.25	0.77
1.583	4.64	3.167	10.06	4.750	1.55		

				TOTALS
Max.Eff.Inten.(mm/hr)=	35.60	9.13		
over (min)	5.00	25.00		
Storage Coeff. (min)=	3.38 (ii)	21.77 (ii)		
Unit Hyd. Tpeak (min)=	5.00	25.00		
Unit Hyd. peak (cms)=	0.26	0.05		
PEAK FLOW (cms)=	0.21	0.03		0.235 (iii)
TIME TO PEAK (hrs)=	2.75	3.00		2.75
RUNOFF VOLUME (mm)=	36.69	6.18		19.91
TOTAL RAINFALL (mm)=	38.69	38.69		38.69
RUNOFF COEFFICIENT =	0.95	0.16		0.51

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 53.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0014)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (0201):	6.68	0.417	2.75	24.41
	+ ID2= 2 (0202):	4.80	0.235	2.75	19.91
	ID = 3 (0014):	11.48	0.652	2.75	22.53

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB				
STANDHYD (0203)	Area (ha)=	1.39		
ID= 1 DT= 5.0 min	Total Imp(%)=	50.00	Dir. Conn.(%)=	50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.69	0.69
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	5.00	2.00
Length	(m)=	96.26	40.00
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	1.667	4.64	3.250	10.06	4.83	0.77
0.167	0.00	1.750	4.64	3.333	5.42	4.92	0.77
0.250	0.00	1.833	13.16	3.417	5.42	5.00	0.77
0.333	0.77	1.917	13.16	3.500	5.42	5.08	0.77
0.417	0.77	2.000	13.16	3.583	5.42	5.17	0.77
0.500	0.77	2.083	13.16	3.667	5.42	5.25	0.77
0.583	0.77	2.167	13.16	3.750	5.42	5.33	0.77
0.667	0.77	2.250	13.16	3.833	3.10	5.42	0.77
0.750	0.77	2.333	35.60	3.917	3.10	5.50	0.77
0.833	0.77	2.417	35.60	4.000	3.10	5.58	0.77
0.917	0.77	2.500	35.60	4.083	3.10	5.67	0.77
1.000	0.77	2.583	35.60	4.167	3.10	5.75	0.77
1.083	0.77	2.667	35.60	4.250	3.10	5.83	0.77
1.167	0.77	2.750	35.60	4.333	1.55	5.92	0.77
1.250	0.77	2.833	10.06	4.417	1.55	6.00	0.77
1.333	4.64	2.917	10.06	4.500	1.55	6.08	0.77
1.417	4.64	3.000	10.06	4.583	1.55	6.17	0.77
1.500	4.64	3.083	10.06	4.667	1.55	6.25	0.77
1.583	4.64	3.167	10.06	4.750	1.55		

```
     Max.Eff.Inten.(mm/hr)=      35.60         4.29
               over (min)        5.00        30.00
     Storage Coeff.  (min)=      2.33 (ii)   27.20 (ii)
     Unit Hyd. Tpeak (min)=      5.00        30.00
     Unit Hyd. peak  (cms)=      0.30         0.04
                                                      *TOTALS*
     PEAK FLOW       (cms)=      0.07         0.01          0.071 (iii)
     TIME TO PEAK    (hrs)=      2.75         3.17          2.75
     RUNOFF VOLUME    (mm)=     36.69         4.38         20.53
     TOTAL RAINFALL   (mm)=     38.69        38.69         38.69
     RUNOFF COEFFICIENT   =      0.95         0.11          0.53

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  53.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD  (  0001)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0014):    11.48   0.652     2.75    22.53
     + ID2= 2 (  0203):     1.39   0.071     2.75    20.53
       ================================================
       ID = 3 (  0001):    12.87   0.723     2.75    22.31

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0002)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   1.7418      0.6925
                          0.0104     0.0854   |   2.0360      0.7592
                          0.0162     0.1787   |   2.3451      0.8279
                          0.1996     0.2797   |   2.9855      0.8985
                          0.3514     0.3331   |   3.9020      0.9711
                          0.5308     0.3883   |   5.0025      1.0457
                          0.7339     0.4453   |   6.2539      1.1222
                          0.9582     0.5042   |   7.6369      1.2007
                          1.2019     0.5650   |  10.7483      1.3627
                          1.4635     0.6278   |  16.1617      1.6172

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0001)    12.870     0.723      2.75      22.31
   OUTFLOW: ID= 1 (  0002)    12.870     0.098      3.92      22.15

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 13.48
                  TIME SHIFT OF PEAK FLOW        (min)= 70.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.2235

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0204)|   Area    (ha)=   3.12
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  30.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      1.56         1.56
     Dep. Storage     (mm)=      2.00         5.00
     Average Slope     (%)=      5.00         2.00
     Length            (m)=    144.22        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    4.64 | 3.250   10.06 |  4.83    0.77
                0.167    0.00 | 1.750    4.64 | 3.333    5.42 |  4.92    0.77
                0.250    0.00 | 1.833   13.16 | 3.417    5.42 |  5.00    0.77
                0.333    0.77 | 1.917   13.16 | 3.500    5.42 |  5.08    0.77
                0.417    0.77 | 2.000   13.16 | 3.583    5.42 |  5.17    0.77
                0.500    0.77 | 2.083   13.16 | 3.667    5.42 |  5.25    0.77
                0.583    0.77 | 2.167   13.16 | 3.750    5.42 |  5.33    0.77
                0.667    0.77 | 2.250   13.16 | 3.833    3.10 |  5.42    0.77
                0.750    0.77 | 2.333   35.60 | 3.917    3.10 |  5.50    0.77
                0.833    0.77 | 2.417   35.60 | 4.000    3.10 |  5.58    0.77
                0.917    0.77 | 2.500   35.60 | 4.083    3.10 |  5.67    0.77
                1.000    0.77 | 2.583   35.60 | 4.167    3.10 |  5.75    0.77
                1.083    0.77 | 2.667   35.60 | 4.250    3.10 |  5.83    0.77
                1.167    0.77 | 2.750   35.60 | 4.333    1.55 |  5.92    0.77
                1.250    0.77 | 2.833   10.06 | 4.417    1.55 |  6.00    0.77
                1.333    4.64 | 2.917   10.06 | 4.500    1.55 |  6.08    0.77
                1.417    4.64 | 3.000   10.06 | 4.583    1.55 |  6.17    0.77
                1.500    4.64 | 3.083   10.06 | 4.667    1.55 |  6.25    0.77
                1.583    4.64 | 3.167   10.06 | 4.750    1.55 |

     Max.Eff.Inten.(mm/hr)=      35.60         9.47
               over (min)        5.00        25.00
     Storage Coeff.  (min)=      2.97 (ii)   21.09 (ii)
     Unit Hyd. Tpeak (min)=      5.00        25.00
     Unit Hyd. peak  (cms)=      0.28         0.05
                                                      *TOTALS*
     PEAK FLOW       (cms)=      0.09         0.03          0.111 (iii)
     TIME TO PEAK    (hrs)=      2.75         3.00          2.75
     RUNOFF VOLUME    (mm)=     36.69         6.29         15.41
     TOTAL RAINFALL   (mm)=     38.69        38.69         38.69
     RUNOFF COEFFICIENT   =      0.95         0.16          0.40

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  53.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD  (  0003)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0002):    12.87   0.098     3.92    22.15
     + ID2= 2 (  0204):     3.12   0.111     2.75    15.41
       ================================================
       ID = 3 (  0003):    15.99   0.126     2.75    20.83

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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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\531e1913-0e12-4e2e-9684-
e2ef03acaa05\855f20eb-f569-45b5-b34e-c4b1b22ceb1a\scena
  Summary filename: C:\Users\Valdor\AppData\Local\Civica\VH5\531e1913-0e12-4e2e-9684-
e2ef03acaa05\855f20eb-f569-45b5-b34e-c4b1b22ceb1a\scena


DATE: 12-16-2022                          TIME: 12:36:46

USER:


COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------------------------
---------------
  ************************************************
  ** SIMULATION : AES_06hr_005yr                 **
  ************************************************


--------------------
|    READ STORM    |    Filename: C:\Users\Valdor\AppD
|                  |              ata\Local\Temp\
|                  |              cb3b72dc-5cab-43c3-b388-d70a01008f1d\a3f7ed82
| Ptotal= 52.41 mm |    Comments: AES_06hr_005yr
--------------------
                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   17.82 |  3.50    7.34 |  5.25    1.05
                0.25    1.05 |  2.00   17.82 |  3.75    4.19 |  5.50    1.05
                0.50    1.05 |  2.25   48.21 |  4.00    4.19 |  5.75    1.05
                0.75    1.05 |  2.50   48.21 |  4.25    2.10 |  6.00    1.05
                1.00    1.05 |  2.75   13.62 |  4.50    2.10 |
                1.25    6.29 |  3.00   13.62 |  4.75    1.05 |
                1.50    6.29 |  3.25    7.34 |  5.00    1.05 |

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--------------------
| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=   6.68
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  60.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.68         2.00
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       5.00         2.00
     Length            (m)=     211.03        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    6.29 | 3.250   13.62 |  4.83    1.05
                0.167    0.00 | 1.750    6.29 | 3.333    7.34 |  4.92    1.05
                0.250    0.00 | 1.833   17.82 | 3.417    7.34 |  5.00    1.05
                0.333    1.05 | 1.917   17.82 | 3.500    7.34 |  5.08    1.05
                0.417    1.05 | 2.000   17.82 | 3.583    7.34 |  5.17    1.05
                0.500    1.05 | 2.083   17.82 | 3.667    7.34 |  5.25    1.05
                0.583    1.05 | 2.167   17.82 | 3.750    7.34 |  5.33    1.05
                0.667    1.05 | 2.250   17.82 | 3.833    4.19 |  5.42    1.05
                0.750    1.05 | 2.333   48.21 | 3.917    4.19 |  5.50    1.05
                0.833    1.05 | 2.417   48.21 | 4.000    4.19 |  5.58    1.05
                0.917    1.05 | 2.500   48.21 | 4.083    4.19 |  5.67    1.05
                1.000    1.05 | 2.583   48.21 | 4.167    4.19 |  5.75    1.05
                1.083    1.05 | 2.667   48.21 | 4.250    4.19 |  5.83    1.05
                1.167    1.05 | 2.750   48.21 | 4.333    2.10 |  5.92    1.05
                1.250    1.05 | 2.833   13.62 | 4.417    2.10 |  6.00    1.05
                1.333    6.29 | 2.917   13.62 | 4.500    2.10 |  6.08    1.05
                1.417    6.29 | 3.000   13.62 | 4.583    2.10 |  6.17    1.05
                1.500    6.29 | 3.083   13.62 | 4.667    2.10 |  6.25    1.05
                1.583    6.29 | 3.167   13.62 | 4.750    2.10 |

     Max.Eff.Inten.(mm/hr)=      48.21        16.66
               over (min)        5.00        20.00
     Storage Coeff.  (min)=      3.30 (ii)   17.76 (ii)
     Unit Hyd. Tpeak (min)=      5.00        20.00
     Unit Hyd. peak  (cms)=      0.27         0.06
                                                      *TOTALS*
     PEAK FLOW       (cms)=      0.54         0.06         0.588 (iii)
     TIME TO PEAK    (hrs)=      2.75         2.92          2.75
     RUNOFF VOLUME    (mm)=     50.41        10.88         34.60
     TOTAL RAINFALL   (mm)=     52.41        52.41         52.41
     RUNOFF COEFFICIENT   =      0.96         0.21          0.66

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  53.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0202)|   Area    (ha)=   4.80
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=  45.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.88         1.92
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       5.00         2.00
     Length            (m)=     178.89        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    6.29 | 3.250   13.62 |  4.83    1.05
                0.167    0.00 | 1.750    6.29 | 3.333    7.34 |  4.92    1.05
                0.250    0.00 | 1.833   17.82 | 3.417    7.34 |  5.00    1.05
                0.333    1.05 | 1.917   17.82 | 3.500    7.34 |  5.08    1.05
                0.417    1.05 | 2.000   17.82 | 3.583    7.34 |  5.17    1.05
                0.500    1.05 | 2.083   17.82 | 3.667    7.34 |  5.25    1.05
                0.583    1.05 | 2.167   17.82 | 3.750    7.34 |  5.33    1.05
                0.667    1.05 | 2.250   17.82 | 3.833    4.19 |  5.42    1.05
                0.750    1.05 | 2.333   48.21 | 3.917    4.19 |  5.50    1.05
                0.833    1.05 | 2.417   48.21 | 4.000    4.19 |  5.58    1.05
```

```
              0.917    1.05 | 2.500   48.21 | 4.083    4.19 |  5.67    1.05
              1.000    1.05 | 2.583   48.21 | 4.167    4.19 |  5.75    1.05
              1.083    1.05 | 2.667   48.21 | 4.250    4.19 |  5.83    1.05
              1.167    1.05 | 2.750   48.21 | 4.333    2.10 |  5.92    1.05
              1.250    1.05 | 2.833   13.62 | 4.417    2.10 |  6.00    1.05
              1.333    6.29 | 2.917   13.62 | 4.500    2.10 |  6.08    1.05
              1.417    6.29 | 3.000   13.62 | 4.583    2.10 |  6.17    1.05
              1.500    6.29 | 3.083   13.62 | 4.667    2.10 |  6.25    1.05
              1.583    6.29 | 3.167   13.62 | 4.750    2.10 |

     Max.Eff.Inten.(mm/hr)=      48.21        17.66
               over (min)        5.00        20.00
     Storage Coeff.  (min)=       2.99 (ii)   17.11 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.28         0.06
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.29         0.06          0.342 (iii)
     TIME TO PEAK    (hrs)=       2.75         2.92          2.75
     RUNOFF VOLUME    (mm)=      50.41        11.19         28.84
     TOTAL RAINFALL   (mm)=      52.41        52.41         52.41
     RUNOFF COEFFICIENT   =       0.96         0.21          0.55

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  53.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

-------------------
| ADD HYD  (  0014)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0201):     6.68   0.588     2.75    34.60
     + ID2= 2 (  0202):     4.80   0.342     2.75    28.84
       ================================================
       ID = 3 (  0014):    11.48   0.930     2.75    32.19

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
-------------------
| CALIB            |
| STANDHYD (  0203)|   Area    (ha)=   1.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  50.00
-------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.69         0.69
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       5.00         2.00
     Length            (m)=      96.26        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    6.29 | 3.250   13.62 |  4.83    1.05
     0.167    0.00 | 1.750    6.29 | 3.333    7.34 |  4.92    1.05
     0.250    0.00 | 1.833   17.82 | 3.417    7.34 |  5.00    1.05
     0.333    1.05 | 1.917   17.82 | 3.500    7.34 |  5.08    1.05
     0.417    1.05 | 2.000   17.82 | 3.583    7.34 |  5.17    1.05
     0.500    1.05 | 2.083   17.82 | 3.667    7.34 |  5.25    1.05
     0.583    1.05 | 2.167   17.82 | 3.750    7.34 |  5.33    1.05
     0.667    1.05 | 2.250   17.82 | 3.833    4.19 |  5.42    1.05
     0.750    1.05 | 2.333   48.21 | 3.917    4.19 |  5.50    1.05
```

```
              0.833    1.05 | 2.417   48.21 | 4.000    4.19 |  5.58    1.05
              0.917    1.05 | 2.500   48.21 | 4.083    4.19 |  5.67    1.05
              1.000    1.05 | 2.583   48.21 | 4.167    4.19 |  5.75    1.05
              1.083    1.05 | 2.667   48.21 | 4.250    4.19 |  5.83    1.05
              1.167    1.05 | 2.750   48.21 | 4.333    2.10 |  5.92    1.05
              1.250    1.05 | 2.833   13.62 | 4.417    2.10 |  6.00    1.05
              1.333    6.29 | 2.917   13.62 | 4.500    2.10 |  6.08    1.05
              1.417    6.29 | 3.000   13.62 | 4.583    2.10 |  6.17    1.05
              1.500    6.29 | 3.083   13.62 | 4.667    2.10 |  6.25    1.05
              1.583    6.29 | 3.167   13.62 | 4.750    2.10 |

     Max.Eff.Inten.(mm/hr)=      48.21         8.85
               over (min)        5.00        25.00
     Storage Coeff.  (min)=       2.06 (ii)   20.68 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=       0.31         0.05
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.09         0.01          0.101 (iii)
     TIME TO PEAK    (hrs)=       2.75         3.00          2.75
     RUNOFF VOLUME    (mm)=      50.41         8.24         29.32
     TOTAL RAINFALL   (mm)=      52.41        52.41         52.41
     RUNOFF COEFFICIENT   =       0.96         0.16          0.56

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  53.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-------------------
| ADD HYD  (  0001)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0014):    11.48   0.930     2.75    32.19
     + ID2= 2 (  0203):     1.39   0.101     2.75    29.32
       ================================================
       ID = 3 (  0001):    12.87   1.031     2.75    31.88

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
-------------------
| RESERVOIR(  0002)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
-------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   1.7418     0.6925
                         0.0104     0.0854   |   2.0360     0.7592
                         0.0162     0.1787   |   2.3451     0.8279
                         0.1996     0.2797   |   2.9855     0.8985
                         0.3514     0.3331   |   3.9020     0.9711
                         0.5308     0.3883   |   5.0025     1.0457
                         0.7339     0.4453   |   6.2539     1.1222
                         0.9582     0.5042   |   7.6369     1.2007
                         1.2019     0.5650   |  10.7483     1.3627
                         1.4635     0.6278   |  16.1617     1.6172

                                   AREA     QPEAK     TPEAK       R.V.
                                   (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0001)     12.870      1.031      2.75      31.88
   OUTFLOW: ID= 1 (  0002)     12.870      0.211      3.58      31.72

                PEAK   FLOW   REDUCTION [Qout/Qin](%)= 20.44
                TIME SHIFT OF PEAK FLOW        (min)= 50.00
                MAXIMUM  STORAGE   USED       (ha.m.)=  0.2836

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-------------------
| CALIB           |
| STANDHYD (  0204)|   Area    (ha)=   3.12
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  30.00
-------------------
                         IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.56         1.56
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       5.00         2.00
     Length            (m)=     144.22        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    6.29 | 3.250   13.62 |  4.83    1.05
               0.167    0.00 | 1.750    6.29 | 3.333    7.34 |  4.92    1.05
               0.250    0.00 | 1.833   17.82 | 3.417    7.34 |  5.00    1.05
               0.333    1.05 | 1.917   17.82 | 3.500    7.34 |  5.08    1.05
               0.417    1.05 | 2.000   17.82 | 3.583    7.34 |  5.17    1.05
               0.500    1.05 | 2.083   17.82 | 3.667    7.34 |  5.25    1.05
               0.583    1.05 | 2.167   17.82 | 3.750    7.34 |  5.33    1.05
               0.667    1.05 | 2.250   17.82 | 3.833    4.19 |  5.42    1.05
               0.750    1.05 | 2.333   48.21 | 3.917    4.19 |  5.50    1.05
               0.833    1.05 | 2.417   48.21 | 4.000    4.19 |  5.58    1.05
               0.917    1.05 | 2.500   48.21 | 4.083    4.19 |  5.67    1.05
               1.000    1.05 | 2.583   48.21 | 4.167    4.19 |  5.75    1.05
               1.083    1.05 | 2.667   48.21 | 4.250    4.19 |  5.83    1.05
               1.167    1.05 | 2.750   48.21 | 4.333    2.10 |  5.92    1.05
               1.250    1.05 | 2.833   13.62 | 4.417    2.10 |  6.00    1.05
               1.333    6.29 | 2.917   13.62 | 4.500    2.10 |  6.08    1.05
               1.417    6.29 | 3.000   13.62 | 4.583    2.10 |  6.17    1.05
               1.500    6.29 | 3.083   13.62 | 4.667    2.10 |  6.25    1.05
               1.583    6.29 | 3.167   13.62 | 4.750    2.10 |

     Max.Eff.Inten.(mm/hr)=      48.21        18.27
               over (min)        5.00        20.00
     Storage Coeff.  (min)=      2.63 (ii)   16.56 (ii)
     Unit Hyd. Tpeak (min)=      5.00        20.00
     Unit Hyd. peak  (cms)=      0.29         0.06
                                                      *TOTALS*
     PEAK FLOW       (cms)=      0.13         0.05       0.171 (iii)
     TIME TO PEAK    (hrs)=      2.75         2.92        2.75
     RUNOFF VOLUME    (mm)=     50.41        11.37       23.08
     TOTAL RAINFALL   (mm)=     52.41        52.41       52.41
     RUNOFF COEFFICIENT   =      0.96         0.22        0.44

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  53.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

-------------------
| ADD HYD  (  0003)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0002):    12.87   0.211     3.58    31.72
      + ID2= 2 (  0204):     3.12   0.171     2.75    23.08
        ================================================
        ID = 3 (  0003):    15.99   0.271     3.25    30.03

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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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\531e1913-0e12-4e2e-9684-
e2ef03acaa05\36af06f8-e4e9-4e89-86d7-f320de46ddb9\scena
  Summary filename: C:\Users\Valdor\AppData\Local\Civica\VH5\531e1913-0e12-4e2e-9684-
e2ef03acaa05\36af06f8-e4e9-4e89-86d7-f320de46ddb9\scena


DATE: 12-16-2022                          TIME: 12:36:46

USER:



COMMENTS: _____________________________________________________________

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  ***********************************************
  ** SIMULATION : AES_06hr_010yr                **
  ***********************************************


-------------------
|    READ STORM    |    Filename: C:\Users\Valdor\AppD
|                  |              ata\Local\Temp\
|                  |              cb3b72dc-5cab-43c3-b388-d70a01008f1d\b0a61c61
| Ptotal= 61.50 mm |    Comments: AES_06hr_010yr
-------------------
                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   20.91 |  3.50    8.61 |  5.25    1.23
               0.25    1.23 |  2.00   20.91 |  3.75    4.92 |  5.50    1.23
               0.50    1.23 |  2.25   56.58 |  4.00    4.92 |  5.75    1.23
               0.75    1.23 |  2.50   56.58 |  4.25    2.46 |  6.00    1.23
               1.00    1.23 |  2.75   15.99 |  4.50    2.46 |
               1.25    7.38 |  3.00   15.99 |  4.75    1.23 |
               1.50    7.38 |  3.25    8.61 |  5.00    1.23 |

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

-------------------
| CALIB           |
| STANDHYD (  0201)|   Area    (ha)=   6.68
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  60.00
-------------------
                         IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.68         2.00
```

```
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       5.00         2.00
     Length            (m)=     211.03        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    7.38 | 3.250   15.99 |  4.83    1.23
              0.167    0.00 | 1.750    7.38 | 3.333    8.61 |  4.92    1.23
              0.250    0.00 | 1.833   20.91 | 3.417    8.61 |  5.00    1.23
              0.333    1.23 | 1.917   20.91 | 3.500    8.61 |  5.08    1.23
              0.417    1.23 | 2.000   20.91 | 3.583    8.61 |  5.17    1.23
              0.500    1.23 | 2.083   20.91 | 3.667    8.61 |  5.25    1.23
              0.583    1.23 | 2.167   20.91 | 3.750    8.61 |  5.33    1.23
              0.667    1.23 | 2.250   20.91 | 3.833    4.92 |  5.42    1.23
              0.750    1.23 | 2.333   56.58 | 3.917    4.92 |  5.50    1.23
              0.833    1.23 | 2.417   56.58 | 4.000    4.92 |  5.58    1.23
              0.917    1.23 | 2.500   56.58 | 4.083    4.92 |  5.67    1.23
              1.000    1.23 | 2.583   56.58 | 4.167    4.92 |  5.75    1.23
              1.083    1.23 | 2.667   56.58 | 4.250    4.92 |  5.83    1.23
              1.167    1.23 | 2.750   56.58 | 4.333    2.46 |  5.92    1.23
              1.250    1.23 | 2.833   15.99 | 4.417    2.46 |  6.00    1.23
              1.333    7.38 | 2.917   15.99 | 4.500    2.46 |  6.08    1.23
              1.417    7.38 | 3.000   15.99 | 4.583    2.46 |  6.17    1.23
              1.500    7.38 | 3.083   15.99 | 4.667    2.46 |  6.25    1.23
              1.583    7.38 | 3.167   15.99 | 4.750    2.46 |

     Max.Eff.Inten.(mm/hr)=      56.58        22.49
               over (min)        5.00        20.00
     Storage Coeff.  (min)=       3.10 (ii)   15.92 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.27         0.07
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.63         0.09          0.704 (iii)
     TIME TO PEAK    (hrs)=       2.75         2.92           2.75
     RUNOFF VOLUME    (mm)=      59.50        14.71          41.58
     TOTAL RAINFALL   (mm)=      61.50        61.50          61.50
     RUNOFF COEFFICIENT   =       0.97         0.24           0.68

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  53.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-------------------
| CALIB           |
| STANDHYD (  0202)|   Area    (ha)=   4.80
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=  45.00
-------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.88         1.92
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       5.00         2.00
     Length            (m)=     178.89        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    7.38 | 3.250   15.99 |  4.83    1.23
              0.167    0.00 | 1.750    7.38 | 3.333    8.61 |  4.92    1.23
              0.250    0.00 | 1.833   20.91 | 3.417    8.61 |  5.00    1.23
              0.333    1.23 | 1.917   20.91 | 3.500    8.61 |  5.08    1.23
              0.417    1.23 | 2.000   20.91 | 3.583    8.61 |  5.17    1.23
              0.500    1.23 | 2.083   20.91 | 3.667    8.61 |  5.25    1.23
              0.583    1.23 | 2.167   20.91 | 3.750    8.61 |  5.33    1.23
              0.667    1.23 | 2.250   20.91 | 3.833    4.92 |  5.42    1.23
              0.750    1.23 | 2.333   56.58 | 3.917    4.92 |  5.50    1.23
              0.833    1.23 | 2.417   56.58 | 4.000    4.92 |  5.58    1.23
              0.917    1.23 | 2.500   56.58 | 4.083    4.92 |  5.67    1.23
              1.000    1.23 | 2.583   56.58 | 4.167    4.92 |  5.75    1.23
              1.083    1.23 | 2.667   56.58 | 4.250    4.92 |  5.83    1.23
              1.167    1.23 | 2.750   56.58 | 4.333    2.46 |  5.92    1.23
              1.250    1.23 | 2.833   15.99 | 4.417    2.46 |  6.00    1.23
              1.333    7.38 | 2.917   15.99 | 4.500    2.46 |  6.08    1.23
              1.417    7.38 | 3.000   15.99 | 4.583    2.46 |  6.17    1.23
              1.500    7.38 | 3.083   15.99 | 4.667    2.46 |  6.25    1.23
              1.583    7.38 | 3.167   15.99 | 4.750    2.46 |

     Max.Eff.Inten.(mm/hr)=      56.58        23.81
               over (min)        5.00        20.00
     Storage Coeff.  (min)=       2.81 (ii)   15.34 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.28         0.07
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.34         0.09          0.416 (iii)
     TIME TO PEAK    (hrs)=       2.75         2.92           2.75
     RUNOFF VOLUME    (mm)=      59.50        15.10          35.08
     TOTAL RAINFALL   (mm)=      61.50        61.50          61.50
     RUNOFF COEFFICIENT   =       0.97         0.25           0.57

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  53.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-------------------
| ADD HYD  (  0014)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0201):     6.68   0.704     2.75    41.58
     + ID2= 2 (  0202):     4.80   0.416     2.75    35.08
       ================================================
       ID = 3 (  0014):    11.48   1.119     2.75    38.86

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
-------------------
| CALIB           |
| STANDHYD (  0203)|   Area    (ha)=   1.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  50.00
-------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.69         0.69
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       5.00         2.00
     Length            (m)=      96.26        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	7.38	3.250	15.99	4.83	1.23
0.167	0.00	1.750	7.38	3.333	8.61	4.92	1.23
0.250	0.00	1.833	20.91	3.417	8.61	5.00	1.23
0.333	1.23	1.917	20.91	3.500	8.61	5.08	1.23
0.417	1.23	2.000	20.91	3.583	8.61	5.17	1.23
0.500	1.23	2.083	20.91	3.667	8.61	5.25	1.23
0.583	1.23	2.167	20.91	3.750	8.61	5.33	1.23
0.667	1.23	2.250	20.91	3.833	4.92	5.42	1.23
0.750	1.23	2.333	56.58	3.917	4.92	5.50	1.23
0.833	1.23	2.417	56.58	4.000	4.92	5.58	1.23
0.917	1.23	2.500	56.58	4.083	4.92	5.67	1.23
1.000	1.23	2.583	56.58	4.167	4.92	5.75	1.23
1.083	1.23	2.667	56.58	4.250	4.92	5.83	1.23
1.167	1.23	2.750	56.58	4.333	2.46	5.92	1.23
1.250	1.23	2.833	15.99	4.417	2.46	6.00	1.23
1.333	7.38	2.917	15.99	4.500	2.46	6.08	1.23
1.417	7.38	3.000	15.99	4.583	2.46	6.17	1.23
1.500	7.38	3.083	15.99	4.667	2.46	6.25	1.23
1.583	7.38	3.167	15.99	4.750	2.46		

			TOTALS
Max.Eff.Inten.(mm/hr)=	56.58	12.19	
over (min)	5.00	20.00	
Storage Coeff. (min)=	1.93 (ii)	18.31 (ii)	
Unit Hyd. Tpeak (min)=	5.00	20.00	
Unit Hyd. peak (cms)=	0.31	0.06	
PEAK FLOW (cms)=	0.11	0.02	0.123 (iii)
TIME TO PEAK (hrs)=	2.75	2.92	2.75
RUNOFF VOLUME (mm)=	59.50	11.33	35.41
TOTAL RAINFALL (mm)=	61.50	61.50	61.50
RUNOFF COEFFICIENT =	0.97	0.18	0.58

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 53.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0001)		AREA	QPEAK	TPEAK	R.V.
		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0014):		11.48	1.119	2.75	38.86
+ ID2= 2 (0203):		1.39	0.123	2.75	35.41
ID = 3 (0001):		12.87	1.242	2.75	38.49

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR(0002)	OVERFLOW IS OFF			
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	1.7418	0.6925
	0.0104	0.0854	2.0360	0.7592
	0.0162	0.1787	2.3451	0.8279
	0.1996	0.2797	2.9855	0.8985
	0.3514	0.3331	3.9020	0.9711
	0.5308	0.3883	5.0025	1.0457
	0.7339	0.4453	6.2539	1.1222
	0.9582	0.5042	7.6369	1.2007
	1.2019	0.5650	10.7483	1.3627
	1.4635	0.6278	16.1617	1.6172

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0001)	12.870	1.242	2.75	38.49
OUTFLOW: ID= 1 (0002)	12.870	0.321	3.33	38.33

PEAK FLOW REDUCTION [Qout/Qin](%)= 25.82
TIME SHIFT OF PEAK FLOW (min)= 35.00
MAXIMUM STORAGE USED (ha.m.)= 0.3225

CALIB			
STANDHYD (0204)	Area (ha)= 3.12		
ID= 1 DT= 5.0 min	Total Imp(%)= 50.00	Dir. Conn.(%)= 30.00	
	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	1.56	1.56	
Dep. Storage (mm)=	2.00	5.00	
Average Slope (%)=	5.00	2.00	
Length (m)=	144.22	40.00	
Mannings n =	0.013	0.250	

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	1.667	7.38	3.250	15.99	4.83	1.23
0.167	0.00	1.750	7.38	3.333	8.61	4.92	1.23
0.250	0.00	1.833	20.91	3.417	8.61	5.00	1.23
0.333	1.23	1.917	20.91	3.500	8.61	5.08	1.23
0.417	1.23	2.000	20.91	3.583	8.61	5.17	1.23
0.500	1.23	2.083	20.91	3.667	8.61	5.25	1.23
0.583	1.23	2.167	20.91	3.750	8.61	5.33	1.23
0.667	1.23	2.250	20.91	3.833	4.92	5.42	1.23
0.750	1.23	2.333	56.58	3.917	4.92	5.50	1.23
0.833	1.23	2.417	56.58	4.000	4.92	5.58	1.23
0.917	1.23	2.500	56.58	4.083	4.92	5.67	1.23
1.000	1.23	2.583	56.58	4.167	4.92	5.75	1.23
1.083	1.23	2.667	56.58	4.250	4.92	5.83	1.23
1.167	1.23	2.750	56.58	4.333	2.46	5.92	1.23
1.250	1.23	2.833	15.99	4.417	2.46	6.00	1.23
1.333	7.38	2.917	15.99	4.500	2.46	6.08	1.23
1.417	7.38	3.000	15.99	4.583	2.46	6.17	1.23
1.500	7.38	3.083	15.99	4.667	2.46	6.25	1.23
1.583	7.38	3.167	15.99	4.750	2.46		

			TOTALS
Max.Eff.Inten.(mm/hr)=	56.58	24.61	
over (min)	5.00	15.00	
Storage Coeff. (min)=	2.47 (ii)	14.83 (ii)	
Unit Hyd. Tpeak (min)=	5.00	15.00	
Unit Hyd. peak (cms)=	0.30	0.08	
PEAK FLOW (cms)=	0.15	0.08	0.220 (iii)
TIME TO PEAK (hrs)=	2.75	2.83	2.75
RUNOFF VOLUME (mm)=	59.50	15.34	28.58
TOTAL RAINFALL (mm)=	61.50	61.50	61.50
RUNOFF COEFFICIENT =	0.97	0.25	0.46

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 53.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
--------------------
| ADD HYD  (  0003)|
|   1 +  2 =  3    |        AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0002):    12.87   0.321     3.33    38.33
     + ID2= 2 (  0204):     3.12   0.220     2.75    28.58
       ====================================================
       ID = 3 (  0003):    15.99   0.405     3.25    36.43

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
-------------------------------------------------------------------------------
===============================================================================================
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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\531e1913-0e12-4e2e-9684-
e2ef03acaa05\8f9b1644-02ba-4d1f-932a-12bed054710c\scena
  Summary filename: C:\Users\Valdor\AppData\Local\Civica\VH5\531e1913-0e12-4e2e-9684-
e2ef03acaa05\8f9b1644-02ba-4d1f-932a-12bed054710c\scena


DATE: 12-16-2022                          TIME: 12:36:46

USER:



COMMENTS: _____________________________________________________


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  ************************************************
  ** SIMULATION : AES_06hr_025yr                 **
  ************************************************


--------------------
|    READ STORM    |    Filename: C:\Users\Valdor\AppD
|                  |              ata\Local\Temp\
|                  |              cb3b72dc-5cab-43c3-b388-d70a01008f1d\ea9f6f15
| Ptotal= 72.91 mm |    Comments: AES_06hr_025yr
--------------------
                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   24.79 |  3.50   10.21 |  5.25    1.46
                0.25    1.46 |  2.00   24.79 |  3.75    5.83 |  5.50    1.46
                0.50    1.46 |  2.25   67.07 |  4.00    5.83 |  5.75    1.46
                0.75    1.46 |  2.50   67.07 |  4.25    2.92 |  6.00    1.46
                1.00    1.46 |  2.75   18.95 |  4.50    2.92 |
                1.25    8.75 |  3.00   18.95 |  4.75    1.46 |
                1.50    8.75 |  3.25   10.21 |  5.00    1.46 |
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--------------------
| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=   6.68
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  60.00
--------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.68         2.00
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       5.00         2.00
     Length            (m)=     211.03        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    8.75 | 3.250   18.95 |  4.83    1.46
               0.167    0.00 | 1.750    8.75 | 3.333   10.21 |  4.92    1.46
               0.250    0.00 | 1.833   24.79 | 3.417   10.21 |  5.00    1.46
               0.333    1.46 | 1.917   24.79 | 3.500   10.21 |  5.08    1.46
               0.417    1.46 | 2.000   24.79 | 3.583   10.21 |  5.17    1.46
               0.500    1.46 | 2.083   24.79 | 3.667   10.21 |  5.25    1.46
               0.583    1.46 | 2.167   24.79 | 3.750   10.21 |  5.33    1.46
               0.667    1.46 | 2.250   24.79 | 3.833    5.83 |  5.42    1.46
               0.750    1.46 | 2.333   67.07 | 3.917    5.83 |  5.50    1.46
               0.833    1.46 | 2.417   67.07 | 4.000    5.83 |  5.58    1.46
               0.917    1.46 | 2.500   67.07 | 4.083    5.83 |  5.67    1.46
               1.000    1.46 | 2.583   67.07 | 4.167    5.83 |  5.75    1.46
               1.083    1.46 | 2.667   67.07 | 4.250    5.83 |  5.83    1.46
               1.167    1.46 | 2.750   67.07 | 4.333    2.92 |  5.92    1.46
               1.250    1.46 | 2.833   18.95 | 4.417    2.92 |  6.00    1.46
               1.333    8.75 | 2.917   18.95 | 4.500    2.92 |  6.08    1.46
               1.417    8.75 | 3.000   18.95 | 4.583    2.92 |  6.17    1.46
               1.500    8.75 | 3.083   18.95 | 4.667    2.92 |  6.25    1.46
               1.583    8.75 | 3.167   18.95 | 4.750    2.92 |

     Max.Eff.Inten.(mm/hr)=      67.07        30.66
               over (min)        5.00        15.00
     Storage Coeff.  (min)=      2.89 (ii)   14.22 (ii)
     Unit Hyd. Tpeak (min)=      5.00        15.00
     Unit Hyd. peak  (cms)=      0.28         0.08
                                                      *TOTALS*
     PEAK FLOW       (cms)=      0.75         0.13       0.867 (iii)
     TIME TO PEAK    (hrs)=      2.75         2.83        2.75
     RUNOFF VOLUME    (mm)=     70.91        20.09       50.58
     TOTAL RAINFALL   (mm)=     72.91        72.91       72.91
     RUNOFF COEFFICIENT   =      0.97         0.28        0.69

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  53.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0202)|   Area    (ha)=   4.80
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=  45.00
--------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.88         1.92
     Dep. Storage     (mm)=       2.00         5.00
```

```
     Average Slope     (%)=       5.00         2.00
     Length            (m)=     178.89        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    8.75 | 3.250   18.95 |  4.83    1.46
              0.167    0.00 | 1.750    8.75 | 3.333   10.21 |  4.92    1.46
              0.250    0.00 | 1.833   24.79 | 3.417   10.21 |  5.00    1.46
              0.333    1.46 | 1.917   24.79 | 3.500   10.21 |  5.08    1.46
              0.417    1.46 | 2.000   24.79 | 3.583   10.21 |  5.17    1.46
              0.500    1.46 | 2.083   24.79 | 3.667   10.21 |  5.25    1.46
              0.583    1.46 | 2.167   24.79 | 3.750   10.21 |  5.33    1.46
              0.667    1.46 | 2.250   24.79 | 3.833    5.83 |  5.42    1.46
              0.750    1.46 | 2.333   67.07 | 3.917    5.83 |  5.50    1.46
              0.833    1.46 | 2.417   67.07 | 4.000    5.83 |  5.58    1.46
              0.917    1.46 | 2.500   67.07 | 4.083    5.83 |  5.67    1.46
              1.000    1.46 | 2.583   67.07 | 4.167    5.83 |  5.75    1.46
              1.083    1.46 | 2.667   67.07 | 4.250    5.83 |  5.83    1.46
              1.167    1.46 | 2.750   67.07 | 4.333    2.92 |  5.92    1.46
              1.250    1.46 | 2.833   18.95 | 4.417    2.92 |  6.00    1.46
              1.333    8.75 | 2.917   18.95 | 4.500    2.92 |  6.08    1.46
              1.417    8.75 | 3.000   18.95 | 4.583    2.92 |  6.17    1.46
              1.500    8.75 | 3.083   18.95 | 4.667    2.92 |  6.25    1.46
              1.583    8.75 | 3.167   18.95 | 4.750    2.92 |

     Max.Eff.Inten.(mm/hr)=      67.07        32.40
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       2.62 (ii)   13.70 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.29         0.08
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.40         0.13          0.526 (iii)
     TIME TO PEAK    (hrs)=       2.75         2.83           2.75
     RUNOFF VOLUME    (mm)=      70.91        20.59          43.23
     TOTAL RAINFALL   (mm)=      72.91        72.91          72.91
     RUNOFF COEFFICIENT   =       0.97         0.28           0.59

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  53.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

-------------------
| ADD HYD  (  0014)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0201):     6.68   0.867     2.75    50.58
      + ID2= 2 (  0202):     4.80   0.526     2.75    43.23
        ==========================================
        ID = 3 (  0014):    11.48   1.392     2.75    47.51

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
-------------------
| CALIB            |
| STANDHYD (  0203)|   Area    (ha)=   1.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  50.00
-------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.69         0.69
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       5.00         2.00
     Length            (m)=      96.26        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    8.75 | 3.250   18.95 |  4.83    1.46
              0.167    0.00 | 1.750    8.75 | 3.333   10.21 |  4.92    1.46
              0.250    0.00 | 1.833   24.79 | 3.417   10.21 |  5.00    1.46
              0.333    1.46 | 1.917   24.79 | 3.500   10.21 |  5.08    1.46
              0.417    1.46 | 2.000   24.79 | 3.583   10.21 |  5.17    1.46
              0.500    1.46 | 2.083   24.79 | 3.667   10.21 |  5.25    1.46
              0.583    1.46 | 2.167   24.79 | 3.750   10.21 |  5.33    1.46
              0.667    1.46 | 2.250   24.79 | 3.833    5.83 |  5.42    1.46
              0.750    1.46 | 2.333   67.07 | 3.917    5.83 |  5.50    1.46
              0.833    1.46 | 2.417   67.07 | 4.000    5.83 |  5.58    1.46
              0.917    1.46 | 2.500   67.07 | 4.083    5.83 |  5.67    1.46
              1.000    1.46 | 2.583   67.07 | 4.167    5.83 |  5.75    1.46
              1.083    1.46 | 2.667   67.07 | 4.250    5.83 |  5.83    1.46
              1.167    1.46 | 2.750   67.07 | 4.333    2.92 |  5.92    1.46
              1.250    1.46 | 2.833   18.95 | 4.417    2.92 |  6.00    1.46
              1.333    8.75 | 2.917   18.95 | 4.500    2.92 |  6.08    1.46
              1.417    8.75 | 3.000   18.95 | 4.583    2.92 |  6.17    1.46
              1.500    8.75 | 3.083   18.95 | 4.667    2.92 |  6.25    1.46
              1.583    8.75 | 3.167   18.95 | 4.750    2.92 |

     Max.Eff.Inten.(mm/hr)=      67.07        18.06
               over (min)        5.00        20.00
     Storage Coeff.  (min)=       1.81 (ii)   15.80 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.32         0.07
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.13         0.02          0.150 (iii)
     TIME TO PEAK    (hrs)=       2.75         2.92           2.75
     RUNOFF VOLUME    (mm)=      70.91        15.73          43.31
     TOTAL RAINFALL   (mm)=      72.91        72.91          72.91
     RUNOFF COEFFICIENT   =       0.97         0.22           0.59

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  53.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-------------------
| ADD HYD  (  0001)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0014):    11.48   1.392     2.75    47.51
      + ID2= 2 (  0203):     1.39   0.150     2.75    43.31
        ==========================================
        ID = 3 (  0001):    12.87   1.542     2.75    47.05

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
-------------------
| RESERVOIR(  0002)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
-------------------       (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000    |   1.7418      0.6925
```

```
                      0.0104     0.0854   |   2.0360      0.7592
                      0.0162     0.1787   |   2.3451      0.8279
                      0.1996     0.2797   |   2.9855      0.8985
                      0.3514     0.3331   |   3.9020      0.9711
                      0.5308     0.3883   |   5.0025      1.0457
                      0.7339     0.4453   |   6.2539      1.1222
                      0.9582     0.5042   |   7.6369      1.2007
                      1.2019     0.5650   |  10.7483      1.3627
                      1.4635     0.6278   |  16.1617      1.6172

                           AREA     QPEAK     TPEAK       R.V.
                           (ha)     (cms)     (hrs)       (mm)
  INFLOW : ID= 2 (  0001)     12.870      1.542      2.75      47.05
  OUTFLOW: ID= 1 (  0002)     12.870      0.470      3.25      46.89

                PEAK   FLOW   REDUCTION [Qout/Qin](%)= 30.49
                TIME SHIFT OF PEAK FLOW         (min)= 30.00
                MAXIMUM  STORAGE   USED       (ha.m.)=  0.3705

--------------------------------------------------------------------------------
-------------------
| CALIB           |
| STANDHYD (  0204)|   Area    (ha)=   3.12
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  30.00
-------------------

                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.56         1.56
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       5.00         2.00
     Length            (m)=     144.22        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    8.75 | 3.250   18.95 |  4.83    1.46
              0.167    0.00 | 1.750    8.75 | 3.333   10.21 |  4.92    1.46
              0.250    0.00 | 1.833   24.79 | 3.417   10.21 |  5.00    1.46
              0.333    1.46 | 1.917   24.79 | 3.500   10.21 |  5.08    1.46
              0.417    1.46 | 2.000   24.79 | 3.583   10.21 |  5.17    1.46
              0.500    1.46 | 2.083   24.79 | 3.667   10.21 |  5.25    1.46
              0.583    1.46 | 2.167   24.79 | 3.750   10.21 |  5.33    1.46
              0.667    1.46 | 2.250   24.79 | 3.833    5.83 |  5.42    1.46
              0.750    1.46 | 2.333   67.07 | 3.917    5.83 |  5.50    1.46
              0.833    1.46 | 2.417   67.07 | 4.000    5.83 |  5.58    1.46
              0.917    1.46 | 2.500   67.07 | 4.083    5.83 |  5.67    1.46
              1.000    1.46 | 2.583   67.07 | 4.167    5.83 |  5.75    1.46
              1.083    1.46 | 2.667   67.07 | 4.250    5.83 |  5.83    1.46
              1.167    1.46 | 2.750   67.07 | 4.333    2.92 |  5.92    1.46
              1.250    1.46 | 2.833   18.95 | 4.417    2.92 |  6.00    1.46
              1.333    8.75 | 2.917   18.95 | 4.500    2.92 |  6.08    1.46
              1.417    8.75 | 3.000   18.95 | 4.583    2.92 |  6.17    1.46
              1.500    8.75 | 3.083   18.95 | 4.667    2.92 |  6.25    1.46
              1.583    8.75 | 3.167   18.95 | 4.750    2.92 |

     Max.Eff.Inten.(mm/hr)=      67.07        33.45
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       2.30 (ii)   13.24 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.30         0.08
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.17         0.11          0.279 (iii)
     TIME TO PEAK    (hrs)=       2.75         2.83           2.75
     RUNOFF VOLUME    (mm)=      70.91        20.88          35.89
     TOTAL RAINFALL   (mm)=      72.91        72.91          72.91
     RUNOFF COEFFICIENT   =       0.97         0.29           0.49

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  53.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-------------------
| ADD HYD  (  0003)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0002):    12.87   0.470     3.25    46.89
     + ID2= 2 (  0204):     3.12   0.279     2.75    35.89
       ================================================
       ID = 3 (  0003):    15.99   0.597     2.75    44.75

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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================================================================================
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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\531e1913-0e12-4e2e-9684-
e2ef03acaa05\4fd6c071-ca0c-40ec-891d-69e0991c9ada\scena
  Summary filename: C:\Users\Valdor\AppData\Local\Civica\VH5\531e1913-0e12-4e2e-9684-
e2ef03acaa05\4fd6c071-ca0c-40ec-891d-69e0991c9ada\scena


DATE: 12-16-2022                          TIME: 12:36:46

USER:



COMMENTS: _____________________________________________________

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  ***********************************************
  ** SIMULATION : AES_06hr_050yr                **
  ***********************************************


-------------------
|    READ STORM    |    Filename: C:\Users\Valdor\AppD
|                  |              ata\Local\Temp\
|                  |              cb3b72dc-5cab-43c3-b388-d70a01008f1d\12dd90ee
| Ptotal= 81.41 mm |    Comments: AES_06hr_050yr
```

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--------------------
                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   27.68 |  3.50   11.40 |  5.25    1.63
                0.25    1.63 |  2.00   27.68 |  3.75    6.51 |  5.50    1.63
                0.50    1.63 |  2.25   74.89 |  4.00    6.51 |  5.75    1.63
                0.75    1.63 |  2.50   74.89 |  4.25    3.26 |  6.00    1.63
                1.00    1.63 |  2.75   21.16 |  4.50    3.26 |
                1.25    9.77 |  3.00   21.16 |  4.75    1.63 |
                1.50    9.77 |  3.25   11.40 |  5.00    1.63 |

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--------------------
| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=   6.68
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  60.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.68         2.00
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       5.00         2.00
     Length            (m)=     211.03        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    9.77 | 3.250   21.16 |  4.83    1.63
               0.167    0.00 | 1.750    9.77 | 3.333   11.40 |  4.92    1.63
               0.250    0.00 | 1.833   27.68 | 3.417   11.40 |  5.00    1.63
               0.333    1.63 | 1.917   27.68 | 3.500   11.40 |  5.08    1.63
               0.417    1.63 | 2.000   27.68 | 3.583   11.40 |  5.17    1.63
               0.500    1.63 | 2.083   27.68 | 3.667   11.40 |  5.25    1.63
               0.583    1.63 | 2.167   27.68 | 3.750   11.40 |  5.33    1.63
               0.667    1.63 | 2.250   27.68 | 3.833    6.51 |  5.42    1.63
               0.750    1.63 | 2.333   74.89 | 3.917    6.51 |  5.50    1.63
               0.833    1.63 | 2.417   74.89 | 4.000    6.51 |  5.58    1.63
               0.917    1.63 | 2.500   74.89 | 4.083    6.51 |  5.67    1.63
               1.000    1.63 | 2.583   74.89 | 4.167    6.51 |  5.75    1.63
               1.083    1.63 | 2.667   74.89 | 4.250    6.51 |  5.83    1.63
               1.167    1.63 | 2.750   74.89 | 4.333    3.26 |  5.92    1.63
               1.250    1.63 | 2.833   21.16 | 4.417    3.26 |  6.00    1.63
               1.333    9.77 | 2.917   21.16 | 4.500    3.26 |  6.08    1.63
               1.417    9.77 | 3.000   21.16 | 4.583    3.26 |  6.17    1.63
               1.500    9.77 | 3.083   21.16 | 4.667    3.26 |  6.25    1.63
               1.583    9.77 | 3.167   21.16 | 4.750    3.26 |

     Max.Eff.Inten.(mm/hr)=      74.89        37.29
                 over (min)        5.00        15.00
     Storage Coeff.  (min)=       2.77 (ii)   13.24 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.28         0.08
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.83         0.16      0.985 (iii)
     TIME TO PEAK    (hrs)=       2.75         2.83       2.75
     RUNOFF VOLUME    (mm)=      79.41        24.46      57.43
     TOTAL RAINFALL   (mm)=      81.41        81.41      81.41
     RUNOFF COEFFICIENT   =       0.98         0.30       0.71

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  53.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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--------------------
| CALIB            |
| STANDHYD (  0202)|   Area    (ha)=   4.80
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=  45.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.88         1.92
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       5.00         2.00
     Length            (m)=     178.89        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    9.77 | 3.250   21.16 |  4.83    1.63
               0.167    0.00 | 1.750    9.77 | 3.333   11.40 |  4.92    1.63
               0.250    0.00 | 1.833   27.68 | 3.417   11.40 |  5.00    1.63
               0.333    1.63 | 1.917   27.68 | 3.500   11.40 |  5.08    1.63
               0.417    1.63 | 2.000   27.68 | 3.583   11.40 |  5.17    1.63
               0.500    1.63 | 2.083   27.68 | 3.667   11.40 |  5.25    1.63
               0.583    1.63 | 2.167   27.68 | 3.750   11.40 |  5.33    1.63
               0.667    1.63 | 2.250   27.68 | 3.833    6.51 |  5.42    1.63
               0.750    1.63 | 2.333   74.89 | 3.917    6.51 |  5.50    1.63
               0.833    1.63 | 2.417   74.89 | 4.000    6.51 |  5.58    1.63
               0.917    1.63 | 2.500   74.89 | 4.083    6.51 |  5.67    1.63
               1.000    1.63 | 2.583   74.89 | 4.167    6.51 |  5.75    1.63
               1.083    1.63 | 2.667   74.89 | 4.250    6.51 |  5.83    1.63
               1.167    1.63 | 2.750   74.89 | 4.333    3.26 |  5.92    1.63
               1.250    1.63 | 2.833   21.16 | 4.417    3.26 |  6.00    1.63
               1.333    9.77 | 2.917   21.16 | 4.500    3.26 |  6.08    1.63
               1.417    9.77 | 3.000   21.16 | 4.583    3.26 |  6.17    1.63
               1.500    9.77 | 3.083   21.16 | 4.667    3.26 |  6.25    1.63
               1.583    9.77 | 3.167   21.16 | 4.750    3.26 |

     Max.Eff.Inten.(mm/hr)=      74.89        39.35
                 over (min)        5.00        15.00
     Storage Coeff.  (min)=       2.51 (ii)   12.76 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.29         0.08
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.45         0.16       0.604 (iii)
     TIME TO PEAK    (hrs)=       2.75         2.83       2.75
     RUNOFF VOLUME    (mm)=      79.41        25.04      49.50
     TOTAL RAINFALL   (mm)=      81.41        81.41      81.41
     RUNOFF COEFFICIENT   =       0.98         0.31       0.61

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  53.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD  (  0014)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0201):     6.68   0.985     2.75    57.43
     + ID2= 2 (  0202):     4.80   0.604     2.75    49.50
       ==========================================================
       ID = 3 (  0014):    11.48   1.589     2.75    54.11
```

```
     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
-------------------
| CALIB           |
| STANDHYD (  0203)|   Area    (ha)=   1.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  50.00
-------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.69         0.69
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       5.00         2.00
     Length            (m)=      96.26        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    9.77 | 3.250   21.16 |  4.83    1.63
               0.167    0.00 | 1.750    9.77 | 3.333   11.40 |  4.92    1.63
               0.250    0.00 | 1.833   27.68 | 3.417   11.40 |  5.00    1.63
               0.333    1.63 | 1.917   27.68 | 3.500   11.40 |  5.08    1.63
               0.417    1.63 | 2.000   27.68 | 3.583   11.40 |  5.17    1.63
               0.500    1.63 | 2.083   27.68 | 3.667   11.40 |  5.25    1.63
               0.583    1.63 | 2.167   27.68 | 3.750   11.40 |  5.33    1.63
               0.667    1.63 | 2.250   27.68 | 3.833    6.51 |  5.42    1.63
               0.750    1.63 | 2.333   74.89 | 3.917    6.51 |  5.50    1.63
               0.833    1.63 | 2.417   74.89 | 4.000    6.51 |  5.58    1.63
               0.917    1.63 | 2.500   74.89 | 4.083    6.51 |  5.67    1.63
               1.000    1.63 | 2.583   74.89 | 4.167    6.51 |  5.75    1.63
               1.083    1.63 | 2.667   74.89 | 4.250    6.51 |  5.83    1.63
               1.167    1.63 | 2.750   74.89 | 4.333    3.26 |  5.92    1.63
               1.250    1.63 | 2.833   21.16 | 4.417    3.26 |  6.00    1.63
               1.333    9.77 | 2.917   21.16 | 4.500    3.26 |  6.08    1.63
               1.417    9.77 | 3.000   21.16 | 4.583    3.26 |  6.17    1.63
               1.500    9.77 | 3.083   21.16 | 4.667    3.26 |  6.25    1.63
               1.583    9.77 | 3.167   21.16 | 4.750    3.26 |

     Max.Eff.Inten.(mm/hr)=      74.89        22.19
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       1.73 (ii)   14.62 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.32         0.08
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.14         0.03          0.174 (iii)
     TIME TO PEAK    (hrs)=       2.75         2.83           2.75
     RUNOFF VOLUME    (mm)=      79.41        19.35          49.38
     TOTAL RAINFALL   (mm)=      81.41        81.41          81.41
     RUNOFF COEFFICIENT   =       0.98         0.24           0.61

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  53.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-------------------
| ADD HYD  (  0001)|
|   1 +  2 =  3    |        AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
       ID= 1 (  0014):    11.48   1.589     2.75    54.11
     + ID2= 2 (  0203):     1.39   0.174     2.75    49.38
       ==================================================

       ID = 3 (  0001):    12.87   1.763     2.75    53.60

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
-------------------
| RESERVOIR(  0002)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
-------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   1.7418      0.6925
                         0.0104     0.0854   |   2.0360      0.7592
                         0.0162     0.1787   |   2.3451      0.8279
                         0.1996     0.2797   |   2.9855      0.8985
                         0.3514     0.3331   |   3.9020      0.9711
                         0.5308     0.3883   |   5.0025      1.0457
                         0.7339     0.4453   |   6.2539      1.1222
                         0.9582     0.5042   |   7.6369      1.2007
                         1.2019     0.5650   |  10.7483      1.3627
                         1.4635     0.6278   |  16.1617      1.6172

                              AREA     QPEAK     TPEAK       R.V.
                              (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0001)     12.870      1.763      2.75      53.60
   OUTFLOW: ID= 1 (  0002)     12.870      0.587      3.25      53.44

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 33.28
                  TIME SHIFT OF PEAK FLOW         (min)= 30.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.4042

--------------------------------------------------------------------------------
-------------------
| CALIB           |
| STANDHYD (  0204)|   Area    (ha)=   3.12
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  30.00
-------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.56         1.56
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       5.00         2.00
     Length            (m)=     144.22        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    9.77 | 3.250   21.16 |  4.83    1.63
               0.167    0.00 | 1.750    9.77 | 3.333   11.40 |  4.92    1.63
               0.250    0.00 | 1.833   27.68 | 3.417   11.40 |  5.00    1.63
               0.333    1.63 | 1.917   27.68 | 3.500   11.40 |  5.08    1.63
               0.417    1.63 | 2.000   27.68 | 3.583   11.40 |  5.17    1.63
               0.500    1.63 | 2.083   27.68 | 3.667   11.40 |  5.25    1.63
               0.583    1.63 | 2.167   27.68 | 3.750   11.40 |  5.33    1.63
               0.667    1.63 | 2.250   27.68 | 3.833    6.51 |  5.42    1.63
               0.750    1.63 | 2.333   74.89 | 3.917    6.51 |  5.50    1.63
               0.833    1.63 | 2.417   74.89 | 4.000    6.51 |  5.58    1.63
               0.917    1.63 | 2.500   74.89 | 4.083    6.51 |  5.67    1.63
               1.000    1.63 | 2.583   74.89 | 4.167    6.51 |  5.75    1.63
               1.083    1.63 | 2.667   74.89 | 4.250    6.51 |  5.83    1.63
               1.167    1.63 | 2.750   74.89 | 4.333    3.26 |  5.92    1.63
               1.250    1.63 | 2.833   21.16 | 4.417    3.26 |  6.00    1.63
               1.333    9.77 | 2.917   21.16 | 4.500    3.26 |  6.08    1.63
               1.417    9.77 | 3.000   21.16 | 4.583    3.26 |  6.17    1.63
               1.500    9.77 | 3.083   21.16 | 4.667    3.26 |  6.25    1.63
               1.583    9.77 | 3.167   21.16 | 4.750    3.26 |

     Max.Eff.Inten.(mm/hr)=      74.89        42.59
               over (min)        5.00        15.00
```

```
     Storage Coeff.  (min)=       2.20 (ii)   12.13 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.30         0.09
                                                  *TOTALS*
     PEAK FLOW       (cms)=       0.19         0.14          0.327 (iii)
     TIME TO PEAK    (hrs)=       2.75         2.83           2.75
     RUNOFF VOLUME    (mm)=      79.41        25.38          41.59
     TOTAL RAINFALL   (mm)=      81.41        81.41          81.41
     RUNOFF COEFFICIENT   =       0.98         0.31           0.51

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  53.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

-------------------
| ADD HYD  (  0003)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0002):    12.87   0.587     3.25     53.44
     + ID2= 2 (  0204):     3.12   0.327     2.75     41.59
       ====================================================
       ID = 3 (  0003):    15.99   0.765     2.75     51.13

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

       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\531e1913-0e12-4e2e-9684-
e2ef03acaa05\341b89af-c95d-45b3-a9b8-cc0f7699e01f\scena
  Summary filename: C:\Users\Valdor\AppData\Local\Civica\VH5\531e1913-0e12-4e2e-9684-
e2ef03acaa05\341b89af-c95d-45b3-a9b8-cc0f7699e01f\scena


DATE: 12-16-2022                          TIME: 12:36:46

USER:



COMMENTS: _____

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  ************************************************
  ** SIMULATION : AES_06hr_100yr                **
  ************************************************


--------------------
|    READ STORM    |    Filename: C:\Users\Valdor\AppD
|                  |              ata\Local\Temp\
|                  |              cb3b72dc-5cab-43c3-b388-d70a01008f1d\1ec3a0e5
| Ptotal= 89.91 mm |    Comments: AES_06hr_100yr
--------------------
                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   30.57 |  3.50   12.59 |  5.25    1.80
                0.25    1.80 |  2.00   30.57 |  3.75    7.19 |  5.50    1.80
                0.50    1.80 |  2.25   82.71 |  4.00    7.19 |  5.75    1.80
                0.75    1.80 |  2.50   82.71 |  4.25    3.60 |  6.00    1.80
                1.00    1.80 |  2.75   23.37 |  4.50    3.60 |
                1.25   10.79 |  3.00   23.37 |  4.75    1.80 |
                1.50   10.79 |  3.25   12.59 |  5.00    1.80 |

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-------------------
| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=   6.68
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  60.00
-------------------
                                  IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.68          2.00
     Dep. Storage     (mm)=       2.00          5.00
     Average Slope     (%)=       5.00          2.00
     Length            (m)=     211.03         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   10.79 | 3.250   23.37 |  4.83    1.80
               0.167    0.00 | 1.750   10.79 | 3.333   12.59 |  4.92    1.80
               0.250    0.00 | 1.833   30.57 | 3.417   12.59 |  5.00    1.80
               0.333    1.80 | 1.917   30.57 | 3.500   12.59 |  5.08    1.80
               0.417    1.80 | 2.000   30.57 | 3.583   12.59 |  5.17    1.80
               0.500    1.80 | 2.083   30.57 | 3.667   12.59 |  5.25    1.80
               0.583    1.80 | 2.167   30.57 | 3.750   12.59 |  5.33    1.80
               0.667    1.80 | 2.250   30.57 | 3.833    7.19 |  5.42    1.80
               0.750    1.80 | 2.333   82.71 | 3.917    7.19 |  5.50    1.80
               0.833    1.80 | 2.417   82.71 | 4.000    7.19 |  5.58    1.80
               0.917    1.80 | 2.500   82.71 | 4.083    7.19 |  5.67    1.80
               1.000    1.80 | 2.583   82.71 | 4.167    7.19 |  5.75    1.80
               1.083    1.80 | 2.667   82.71 | 4.250    7.19 |  5.83    1.80
               1.167    1.80 | 2.750   82.71 | 4.333    3.60 |  5.92    1.80
               1.250    1.80 | 2.833   23.37 | 4.417    3.60 |  6.00    1.80
               1.333   10.79 | 2.917   23.37 | 4.500    3.60 |  6.08    1.80
               1.417   10.79 | 3.000   23.37 | 4.583    3.60 |  6.17    1.80
               1.500   10.79 | 3.083   23.37 | 4.667    3.60 |  6.25    1.80
               1.583   10.79 | 3.167   23.37 | 4.750    3.60 |

     Max.Eff.Inten.(mm/hr)=      82.71         46.43
               over (min)        5.00         15.00
     Storage Coeff.  (min)=       2.66 (ii)   12.25 (ii)
     Unit Hyd. Tpeak (min)=       5.00         15.00
     Unit Hyd. peak  (cms)=       0.29          0.09
                                                  *TOTALS*
     PEAK FLOW       (cms)=       0.92          0.19           1.106 (iii)
     TIME TO PEAK    (hrs)=       2.75          2.83            2.75
     RUNOFF VOLUME    (mm)=      87.91         29.10           64.39
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     TOTAL RAINFALL   (mm)=      89.91        89.91          89.91
     RUNOFF COEFFICIENT   =       0.98         0.32           0.72

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  53.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0202)|   Area    (ha)=   4.80
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=  45.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.88         1.92
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       5.00         2.00
     Length            (m)=     178.89        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   10.79 | 3.250   23.37 |  4.83    1.80
    0.167    0.00 | 1.750   10.79 | 3.333   12.59 |  4.92    1.80
    0.250    0.00 | 1.833   30.57 | 3.417   12.59 |  5.00    1.80
    0.333    1.80 | 1.917   30.57 | 3.500   12.59 |  5.08    1.80
    0.417    1.80 | 2.000   30.57 | 3.583   12.59 |  5.17    1.80
    0.500    1.80 | 2.083   30.57 | 3.667   12.59 |  5.25    1.80
    0.583    1.80 | 2.167   30.57 | 3.750   12.59 |  5.33    1.80
    0.667    1.80 | 2.250   30.57 | 3.833    7.19 |  5.42    1.80
    0.750    1.80 | 2.333   82.71 | 3.917    7.19 |  5.50    1.80
    0.833    1.80 | 2.417   82.71 | 4.000    7.19 |  5.58    1.80
    0.917    1.80 | 2.500   82.71 | 4.083    7.19 |  5.67    1.80
    1.000    1.80 | 2.583   82.71 | 4.167    7.19 |  5.75    1.80
    1.083    1.80 | 2.667   82.71 | 4.250    7.19 |  5.83    1.80
    1.167    1.80 | 2.750   82.71 | 4.333    3.60 |  5.92    1.80
    1.250    1.80 | 2.833   23.37 | 4.417    3.60 |  6.00    1.80
    1.333   10.79 | 2.917   23.37 | 4.500    3.60 |  6.08    1.80
    1.417   10.79 | 3.000   23.37 | 4.583    3.60 |  6.17    1.80
    1.500   10.79 | 3.083   23.37 | 4.667    3.60 |  6.25    1.80
    1.583   10.79 | 3.167   23.37 | 4.750    3.60 |

     Max.Eff.Inten.(mm/hr)=      82.71        48.92
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       2.41 (ii)   11.81 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.30         0.09
                                                    *TOTALS*
     PEAK FLOW       (cms)=       0.50         0.20          0.686 (iii)
     TIME TO PEAK    (hrs)=       2.75         2.83           2.75
     RUNOFF VOLUME    (mm)=      87.91        29.76          55.93
     TOTAL RAINFALL   (mm)=      89.91        89.91          89.91
     RUNOFF COEFFICIENT   =       0.98         0.33           0.62

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  53.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD  (  0014)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0201):     6.68   1.106     2.75    64.39
     + ID2= 2 (  0202):     4.80   0.686     2.75    55.93
       ================================================
       ID = 3 (  0014):    11.48   1.793     2.75    60.85

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0203)|   Area    (ha)=   1.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  50.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.69         0.69
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       5.00         2.00
     Length            (m)=      96.26        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   10.79 | 3.250   23.37 |  4.83    1.80
    0.167    0.00 | 1.750   10.79 | 3.333   12.59 |  4.92    1.80
    0.250    0.00 | 1.833   30.57 | 3.417   12.59 |  5.00    1.80
    0.333    1.80 | 1.917   30.57 | 3.500   12.59 |  5.08    1.80
    0.417    1.80 | 2.000   30.57 | 3.583   12.59 |  5.17    1.80
    0.500    1.80 | 2.083   30.57 | 3.667   12.59 |  5.25    1.80
    0.583    1.80 | 2.167   30.57 | 3.750   12.59 |  5.33    1.80
    0.667    1.80 | 2.250   30.57 | 3.833    7.19 |  5.42    1.80
    0.750    1.80 | 2.333   82.71 | 3.917    7.19 |  5.50    1.80
    0.833    1.80 | 2.417   82.71 | 4.000    7.19 |  5.58    1.80
    0.917    1.80 | 2.500   82.71 | 4.083    7.19 |  5.67    1.80
    1.000    1.80 | 2.583   82.71 | 4.167    7.19 |  5.75    1.80
    1.083    1.80 | 2.667   82.71 | 4.250    7.19 |  5.83    1.80
    1.167    1.80 | 2.750   82.71 | 4.333    3.60 |  5.92    1.80
    1.250    1.80 | 2.833   23.37 | 4.417    3.60 |  6.00    1.80
    1.333   10.79 | 2.917   23.37 | 4.500    3.60 |  6.08    1.80
    1.417   10.79 | 3.000   23.37 | 4.583    3.60 |  6.17    1.80
    1.500   10.79 | 3.083   23.37 | 4.667    3.60 |  6.25    1.80
    1.583   10.79 | 3.167   23.37 | 4.750    3.60 |

     Max.Eff.Inten.(mm/hr)=      82.71        26.63
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       1.66 (ii)   13.64 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.32         0.08
                                                    *TOTALS*
     PEAK FLOW       (cms)=       0.16         0.04          0.196 (iii)
     TIME TO PEAK    (hrs)=       2.75         2.83           2.75
     RUNOFF VOLUME    (mm)=      87.91        23.25          55.57
     TOTAL RAINFALL   (mm)=      89.91        89.91          89.91
     RUNOFF COEFFICIENT   =       0.98         0.26           0.62

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  53.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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--------------------
| ADD HYD  (  0001)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0014):    11.48   1.793     2.75    60.85
     + ID2= 2 (  0203):     1.39   0.196     2.75    55.57
       ====================================================
       ID = 3 (  0001):    12.87   1.989     2.75    60.28

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0002)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   1.7418      0.6925
                          0.0104     0.0854   |   2.0360      0.7592
                          0.0162     0.1787   |   2.3451      0.8279
                          0.1996     0.2797   |   2.9855      0.8985
                          0.3514     0.3331   |   3.9020      0.9711
                          0.5308     0.3883   |   5.0025      1.0457
                          0.7339     0.4453   |   6.2539      1.1222
                          0.9582     0.5042   |   7.6369      1.2007
                          1.2019     0.5650   |  10.7483      1.3627
                          1.4635     0.6278   |  16.1617      1.6172

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0001)     12.870     1.989      2.75      60.28
   OUTFLOW: ID= 1 (  0002)     12.870     0.707      3.17      60.12

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 35.56
                  TIME SHIFT OF PEAK FLOW         (min)= 25.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.4380

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--------------------
| CALIB            |
| STANDHYD (  0204)|   Area    (ha)=   3.12
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  30.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.56         1.56
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       5.00         2.00
     Length            (m)=     144.22        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   10.79 | 3.250   23.37 |  4.83    1.80
               0.167    0.00 | 1.750   10.79 | 3.333   12.59 |  4.92    1.80
               0.250    0.00 | 1.833   30.57 | 3.417   12.59 |  5.00    1.80
               0.333    1.80 | 1.917   30.57 | 3.500   12.59 |  5.08    1.80
               0.417    1.80 | 2.000   30.57 | 3.583   12.59 |  5.17    1.80
               0.500    1.80 | 2.083   30.57 | 3.667   12.59 |  5.25    1.80
               0.583    1.80 | 2.167   30.57 | 3.750   12.59 |  5.33    1.80
               0.667    1.80 | 2.250   30.57 | 3.833    7.19 |  5.42    1.80
               0.750    1.80 | 2.333   82.71 | 3.917    7.19 |  5.50    1.80
               0.833    1.80 | 2.417   82.71 | 4.000    7.19 |  5.58    1.80
               0.917    1.80 | 2.500   82.71 | 4.083    7.19 |  5.67    1.80
               1.000    1.80 | 2.583   82.71 | 4.167    7.19 |  5.75    1.80
               1.083    1.80 | 2.667   82.71 | 4.250    7.19 |  5.83    1.80
               1.167    1.80 | 2.750   82.71 | 4.333    3.60 |  5.92    1.80
               1.250    1.80 | 2.833   23.37 | 4.417    3.60 |  6.00    1.80
               1.333   10.79 | 2.917   23.37 | 4.500    3.60 |  6.08    1.80
               1.417   10.79 | 3.000   23.37 | 4.583    3.60 |  6.17    1.80
               1.500   10.79 | 3.083   23.37 | 4.667    3.60 |  6.25    1.80
               1.583   10.79 | 3.167   23.37 | 4.750    3.60 |

     Max.Eff.Inten.(mm/hr)=      82.71        50.43
                  over (min)        5.00        15.00
     Storage Coeff.  (min)=       2.12 (ii)   11.40 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.31         0.09
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.22         0.17        0.376 (iii)
     TIME TO PEAK    (hrs)=       2.75         2.83         2.75
     RUNOFF VOLUME    (mm)=      87.91        30.15        47.48
     TOTAL RAINFALL   (mm)=      89.91        89.91        89.91
     RUNOFF COEFFICIENT   =       0.98         0.34         0.53

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  53.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0003)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0002):    12.87   0.707     3.17    60.12
     + ID2= 2 (  0204):     3.12   0.376     2.75    47.48
       ====================================================
       ID = 3 (  0003):    15.99   0.938     2.75    57.65

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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       V    V   I    SSSSS  U   U    A    L              (v 6.2.2009)
       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\531e1913-0e12-4e2e-9684-
e2ef03acaa05\345de98e-f053-418f-9bed-81f22e84d47b\scena
```

```
  Summary filename: C:\Users\Valdor\AppData\Local\Civica\VH5\531e1913-0e12-4e2e-9684-
e2ef03acaa05\345de98e-f053-418f-9bed-81f22e84d47b\scena

DATE: 12-16-2022                          TIME: 12:36:45

USER:


COMMENTS: _____

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


--------------------
|    READ STORM    |    Filename: C:\Users\Valdor\AppD
|                  |              ata\Local\Temp\
|                  |              cb3b72dc-5cab-43c3-b388-d70a01008f1d\2f835815
| Ptotal=193.00 mm |    Comments: TIMMINS
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.00   15.00 |  3.00    3.00 |  6.00   43.00 |  9.00   13.00
                0.25   15.00 |  3.25    3.00 |  6.25   43.00 |  9.25   13.00
                0.50   15.00 |  3.50    3.00 |  6.50   43.00 |  9.50   13.00
                0.75   15.00 |  3.75    3.00 |  6.75   43.00 |  9.75   13.00
                1.00   20.00 |  4.00    5.00 |  7.00   20.00 | 10.00   13.00
                1.25   20.00 |  4.25    5.00 |  7.25   20.00 | 10.25   13.00
                1.50   20.00 |  4.50    5.00 |  7.50   20.00 | 10.50   13.00
                1.75   20.00 |  4.75    5.00 |  7.75   20.00 | 10.75   13.00
                2.00   10.00 |  5.00   20.00 |  8.00   23.00 | 11.00    8.00
                2.25   10.00 |  5.25   20.00 |  8.25   23.00 | 11.25    8.00
                2.50   10.00 |  5.50   20.00 |  8.50   23.00 | 11.50    8.00
                2.75   10.00 |  5.75   20.00 |  8.75   23.00 | 11.75    8.00

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| CALIB           |
| STANDHYD (  0201)|   Area    (ha)=   6.68
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  60.00
-------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.68         2.00
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       5.00         2.00
     Length            (m)=     211.03        40.00
     Mannings n             =     0.013        0.250

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


                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083   15.00 | 3.083    3.00 | 6.083   43.00 |  9.08   13.00
               0.167   15.00 | 3.167    3.00 | 6.167   43.00 |  9.17   13.00
               0.250   15.00 | 3.250    3.00 | 6.250   43.00 |  9.25   13.00
               0.333   15.00 | 3.333    3.00 | 6.333   43.00 |  9.33   13.00
               0.417   15.00 | 3.417    3.00 | 6.417   43.00 |  9.42   13.00
               0.500   15.00 | 3.500    3.00 | 6.500   43.00 |  9.50   13.00
               0.583   15.00 | 3.583    3.00 | 6.583   43.00 |  9.58   13.00
               0.667   15.00 | 3.667    3.00 | 6.667   43.00 |  9.67   13.00
               0.750   15.00 | 3.750    3.00 | 6.750   43.00 |  9.75   13.00
               0.833   15.00 | 3.833    3.00 | 6.833   43.00 |  9.83   13.00
               0.917   15.00 | 3.917    3.00 | 6.917   43.00 |  9.92   13.00
               1.000   15.00 | 4.000    3.00 | 7.000   43.00 | 10.00   13.00
               1.083   20.00 | 4.083    5.00 | 7.083   20.00 | 10.08   13.00
               1.167   20.00 | 4.167    5.00 | 7.167   20.00 | 10.17   13.00
               1.250   20.00 | 4.250    5.00 | 7.250   20.00 | 10.25   13.00
               1.333   20.00 | 4.333    5.00 | 7.333   20.00 | 10.33   13.00
               1.417   20.00 | 4.417    5.00 | 7.417   20.00 | 10.42   13.00
               1.500   20.00 | 4.500    5.00 | 7.500   20.00 | 10.50   13.00
               1.583   20.00 | 4.583    5.00 | 7.583   20.00 | 10.58   13.00
               1.667   20.00 | 4.667    5.00 | 7.667   20.00 | 10.67   13.00
               1.750   20.00 | 4.750    5.00 | 7.750   20.00 | 10.75   13.00
               1.833   20.00 | 4.833    5.00 | 7.833   20.00 | 10.83   13.00
               1.917   20.00 | 4.917    5.00 | 7.917   20.00 | 10.92   13.00
               2.000   20.00 | 5.000    5.00 | 8.000   20.00 | 11.00   13.00
               2.083   10.00 | 5.083   20.00 | 8.083   23.00 | 11.08    8.00
               2.167   10.00 | 5.167   20.00 | 8.167   23.00 | 11.17    8.00
               2.250   10.00 | 5.250   20.00 | 8.250   23.00 | 11.25    8.00
               2.333   10.00 | 5.333   20.00 | 8.333   23.00 | 11.33    8.00
               2.417   10.00 | 5.417   20.00 | 8.417   23.00 | 11.42    8.00
               2.500   10.00 | 5.500   20.00 | 8.500   23.00 | 11.50    8.00
               2.583   10.00 | 5.583   20.00 | 8.583   23.00 | 11.58    8.00
               2.667   10.00 | 5.667   20.00 | 8.667   23.00 | 11.67    8.00
               2.750   10.00 | 5.750   20.00 | 8.750   23.00 | 11.75    8.00
               2.833   10.00 | 5.833   20.00 | 8.833   23.00 | 11.83    8.00
               2.917   10.00 | 5.917   20.00 | 8.917   23.00 | 11.92    8.00
               3.000   10.00 | 6.000   20.00 | 9.000   23.00 | 12.00    8.00

     Max.Eff.Inten.(mm/hr)=      43.00        35.82
               over (min)        5.00        15.00
     Storage Coeff.  (min)=      3.46 (ii)   14.10 (ii)
     Unit Hyd. Tpeak (min)=      5.00        15.00
     Unit Hyd. peak  (cms)=      0.26         0.08
                                                        *TOTALS*
     PEAK FLOW       (cms)=      0.48         0.19         0.668 (iii)
     TIME TO PEAK    (hrs)=      6.75         7.00           7.00
     RUNOFF VOLUME    (mm)=    191.00        99.99         154.60
     TOTAL RAINFALL   (mm)=    193.00       193.00         193.00
     RUNOFF COEFFICIENT   =      0.99         0.52           0.80

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  53.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-------------------
| CALIB           |
| STANDHYD (  0202)|   Area    (ha)=   4.80
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=  45.00
-------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.88         1.92
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       5.00         2.00
     Length            (m)=     178.89        40.00
     Mannings n             =     0.013        0.250

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


                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083   15.00 | 3.083    3.00 | 6.083   43.00 |  9.08   13.00
               0.167   15.00 | 3.167    3.00 | 6.167   43.00 |  9.17   13.00
               0.250   15.00 | 3.250    3.00 | 6.250   43.00 |  9.25   13.00
```

0.333	15.00	3.333	3.00	6.333	43.00	9.33	13.00
0.417	15.00	3.417	3.00	6.417	43.00	9.42	13.00
0.500	15.00	3.500	3.00	6.500	43.00	9.50	13.00
0.583	15.00	3.583	3.00	6.583	43.00	9.58	13.00
0.667	15.00	3.667	3.00	6.667	43.00	9.67	13.00
0.750	15.00	3.750	3.00	6.750	43.00	9.75	13.00
0.833	15.00	3.833	3.00	6.833	43.00	9.83	13.00
0.917	15.00	3.917	3.00	6.917	43.00	9.92	13.00
1.000	15.00	4.000	3.00	7.000	43.00	10.00	13.00
1.083	20.00	4.083	5.00	7.083	20.00	10.08	13.00
1.167	20.00	4.167	5.00	7.167	20.00	10.17	13.00
1.250	20.00	4.250	5.00	7.250	20.00	10.25	13.00
1.333	20.00	4.333	5.00	7.333	20.00	10.33	13.00
1.417	20.00	4.417	5.00	7.417	20.00	10.42	13.00
1.500	20.00	4.500	5.00	7.500	20.00	10.50	13.00
1.583	20.00	4.583	5.00	7.583	20.00	10.58	13.00
1.667	20.00	4.667	5.00	7.667	20.00	10.67	13.00
1.750	20.00	4.750	5.00	7.750	20.00	10.75	13.00
1.833	20.00	4.833	5.00	7.833	20.00	10.83	13.00
1.917	20.00	4.917	5.00	7.917	20.00	10.92	13.00
2.000	20.00	5.000	5.00	8.000	20.00	11.00	13.00
2.083	10.00	5.083	20.00	8.083	23.00	11.08	8.00
2.167	10.00	5.167	20.00	8.167	23.00	11.17	8.00
2.250	10.00	5.250	20.00	8.250	23.00	11.25	8.00
2.333	10.00	5.333	20.00	8.333	23.00	11.33	8.00
2.417	10.00	5.417	20.00	8.417	23.00	11.42	8.00
2.500	10.00	5.500	20.00	8.500	23.00	11.50	8.00
2.583	10.00	5.583	20.00	8.583	23.00	11.58	8.00
2.667	10.00	5.667	20.00	8.667	23.00	11.67	8.00
2.750	10.00	5.750	20.00	8.750	23.00	11.75	8.00
2.833	10.00	5.833	20.00	8.833	23.00	11.83	8.00
2.917	10.00	5.917	20.00	8.917	23.00	11.92	8.00
3.000	10.00	6.000	20.00	9.000	23.00	12.00	8.00

Max.Eff.Inten.(mm/hr)=	43.00	37.48	
over (min)	5.00	15.00	
Storage Coeff. (min)=	3.13 (ii)	13.58 (ii)	
Unit Hyd. Tpeak (min)=	5.00	15.00	
Unit Hyd. peak (cms)=	0.27	0.08	
			TOTALS
PEAK FLOW (cms)=	0.26	0.19	0.448 (iii)
TIME TO PEAK (hrs)=	6.75	7.00	7.00
RUNOFF VOLUME (mm)=	191.00	101.53	141.79
TOTAL RAINFALL (mm)=	193.00	193.00	193.00
RUNOFF COEFFICIENT =	0.99	0.53	0.73

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 53.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0014)					
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0201):	6.68	0.668	7.00	154.60
+ ID2= 2 (0202):	4.80	0.448	7.00	141.79
ID = 3 (0014):	11.48	1.116	7.00	149.24

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB			
STANDHYD (0203)	Area	(ha)=	1.39

|ID= 1 DT= 5.0 min | Total Imp(%)= 50.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.69	0.69
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	5.00	2.00
Length	(m)=	96.26	40.00
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	15.00	3.083	3.00	6.083	43.00	9.08	13.00
0.167	15.00	3.167	3.00	6.167	43.00	9.17	13.00
0.250	15.00	3.250	3.00	6.250	43.00	9.25	13.00
0.333	15.00	3.333	3.00	6.333	43.00	9.33	13.00
0.417	15.00	3.417	3.00	6.417	43.00	9.42	13.00
0.500	15.00	3.500	3.00	6.500	43.00	9.50	13.00
0.583	15.00	3.583	3.00	6.583	43.00	9.58	13.00
0.667	15.00	3.667	3.00	6.667	43.00	9.67	13.00
0.750	15.00	3.750	3.00	6.750	43.00	9.75	13.00
0.833	15.00	3.833	3.00	6.833	43.00	9.83	13.00
0.917	15.00	3.917	3.00	6.917	43.00	9.92	13.00
1.000	15.00	4.000	3.00	7.000	43.00	10.00	13.00
1.083	20.00	4.083	5.00	7.083	20.00	10.08	13.00
1.167	20.00	4.167	5.00	7.167	20.00	10.17	13.00
1.250	20.00	4.250	5.00	7.250	20.00	10.25	13.00
1.333	20.00	4.333	5.00	7.333	20.00	10.33	13.00
1.417	20.00	4.417	5.00	7.417	20.00	10.42	13.00
1.500	20.00	4.500	5.00	7.500	20.00	10.50	13.00
1.583	20.00	4.583	5.00	7.583	20.00	10.58	13.00
1.667	20.00	4.667	5.00	7.667	20.00	10.67	13.00
1.750	20.00	4.750	5.00	7.750	20.00	10.75	13.00
1.833	20.00	4.833	5.00	7.833	20.00	10.83	13.00
1.917	20.00	4.917	5.00	7.917	20.00	10.92	13.00
2.000	20.00	5.000	5.00	8.000	20.00	11.00	13.00
2.083	10.00	5.083	20.00	8.083	23.00	11.08	8.00
2.167	10.00	5.167	20.00	8.167	23.00	11.17	8.00
2.250	10.00	5.250	20.00	8.250	23.00	11.25	8.00
2.333	10.00	5.333	20.00	8.333	23.00	11.33	8.00
2.417	10.00	5.417	20.00	8.417	23.00	11.42	8.00
2.500	10.00	5.500	20.00	8.500	23.00	11.50	8.00
2.583	10.00	5.583	20.00	8.583	23.00	11.58	8.00
2.667	10.00	5.667	20.00	8.667	23.00	11.67	8.00
2.750	10.00	5.750	20.00	8.750	23.00	11.75	8.00
2.833	10.00	5.833	20.00	8.833	23.00	11.83	8.00
2.917	10.00	5.917	20.00	8.917	23.00	11.92	8.00
3.000	10.00	6.000	20.00	9.000	23.00	12.00	8.00

Max.Eff.Inten.(mm/hr)=	43.00	23.07	
over (min)	5.00	15.00	
Storage Coeff. (min)=	2.16 (ii)	14.85 (ii)	
Unit Hyd. Tpeak (min)=	5.00	15.00	
Unit Hyd. peak (cms)=	0.31	0.08	
			TOTALS
PEAK FLOW (cms)=	0.08	0.04	0.125 (iii)
TIME TO PEAK (hrs)=	6.75	7.00	7.00
RUNOFF VOLUME (mm)=	191.00	85.53	138.26
TOTAL RAINFALL (mm)=	193.00	193.00	193.00
RUNOFF COEFFICIENT =	0.99	0.44	0.72

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 53.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.

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

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

-------------------
| ADD HYD  (  0001)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0014):    11.48   1.116     7.00   149.24
      + ID2= 2 (  0203):     1.39   0.125     7.00   138.26
        ================================================
        ID = 3 (  0001):    12.87   1.241     7.00   148.06

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
-------------------
| RESERVOIR(  0002)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
-------------------       (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   1.7418      0.6925
                          0.0104     0.0854   |   2.0360      0.7592
                          0.0162     0.1787   |   2.3451      0.8279
                          0.1996     0.2797   |   2.9855      0.8985
                          0.3514     0.3331   |   3.9020      0.9711
                          0.5308     0.3883   |   5.0025      1.0457
                          0.7339     0.4453   |   6.2539      1.1222
                          0.9582     0.5042   |   7.6369      1.2007
                          1.2019     0.5650   |  10.7483      1.3627
                          1.4635     0.6278   |  16.1617      1.6172

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0001)     12.870     1.241      7.00     148.06
   OUTFLOW: ID= 1 (  0002)     12.870     0.943      7.08     147.89

                PEAK   FLOW   REDUCTION [Qout/Qin](%)= 76.00
                TIME SHIFT OF PEAK FLOW         (min)=  5.00
                MAXIMUM  STORAGE   USED       (ha.m.)=  0.5010

--------------------------------------------------------------------------------
-------------------
| CALIB           |
| STANDHYD (  0204)|   Area    (ha)=   3.12
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  30.00
-------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.56         1.56
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       5.00         2.00
     Length            (m)=     144.22        40.00
     Mannings n           =      0.013        0.250

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


                          ---- TRANSFORMED HYETOGRAPH ----
     TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
      hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
    0.083   15.00 | 3.083    3.00 | 6.083   43.00 |  9.08   13.00
    0.167   15.00 | 3.167    3.00 | 6.167   43.00 |  9.17   13.00
    0.250   15.00 | 3.250    3.00 | 6.250   43.00 |  9.25   13.00
    0.333   15.00 | 3.333    3.00 | 6.333   43.00 |  9.33   13.00
    0.417   15.00 | 3.417    3.00 | 6.417   43.00 |  9.42   13.00
    0.500   15.00 | 3.500    3.00 | 6.500   43.00 |  9.50   13.00
    0.583   15.00 | 3.583    3.00 | 6.583   43.00 |  9.58   13.00
    0.667   15.00 | 3.667    3.00 | 6.667   43.00 |  9.67   13.00
    0.750   15.00 | 3.750    3.00 | 6.750   43.00 |  9.75   13.00
    0.833   15.00 | 3.833    3.00 | 6.833   43.00 |  9.83   13.00
    0.917   15.00 | 3.917    3.00 | 6.917   43.00 |  9.92   13.00
    1.000   15.00 | 4.000    3.00 | 7.000   43.00 | 10.00   13.00
    1.083   20.00 | 4.083    5.00 | 7.083   20.00 | 10.08   13.00
    1.167   20.00 | 4.167    5.00 | 7.167   20.00 | 10.17   13.00
    1.250   20.00 | 4.250    5.00 | 7.250   20.00 | 10.25   13.00
    1.333   20.00 | 4.333    5.00 | 7.333   20.00 | 10.33   13.00
    1.417   20.00 | 4.417    5.00 | 7.417   20.00 | 10.42   13.00
    1.500   20.00 | 4.500    5.00 | 7.500   20.00 | 10.50   13.00
    1.583   20.00 | 4.583    5.00 | 7.583   20.00 | 10.58   13.00
    1.667   20.00 | 4.667    5.00 | 7.667   20.00 | 10.67   13.00
    1.750   20.00 | 4.750    5.00 | 7.750   20.00 | 10.75   13.00
    1.833   20.00 | 4.833    5.00 | 7.833   20.00 | 10.83   13.00
    1.917   20.00 | 4.917    5.00 | 7.917   20.00 | 10.92   13.00
    2.000   20.00 | 5.000    5.00 | 8.000   20.00 | 11.00   13.00
    2.083   10.00 | 5.083   20.00 | 8.083   23.00 | 11.08    8.00
    2.167   10.00 | 5.167   20.00 | 8.167   23.00 | 11.17    8.00
    2.250   10.00 | 5.250   20.00 | 8.250   23.00 | 11.25    8.00
    2.333   10.00 | 5.333   20.00 | 8.333   23.00 | 11.33    8.00
    2.417   10.00 | 5.417   20.00 | 8.417   23.00 | 11.42    8.00
    2.500   10.00 | 5.500   20.00 | 8.500   23.00 | 11.50    8.00
    2.583   10.00 | 5.583   20.00 | 8.583   23.00 | 11.58    8.00
    2.667   10.00 | 5.667   20.00 | 8.667   23.00 | 11.67    8.00
    2.750   10.00 | 5.750   20.00 | 8.750   23.00 | 11.75    8.00
    2.833   10.00 | 5.833   20.00 | 8.833   23.00 | 11.83    8.00
    2.917   10.00 | 5.917   20.00 | 8.917   23.00 | 11.92    8.00
    3.000   10.00 | 6.000   20.00 | 9.000   23.00 | 12.00    8.00

     Max.Eff.Inten.(mm/hr)=      43.00        38.49
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       2.75 (ii)   13.09 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.28         0.08
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.11         0.16          0.271 (iii)
     TIME TO PEAK    (hrs)=       6.75         7.00           7.00
     RUNOFF VOLUME    (mm)=     191.00       102.43         129.00
     TOTAL RAINFALL   (mm)=     193.00       193.00         193.00
     RUNOFF COEFFICIENT   =       0.99         0.53           0.67

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  53.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

-------------------
| ADD HYD  (  0003)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0002):    12.87   0.943     7.08   147.89
      + ID2= 2 (  0204):     3.12   0.271     7.00   129.00
        ================================================
        ID = 3 (  0003):    15.99   1.199     7.00   144.21

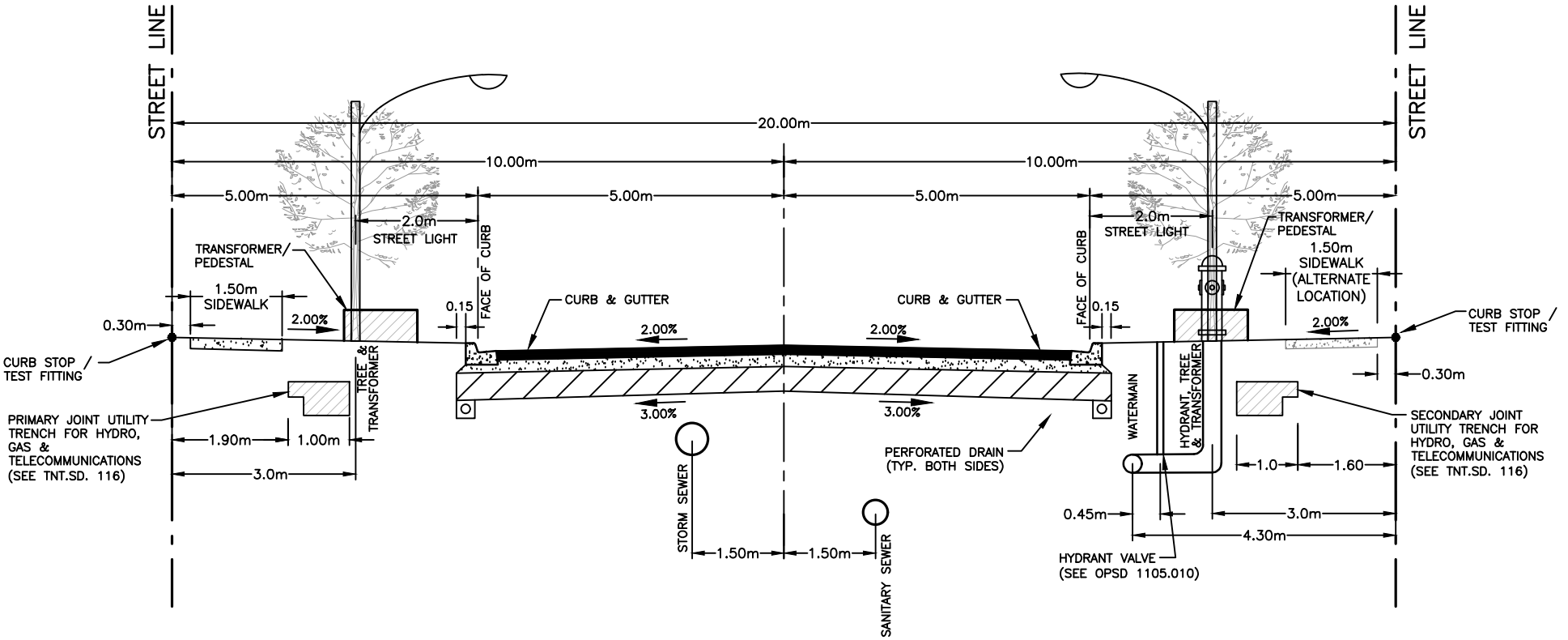
     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
```

APPENDIX "G"

Standard Road & Sidewalk Cross Sections

VALDOR

METRIC
ALL DIMENSIONS ARE IN METRES
UNLESS OTHERWISE SHOWN



MILLBROOK SOUTH EAST SUBDIVISION

URBAN LOCAL
20.0m RIGHT–OF–WAY (10.0m ROAD)

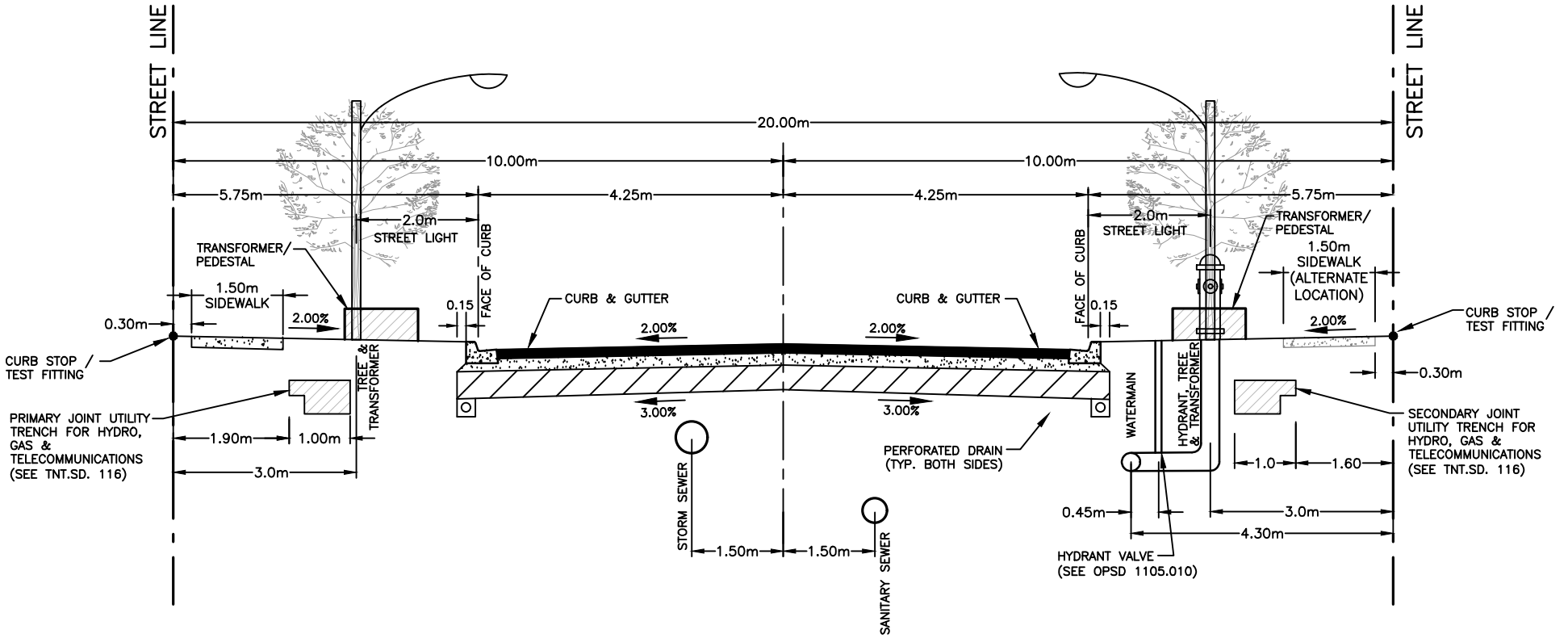
NO.	REVISIONS	DATE	APR'D

SCALE: N.T.S.

DATE: Feb. 2022

FIGURE G1

METRIC
ALL DIMENSIONS ARE IN METRES
UNLESS OTHERWISE SHOWN



MILLBROOK SOUTH EAST SUBDIVISION

URBAN LOCAL
20.0m RIGHT–OF–WAY (8.50m ROAD)

NO.	REVISIONS	DATE	APR'D

SCALE: N.T.S.

DATE: Feb. 2022

FIGURE G2

APPENDIX "H"

Excerpts from the Geotechnical Investigation Report

Updated Geotechnical Investigation Report

Proposed Residential and Commercial Development – Part Lot 13, Concession 5, Millbrook, Ontario

Vargas Properties Inc.

11 March 2022

→ The Power of Commitment

– the area annually recharges a volume of water to the underlying aquifer that is 55% or more of the volume determined by subtracting the annual evapotranspiration for the whole of the related groundwater recharge area from the annual precipitation for the whole of the related groundwater recharge area.

The majority of the developable area is located outside of SGRAs as shown on Figure 10. The SGRA is located at the bottom of the slope and the area of the Baxter Creek tributary and has a score of 2. The development will consider maintaining pre-development infiltration. Therefore, no impacts are expected to the SGRA.

6. Conclusions and Recommendations

Supporting data upon which our recommendations are based have been presented in the foregoing sections of this report. The following recommendations are governed by the physical properties of the subsurface materials that were encountered at the Site and assume that they are representative of the overall site conditions. It should be noted that these conclusions and recommendations are intended for use by the designers only. Contractors bidding on or undertaking any work at the Site should examine the factual results of the investigation, satisfy themselves as to the adequacy of the information for construction, and make their own interpretation of this factual data as it affects their proposed construction techniques, equipment capabilities, costs, sequencing, and the like.

Comments, techniques, or recommendations pertaining to construction should not be construed as instructions to the contractor. It should be noted that where the Municipality has design standards that apply to specific aspects of this project, such standards shall take precedence over any corresponding dissimilar recommendations contained herein.

Based on the results of the geotechnical investigation, it is our professional opinion that the Site is suitable for the proposed residential and commercial development and there is low potential for groundwater impact as a result of developing the Site. It is recommended that good construction and mitigation techniques must be used to minimize the potential for impact. Detailed conclusions and recommendations are presented in the following sections regarding the water balance and potential impacts to groundwater and surface water resources. Details regarding the Geotechnical Investigation including conclusions and recommendations are provided beginning in Section 6.2.

6.1 Hydrogeology

6.1.1 Updated Water Balance Evaluation

An updated evaluation of the water balance was completed based upon the Conceptual Master Plan to compute the potential impacts that may occur in the recharge/ discharge characteristics related to the proposed development.

The objective of the water balance calculations is to illustrate that post-development infiltration can meet or be close to pre-development values from a conceptual perspective. The computations have used detailed parameters such as precipitation, regional evapotranspiration, infiltration and runoff. Weather data from Peterborough A was selected as it was the closest weather station to the Site (~10.2km to the northeast). The detailed calculations can be reviewed in Appendix E. The total Site area is 29.57 ha based on information provided. The following is a summary of the expected pre-development water balance values for the proposed residential and commercial development based on the updated information.

6.1.1.1 Pre-Development Water Balance

The pre-development water balance incorporated the existing soils, slope and ground cover areas. The infiltration factor for the area was calculated from the table of values presented in the “Land Development Guidelines” (MOEE, 1995). It is based on three sub-factors which are:

– Topography sub-factor;
– Soil sub-factor; and
– Cover sub-factor.

The slope of the Site will be considered as “hilly” (slope of 28 m to 47 m per km) to rolling (slope of 2.8 to 3.8 m per km). The soils are generally comprised of sandy silt till or silty clay material and will be considered a medium combination of clay and loam as per the water balance calculations. Table 6 summarizes the expected updated pre-development water balance values for the Site.

Table 6 Updated Pre-Development Summary

Total Precipitation (Peterborough A)	- 855 mm/year
Regional Evapotranspiration	- 561 mm/year
Recharge Available	- 299 mm/year
Area of Recharge Available	- 295,700 m^2
Total Water Surplus	- 88,465 m^3/year
Total Estimated Infiltration	- 43,579 m^3/year
Total Estimated Runoff	- 44,887 m^3/year

Based upon these values, the Site infiltrates on the order of 43,579 m^3 per year (147 mm/year).

6.1.1.2 Updated Post-Development Water Balance (No Enhancements)

The computation of the water budget was repeated and updated for the proposed development assuming no mitigation techniques, that is, runoff from impervious surfaces is unrecoverable and not infiltrated into the ground. The anticipated impact of the development is related to increased runoff from imperious surfaces, such as asphalt surface for the proposed access roads and the building rooftops. These are assumed to be impervious surfaces with zero infiltration capacity in this model. A summary of the updated computations is provided in Table 7.

Table 7 Post-Development Summary (No Enhancements)

Area of Site	- 295,700 m^2
Impervious Surfaces	- 101,505 m^2
Area Available for Infiltration	- 194,195 m^2
Total Water Surplus	- 127,560 m^3/year
Total Estimated Infiltration	- 31,665 m^3/year
Infiltration % Difference (pre- vs. post-)	- (-27%) Decrease
Total Estimated Runoff	- 95,895 m^3/year
Runoff % Difference (pre- vs. post-)	- 114% Increase

The impermeable surface area of proposed paved areas, concrete sidewalks and building rooftops was estimated based on the design concept plan presented in Figure 4 and information provided by the Client. Under this scenario, the total infiltration volume decreased by 27% and runoff volume increased by 114%. Within the areas evaluated, the infiltration has reduced and the runoff increased versus the pre-development values. Groundwater base flow would be expected to decrease over time in this scenario. However, recharge via infiltration through the underlying till and silty clay to the lower aquifer from these lands is expected to be minor. Based upon this scenario, mitigative strategies are required to minimize infiltration losses and reduce storm water runoff. The following section discusses the water balance after considering the enhanced infiltration option of directing rooftop stormwater runoff to sodded or vegetated / naturalized areas for infiltration.

6.1.1.3 Updated Post-Development Water Balance (Downspout Disconnection)

The post-construction water budget computations were repeated and updated considering enhanced infiltration options which are also known as Low Impact Development (LID) technologies. These technologies include and are not restricted to rainwater harvesting, downspout disconnection, infiltration trenches, vegetated filter strips, bioretention, permeable pavement, enhanced grass swales, dry swales and perforated pipe systems in order to balance the water budget and maintain any wetland features including nearby creeks. The shallow subsurface soils are sandy silt over silty clay and/or glacial till material. It is noted that LIDs can work in any soil type. The

primary enhancement for this Site is to promote infiltration of rooftop runoff and to move water from impervious surfaces to sodded or vegetated areas where infiltration can occur naturally.

The post-development water balance was modelled to include the disconnection of downspouts from storm sewers and directing water from the building roof tops to sodded areas or undeveloped grass areas which can be enhanced with increased topsoil depths or levelled to further encourage infiltration. A summary of the post-construction updated water budget with enhancements for infiltration is presented in Table 8.

Table 8 Updated Post-Development Summary with Downspout Disconnection LID Strategy

Area of Site	-	295,700 m^2
Total Water Surplus	-	127,560 m^3/year
Total Estimated Infiltration	-	43,579 m^3/year
Infiltration % Difference (pre- vs. post-)	-	(0%) No change
Total Estimated Runoff	-	83,981 m^3/year
Runoff % Difference (pre- vs. post-)	-	87% Increase

Under this scenario, the total infiltration volume is maintained and runoff volume increased by 87% compared to pre-development values. Within the areas evaluated, the infiltration and runoff amounts have improved compared to post-development (no mitigation) numbers. Runoff increase compared with the pre-development conditions will need to be managed as per the storm water management plan.

It is expected that recharge via infiltration through the till to the lower aquifers is a small component and impacts to the groundwater aquifer are expected to be insignificant. It is our professional opinion that there would be minimal impact to the local groundwater regime and minimal impact to the downgradient surface water regime from a quantity perspective.

6.1.2 Impact on Groundwater Baseflow

The importance of the groundwater baseflow is that it provides discharge to water bodies, wells and may have some hydraulic functionality with the on-site features. Water balance calculations suggest that conceptually the infiltration to the subsurface can be kept near pre-development values if appropriate LID technologies are used. It is GHD's professional opinion that there is not expected to be a significant impact to the shallow groundwater baseflow that may be supplying baseflow to the downgradient Baxter Creek.

6.1.3 Impact on Surface Water Bodies

The impacts to surface water bodies are related to the reduction of the groundwater baseflow and water quality concerns related to human activities such as salting of paved areas, minor fuel and oil leaks, fertilizer application, etc. It is expected that there will be minor impacts to groundwater and neighbouring surface water bodies. Runoff from the development will be collected by an internal storm sewer system and treated using a stormwater management pond or other LID strategies. Further details are provided within the Functional Servicing Report regarding the stormwater management.

6.1.4 Mitigation Measures

Several mitigative techniques have been recommended in order to address concerns relating to the potential for impact to the base flow. The impact and mitigation measures can be arranged into two (2) distinct categories: construction phase and operational phase. Prior to construction, storm water management techniques should be incorporated to control additional surface water runoff and permit enhanced infiltration into the surrounding ground. Storm water management techniques will minimize the potential for groundwater impact and also minimize the amount of silt or other fine-grained soil particles becoming mobile and entering into down-gradient areas.

The installation of strategically placed silt fences will filter any excess storm water runoff prior to entering the infiltration areas.

During the operational phase of the development, it is expected that storm water excess will be controlled as indicated in the Functional Servicing Report. It is recommended that all roof leader drains of the future residential buildings be allowed to drain onto the ground surface for infiltration. Swales may be required in some areas to

Appendix A

Soil Exploration Data

REFERENCE No.: 11209539-01 ENCLOSURE No.: A-1

BOREHOLE No.: BH-1
ELEVATION: 250.3 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Vargas Properties
PROJECT: Proposed Residential and Commercial Development
LOGGED BY: Jamie McEachern DATE: 13 March 2020
DRILLING COMPANY: Strong Soil Search METHOD: Solid Stem Augers and Spilt Spoons
NOTES: Ground surface elevation interpolated from Topographic plan prepared by IBW Surveyors, File Name "P-0400 Topo_v4.dwg" dated Jan. 14, 2020

LEGEND
- SS - SPLIT SPOON
- AS - AUGER SAMPLE
- ST - SHELBY TUBE
- CS - CORE SAMPLE
- ▼ - WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery %	Moisture Content %	Blows per 6 in. / 15 cm	Penetration Index N	COMMENTS
		0.0		GROUND SURFACE						
		0.3		**TOPSOIL** (300 mm)	SS-1A	63	24	0 2 2	4	Borehole remained open throughout drilling activities
		0.5		**SANDY SILT** - Reddish Brown Sandy Silt, Moist to Wet, Loose	SS-1A		13	2 3		
	1.0			**TILL** - Light Brown Sandy Silt, Trace Gravel, Clay, Moist to Wet, Compact	SS-2	72	11	4 13 13	26	
		1.5		Cobble (Inferred From Augers Grinding), Moist, Very Dense	SS-3	72	7	8 23 28	51	
	2.0				SS-4	100	8	16 37 50=5"	100+	First encounter of groundwater seepage at 2.6 m
	3.0				SS-5	100	10	30 50=2"	100+	
	4.0									WL - 4.1 m immediately after drilling
	5.0				SS-6	100	5	40 50=2"	100+	
	6.0									
		6.3		END OF BOREHOLE	SS-7	100	10	31 50=2"	100+	
	7.0									
	8.0									

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
× "N" Value (blows / 0.3 m)
◆ RQD
◎ CONE

10 20 30 40 50 60 70 80 90

BOREHOLE LOG GEOTECH (MULTIPLE DRILLERS) 11209539-01-DWG-20-06-01, VARGAS BOREHOLE LOGS, JM, EW.GPJ GEOLOGIC.GDT 15/6/20

REFERENCE No.: 11209539-01 ENCLOSURE No.: A-2

BOREHOLE No.: BH-2

ELEVATION: 248.6 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Vargas Properties

PROJECT: Proposed Residential and Commercial Development

LOGGED BY: Jamie McEachern DATE: 13 March 2020

DRILLING COMPANY: Strong Soil Search METHOD: Solid Stem Augers and Spilt Spoons

NOTES: Ground surface elevation interpolated from Topographic plan prepared by IBW Surveyors, File Name "P-0400 Topo_v4.dwg" dated Jan. 14, 2020

LEGEND

- SS - SPLIT SPOON
- AS - AUGER SAMPLE
- ST - SHELBY TUBE
- CS - CORE SAMPLE
- ▼ - WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery %	Moisture Content %	Blows per 6 in. / 15 cm	Penetration Index N	COMMENTS
		0.0		GROUND SURFACE						
		0.3		**TOPSOIL** (300 mm)	SS-1A	71	27	1 2 2	4	
		0.5		**SANDY SILT** - Reddish Brown Sandy Silt, Moist to Wet, Loose	SS-1B		26	4		
	1.0			**TILL** - Light Brown Clayey Silt, Trace Sand, Moist to Wet, Compact	SS-2	78	22	6 10 15	25	
		1.5		With Gravel, Moist	SS-3	100	10	5 7 8	15	
	2.0				SS-4	72	8	5 8 14	22	WL - 2.3 m immediately after drilling First encounter of groundwater seepage at 2.4 m
	3.0	3.0		Light Brown Silty Sand with Gravel, Trace Clay, Moist, Very Dense	SS-5	44	10	20 41 34	75	
	4.0									
	5.0				SS-6	94	7	12 28 33	61	Borehole Caving to 5.3 m at completion on drilling
	6.0	6.1		Grey, Dense	SS-7	78		8 17 28	45	
		6.6		END OF BOREHOLE						
	7.0									
	8.0									

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
× "N" Value (blows / 0.3 m)
◆ RQD
◎ CONE

10 20 30 40 50 60 70 80 90

BOREHOLE LOG GEOTECH (MULTIPLE DRILLERS) 11209539-01-DWG-20-06-01, VARGAS BOREHOLE LOGS, JM, EW.GPJ GEOLOGIC.GDT 15/6/20

REFERENCE No.: 11209539-01 ENCLOSURE No.: A-3

BOREHOLE REPORT

BOREHOLE No.: BH-3
ELEVATION: 246.5 m
Page: 1 of 1

CLIENT: Vargas Properties
PROJECT: Proposed Residential and Commercial Development
LOGGED BY: E. Wierdsma DATE: 15 April 2020
DRILLING COMPANY: Landshark Drilling METHOD: Solid Stem Augers and Spilt Spoons
NOTES: Ground surface elevation interpolated from Topographic plan prepared by IBW Surveyors, File Name "P-0400 Topo_v4.dwg" dated Jan. 14, 2020

LEGEND
- SS - SPLIT SPOON
- AS - AUGER SAMPLE
- ST - SHELBY TUBE
- CS - CORE SAMPLE
- ▼ - WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery %	Moisture Content %	Blows per 6 in. / 15 cm	Penetration Index N
		0.0		GROUND SURFACE					
		0.3		**TOPSOIL** (300 mm)					
1				**SANDY SILT** - Brown Sandy Silt, Moist, Loose	SS-1	40	7	1 2 3 4	5
2									
3	1.0	1.1		**TILL** - Light Brown Sandy Silt with Clay and Gravel, Moist, Compact	SS-2	100	31	4 6 7 7	13
4									
5									
6	2.0				SS-3	50	12	4 7 11 9	18
7									
8					SS-4	100	12	6 11 14 12	25
9									
10	3.0	3.0		Dense	SS-5	100	10	3 18 30 22	48
11									
12		3.7		Cobble (Inferred From Augers Grinding)					
13	4.0								
14									
15		4.6		Very Dense	SS-6	100	8	50=4"	100+
16									
17	5.0								
18									
19									
20	6.0								
21		6.4		Wet	SS-7	100	11	26 24 26	50
22		6.6		END OF BOREHOLE					
23	7.0								
24									
25									
26	8.0								
27									

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
× "N" Value (blows / 0.3 m)
◆ RQD
◎ CONE

10 20 30 40 50 60 70 80 90

COMMENTS

Grain Size Data
SS-4:
13% Gravel
29% Sand
58% Silt and Clay-sized Particles
33% Between 5-75 um

End of borehole open and dry upon completion of drilling

BOREHOLE LOG GEOTECH (MULTIPLE DRILLERS) 11209539-01-DWG-20-06-01, VARGAS BOREHOLE LOGS, JM, EW.GPJ GEOLOGIC.GDT 15/6/20

REFERENCE No.: 11209539-01 ENCLOSURE No.: A-4

BOREHOLE No.: BH-4
ELEVATION: 244.2 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Vargas Properties
PROJECT: Proposed Residential and Commercial Development
LOGGED BY: Jamie McEachern DATE: 13 March 2020
DRILLING COMPANY: Strong Soil Search METHOD: Solid Stem Augers and Spilt Spoons
NOTES: Ground surface elevation interpolated from Topographic plan prepared by IBW Surveyors, File Name "P-0400 Topo_v4.dwg" dated Jan. 14, 2020

LEGEND
SS - SPLIT SPOON
AS - AUGER SAMPLE
ST - SHELBY TUBE
CS - CORE SAMPLE
- WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery %	Moisture Content %	Blows per 6 in. / 15 cm	Penetration Index N
		0.0		GROUND SURFACE					
		0.3		**TOPSOIL** (300 mm)	SS-1	50	11	1 3 2 3	5
		0.9		**SANDY SILT** - Reddish Brown Sandy Silt, Trace Clay, Moist to Wet, Firm	SS-2	39	21	7 8 12	20
		1.5		**TILL** - Light Brown Silty Sand, Trace Gravel, Clay, Moist to Wet, Compact Dense	SS-3A SS-3B	100	11 5	28 21 16	37
		2.3		With Gravel, Very Dense	SS-4	83	18	18 28 42	70
					SS-5	100	10	11 24 47	71
					SS-6	100	6	14 20 24	44
					SS-7	100	18	16 31 50=4"	100+
		7.8		END OF BOREHOLE	SS-8	100		33 50=3"	100+

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
Atterberg limits (%) W_p W_l
× "N" Value (blows / 0.3 m)
◆ RQD
◎ CONE

10 20 30 40 50 60 70 80 90

COMMENTS

Borehole remained open and dry throughout drilling activities
WL - Dry
05/19/2020 and
03/19/2020

Shallow piezometer installed to 1.5 m. Piezometer measured dry on 05/19/2020

BOREHOLE LOG GEOTECH (MULTIPLE DRILLERS) 11209539-01-DWG-20-06-01, VARGAS BOREHOLE LOGS, JM, EW.GPJ GEOLOGIC.GDT 15/6/20

REFERENCE No.: 11209539-01 ENCLOSURE No.: A-5

BOREHOLE No.: BH-5

ELEVATION: 253.6 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Vargas Properties

PROJECT: Proposed Residential and Commercial Development

LOGGED BY: Jamie McEachern DATE: 12 March 2020

DRILLING COMPANY: Strong Soil Search METHOD: Solid Stem Augers and Spilt Spoons

NOTES: Ground surface elevation interpolated from Topographic plan prepared by IBW Surveyors, File Name "P-0400 Topo_v4.dwg" dated Jan. 14, 2020

LEGEND

- SS - SPLIT SPOON
- AS - AUGER SAMPLE
- ST - SHELBY TUBE
- CS - CORE SAMPLE
- ▼ - WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery %	Moisture Content %	Blows per 6 in. / 15 cm	Penetration Index N
	0.0			GROUND SURFACE					
		0.3		**TOPSOIL** (300 mm)					
1				**SANDY SILT** - Reddish Brown Sandy Silt, Trace Clay, Moist to Wet, Loose	SS-1	42	17	1 2 4 7	6
2		0.8							
3	1.0			**TILL** - Light Brown Silty Sand With Gravel, Trace Clay, Moist to Wet, Loose to Compact	SS-2	50	14	2 6 5	11
4									
5					SS-3	100	15	3 2 3	5
6									
7	2.0								
8				- Reddish Brown 75mm Sand Seam at 2.6m	SS-4	78	13	8 8 12	20
9									
10	3.0	3.0		Moist, Very Dense	SS-5	72	9	16 29 36	65
11									
12									
13	4.0								
14									
15					SS-6	100	6	20 30 32	64
16									
17	5.0								
18									
19									
20	6.0				SS-7	100	8	26 30 38	64
21									
22		6.6		END OF BOREHOLE					
23	7.0								
24									
25									
26	8.0								
27									

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
× "N" Value (blows / 0.3 m)
◆ RQD
◎ CONE

10 20 30 40 50 60 70 80 90

COMMENTS

Borehole remained open and dry throughout drilling activities

BOREHOLE LOG GEOTECH (MULTIPLE DRILLERS) 11209539-01-DWG-20-06-01, VARGAS BOREHOLE LOGS, JM, EW.GPJ GEOLOGIC.GDT 15/6/20

REFERENCE No.: 11209539-01 ENCLOSURE No.: A-6

BOREHOLE No.: BH-6

ELEVATION: 247.1 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Vargas Properties

PROJECT: Proposed Residential and Commercial Development

LOGGED BY: Jamie McEachern DATE: 13 March 2020

DRILLING COMPANY: Strong Soil Search METHOD: Solid Stem Augers and Spilt Spoons

NOTES: Ground surface elevation interpolated from Topographic plan prepared by IBW Surveyors, File Name "P-0400 Topo_v4.dwg" dated Jan. 14, 2020

LEGEND

- SS - SPLIT SPOON
- AS - AUGER SAMPLE
- ST - SHELBY TUBE
- CS - CORE SAMPLE
- ▼ - WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery %	Moisture Content %	Blows per 6 in. / 15 cm	Penetration Index N
		0.0		GROUND SURFACE					
1		0.3		**TOPSOIL** (300 mm)					
2		0.6		**SANDY SILT** - Reddish Brown Sandy Silt, Trace Clay, Moist to Wet, Loose	SS-1	67	22	3 2 4 4	8
3	1.0	0.9		**TILL** - Light Brown Silty Sand with Gravel, Trace Clay, Moist to Wet, Compact / Moist	SS-2	100	9	3 9 11	20
5					SS-3	72	10	13 14 12	26
6	2.0								
8					SS-4	94	7	4 10 15	25
9									
10	3.0	3.0		Very Dense	SS-5	100	4	11 30 50=4"	100+
12									
13	4.0								
15					SS-6	100	5	45 50=4"	100+
16	5.0								
19									
20	6.0				SS-7	100	5	12 19 33	52
21		6.6		END OF BOREHOLE					
23	7.0								
26	8.0								
27									

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
× "N" Value (blows / 0.3 m)
◆ RQD
◎ CONE

10 20 30 40 50 60 70 80 90

COMMENTS

Borehole remained open and dry throughout drilling activities

BOREHOLE LOG GEOTECH (MULTIPLE DRILLERS) 11209539-01-DWG-20-06-01, VARGAS BOREHOLE LOGS, JM, EW.GPJ GEOLOGIC.GDT 15/6/20

REFERENCE No.: 11209539-01 ENCLOSURE No.: A-7

BOREHOLE No.: BH-7

ELEVATION: 238.8 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Vargas Properties

PROJECT: Proposed Residential and Commercial Development

LOGGED BY: Jamie McEachern DATE: 12 March 2020

DRILLING COMPANY: Strong Soil Search METHOD: Solid Stem Augers and Spilt Spoons

NOTES: Ground surface elevation interpolated from Topographic plan prepared by IBW Surveyors, File Name "P-0400 Topo_v4.dwg" dated Jan. 14, 2020

LEGEND

- SS - SPLIT SPOON
- AS - AUGER SAMPLE
- ST - SHELBY TUBE
- CS - CORE SAMPLE
- ▼ - WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery %	Moisture Content %	Blows per 6 in. / 15 cm	Penetration Index N
		0.0		GROUND SURFACE					
		0.3		**TOPSOIL** (300 mm)					
1				**SANDY SILT** - Reddish Brown Sandy Silt, Trace Clay, Moist to Wet, Soft	SS-1	58	18	1 2 1 4	3
2		0.6							
3	1.0			**TILL** - Light Brown Silty Sand With Gravel, Trace Clay, Moist to Wet, Compact	SS-2	100	12	3 7 11	18
4									
5		1.5		Clayey	SS-3	100	15	2 4 6	10
6									
7	2.0								
8					SS-4A		10	6	
		2.6			SS-4B	100	4	16 34	50
9				Trace Clay, Moist, Very Dense					
10	3.0								
11					SS-5	83	6	12 24 40	64
12									
13	4.0								
14									
15					SS-6	100	8	18 42 50=4"	100+
16									
17	5.0								
18									
19									
20	6.0				SS-7	100	10	28 50=3"	100+
		6.3		END OF BOREHOLE					
21									
22									
23	7.0								
24									
25									
26	8.0								
27									

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
× "N" Value (blows / 0.3 m)
◆ RQD
◎ CONE

10 20 30 40 50 60 70 80 90

COMMENTS

Grain Size Data
SS-1:
4% Gravel
33% Sand
63% Silt and Clay-sized Particles
48% Between 5-75 um

Shallow piezometer installed to 1.5 m. Piezometer measured dry on 05/19/2020

WL - Dry
05/19/2020 and 03/19/2020

Borehole remained open and dry throughout drilling activities

BOREHOLE LOG GEOTECH (MULTIPLE DRILLERS) 11209539-01-DWG-20-06-01, VARGAS BOREHOLE LOGS, JM, EW.GPJ GEOLOGIC.GDT 15/6/20

REFERENCE No.: 11209539-01 ENCLOSURE No.: A-8

BOREHOLE No.: BH-8
ELEVATION: 231.0 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Vargas Properties
PROJECT: Proposed Residential and Commercial Development
LOGGED BY: E. Wierdsma DATE: 15 April 2020
DRILLING COMPANY: Landshark Drilling METHOD: Solid Stem Augers and Spilt Spoons
NOTES: Ground surface elevation interpolated from Topographic plan prepared by IBW Surveyors, File Name "P-0400 Topo_v4.dwg" dated Jan. 14, 2020

LEGEND
SS - SPLIT SPOON
AS - AUGER SAMPLE
ST - SHELBY TUBE
CS - CORE SAMPLE
- WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery %	Moisture Content %	Blows per 6 in. / 15 cm	Penetration Index N	COMMENTS
		0.0		GROUND SURFACE						
		0.3		**TOPSOIL** (300 mm)						
				SANDY SILT - Brown Sandy Silt, Moist, Very Loose	SS-1	25	33	1 1 1 2	2	
		0.8		**TILL** - Light Brown Sandy Silt With Clay and Gravel, Moist, Loose	SS-2	60	10	2 3 5 7	8	
	1.0	1.2		Cobble (Inferred From Augers Grinding)						
		1.5		Clayey Silt with Sand and Gravel, Mottled, Moist, Compact to Dense	SS-3	50	13	4 20 19 16	39	
	2.0									
		2.6		Grey	SS-4	60	9	3 3 25 10	28	
	3.0	3.0		Wet	SS-5	60	11	7 10 24 14	34	First encounter of groundwater seepage at 3.0 m Water up to 3.4 m upon completion
	4.0									
		4.6		Grey Sandy Silt with Clay and Gravel, Moist, Dense	SS-6	50	9	12 19 17 19	31	Borehole cave-in up to 4.3 m upon completion
	5.0									
	6.0				SS-7	50	9	14 16 22 10	38	
		6.7		END OF BOREHOLE						
	7.0									
	8.0									

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
× "N" Value (blows / 0.3 m)
◆ RQD
◎ CONE

10 20 30 40 50 60 70 80 90

BOREHOLE LOG GEOTECH (MULTIPLE DRILLERS) 11209539-01-DWG-20-06-01, VARGAS BOREHOLE LOGS, JM, EW.GPJ GEOLOGIC.GDT 15/6/20

REFERENCE No.: 11209539-01 ENCLOSURE No.: A-9

BOREHOLE No.: BH-9

ELEVATION: 218.4 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Vargas Properties

PROJECT: Proposed Residential and Commercial Development

LOGGED BY: E. Wierdsma DATE: 15 April 2020

DRILLING COMPANY: Landshark Drilling METHOD: Solid Stem Augers and Spilt Spoons

NOTES: Ground surface elevation interpolated from Topographic plan prepared by IBW Surveyors, File Name "P-0400 Topo_v4.dwg" dated Jan. 14, 2020

LEGEND

- SS - SPLIT SPOON
- AS - AUGER SAMPLE
- ST - SHELBY TUBE
- CS - CORE SAMPLE
- ▼ - WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery %	Moisture Content %	Blows per 6 in. / 15 cm	Penetration Index N
		0.0		GROUND SURFACE					
		0.2		**TOPSOIL** (150 mm)					
1				**SANDY SILT** - Light Brown Sandy Silt With Clay, Mottled, Wet, Loose	SS-1	60	19	1 1 3 3	4
2									
3	1.0				SS-2	60	19	2 3 2 4	5
4									
5		1.7		**SILTY CLAY** - Brown Silty Clay, trace Sand, Mottled, Moist, Soft to Firm	SS-3	60	28	2 2 3 3	5
6	2.0								
7					SS-4	100	39	1 1 2 2	3
8									
9									
10	3.0	3.0		Brown Silty Clay with Sand, Wet, Very Soft	SS-5	100	36	1 1 1 1	2
11									
12									
13	4.0								
14									
15		4.6		Grey	SS-6	100	42	1 0 1 1	1
16	5.0								
17									
18									
19									
20	6.0	6.1		Soft	SS-7	100	21	1 1 3 2	4
21									
22									
23	7.0								
24									
25		7.6		**TILL** - Grey Sandy Silt, With Gravel, Trace Clay, Moist, Dense	SS-8	90	14	5 13 16 31	29
26	8.0								
27		8.2		END OF BOREHOLE					

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
× "N" Value (blows / 0.3 m)
◆ RQD
◎ CONE

10 20 30 40 50 60 70 80 90

COMMENTS

Water up to 2.4 m upon completion
First encounter of groundwater seepage at 3.0 m
Grain Size Data
SS-5:
2% Gravel
8% Sand
90% Silt and Clay-sized Particles
23% Between 5-75 um
Atterberg Limits
LL = 40%
PI = 22%

Borehole cave-in up to 5.8 m upon completion

BOREHOLE LOG GEOTECH (MULTIPLE DRILLERS) 11209539-01-DWG-20-06-01, VARGAS BOREHOLE LOGS, JM, EW.GPJ GEOLOGIC.GDT 15/6/20

REFERENCE No.: 11209539-01 ENCLOSURE No.: A-10

BOREHOLE No.: BH-10

ELEVATION: 216.2 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Vargas Properties

PROJECT: Proposed Residential and Commercial Development

LOGGED BY: E. Wierdsma DATE: 15 April 2020

DRILLING COMPANY: Landshark Drilling METHOD: Solid Stem Augers and Spilt Spoons

NOTES: Ground surface elevation interpolated from Topographic plan prepared by IBW Surveyors, File Name "P-0400 Topo_v4.dwg" dated Jan. 14, 2020

LEGEND

- SS - SPLIT SPOON
- AS - AUGER SAMPLE
- ST - SHELBY TUBE
- CS - CORE SAMPLE
- ▼ - WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery %	Moisture Content %	Blows per 6 in. / 15 cm	Penetration Index N
		0.0		GROUND SURFACE					
		0.2		**TOPSOIL** (150 mm)					
1				**SANDY SILT** - Brown Sandy Silt, Moist, Very Loose	SS-1	50	29	0 1 1 1	2
2		0.8		Loose					
3	1.0				SS-2	25	36	2 3 4 4	7
4									
5		1.5		**SILTY CLAY** - Brown Silty Clay, trace Sand, Moist, Stiff					
6					SS-3	75	22	2 5 8 9	13
7	2.0								
8		2.3		Very Stiff					
9					SS-4	30	27	5 9 8 9	17
10	3.0	3.0		Stiff					
11					SS-5	100	25	3 4 5 4	9
12									
13	4.0	4.0		Wet					
14									
15		4.6		Grey, Very Soft					
16	5.0				SS-6	100	26	1 1 1 1	2
17									
18									
19									
20	6.0	6.1		Hard					
21					SS-7	25	22	6 10 24 19	34
22		6.7		END OF BOREHOLE					
23	7.0								
24									
25									
26	8.0								
27									

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
× "N" Value (blows / 0.3 m)
◆ RQD
◎ CONE

10 20 30 40 50 60 70 80 90

COMMENTS

Grain Size Data
SS-3:
0% Gravel
9% Sand
91% Silt and Clay-sized Particles
33% Between 5-75 um

Water up to 3.5 m upon completion

First encounter of groundwater seepage at 4.0 m

Borehole cave-in up to 4.6 m upon completion

BOREHOLE LOG GEOTECH (MULTIPLE DRILLERS) 11209539-01-DWG-20-06-01, VARGAS BOREHOLE LOGS, JM, EW.GPJ GEOLOGIC.GDT 15/6/20

REFERENCE No.: 11209539-01 ENCLOSURE No.: A-11

BOREHOLE No.: BH-11

ELEVATION: 214.2 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Vargas Properties

PROJECT: Proposed Residential and Commercial Development

LOGGED BY: E. Wierdsma DATE: 16 April 2020

DRILLING COMPANY: Landshark Drilling METHOD: Solid Stem Augers and Spilt Spoons

NOTES: Ground surface elevation interpolated from Topographic plan prepared by IBW Surveyors, File Name "P-0400 Topo_v4.dwg" dated Jan. 14, 2020

LEGEND

- SS - SPLIT SPOON
- AS - AUGER SAMPLE
- ST - SHELBY TUBE
- CS - CORE SAMPLE
- ▼ - WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery %	Moisture Content %	Blows per 6 in. / 15 cm	Penetration Index N
		0.0		GROUND SURFACE					
		0.3		**TOPSOIL** (300 mm)					
1		0.5		**SILTY SAND** - Brown Silty Sand, Moist, Very Loose	SS-1	60	25	0 1 2 3	3
2				**SILTY CLAY** - Light Brown Silty Clay, Trace Sand, Moist, Soft					
3	1.0				SS-2	75	25	1 1 3 4	4
4									
5		1.5		Cobble (Inferred From Augers Grinding), Stiff					
6		1.8		Wet	SS-3	90	21	6 6 8 8	14
7	2.0								
8		2.3		Firm	SS-4	100	23	2 4 4 4	8
9									
10	3.0	3.0		Stiff	SS-5	100	27	2 2 11 12	13
11		3.5		**SILTY SAND** - Light Brown Silty Sand, Wet, Compact					
12									
13	4.0								
14									
15					SS-6A		19	3	
16		4.9		**SILTY CLAY** - Light Brown Silty Clay, trace Sand, Moist, Stiff	SS-6B	100	20	2 8 5	10
17	5.0								
18									
19									
20	6.0	6.1		Grey				6 6	
21					SS-7	50	19	10 9	16
22		6.7		END OF BOREHOLE					
23	7.0								
24									
25									
26	8.0								
27									

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
× "N" Value (blows / 0.3 m)
◆ RQD
◎ CONE

10 20 30 40 50 60 70 80 90

COMMENTS

First encounter of groundwater seepage at 1.8 m

Water up to 2.4 m upon completion

Borehole cave-in up to 4.0 m upon completion

Grain Size Data
SS-6A:
0% Gravel
91% Sand
9% Silt and Clay-sized Particles

BOREHOLE LOG GEOTECH (MULTIPLE DRILLERS) 11209539-01-DWG-20-06-01, VARGAS BOREHOLE LOGS, JM, EW.GPJ GEOLOGIC.GDT 15/6/20

REFERENCE No.: 11209539-01 ENCLOSURE No.: A-12

BOREHOLE No.: BH-12
ELEVATION: 215.7 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Vargas Properties
PROJECT: Proposed Residential and Commercial Development
LOGGED BY: E. Wierdsma DATE: 16 April 2020
DRILLING COMPANY: Landshark Drilling METHOD: Solid Stem Augers and Spilt Spoons
NOTES: Ground surface elevation interpolated from Topographic plan prepared by IBW Surveyors, File Name "P-0400 Topo_v4.dwg" dated Jan. 14, 2020

LEGEND
- SS - SPLIT SPOON
- AS - AUGER SAMPLE
- ST - SHELBY TUBE
- CS - CORE SAMPLE
- ▼ - WATER LEVEL

Depth ft	Depth m	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery %	Moisture Content %	Blows per 6 in. / 15 cm	Penetration Index N	Shear test (Cu) / Sensitivity (S) / Water content (%) / Atterberg limits (%) / "N" Value (blows / 0.3 m) / Field / Lab / RQD / CONE	COMMENTS
		0.0		GROUND SURFACE						10 20 30 40 50 60 70 80 90	
		0.2		**TOPSOIL** (300 mm)							
1				**SILTY SAND** - Brown Silty Sand With Clay, Mottled, Moist, Very Loose	SS-1	25	21	0 1 1 2	2		
2		0.8		Wet, Compact							
3	1.0				SS-2	90	18	3 8 6 9	14		
4											
5											
6		1.8		Moist	SS-3	80	16	6 11 9 13	20		
7	2.0	2.1		Grey, Trace Clay, Dense							
8					SS-4	80	15	5 16 25 15	41		
9		2.7		Wet							
10	3.0				SS-5	100	17	6 15 20	35		First encounter of groundwater seepage at 2.7 m Water up to 3.0 m upon completion Borehole cave-in up to 3.4 m upon completion
11											
12											
13	4.0										
14											
15		4.6		Compact							
16	5.0				SS-6	100	19	14 11 7 15	18		Grain Size Data SS-6: 0% Gravel 53% Sand 47% Silt and Clay-sized Particles 41% Between 5-75 um
17											
18											
19											
20	6.0				SS-7	100	18	6 13 16	29		
21											
22		6.6		END OF BOREHOLE							
23	7.0										
24											
25											
26	8.0										
27											

BOREHOLE LOG GEOTECH (MULTIPLE DRILLERS) 11209539-01-DWG-20-06-01, VARGAS BOREHOLE LOGS, JM, EW.GPJ GEOLOGIC.GDT 15/6/20

REFERENCE No.: 11209539-01 ENCLOSURE No.: A-13

BOREHOLE No.: BH-13

ELEVATION: 213.8 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Vargas Properties

PROJECT: Proposed Residential and Commercial Development

LOGGED BY: E. Wierdsma DATE: 16 April 2020

DRILLING COMPANY: Landshark Drilling METHOD: Solid Stem Augers and Spilt Spoons

NOTES: Ground surface elevation interpolated from Topographic plan prepared by IBW Surveyors, File Name "P-0400 Topo_v4.dwg" dated Jan. 14, 2020

LEGEND

- SS - SPLIT SPOON
- AS - AUGER SAMPLE
- ST - SHELBY TUBE
- CS - CORE SAMPLE
- ▼ - WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery %	Moisture Content %	Blows per 6 in. / 15 cm	Penetration Index N
	0.0	0.0		GROUND SURFACE					
		0.3		**TOPSOIL** (300 mm)					
1				**SANDY SILT** - Brown Sandy Silt With Clay, Moist, Loose	SS-1	60	23	1 1 2 2	3
2		0.8		Mottled					
3	1.0				SS-2	90	24	1 3 6 6	9
4									
5		1.5		**SILTY CLAY** - Light Brown Silty Clay, Trace Sand, Moist, Stiff	SS-3	100	26	2 4 7 6	11
6	2.0								
7									
8					SS-4A	100	27	3 3 5 6	8
9		2.7		**SILTY SAND** - Light Brown Silty Sand, Trace Clay, Wet, Compact	SS-4B		18	8 11 10 10	21
10	3.0								
11					SS-5	90	21		
12									
13	4.0								
14									
15		4.6		**SAND & GRAVEL** - Brown Sand and Gravel, Wet, Compact	SS-6	100	18	7 2 8 6	10
16	5.0								
17									
18									
19									
20	6.0	6.1		**SILTY CLAY** - Grey Silty Clay, Moist, Stiff	SS-7	75	21	3 3 6 6	9
21									
22		6.7		END OF BOREHOLE					
23	7.0								
24									
25									
26	8.0								
27									

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
Atterberg limits (%) W_p W_l
× "N" Value (blows / 0.3 m) ◆ RQD ◎ CONE

10 20 30 40 50 60 70 80 90

COMMENTS

— 0.79 m
— 0.77 m

WL - 2.4 m
5/22/2020

First encounter of groundwater seepage at 2.7 m

50mm diameter monitoring well installed to 6.1m

BOREHOLE LOG GEOTECH (MULTIPLE DRILLERS) 11209539-01-DWG-20-06-01, VARGAS BOREHOLE LOGS, JM, EW.GPJ GEOLOGIC.GDT 15/6/20

REFERENCE No.: 11209539-01 ENCLOSURE No.: A-14

TEST PIT No.: TP-1
ELEVATION: 247.8 m

TEST PIT REPORT

Page: 1 of 1

CLIENT: Vargas Properties

PROJECT: Proposed Residential and Commercial Development

LOGGED BY: Jamie McEachern DATE: 6 March 2020

EXCAVATION COMPANY: Balterre Contracting Limited METHOD: Track Excavator

NOTES: Ground surface elevation interpolated from Topographic plan prepared by IBW Surveyors, File Name "P-0400 Topo_v4.dwg" dated Jan. 14, 2020

LEGEND

GS - GRAB SAMPLE

▼ - WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content (%)	Shear test (Cu) / Sensitivity (S) / Water content (%) / Atterberg limits (w_p, w_l)	COMMENTS
		0.0		GROUND SURFACE				
				TOPSOIL (150 mm)				
		0.2		**SANDY SILT** - Reddish Brown Sandy Silt, Loose, Moist	AS-1	28		
1		0.3		Occasional Cobbles				No seepage observed during the excavation of the test pit
	0.5							
2		0.6		**TILL** - Light Brown Silty Sand and Gravel, Compact, Moist	AS-2	5		
3		0.9		Boulders				
	1.0							
4								
	1.5							
5								
6		1.8		Light Brown Clayey Silt, Trace Gravel, Cobbles and Boulders, Dense, Moist	AS-3	19		
	2.0							
7								
8								
	2.5							
9								
	3.0							
10								
11					AS-4	22		
	3.5	3.5		END OF TEST PIT				
12								
	4.0							
13								

10 20 30 40 50 60 70 80 90 %

△ Field □ Lab

TEST PIT LOG GEOTECH 11209539-01-DWG-20-03-31, VARGAS TESTPIT LOGS - .GPJ GEOLOGIC.GDT 12/6/20

REFERENCE No.: 11209539-01 ENCLOSURE No.: A-15

TEST PIT No.: TP-2
ELEVATION: 243.0 m

TEST PIT REPORT

Page: 1 of 1

CLIENT: Vargas Properties
PROJECT: Proposed Residential and Commercial Development
LOGGED BY: Jamie McEachern DATE: 6 March 2020
EXCAVATION COMPANY: Balterre Contracting Limited METHOD: Track Excavator
NOTES: Ground surface elevation interpolated from Topographic plan prepared by IBW Surveyors, File Name "P-0400 Topo_v4.dwg" dated Jan. 14, 2020

LEGEND
GS - GRAB SAMPLE
▼ - WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content (%)	COMMENTS
		0.0		GROUND SURFACE			
				TOPSOIL (200 mm)			
		0.2		**TILL** - Light Brown Silty Sand and Gravel, Cobbles, Compact, Moist	AS-1	2	No seepage observed during the excavation of the test pit
		0.8		Boulders	AS-2	9	
					AS-3	10	
					AS-4	8	
		3.4		Very Dense			
		3.5		END OF TEST PIT			

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
w_p w_l Atterberg limits (%)

10 20 30 40 50 60 70 80 90

TEST PIT LOG GEOTECH 11209539-01-DWG-20-03-31, VARGAS TESTPIT LOGS - .GPJ GEOLOGIC.GDT 12/6/20

REFERENCE No.: 11209539-01 ENCLOSURE No.: A-16

TEST PIT No.: TP-3
ELEVATION: 223.2 m

TEST PIT REPORT

Page: 1 of 1

CLIENT: Vargas Properties
PROJECT: Proposed Residential and Commercial Development
LOGGED BY: Jamie McEachern DATE: 6 March 2020
EXCAVATION COMPANY: Balterre Contracting Limited METHOD: Track Excavator
NOTES: Ground surface elevation interpolated from Topographic plan prepared by IBW Surveyors, File Name "P-0400 Topo_v4.dwg" dated Jan. 14, 2020

LEGEND
GS - GRAB SAMPLE
▼ - WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content (%)	COMMENTS
		0.0		GROUND SURFACE			
				TOPSOIL (150 mm)			
		0.2		**SANDY SILT** - Reddish Brown Sandy Silt, Loose, Moist to Wet	AS-1	23	
1		0.3		**TILL** - Light Brown Silty Sand, Compact, Moist			
	0.5						
2							
					AS-2	23	
3	1.0						
4							
	1.5						
5							
6							
	2.0				AS-3	22	
7							Groundwater seepage Observed at 2.1 m
8	2.5						
9							
	3.0				AS-4	23	
10							
					AS-5	20	
11		3.4		END OF TEST PIT			
	3.5						
12							
13	4.0						

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
w_p w_l Atterberg limits (%)

10 20 30 40 50 60 70 80 90

TEST PIT LOG GEOTECH 11209539-01-DWG-20-03-31, VARGAS TESTPIT LOGS - .GPJ GEOLOGIC.GDT 12/6/20

REFERENCE No.: 11209539-01 ENCLOSURE No.: A-17

TEST PIT No.: TP-4
ELEVATION: 216.0 m

TEST PIT REPORT

Page: 1 of 1

CLIENT: Vargas Properties
PROJECT: Proposed Residential and Commercial Development
LOGGED BY: Jamie McEachern DATE: 6 March 2020
EXCAVATION COMPANY: Balterre Contracting Limited METHOD: Track Excavator
NOTES: Ground surface elevation interpolated from Topographic plan prepared by IBW Surveyors, File Name "P-0400 Topo_v4.dwg" dated Jan. 14, 2020

LEGEND
GS - GRAB SAMPLE
▼ - WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content (%)	COMMENTS
		0.0		GROUND SURFACE			
				TOPSOIL (150 mm)			
		0.3		**SANDY SILT** - Reddish Brown Sandy Silt, Loose, Moist	AS-1	28	
1		0.4		**TILL** - Light Brown Silty Sand and Gravel, Compact, Moist			No seepage observed during the excavation of the test pit
	0.5						
2					AS-2	37	
3	1.0						
4							
5	1.5				AS-3	26	
6							
	2.0						
7							
8	2.5						
9							
10	3.0				AS-4	27	
11		3.4		END OF TEST PIT			
	3.5						
12							
13	4.0						

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
w_p w_l Atterberg limits (%)

10 20 30 40 50 60 70 80 90

TEST PIT LOG GEOTECH 11209539-01-DWG-20-03-31, VARGAS TESTPIT LOGS - .GPJ GEOLOGIC.GDT 12/6/20

REFERENCE No.: 11209539-01 ENCLOSURE No.: A-18

TEST PIT No.: TP-5
ELEVATION: 215.2 m

TEST PIT REPORT

Page: 1 of 1

CLIENT: Vargas Properties
PROJECT: Proposed Residential and Commercial Development
LOGGED BY: Jamie McEachern DATE: 6 March 2020
EXCAVATION COMPANY: Balterre Contracting Limited METHOD: Track Excavator
NOTES: Ground surface elevation interpolated from Topographic plan prepared by IBW Surveyors, File Name "P-0400 Topo_v4.dwg" dated Jan. 14, 2020

LEGEND
GS - GRAB SAMPLE
▼ - WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content (%)	COMMENTS
		0.0		GROUND SURFACE			
				TOPSOIL (150 mm)			
		0.3		**SANDY SILT** - Reddish Brown Sandy Silt, Loose, Moist	AS-1	33	No seepage observed during the excavation of the test pit
3	1.0				AS-2	28	
5	1.5				AS-3	20	
9	2.7			**TILL** - Light Brown Silty Sand and Gravel, Compact, Moist			
10	3.0				AS-4	16	
		3.0		END OF TEST PIT			

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
w_p w_l Atterberg limits (%)

10 20 30 40 50 60 70 80 90

TEST PIT LOG GEOTECH 11209539-01-DWG-20-03-31, VARGAS TESTPIT LOGS - .GPJ GEOLOGIC.GDT 12/6/20

REFERENCE No.: 11209539-01 ENCLOSURE No.: A-19

TEST PIT No.: TP-6
ELEVATION: 212.7 m

TEST PIT REPORT

Page: 1 of 1

CLIENT: Vargas Properties
PROJECT: Proposed Residential and Commercial Development
LOGGED BY: Jamie McEachern DATE: 6 March 2020
EXCAVATION COMPANY: Balterre Contracting Limited METHOD: Track Excavator
NOTES: Ground surface elevation interpolated from Topographic plan prepared by IBW Surveyors, File Name "P-0400 Topo_v4.dwg" dated Jan. 14, 2020

LEGEND
GS - GRAB SAMPLE
▼ - WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content (%)	COMMENTS
		0.0		GROUND SURFACE			
				TOPSOIL (150 mm)			
		0.2		**SANDY SILT** - Reddish Brown Sandy Silt, Loose, Moist	AS-1	18	
1		0.5		**TILL** - Light Brown Silty Sand and Gravel, Compact, Moist			No seepage observed during the excavation of the test pit
2	0.5						
					AS-2	9	
3	1.0						
4							
5	1.5						
6							
7	2.0						
					AS-3	7	
8	2.5						
9							
					AS-4	8	
10	3.0	3.0		END OF TEST PIT			
11	3.5						
12							
13	4.0						

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
w_p w_l Atterberg limits (%)

10 20 30 40 50 60 70 80 90

TEST PIT LOG GEOTECH 11209539-01-DWG-20-03-31, VARGAS TESTPIT LOGS - .GPJ GEOLOGIC.GDT 12/6/20

Parameter	Monitoring Wells		Water Well	ODWS		
	BH-7	BH-13	W-3 (Water Well N of Site*)	MAC	IMAC	AO/OG
Magnesium	7.84	7.73	6.41	NS	NS	NS
Manganese	0.030	0.026	<0.001	NS	NS	0.05
Nitrite (N)	<0.1	<0.1	<0.1	1.0	NS	NS
Nitrate (N)	<0.1	<0.1	3.0	10	NS	NS
pH (unitless)	8.02	7.81	8.00	NS	NS	6.5 to 8.5
Potassium	1.4	1.3	0.9	NS	NS	NS
Sodium	4.1	4.0	6.7	NS	NS	200
Sulphate	7	7	4	NS	NS	500
Turbidity (N.T.U.)	**17.8**	**1180**	0.8	1	NS	5
Zinc	<0.005	<0.005	<0.005	NS	NS	5.0

Notes: All units in mg/L (i.e. parts per million) unless otherwise noted. MAC = maximum acceptable concentration (health related); IMAC = Interim MAC (insufficient data to establish MAC or not feasible to establish MAC to desired level); AO/OG = aesthetic objective or operational guideline (not health related). **Bolded value** exceeds ODWS. NS denotes No Standard. (*) See L-5 water well location on Enclosure B.4 in Appendix B.

The groundwater beneath the Site is relatively hard which is common in Southern Ontario due to overburden materials containing calcium. In general, the water quality is relatively good with no indication of organic pollution as evidenced by the lack of nitrite and nitrate.

4.2.5 Hydraulic Conductivity

Hydraulic conductivity (K) testing was completed at the monitoring wells installed in boreholes BH-4, BH-7 and BH-13. The testing consisted of falling and/or rising head testing and was completed by introducing a one-metre long slug within the well or by filling the monitoring well with potable water, and then measuring the water levels using a data logger programmed to record readings at three (3) second intervals. The data was analyzed using AQTESOLV and the Bouwer-Rice solution for each test (see Appendix C for solution data).

The K values for the hydraulic conductivity testing range from on the order of 10^{-3} to 10^{-5} cm/sec. The K values from the test data indicate that the monitoring wells were screened within medium (sand) to low (till) hydraulic conductivity units. The hydraulic conductivity testing suggests that excavations within these soils are expected to yield low to little water. However, increased amounts of water may be expected when pockets or layer of sand and/or gravel are intersected.

4.2.6 Infiltration Testing

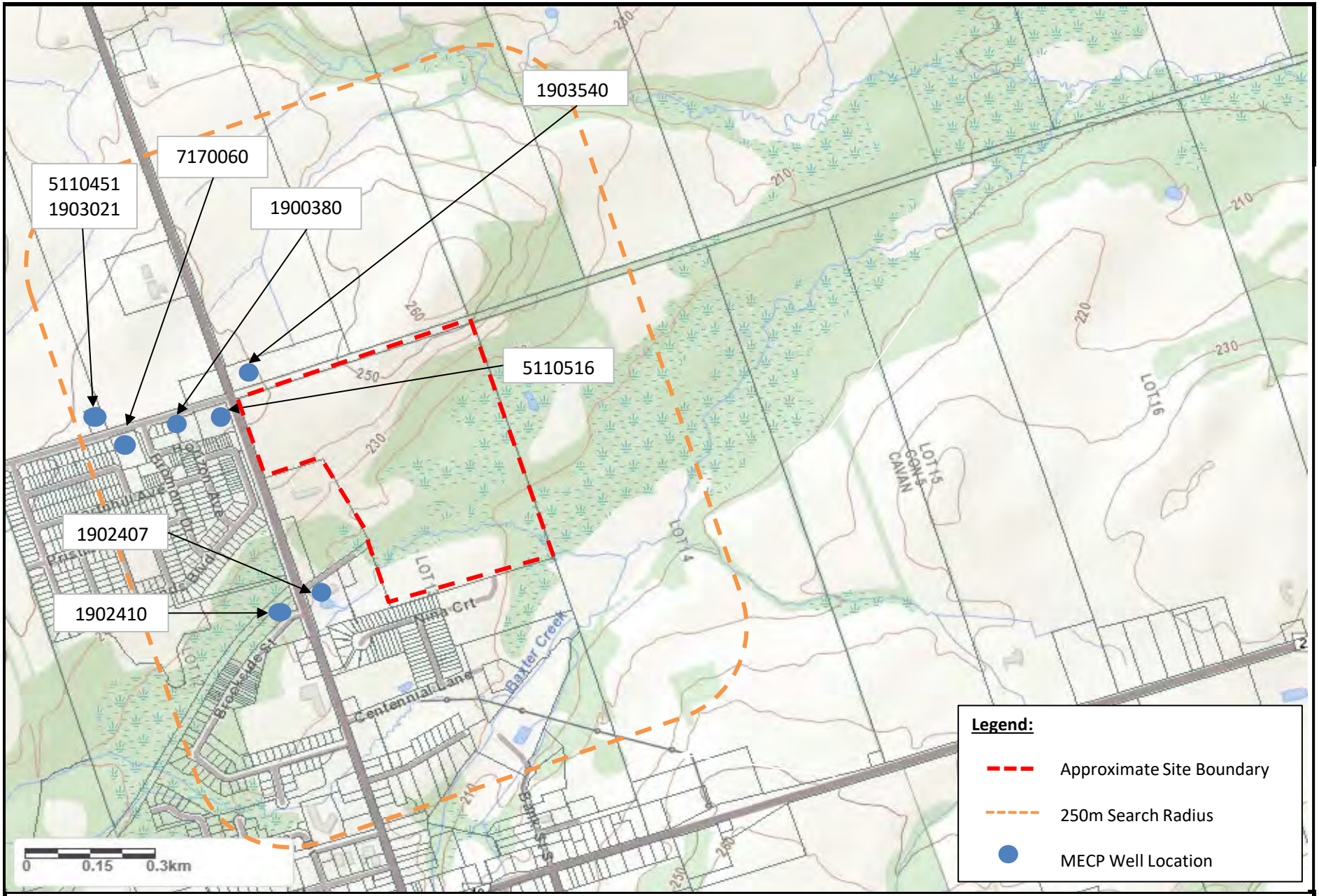
For purposes of Low Impact Development strategies, infiltration data of the shallow site soils is presented in this section. In-situ constant head permeameter tests were conducted at six (6) locations in test pits TP-2 (at 0.6 and 1.2 m depth), TP-5 (at 0.3 m depth), TP-6 (at 1.0 m depth), and near boreholes BH-4 (at 0.6 m depth) and BH-7 (at 0.6 m depth). The importance of infiltration is for the implementation of low impact development strategies to recharge precipitation into the ground at pre-development or near pre-development values. Infiltration testing was completed using an ETC Pask (constant head well) permeameter. The testing was not successful at test pits TP-1, TP-3, TP-4 due to unknown subsurface conditions that may have been related to clayey till, boulders or some other condition.

Based upon the infiltration testing conducted near test pits TP-2, TP-5 and TP-6, the upper vadose zone has a field saturated hydraulic conductivity ranging from 10^{-3} to 10^{-5} cm/sec (Appendix C). The infiltration test results provide preliminary infiltration values for the Site and are indicative of silty sand or sandy silt material. Although LIDs can be applied to any soil type, additional testing should be considered at the detailed design stage when infiltration areas are known.

Based on the Supplementary Guidelines to the Ontario Building Code 2012, this correlates to an infiltration rate in the order of 30 to 75 mm/hr. It is noted, however, that slight variations in the soil stratigraphy may cause variations in the permeability of the soil in both vertical and horizontal orientations.

Appendix B

MECP Well Records and Well Survey



Source: MECP Water Well Record Mapping, accessed online (https://www.ontario.ca/environment-and-energy/map-well-records)

Scale:
Refer to Scale Bar
Coordinate System:
NAD 1983 UTM Zone 17

Vargas Development
Proposed Residential Development
Fallis Line, Millbrook, ON

11209539-01
June, 2020

Well Location Plan

FIGURE B.1

APPENDIX B.2: WELL SUMMARY - OVERBURDEN BEDROCK

Well Record Summary
Vargas Development
Millbrook, ON

	Well	Water Found		Static Level		Pump Rate		Well Depth		Comments
Well No.	Use	Feet	Metres	Feet	Metres	Igpm	L/min	Feet	Metres	
1900380	Domestic	53.0	16.2	39.0	11.9	22.0	100.1	54.0	16.5	Topsoil to 2', till to 20', clay with stones to 53', gravel to 54'
1902407	Domestic	121.0	36.9	0.0	0.0	16.0	72.8	121.0	36.9	Topsoil to 2', clay and stones to 110', clay with gravel and shale rock to 121'
1902410	Domestic	106.0	32.3	0.0	0.0	15.0	68.3	106.0	32.3	Topsoil to 2', clay to 100', gravel to 106'
5110451	Domestic	209	63.7	82	25.0	4.0	18.2	209	63.7	Clay and stones to 16', sand and gravel to 98', sand to 123', clay and gravel to 129', sand to 146', sand with gravel and clay to 208', shale to 209'
5110516	Domestic	115	35.1	49	14.9	6.0	27.3	119	36.3	Topsoil to 1', clay with stones to 37', gravel to 44', clay to 102', gravel and sand to 115', sand and gravel to 119'
717060	Domestic	208.0	63.4	175.0	53.3	10.0	45.5	208.0	63.4	Clay with stones to 15', sand and gravel to 38', clay to 110', clayey silt to 168', clay to 195', silty sand to 203', sand to 208'

Number of wells = 6

	Water Found		Static Level		Pump Rate		Well Depth	
	Feet	Metres	Feet	Metres	Igpm	L/min	Feet	Metres
AVERAGE	135.3	41.2	57.5	17.5	12.2	55.4	136.2	41.5
MAXIMUM	209.0	63.7	175.0	53.3	22.0	100.1	209.0	63.7
MINIMUM	53.0	16.2	0.0	0.0	4.0	18.2	54.0	16.5

APPENDIX B.3: WELL SUMMARY - DRILLED BEDROCK

Well Record Summary
Vargas Development
Millbrook, ON

	Well	Water Found		Static Level		Pump Rate		Well Depth		Depth to Bedrock		Comments
Well No.	Use	Feet	Metres	Feet	Metres	lgpm	L/min	Feet	Metres	Feet	Metres	
1903021	Domestic	216.0	65.8	66.0	20.1	3.0	13.7	237.0	72.2	215.0	65.5	Clay with stones to 130', clay with sand layers to 135', clay with stones to 215', limestone to 237'
1903540	Domestic	225.0	68.6	70.0	21.3	2.0	9.1	230.0	70.1	225.0	68.6	Topsoil to 1', clay and stones to 135', sand and clay to 144', sand and gravel to 155', sand and clay to 225', limestone to 230'

Number of wells = 2

	Water Found		Static Level		Pump Rate		Well Depth		Depth to Bedrock	
	Feet	Metres	Feet	Metres	lgpm	L/min	Feet	Metres	Feet	Metres
AVERAGE	220.5	67.2	68.0	20.7	2.5	11.4	233.5	71.2	220.0	67.1
MAXIMUM	225.0	68.6	70.0	21.3	3.0	13.7	237.0	72.2	225.0	68.6
MINIMUM	216.0	65.8	66.0	20.1	2.0	9.1	230.0	70.1	215.0	65.5

Source: Compiled from Google Earth. Aerial photo dated November 27, 2019

Scale:
Refer to Scale Bar
Coordinate System:
NAD 1983 UTM Zone 17

Geotechnical Investigation
Vargas Development
Proposed Residential Development
Fallis Line, Millbrook, ON

Well Survey Locations

11209539-01
March, 2020

Appendix B.3

APPENDIX B.4: WATER WELL INFORMATION SURVEY
PROJECT: 11209539-01, March 18 and 19, 2020
LOCATION: Fallis Line, Millbrook, ON

Address	Well ID for Map	Easting (m)	Northing (m)	Well Type	Top of Well (m)	Water Level (m)	Depth (m)	Quality	Quantity	Comments
893 Fallis Line	L-1	703391	4892952	Drilled	0.51	18.45	60.5	Methane gas and cloudy	No known issues	Municipally serviced as of 2018. Former well on property.
1 Buckland Drive	L-2	703925	4892576	--	--	--	--	--	--	Municipallly serviced for past 30 years. On a well prior to that.
23 Buckland Drive	L-3	704025	4892662	Drilled	0.01	0.68		No known issues	'No known issues	Municipally serviced since 1986. Former well on property. Water sample collected (W-1).
917 County Road 10	L-4	703867	4892831	Dug	Unknown	Unknown	Unknown	No known issues	No known issues	Current Water Supply- no issues, plenty of water. Water sample collected from tap (W-2).
Onsite (North of Fallis Line)	L-5	7037730	4893143	Dug	0.015	5.15	Unknown	No known issues	No known issues	Current Water Supply- no issues, plenty of water. Water sample collected from tap (W-3).

UTM 17 Z 703510 E
9 R 4892781 N

Elev. 9 R 08215

Basin 24

ONTARIO

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FEB 22 1954
GEOLOGICAL BRANCH
DEPARTMENT of MINES

19 No 380

The Well Drillers Act
Department of Mines, Province of Ontario

Water Well Record

Durham [redacted] Village, Town or City Cavan

[redacted] wn or City) ..... RR#3 Millbrook

Date Completed 9 (day) Dec (month) 53 (year) Cost of Well (excluding pump) .....

Pipe and Casing Record

Casing diameter(s) 6 5/4
Length(s) of casing(s) 54'
Type of screen none
Length of screen .....
Distance from top of screen to ground level .....
Is well a gravel-wall type? .....

Pumping Test

Date Dec 9
Static level 40
Pumping level 44
Pumping rate 220 IGPH
Duration of test 2 hrs
Distance from cylinder or bowls to ground level .....

Water Record

Kind (fresh or mineral) fresh
Quality (hard, soft, contains iron, sulphur, etc.) soft
Appearance (clear, cloudy, coloured) clear
For what purpose(s) is the water to be used? Farm Stock
.....
How far is well from possible source of contamination? none
What is the source of contamination? .....
Enclose a copy of any mineral analysis that has been made of water .....

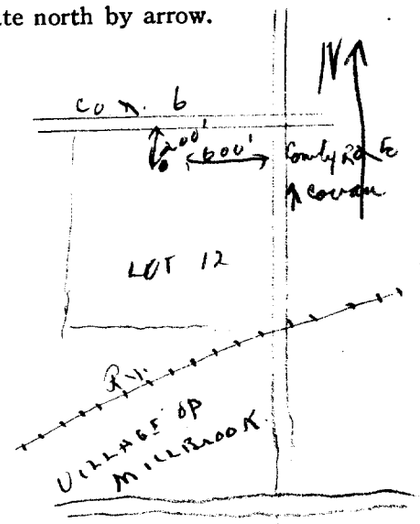
Depth(s) to Water Horizon(s)	Kind of Water	No. of Feet Water Rises
53-54	clear	14'

Well Log

Overburden and Bedrock Record	From	To
Top Soil	0 ft.	2 ft.
Brown Till	2	20
Blue Clay & Stone	20	53
Hard	53	54

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



Situation: Is well on upland, in valley, or on hillside? upland
Drilling Firm Jim Sanderson
Address 131 Main St. Peterborough
Name of Driller Jim Sanderson Address .....
Date Feb 15 / 54 Licence Number 209
Jim Sanderson
Signature of Licensee

FORM 5

UTM 17Z 703898E
9R 4892378N
Elev. 9R 0720
Basin 24

ONTARIO

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DEC 29 1954
GEOLOGICAL BRANCH
DEPARTMENT of MINES

19 No. 2407

The Water-well Drillers Act, 1954
Department of Mines

Water-Well Record

MILLBROOK

County or Territorial District Durham Township, Village, ~~Town or City~~ Millbrook
[redacted] Village, ~~Town or City~~) Millbrook
[redacted] ddress Millbrook
Date completed [redacted] (day) (month) (year)

Pipe and Casing Record

Casing diameter(s) 6"
Length(s) 121'
Type of screen
Length of screen

Pumping Test

Static level flowing
Pumping rate 1600 gals per hr.
Pumping level 60'
Duration of test 1 hr.

Well Log

Overburden and Bedrock Record	From ft.	To ft.
Top soil	0	2'
Blue clay + some stones	2'	110'
clay, gravel + shale rock	110'	121'

Water Record

Depth(s) at which water(s) found	No. of feet water rises	Kind of water (fresh, salty, or sulphur)
121'	flows	fresh.

For what purpose(s) is the water to be used?
Domestic
Is water clear or cloudy? clear
Is well on upland, in valley, or on hillside? upland

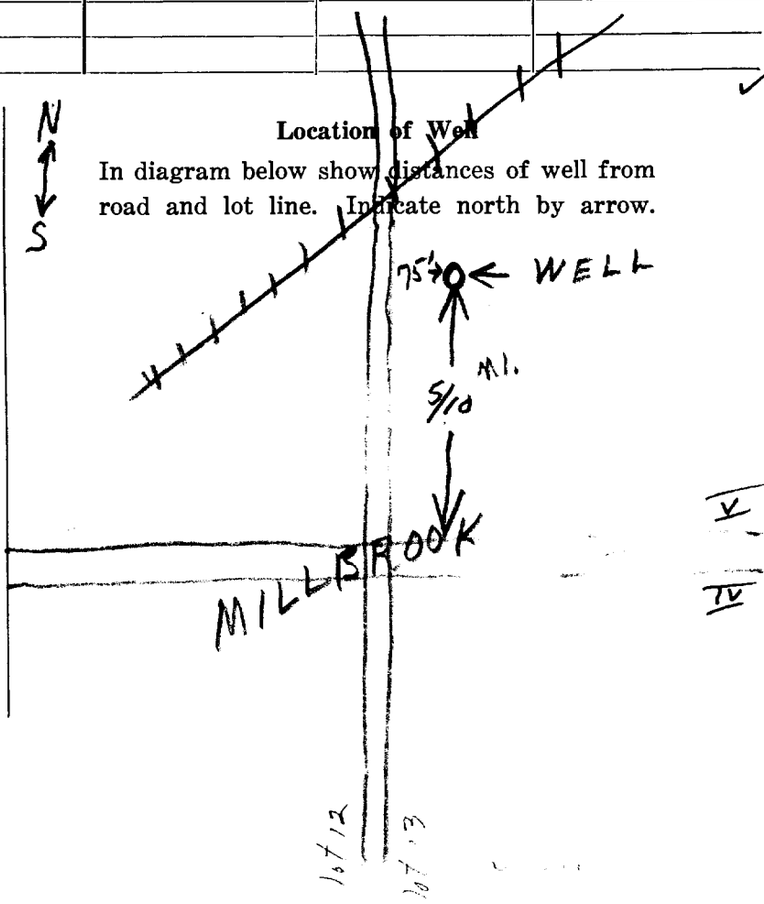
Drilling firm N. N. Faulkner.
Address 687 Water St.
Peterboro
Name of Driller F. G. Sang.
Address Sturgeon Rd
Omemee
Licence Number 456

I certify that the foregoing statements of fact are true.

Date Dec. 19 F. G. Sang
Signature of Licensee

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



Form 5

UTM | 17 | Z | 703850 | E
| 9 | R | 4892304 | N
Elev. | 9 | R | 0720
Basin | 29 |

ONTARIO

The Water-well Drillers Act, 1954
Department of Mines

19 No. 2410

Water-Well Record

County or Territorial District Durham Township, Village, Town or City Millbrook

[redacted] Village, Town or City)

Address Millbrook

(day) (month) (year)

Pipe and Casing Record

Casing diameter(s) 6 1/4"
Length(s) 106
Type of screen
Length of screen

Pumping Test

Static level [redacted] flowing gpm
Pumping rate 15 g.p.m.
Pumping level 93
Duration of test 3 hrs

Well Log

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	No. of feet water rises	Kind of water (fresh, salty, or sulphur)
top soil	0	2			
brown clay	2	23			
blue clay	23	100			
gravel	100	106	106	106	fresh

Water Record

For what purpose(s) is the water to be used?
Domestic
Is water clear or cloudy? Clear
Is well on upland, in valley, or on hillside? upland

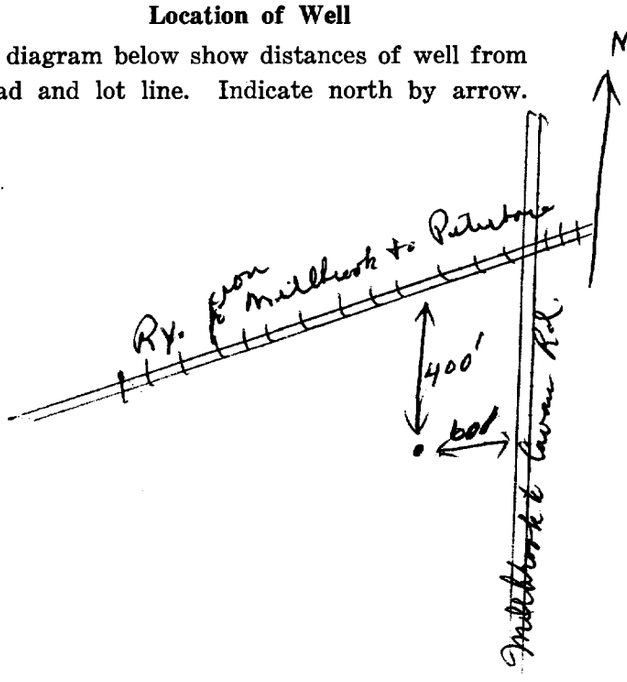
Drilling firm W. Henderson
Address 13 St. Patrick St. Peterborough
Name of Driller H. H. Hammers
Address 153 Nassau St. Peterborough
Licence Number 769

I certify that the foregoing statements of fact are true.

Date May 17/56 H. H. Hammers
Signature of Licensee

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



Form 5

The Ontario Water Resources Commission Act

31 D/1 W

WATER WELL RECORD

Water management is Ontario

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11 | 1903021 | MUNICIP. 19002 | CON. GCN | OST

COUNTY OR DISTRICT | TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE | CON. BLOCK, TRACT, SURVEY, ETC. | LOT 012

[redacted] Millbrook, Ontario

DATE COMPLETED DAY 17 MO. Sept YR. 70

[illegible] | RC 4 | ELEVATION 0835 | RC 5 | BASIN CODE 24

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH – FEET FROM	DEPTH – FEET TO
Brown	clay	Stones	Land	0	22
Blue	clay	Stone	Land	22	130
Blue	clay	Sand layers	Soft	130	135
Blue	clay	Stones	Land	135	215
Grey	limestone		Land	215	237

31 aa27da st12 | a13d3ast12 | a13st3asta9 | a21st3ast12 | a23t2d1st

32

41 WATER RECORD

WATER FOUND AT – FEET	KIND OF WATER
216-220 0216	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH – FEET FROM	DEPTH – FEET TO
6 4	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	.188	0	220 216
06				0216
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE			0237
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET
MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN FEET	

61 PLUGGING & SEALING RECORD

DEPTH SET AT – FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD	PUMPING RATE	DURATION OF PUMPING
1 ☐ PUMP 2 ☒ BAILER	0003 GPM.	01 HOURS 00 MINS.

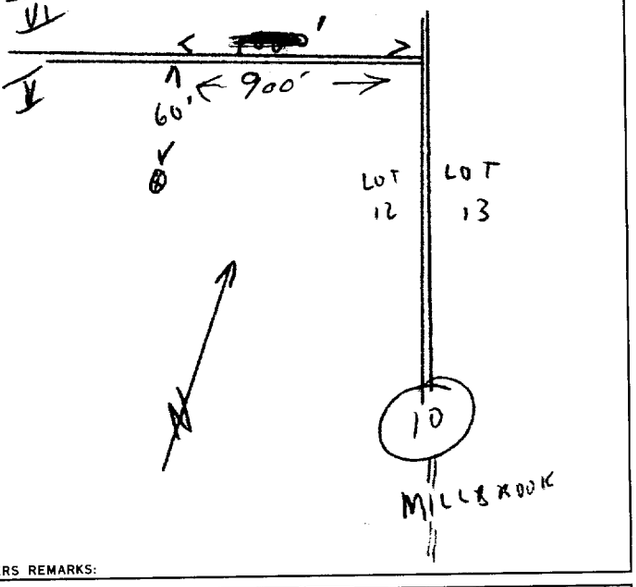
STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
066 FEET	230 FEET	1 ☒ PUMPING 2 ☐ RECOVERY	100 FEET	150 FEET	200 FEET	230 FEET

IF FLOWING, GIVE RATE	PUMP INTAKE SET AT	WATER AT END OF TEST	RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
GPM.	FEET	1 ☒ CLEAR 2 ☐ CLOUDY	☐ SHALLOW ☒ DEEP	230 FEET	0003 GPM.

50-53 000.0 GPM./FT. SPECIFIC CAPACITY

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS:

FINAL STATUS OF WELL

54

1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED

WATER USE 01

55-56

1 ☒ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED

METHOD OF DRILLING

57

1 ☒ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: W. Sanderson | LICENCE NUMBER: 4713

ADDRESS: Millbrook

NAME OF DRILLER OR BORER: W. Sanderson | LICENCE NUMBER:

SIGNATURE OF CONTRACTOR: W. Sanderson | SUBMISSION DATE DAY 15 MO. 9 YR. 70

OFFICE USE ONLY

58 DATA SOURCE 1 | 59-62 CONTRACTOR 4713 | 63-68 DATE RECEIVED 040271

DATE OF INSPECTION APR. 14/71 | INSPECTOR SC/J.B.

REMARKS: P/J.B.

OWRC COPY

The Ontario Water Resources Commission Act

WATER WELL RECORD

31D/1E

Water management in Ontario

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11 | 1903540 | MUNICIP. 19002 | CON. C&N | 96

COUNTY OR DISTRICT: Durham | TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: Cavan | CON., BLOCK, TRACT, SURVEY, ETC.: 6 | LOT: 013

[redacted] R.R.#3 Millbrook

DATE COMPLETED: DAY 13 MO 11 YR. 72

92900 | RC. 4 | ELEVATION 0831S | RC. 5 | BASIN CODE 24

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH – FEET FROM	DEPTH – FEET TO
	top soil			0'	1'
brown	clay & stones	& boulders		1'	45'
grey	clay	& stones		45'	135'
fine sand &	grey clay			135'	144'
fine sand &	gravel	& grey clay		144'	155'
gravel	fine sand	& grey clay		155'	170'
fine sand,	grey clay	& gravel		170'	225'
grey	limestone rock			225'	230'

31: 0001 02 | 0045 05 12 | 0135 05 12 | 0144 08 05 | 0155 08 11 05 | 0170 11 98 95

32: 0225 08 05 IN | 0230 11 05

41 WATER RECORD

WATER FOUND AT – FEET	KIND OF WATER
~~225'~~ ~~230~~ 0225	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH – FEET FROM	DEPTH – FEET TO
~~6~~ 06	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ~~☐ OPEN HOLE~~	188	0'	~~225~~ 0225
~~6~~ 06	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE		225'	~~230'~~ 0230
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET
MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN FEET	

61 PLUGGING & SEALING RECORD

DEPTH SET AT – FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ~~☒~~ BAILER | PUMPING RATE ~~0002~~ 22 GPM. | DURATION OF PUMPING 08 HOURS 00 MINS.

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
070' FEET	~~225~~ FEET	1 ☐ PUMPING 2 ☒ RECOVERY	210 FEET	190 FEET	175 FEET	165 FEET

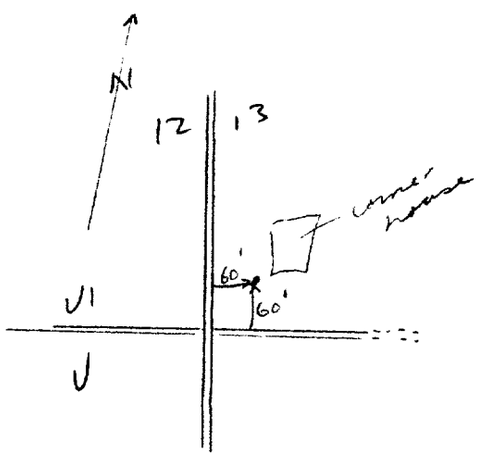
IF FLOWING, GIVE RATE: GPM. | PUMP INTAKE SET AT: FEET | WATER AT END OF TEST: 1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ~~☒~~ DEEP | RECOMMENDED PUMP SETTING 225 FEET | RECOMMENDED PUMPING RATE 0002 GPM.

50-53: 0000 GPM./FT. SPECIFIC CAPACITY

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS:

FINAL STATUS OF WELL (54): 1 ☒ WATER SUPPLY; 2 ☐ OBSERVATION WELL; 3 ☐ TEST HOLE; 4 ☐ RECHARGE WELL; 5 ☐ ABANDONED, INSUFFICIENT SUPPLY; 6 ☐ ABANDONED, POOR QUALITY; 7 ☐ UNFINISHED

WATER USE (55-56): 01 — 1 ☒ DOMESTIC; 2 ☐ STOCK; 3 ☐ IRRIGATION; 4 ☐ INDUSTRIAL; ☐ OTHER; 5 ☐ COMMERCIAL; 6 ☐ MUNICIPAL; 7 ☐ PUBLIC SUPPLY; 8 ☐ COOLING OR AIR CONDITIONING; 9 ☐ NOT USED

METHOD OF DRILLING (57): 1 ☒ CABLE TOOL; 2 ☐ ROTARY (CONVENTIONAL); 3 ☐ ROTARY (REVERSE); 4 ☐ ROTARY (AIR); 5 ☐ AIR PERCUSSION; 6 ☐ BORING; 7 ☐ DIAMOND; 8 ☐ JETTING; 9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: Stuart Stockdale Well Drilling | LICENCE NUMBER: 4814

ADDRESS: R.R.#2, Peterborough

NAME OF DRILLER OR BORER: Ernest Seabrooke | LICENCE NUMBER: 4773

SIGNATURE OF CONTRACTOR: Stuart Stockdale | SUBMISSION DATE: DAY ____ MO. ____ YR. ____

OFFICE USE ONLY

DATA SOURCE (58): 1 | CONTRACTOR (59-62): 4814 | DATE RECEIVED (63-68): 090473

DATE OF INSPECTION: 27, 11, 73 | INSPECTOR: K

REMARKS:

P 2

WI

OWRC COPY

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

3 1 D/2

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(11) 5110451 MUNICIP 5/024 CON. C&N 06

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
Peterborough	Cavan	6	012

[redacted] R. 3, Millbrook, Ont. LOA 1GO

DATE COMPLETED: DAY 16 MO 04 YR 82

UTM ZONE 17 | 0292800 | RC 4 | ELEVATION 0825 | RC 5 | BASIN CODE 24

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
Brown	clay	stones	packed	0	16
Grey	sand	gravel	loose	16	37
Grey	sand	clay, gravel	medium	37	98
Black	sand		soft	98	123
Grey	clay	gravel	packed	123	129
Grey	sand		soft	129	146
Grey	sand	clay, gravel	medium	146	208
Black	shale	gravel	loose	208	209
			9R1334 Pt1		

(31) 0016605121779 | 0037228111777 | 0098209105530 | 0123828855 | 0129205111779 | 0146228855

(32) 0208209130005 | 0209817111777 | 0210 00

(41) WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0209 untested	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL

(51) CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
6 1/4 06	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	.188	0	0210
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET
MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN FEET	

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT LEAD PACKER ETC.)

(71) PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☒ BAILER

PUMPING RATE: 0005 GPM

DURATION OF PUMPING: 02 HOURS 40 MINS

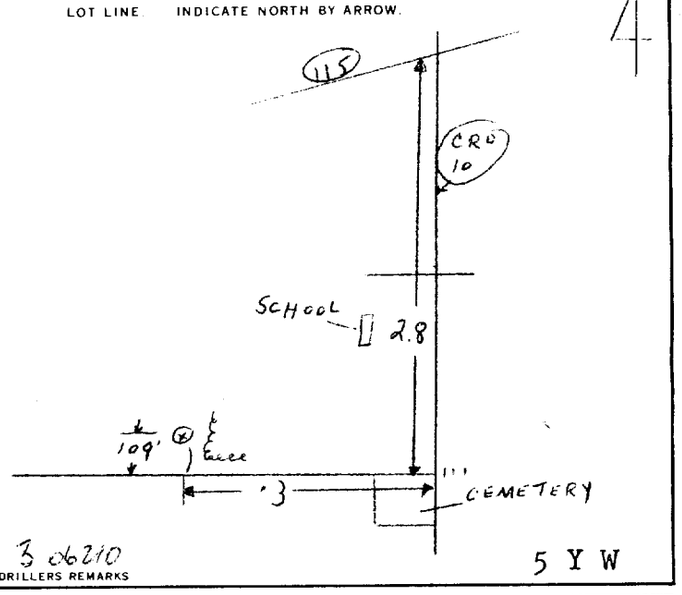
STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING: 1 ☐ PUMPING 2 ☒ RECOVERY			
		15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
082 FEET	199 FEET	119 FEET	082 FEET	082 FEET	082 FEET

IF FLOWING, GIVE RATE	PUMP INTAKE SET AT	WATER AT END OF TEST
-- GPM	204 FEET	1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
☐ SHALLOW ☒ DEEP	204 FEET	0004 4½ GPM

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



3 06210 DRILLERS REMARKS

5 Y W

FINAL STATUS OF WELL 1	1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED
WATER USE 01	1 ☒ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED
METHOD OF DRILLING 1	1 ☒ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: Faulkner Well Drilling Co.Ltd — LICENCE NUMBER: 2104

ADDRESS: 789 Erskine Ave., Peterborough, Ont.

NAME OF DRILLER OR BORER: Edward Taylor — LICENCE NUMBER:

SIGNATURE OF CONTRACTOR: E Faulkner / ET

SUBMISSION DATE: DAY 19 MO. 4 YR. 82

OFFICE USE ONLY

DATA SOURCE 1 | CONTRACTOR 2104 | DATE RECEIVED 11 05 82

DATE OF INSPECTION | INSPECTOR

REMARKS

MINISTRY OF THE ENVIRONMENT COPY

FORM NO. 0506—4—77 FORM 7

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

3101e

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2 CHECK [X] CORRECT BOX WHERE APPLICABLE

(11) 5110516 MUNICIP 51024 CON CON 05

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON, BLOCK, TRACT, SURVEY, ETC	
[redacted]	[redacted]	CON 5	012

DATE COMPLETED: DAY 03 MO 06 YR 81

[redacted] #3, Millbrook, Ontario

UTM 92800 RC 4 ELEVATION 0825 RC 5 BASIN CODE 24

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	TO
			TOP SOIL	0	1
WHITE	CLAY	STONES		1	37
BROWN	GRAVEL		COARSE	37	44
WHITE	CLAY			44	102
BROWN	GRAVEL	SAND	FINE	102	115
BROWN	SAND	GRAVEL	FINE	115	119

(31) 0001 02 0037105 12 0048631 0102105 01196290 8

32

(41) WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0115-119	1 [X] FRESH 3 [ ] SULPHUR; 2 [ ] SALTY 4 [ ] MINERAL
	1 [ ] FRESH 3 [ ] SULPHUR; 2 [ ] SALTY 4 [ ] MINERAL
	1 [ ] FRESH 3 [ ] SULPHUR; 2 [ ] SALTY 4 [ ] MINERAL
	1 [ ] FRESH 3 [ ] SULPHUR; 2 [ ] SALTY 4 [ ] MINERAL
	1 [ ] FRESH 3 [ ] SULPHUR; 2 [ ] SALTY 4 [ ] MINERAL

(51) CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	TO
06	1 [X] STEEL; 2 [ ] GALVANIZED; 3 [ ] CONCRETE; 4 [ ] OPEN HOLE	188	0	0119
	1 [ ] STEEL; 2 [ ] GALVANIZED; 3 [ ] CONCRETE; 4 [ ] OPEN HOLE			
	1 [ ] STEEL; 2 [ ] GALVANIZED; 3 [ ] CONCRETE; 4 [ ] OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER	LENGTH
014 Slot #14	06000 INCHES	02 2" FEET
MATERIAL AND TYPE: Stainless Steel	DEPTH OF SCREEN: 0111 FEET	110'10"

(61) PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

(71) PUMPING TEST

PUMPING TEST METHOD	PUMPING RATE	DURATION OF PUMPING
1 [ ] PUMP 2 [X] BAILER	0006 GPM	04 HOURS 00 MINS

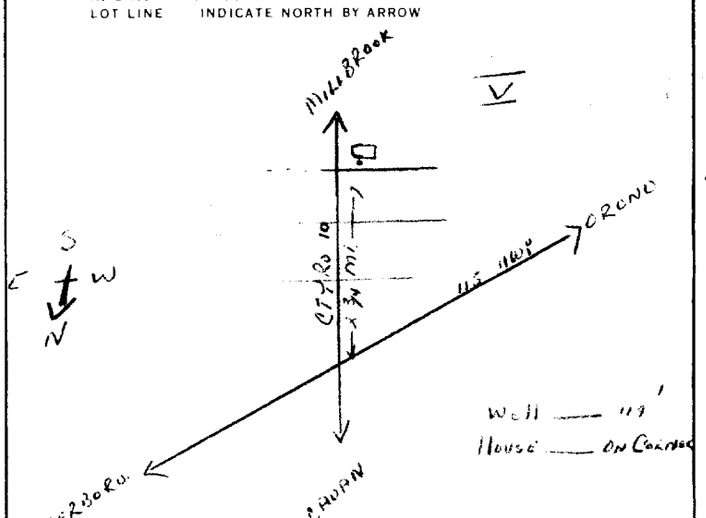
STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING: 1 [ ] PUMPING 2 [ ] RECOVERY			
		15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
049 FEET	113 FEET	FEET	FEET	FEET	FEET

IF FLOWING, GIVE RATE	PUMP INTAKE SET AT	WATER AT END OF TEST
GPM	FEET	1 [X] CLEAR 2 [ ] CLOUDY

RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
[ ] SHALLOW [X] DEEP	FEET	GPM

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW



DRILLERS REMARKS: 2.211 0001

FINAL STATUS OF WELL 1
1 [X] WATER SUPPLY; 2 [ ] OBSERVATION WELL; 3 [ ] TEST HOLE; 4 [ ] RECHARGE WELL; 5 [ ] ABANDONED, INSUFFICIENT SUPPLY; 6 [ ] ABANDONED, POOR QUALITY; 7 [ ] UNFINISHED

WATER USE 01
1 [X] DOMESTIC; 2 [X] STOCK; 3 [ ] IRRIGATION; 4 [ ] INDUSTRIAL; [ ] OTHER; 5 [ ] COMMERCIAL; 6 [ ] MUNICIPAL; 7 [ ] PUBLIC SUPPLY; 8 [ ] COOLING OR AIR CONDITIONING; 9 [ ] NOT USED

METHOD OF DRILLING 1
1 [ ] CABLE TOOL; 2 [X] ROTARY (CONVENTIONAL); 3 [ ] ROTARY (REVERSE); 4 [ ] ROTARY (AIR); 5 [ ] AIR PERCUSSION; 6 [ ] BORING; 7 [ ] DIAMOND; 8 [ ] JETTING; 9 [ ] DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: ROBERT RUTH WELLDRILLING LTD. LICENCE NUMBER: 4635
ADDRESS: R. R. #2, CAVAN, Ont. 705-799-5343
NAME OF DRILLER OR BORER: same LICENCE NUMBER:
SIGNATURE OF CONTRACTOR: Robert Ruth SUBMISSION DATE: DAY 30 MO 9 YR 81

OFFICE USE ONLY

DATA SOURCE 1 CONTRACTOR 4635 DATE RECEIVED 09 07 82
DATE OF INSPECTION INSPECTOR
REMARKS

CSS.ES

MINISTRY OF THE ENVIRONMENT COPY

FORM NO 0506—4—77 FORM 7

Ontario — Ministry of the Environment

Measurements recorded in: ☐ Metric ☑ Imperial

Well Tag No. (Place Sticker and/or Print Below) A108386

A108386

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

[redacted]

Address of Well Location (Street Number/Name)	Township	Lot	Concession
893 Fallis Line	Caven	pt. 12	5
County/District/Municipality	**City/Town/Village**	**Province**	**Postal Code**
Peterborough	Millbrook	Ontario	L0A 1G0
UTM Coordinates Zone / Easting / Northing	**Municipal Plan and Sublot Number**	**Other**	
NAD 83 17 703452 4892976			

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Brown	Clay	Stones	Hard	0	15
Brown	Sand	Gravel	Loose	15	38
Grey	Clay	Hard	Dense	38	110
Grey	Silt	Clay	Soft	110	168
Grey	Clay		Hard	168	195
Grey	Sand	Silt	Fine	195	203
Grey	Sand		Fine - Sharp	203	208

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	20	Wyoben	

Method of Construction

☐ Cable Tool ☐ Diamond ☑ Rotary (Conventional) ☐ Jetting ☐ Rotary (Reverse) ☐ Driving ☐ Boring ☐ Digging ☐ Air percussion ☐ Other, specify

Well Use

☐ Public ☐ Commercial ☐ Not used ☑ Domestic ☐ Municipal ☐ Dewatering ☐ Livestock ☐ Test Hole ☐ Monitoring ☐ Irrigation ☐ Cooling & Air Conditioning ☐ Industrial ☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
6 1/4	Steel	219	0	203

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	To
5 1/2	S. Steel	8	203	208

Status of Well

☑ Water Supply ☐ Replacement Well ☐ Test Hole ☐ Recharge Well ☐ Dewatering Well ☐ Observation and/or Monitoring Hole ☐ Alteration (Construction) ☐ Abandoned, Insufficient Supply ☐ Abandoned, Poor Water Quality ☐ Abandoned, other, specify ☐ Other, specify

Water Details

Water found at Depth	Kind of Water	
208 (m/ft) ☐ Gas	☑ Fresh ☐ Untested ☐ Other, specify	
(m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify	
(m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify	

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	20	10

Results of Well Yield Testing

After test of well yield, water was: ☑ Clear and sand free ☐ Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft): 175

Pumping rate (l/min / GPM): 10

Duration of pumping: 1 hrs + ____ min

Final water level end of pumping (m/ft): 175

If flowing give rate (l/min / GPM):

Recommended pump depth (m/ft): 175

Recommended pump rate (l/min / GPM): 8

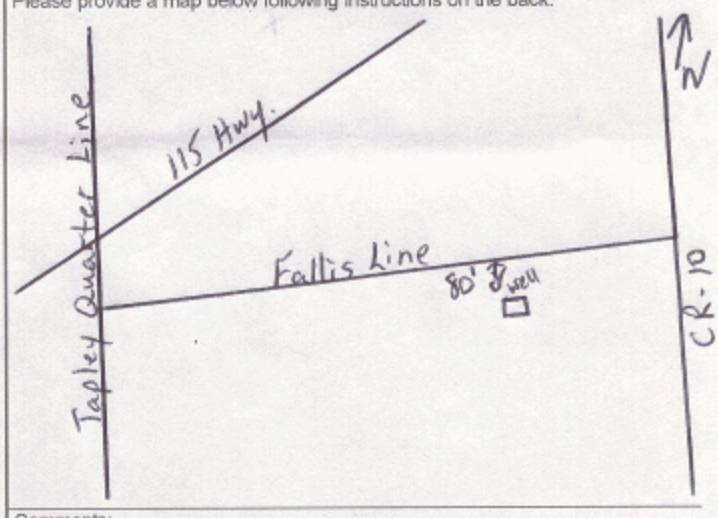
Well production (l/min / GPM): 10

Disinfected? ☑ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	75		
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
50		50	
60		60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Roger Boadway Ent., Ltd.	1113
Business Address (Street Number/Name)	**Municipality**
P.O. Box 397, Sutton West	York
Province	**Postal Code**	**Business E-mail Address**
ON	L0E 1R0	boadwaywells@bellnet.ca
Bus. Telephone No. (inc. area code)	**Name of Well Technician (Last Name, First Name)**
9057225362	Boadway, Grant
Well Technician's Licence No.	**Signature of Technician and/or Contractor**	**Date Submitted**
0029	Grant Boadway	2011 10 04

Well owner's information package delivered ☐ Yes ☐ No

Date Package Delivered: Y Y Y Y M M D D

Date Work Completed: 2011 07 12

Ministry Use Only

Audit No. z128143

Received OCT 14 2011

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Appendix E

Water Balance Calculations

Appendix E.1

Revised Water Budget (Thornthwaite Method) - Average Values*

Weather Station: Peterborough A

Climate Station: 6166418 **Elevation:** 191 masl **Distance Away:** ~ 10.2 km

Month	Mean Temperature (^{o}C)	Heat Index	Unadjusted Potential ET (mm)	Daylight Correction Factor	Adjusted ET (mm)	Total Precipitation (mm)
January	-8.5	0	0	0.78	0	57.4
February	-7.5	0	0	0.88	0	51.5
March	-1.8	0	0	0.99	0	56.1
April	5.9	1.28	28.8	1.12	32.2	68.6
May	12.1	3.81	60.1	1.22	73.3	81.5
June	17	6.38	85.1	1.28	109.0	79.9
July	19.6	7.91	98.5	1.25	123.1	70.6
August	18.3	7.13	91.8	1.15	105.6	77
September	13.9	4.70	69.2	1.04	72.0	85.3
October	7.5	1.85	36.8	0.92	33.8	76.9
November	1.9	0.23	9.0	0.8	7.2	86.4
December	-4.4	0	0	0.76	0	64.2
TOTAL	6.2	33.3	479.3		556.2	855.4

TOTAL WATER SURPLUS: 299.2 mm

Notes:

*Average values of precipitation were used. Average values of temperature were also used.

Appendix E.2
Water Budget Pre-Development

Catchment Designation	PRE-DEVELOPMENT SITE			TOTAL
	Agricultural Areas	Naturalized Areas	Natural Heritage Areas	
Area (m^2)	57224	83876	154600	295700
Pervious Area (m^2)	57224	83876	154600	295700
% Pervious	19.4%	28.4%	52.3%	100.0%
Impervious Area (m^2)	0	0	0	0
% Impervious	0%	0%	0%	0.0%
INFILTRATION FACTORS				
Topography Infiltration Factor	0.1	0.1	0.15	
Soil Infiltration Factor	0.2	0.2	0.2	
Land Cover Infiltration Factor	0.1	0.15	0.2	
MECP Infiltration Factor	0.4	0.45	0.55	
Actual Infiltration Factor	0.4	0.45	0.55	
Runoff Coefficient	0.6	0.55	0.45	
Runoff from Impervious Surfaces*	0	0	0	
INPUTS (PER UNIT AREA)				
Precipitation (mm/yr)	855	855	855	855
Run On (mm/yr)	0	0	0	0
Other Inputs (mm/yr)	0	0	0	0
Total Inputs (mm/yr)	855	855	855	855
OUTPUTS (PER UNIT AREA)				
Precipitation Surplus (mm/yr)	299	299	299	299
Net Surplus (mm/yr)	299	299	299	299
Evaportranspiration (mm/yr)	556	556	556	556
Infiltration (mm/yr)	120	135	165	147
Rooftop Infiltration (mm/yr)	0	0	0	0
Total Infiltration (mm/yr)	120	135	165	147
Runoff Pervious Areas	180	165	135	152
Runoff Impervious Areas	0	0	0	0
Total Runoff (mm/yr)	180	165	135	152
Total Outputs (mm/yr)	855	855	855	855
Difference (Inputs - Outputs)	0	0	0	0
INPUTS (VOLUMES)				
Precipitation (m^3/yr)	48949	71748	132245	252942
Run On (m^3/yr)	0	0	0	0
Other Inputs (m^3/yr)	0	0	0	0
Total Inputs (m^3/yr)	48949	71748	132245	252942
OUTPUTS (VOLUMES)				
Precipitation Surplus (m^3/yr)	17120	25093	46252	88465
Net Surplus (m^3/yr)	17120	25093	46252	88465
Evaportranspiration (m^3/yr)	31830	46654	85993	164476
Infiltration (m^3/yr)	6848	11292	25439	43579
Rooftop Infiltration (m^3/yr)	0	0	0	0
Total Infiltration (m^3/yr)	6848	11292	25439	43579
Runoff Pervious Areas (m^3/yr)	10272	13801	20813	44887
Runoff Impervious Areas (m^3/yr)	0	0	0	0
Total Runoff (m^3/yr)	10272	13801	20813	44887
Total Outputs (m^3/yr)	48949	71748	132245	252942
Difference (Inputs - Outputs)	0	0	0	0

Notes:
Naturalized areas are open, vacant areas that are not used for agriculture and are not natural heritage areas
Agricultural area based upon Peterborough County GIS.
Natural heritage area based upon Conceptual Master Plan CMP-01 dated Jan. 25, 2022.

Appendix E.3

Water Budget Post-Development - No Mitigation Strategies

Catchment Designation	POST-DEVELOPMENT SITE															TOTAL
	Low Density - Singles A, B, C			Med. Density - Townhouse D			Natural	SWM	Road	Road ROWs		Parkland	Commercial Block			
	Lawns	*Rooftops*	*Driveways*	*Lawns*	*Rooftops*	*Driveways*	Heritage	Pond	Widening	*Asphalt*	*Grass*	& Trails	*Landscaping*	*Rooftops*	*Asphalt*	
Area (m^2)	15725	37740	9435	2560	9600	640	154600	16200	1000	15800	15800	3600	910	1690	10400	295700
Pervious Area (m^2)	15725	0	0	2560	0	0	154600	0	1000	0	15800	3600	910	0	0	194195
% Pervious	5.3%	0%	0%	1%	0%	0%	52.3%	0%	0.3%	0%	5.3%	1.2%	0.3%	0%	0%	65.7%
Impervious Area (m^2)	0	37740	9435	0	9600	640	0	16200	0	15800	0	0	0	1690	10400	101505
% Impervious	0%	12.8%	3.2%	0%	3.2%	0.2%	0%	5.5%	0%	5.3%	0%	0%	0%	0.6%	3.5%	34.3%
	INFILTRATION FACTORS															
Topography Infiltration Factor	0.15	0	0	0.15	0	0.1	0.15	0.1	0.1	0.1	0.1	0.15	0.15	0	0	
Soil Infiltration Factor	0.2	0	0	0.2	0	0	0.2	0	0.2	0	0.2	0.2	0.2	0	0	
Land Cover Infiltration Factor	0.15	0	0	0.15	0	0	0.2	0	0.15	0	0.15	0.15	0.15	0	0	
MECP Infiltration Factor	0.5	0	0	0.5	0	0.1	0.55	0.1	0.45	0.1	0.45	0.5	0.5	0	0	
Actual Infiltration Factor	0.5	0	0	0.5	0	0	0.55	0.05	0.45	0	0.45	0.5	0.5	0	0	
Runoff Coefficient	0.5	1	1	0.5	1	1	0.45	0.95	0.55	1	0.55	0.5	0.5	1	1	
Runoff from Impervious Surfaces*	0	0.8	0.8	0	0.8	0.8	0	0.8	0	0.8	0	0.8	0	0.8	0.8	
	INPUTS (PER UNIT AREA)															
Precipitation (mm/yr)	855	855	855	855	855	855	855	855	855	855	855	855	855	855	855	855
Run On (mm/yr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Inputs (mm/yr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Inputs (mm/yr)	855	855	855	855	855	855	855	855	855	855	855	855	855	855	855	855
	OUTPUTS (PER UNIT AREA)															
Precipitation Surplus (mm/yr)	299	684	684	299	684	684	299	684	299	684	299	299	299	684	684	431
Net Surplus (mm/yr)	299	684	684	299	684	684	299	684	299	684	299	299	299	684	684	431
Evaportranspiration (mm/yr)	556	171	171	556	171	171	556	171	556	171	556	556	556	171	171	424
Infiltration (mm/yr)	150	0	0	150	0	0	165	34	135	0	135	150	150	0	0	107
Rooftop Infiltration (mm/yr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Infiltration (mm/yr)	150	0	0	150	0	0	165	34	135	0	135	150	150	0	0	107
Runoff Pervious Areas	150	0	0	150	0	0	135	0	165	0	165	150	150	0	0	91
Runoff Impervious Areas	0	684	684	0	684	684	0	650	0	684	0	0	0	684	684	233
Total Runoff (mm/yr)	150	684	684	150	684	684	135	650	165	684	165	150	150	684	684	324
Total Outputs (mm/yr)	855	855	855	855	855	855	855	855	855	855	855	855	855	855	855	855
Difference (Inputs - Outputs)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	INPUTS (VOLUMES)															
Precipitation (m^3/yr)	13451	32283	8071	2190	8212	547	132245	13857	855	13515	13515	3079	778	1446	8896	252942
Run On (m^3/yr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Inputs (m^3/yr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Inputs (m^3/yr)	13451	32283	8071	2190	8212	547	132245	13857	855	13515	13515	3079	778	1446	8896	252942
	OUTPUTS (VOLUMES)															
Precipitation Surplus (m^3/yr)	4704	25826	6457	766	6569	438	46252	11086	299	10812	4727	1077	272	1157	7117	127560
Net Surplus (m^3/yr)	4704	25826	6457	766	6569	438	46252	11086	299	10812	4727	1077	272	1157	7117	127560
Evaportranspiration (m^3/yr)	8747	6457	1614	1424	1642	109	85993	2771	556	2703	8788	2002	506	289	1779	125382
Infiltration (m^3/yr)	2352	0	0	383	0	0	25439	554	135	0	2127	539	136	0	0	31665
Rooftop Infiltration (m^3/yr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Infiltration (m^3/yr)	2352	0	0	383	0	0	25439	554	135	0	2127	539	136	0	0	31665
Runoff Pervious Areas (m^3/yr)	2352	0	0	383	0	0	20813	0	165	0	2600	539	136	0	0	26988
Runoff Impervious Areas (m^3/yr)	0	25826	6457	0	6569	438	0	10532	0	10812	0	0	0	1157	7117	68908
Total Runoff (m^3/yr)	2352	25826	6457	383	6569	438	20813	10532	165	10812	2600	539	136	1157	7117	95895
Total Outputs (m^3/yr)	13451	32283	8071	2190	8212	547	132245	13857	855	13515	13515	3079	778	1446	8896	252942
Difference (Inputs - Outputs)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes:

Post-Development areas based upon Conceptual Master Plan CMP-01 dated Jan. 25, 2022.

*Evaporation from impervious areas was assumed to be 20% of precipitation.

Asphalt has 0% infiltration capability

Low Density Single Lots: Assume rooftops cover about 60% of the lot. Driveways cover about 15% of the lot; Grass (lawns) cover about 25% of the lot.

Medium Density Townhouse Lots: Assume rooftops cover about 75% of the lot. Driveways cover about 5% of the lot; Grass (lawns) cover about 20% of the lot.

Commercial Lot: Assume rooftops covers about 13% of the lot. Asphalt parking covers about 80% of the lot; Landscaping covers about 7% of the lot.

Road ROWs assumed to be 50% asphalt and 50% grass

Appendix E.4

Water Budget Post-Development - With Downspout Disconnection Mitigation Strategies Only

Catchment Designation	POST-DEVELOPMENT SITE															TOTAL
	Low Density - Singles A, B, C			Med. Density - Townhouse D			Natural	SWM	Road	Road ROWs		Parkland	Commercial			
	Lawns	*Rooftops*	*Driveways*	*Lawns*	*Rooftops*	*Driveways*	**Heritage**	**Pond**	**Widening**	*Asphalt*	*Grass*	**& Trails**	*Landscaping*	*Rooftops*	*Asphalt*	
Area (m^2)	15725	37740	9435	2560	9600	640	154600	16200	1000	15800	15800	3600	910	1690	10400	295700
Pervious Area (m^2)	15725	0	0	2560	0	0	154600	0	1000	0	15800	3600	910	0	0	194195
% Pervious	5.3%	0%	0%	1%	0%	0%	52.3%	0%	0.3%	0%	5.3%	1.2%	0.3%	0%	0%	65.7%
Impervious Area (m^2)	0	37740	9435	0	9600	640	0	16200	0	15800	0	0	0	1690	10400	101505
% Impervious	0%	12.8%	3.2%	0%	3.2%	0.2%	0%	5.5%	0%	5.3%	0%	0%	0%	0.6%	3.5%	34.3%
	INFILTRATION FACTORS															
Topography Infiltration Factor	0.15	0	0	0.15	0	0.1	0.15	0.1	0.1	0.1	0.1	0.15	0.15	0	0	
Soil Infiltration Factor	0.2	0	0	0.2	0	0	0.2	0	0.2	0	0.2	0.2	0.2	0	0	
Land Cover Infiltration Factor	0.15	0	0	0.15	0	0	0.2	0	0.15	0	0.15	0.15	0.15	0	0	
MECP Infiltration Factor	0.5	0	0	0.5	0	0.1	0.55	0.1	0.45	0.1	0.45	0.5	0.5	0	0	
Actual Infiltration Factor	0.5	0	0	0.5	0	0	0.55	0.05	0.45	0	0.45	0.5	0.5	0	0	
Runoff Coefficient	0.5	1	1	0.5	1	1	0.45	0.95	0.55	1	0.55	0.5	0.5	1	1	
Runoff from Impervious Surfaces*	0	0.8	0.8	0	0.8	0.8	0	0.8	0	0.8	0	0.8	0	0.8	0.8	
	INPUTS (PER UNIT AREA)															
Precipitation (mm/yr)	855	855	855	855	855	855	855	855	855	855	855	855	855	855	855	855
Run On (mm/yr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Inputs (mm/yr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Inputs (mm/yr)	855	855	855	855	855	855	855	855	855	855	855	855	855	855	855	855
	OUTPUTS (PER UNIT AREA)															
Precipitation Surplus (mm/yr)	299	684	684	299	684	684	299	684	299	684	299	299	299	684	684	431
Net Surplus (mm/yr)	299	684	684	299	684	684	299	684	299	684	299	299	299	684	684	431
Evaportranspiration (mm/yr)	556	171	171	556	171	171	556	171	556	171	556	556	556	171	171	424
Infiltration (mm/yr)	150	0	0	150	0	0	165	34	135	0	135	150	150	0	0	107
%Rooftop Required to Meet Pre-Development	--	35.5%	--	--	35.5%	--	--	--	--	--	--	--	--	35.5%	--	--
Rooftop Infiltration (mm/yr)	0	243	0	0	243	0	0	0	0	0	0	0	0	243	0	40
Total Infiltration (mm/yr)	150	243	0	150	243	0	165	34	135	0	135	150	150	243	0	147
Runoff Pervious Areas	150	0	0	150	0	0	135	0	165	0	165	150	150	0	0	91
Runoff Impervious Areas	0	441	684	0	441	684	0	650	0	684	0	0	0	441	684	193
Total Runoff (mm/yr)	150	441	684	150	441	684	135	650	165	684	165	150	150	441	684	284
Total Outputs (mm/yr)	855	855	855	855	855	855	855	855	855	855	855	855	855	855	855	855
Difference (Inputs - Outputs)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	INPUTS (VOLUMES)															
Precipitation (m^3/yr)	13451	32283	8071	2190	8212	547	132245	13857	855	13515	13515	3079	778	1446	8896	252942
Run On (m^3/yr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Inputs (m^3/yr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Inputs (m^3/yr)	13451	32283	8071	2190	8212	547	132245	13857	855	13515	13515	3079	778	1446	8896	252942
	OUTPUTS (VOLUMES)															
Precipitation Surplus (m^3/yr)	4704	25826	6457	766	6569	438	46252	11086	299	10812	4727	1077	272	1157	7117	127560
Net Surplus (m^3/yr)	4704	25826	6457	766	6569	438	46252	11086	299	10812	4727	1077	272	1157	7117	127560
Evaportranspiration (m^3/yr)	8747	6457	1614	1424	1642	109	85993	2771	556	2703	8788	2002	506	289	1779	125382
Infiltration (m^3/yr)	2352	0	0	383	0	0	25439	554	135	0	2127	539	136	0	0	31665
Rooftop Infiltration (m^3/yr)	0	9171	0	0	2333	0	0	0	0	0	0	0	0	411	0	11914
Total Infiltration (m^3/yr)	2352	9171	0	383	2333	0	25439	554	135	0	2127	539	136	411	0	43579
Runoff Pervious Areas (m^3/yr)	2352	0	0	383	0	0	20813	0	165	0	2600	539	136	0	0	26988
Runoff Impervious Areas (m^3/yr)	0	16656	6457	0	4237	438	0	10532	0	10812	0	0	0	746	7117	56993
Total Runoff (m^3/yr)	2352	16656	6457	383	4237	438	20813	10532	165	10812	2600	539	136	746	7117	83981
Total Outputs (m^3/yr)	13451	32283	8071	2190	8212	547	132245	13857	855	13515	13515	3079	778	1446	8896	252942
Difference (Inputs - Outputs)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes:

Post-Development areas based upon Conceptual Master Plan CMP-01 dated Jan. 25, 2022.

*Evaporation from impervious areas was assumed to be 20% of precipitation.

Asphalt has 0% infiltration capability

Low Density Single Lots: Assume rooftops cover about 60% of the lot. Driveways cover about 15% of the lot; Grass (lawns) cover about 25% of the lot.

Medium Density Townhouse Lots: Assume rooftops cover about 75% of the lot. Driveways cover about 5% of the lot; Grass (lawns) cover about 20% of the lot.

Commercial Lots: Assume rooftops covers about 13% of the lot. Asphalt parking covers about 80% of the lot; Landscaping covers about 7% of the lot.

Road ROWs assumed to be 50% asphalt and 50% grass

Appendix E.5
Water Budget Summary

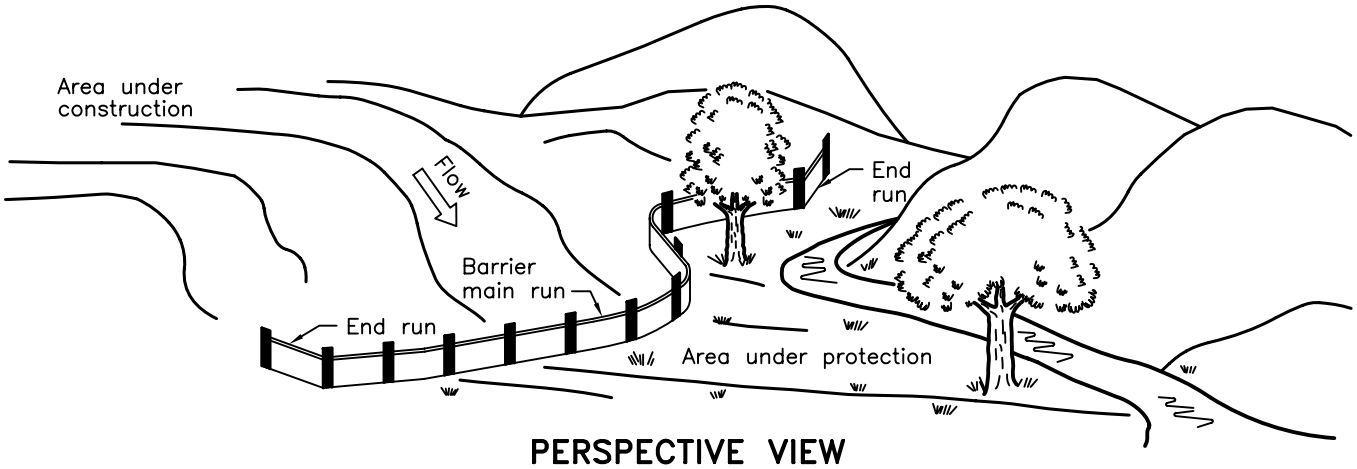
PARAMETER	SITE				
	Pre-Development	*Post-Development No Mitigation*	*Difference Pre- vs. Post-*	*Post-Development with Downspout Disconnection Mitigation*	*Difference Pre- vs. Post-*
		INPUTS (VOLUMES)			
Precipitation (m^3/yr)	252942	252942	0%	252942	0%
Run On (m^3/yr)	0	0	0%	0	0%
Other Inputs (m^3/yr)	0	0	0%	0	0%
Total Inputs (m^3/yr)	252942	252942	0%	252942	0%
		OUTPUTS (VOLUMES)			
Precipitation Surplus (m^3/yr)	88465	127560	44%	127560	44%
Net Surplus (m^3/yr)	88465	127560	44%	127560	44%
Evapotranspiration (m^3/yr)	164476	125382	-24%	125382	-24%
Infiltration (m^3/yr)	43579	31665	-27%	31665	-27%
% Rooftop Runoff to balance infiltration	--	--	--	35.5%	--
Rooftop Infiltration (m^3/yr)	0	0	0%	11914	--
Total Infiltration (m^3/yr)	43579	31665	-27%	43579	0%
Runoff Pervious Areas (m^3/yr)	44887	26988	-40%	26988	-40%
Runoff Impervious Areas (m^3/yr)	0	68908	--	56993	--
Total Runoff (m^3/yr)	44887	95895	114%	83981	87%
Total Outputs (m^3/yr)	252942	252942	0%	252942	0%

To maintain pre-development infiltration values; 35.5% of post-development rooftop runoff needs to be infiltrated.

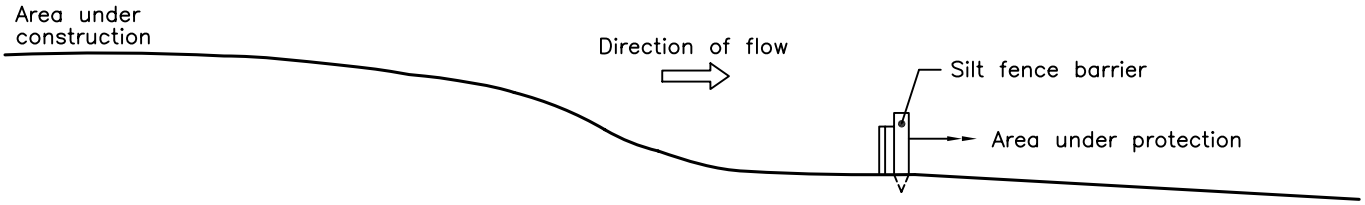
APPENDIX "I"

Erosion & Sediment Control Details

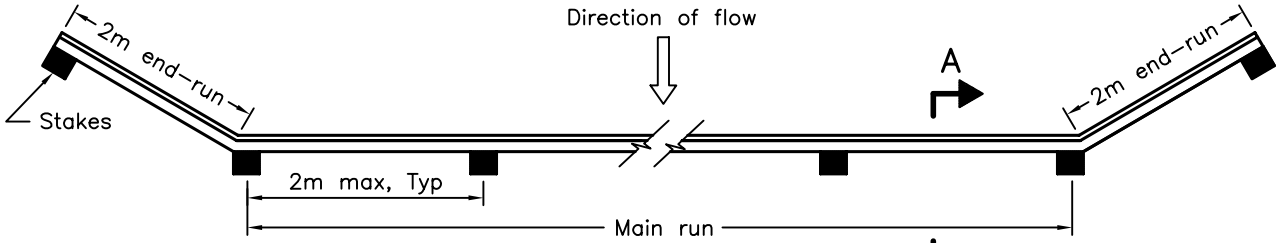
VALDOR



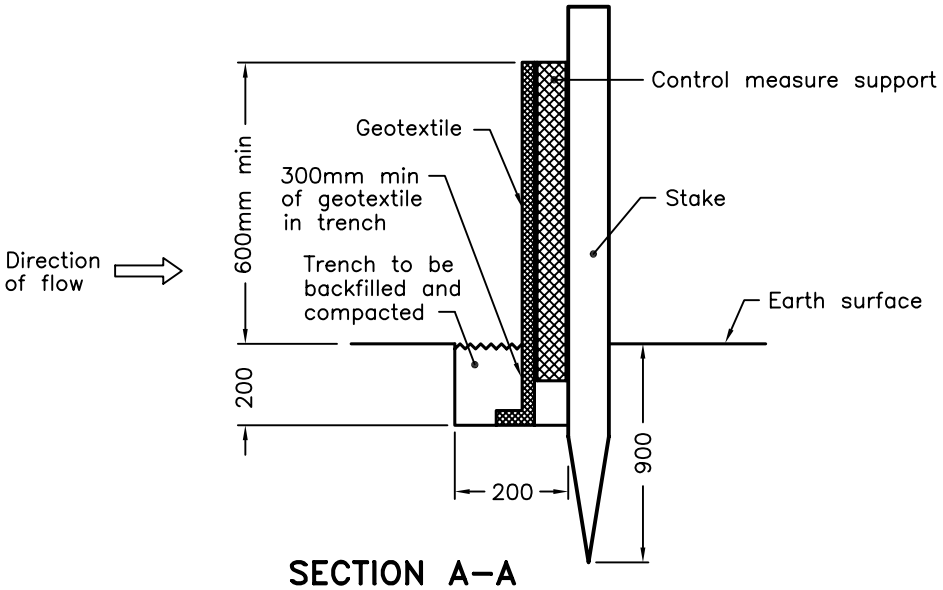
PERSPECTIVE VIEW



SECTION



PLAN

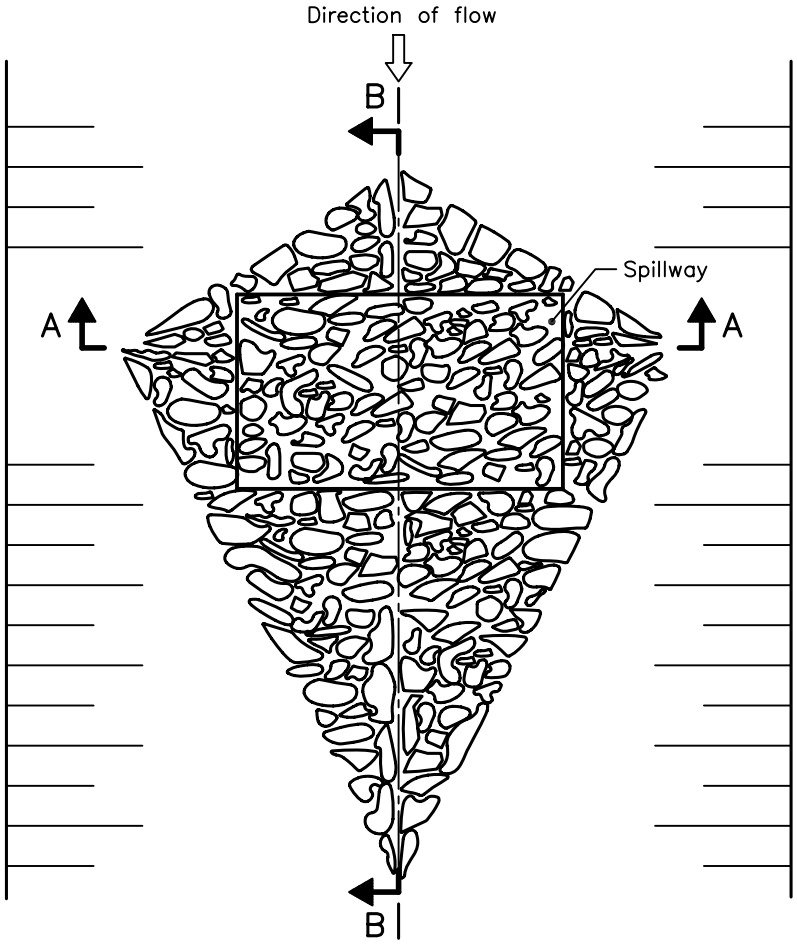


SECTION A–A

NOTE:

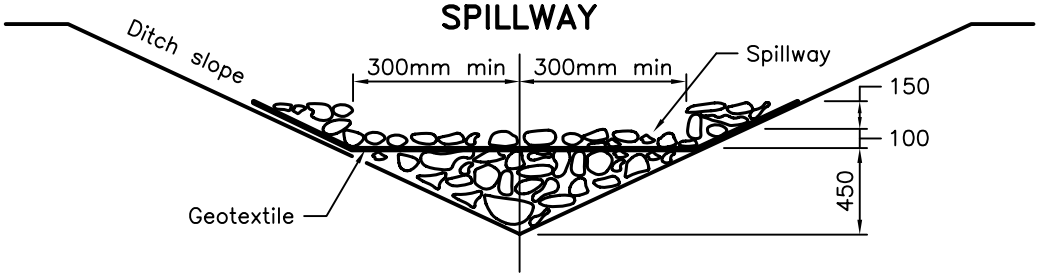
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2006	Rev	1
HEAVY–DUTY SILT FENCE BARRIER			
	OPSD 219.130		

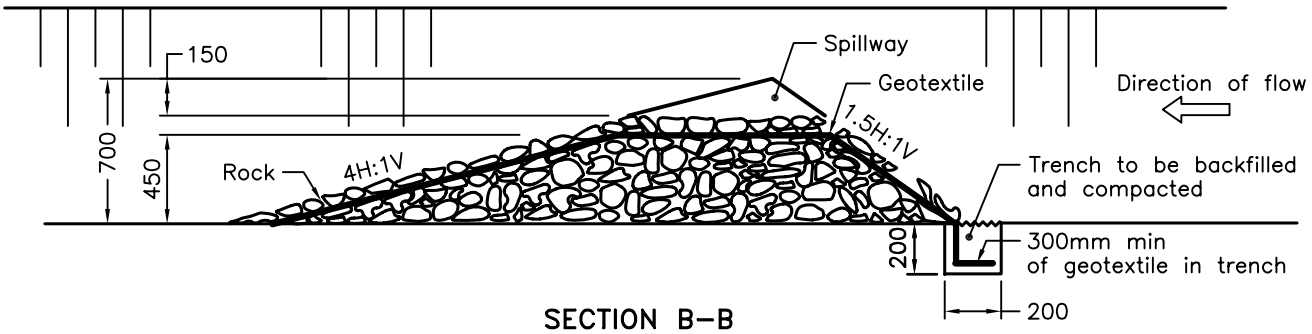


PLAN

SPILLWAY



SECTION A–A



SECTION B–B

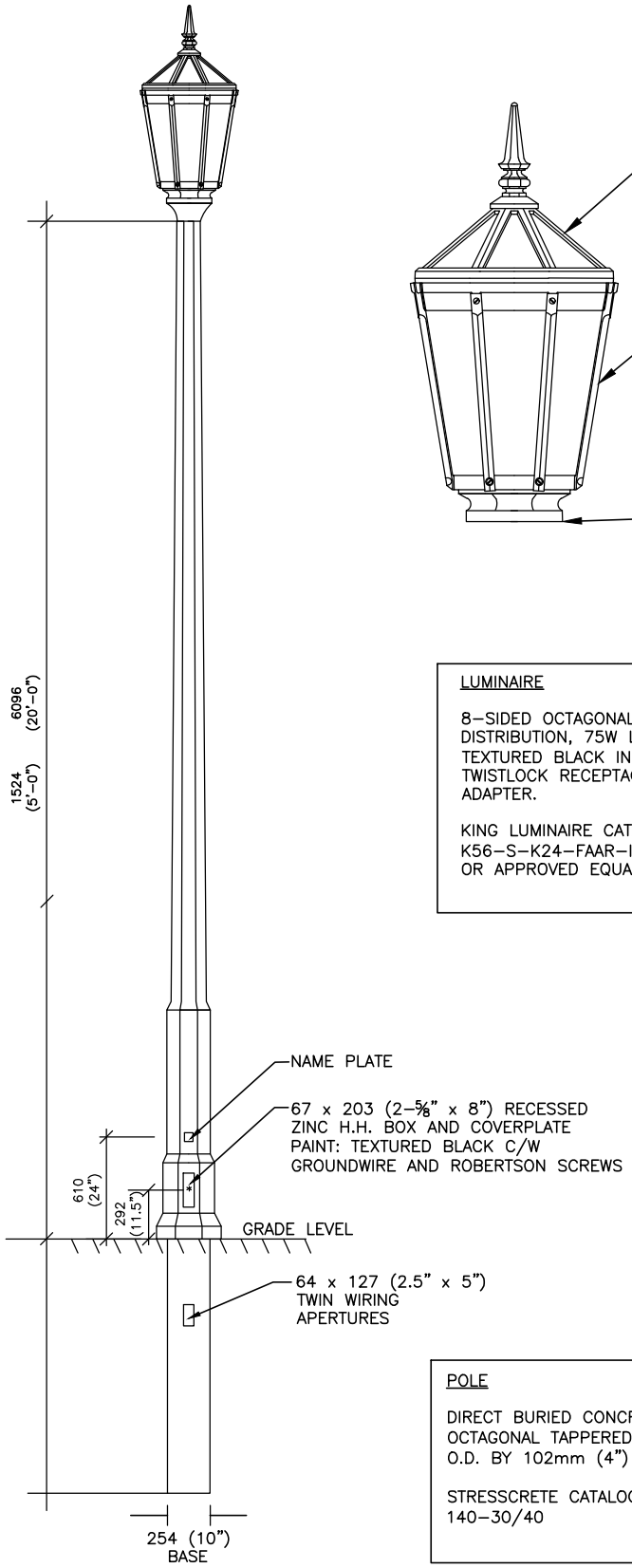
NOTE:

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2006	Rev	1
ROCK FLOW CHECK DAM V–DITCH			
	OPSD 219.210		

APPENDIX "J"

Typical Joint Utility Trench & Street Light Detail



LUMINAIRE

8–SIDED OCTAGONAL POST–TOP LUMINAIRE, TYPE III DISTRIBUTION, 75W LED, RIPPLED ACRYLIC LENS, TEXTURED BLACK IN COLOUR, 120VAC, C/W TWISTLOCK RECEPTACLE AND K24 CAPITAL POLE ADAPTER.

KING LUMINAIRE CATALOGUE NO:
K56–S–K24–FAAR–III–75(SSL)–5000–120–PR–#6
OR APPROVED EQUAL

POLE

DIRECT BURIED CONCRETE POLE, BLACK POLISHED AND, OCTAGONAL TAPPERED SECTION, COMPLETE WITH 76mm (3") O.D. BY 102mm (4") LONG TENON

STRESSCRETE CATALOGUE NO.: KCH20–G–S11–DB C/W 140–30/40

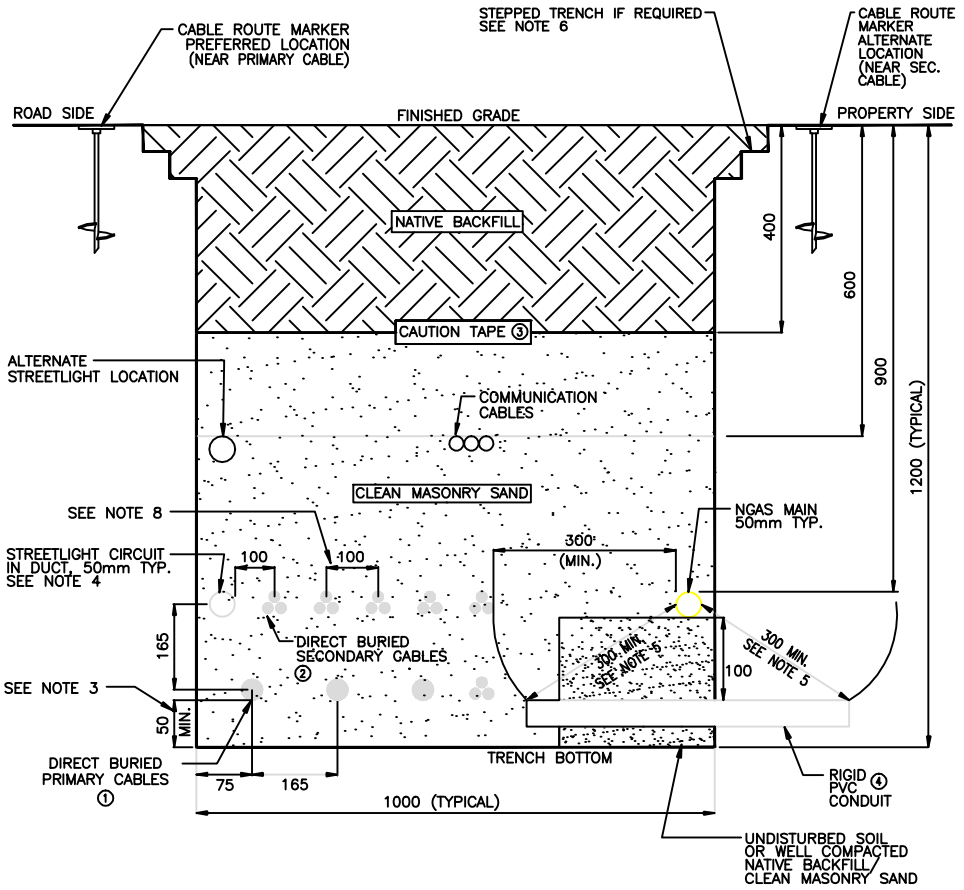
MILLBROOK SOUTH EAST SUBDIVISION

STREET LIGHT DETAIL

VALDOR ENGINEERING INC.
Consulting Engineers - Project Managers
741 ROWNTREE DAIRY ROAD, SUITE 2, WOODBRIDGE, ONTARIO, L4L 5T9
TEL (905)264-0054, FAX (905)264-0069
E-MAIL: info@valdor-engineering.com
www.valdor-engineering.com

SCALE	N.TS.	PROJECT	19121
DATE	March, 2022	DRAWN BY	V.L.

FIGURE J1



NOTES:
1. ALL DIMENSIONS ARE IN mm UNLESS STATED OTHERWISE.
2. ALL SEPARATIONS AND DEPTHS OF BURIAL ARE MINIMUM.
3. IN THE PRESENCE OF SHARP ROCK, DEBRIS OR RUBBLE, INCREASE SAND PADDING TO 100mm
4. STREETLIGHT WIRE DUCT MAY BE INSTALLED AT A REDUCED BURIAL DEPTH, UP TO A MINIMUM DEPTH OF 600mm, SEPARATIONS TO SUPPLY CABLE BASED ON MAXIMUM STREETLIGHT DUCT DIAMETER OF 50mm.
5. MUST MAINTAIN 300mm MINIMUM FROM ALL EXPOSED SUPPLY CABLES TO GAS MAIN. WHEN CROSSING GAS MAIN AND IF 300mm OF CLEAR VERTICAL SEPARATION IS NOT ACHIEVABLE, SECONDARY CABLES SHALL BE INSTALLED IN SHORT LENGTH OF RIGID PVC CONDUIT.
6. CONSTRUCTION, STEPPING AND/OR SUPPORTING OF THE TRENCH WALL TO CONFORM TO THE REQUIREMENTS OF THE OCCUPATIONAL HEALTH AND SAFETY ACT.
7. NON-REQUIRED CIRCUITS OR JOINT USE COMPONENTS MAY BE OMITTED PROVIDED THAT CLEARANCES AND SEPARATIONS ARE MAINTAINED. PRIMARY CABLES (IF PRESENT) MUST BE INSTALLED ON THE BOTTOM ROW OF SUPPLY CABLES. SECONDARY CABLE BUNDLES MAY BE SUBSTITUTED IN PLACE OF PRIMARY CABLE(S) WHEN REQUIRED.
8. INTERMITTENT CONTACT IS ALLOWABLE BETWEEN SECONDAY CABLES WHERE REQUIRED.

PART #	MASTER MATERIAL #	DESCRIPTION	QTY.
(1)	30010134 30006080	CABLE PRIMARY, 25kV, UGROUND, 2/0 AWG, AL CABLE PRIMARY, 25kV, UGROUND, 350 KCMIL, CU	
(2)	30005908 30005915	SERVICE CABLE, UGROUND, 3/0AWG, 3 COND, AL SERVICE CABLE, UGROUND, 250KCMIL, 3 COND, AL	
(3)	20002181	CAUTION TAPE	
(4)	30007542	RIGID PVC CONDUIT	

REFERENCES:

SECTION 1 – DEFINITIONS
SECTION 3C – CONSTRUCTION GUIDE
SECTION 16 – MATERIALS

Rev. No.	Issue Date	Revision	Dwn	Approved By
02	JULY 2011	GENERAL REVISIONS	PC	
			Chk	Date

hydro one **Hydro One Networks Inc.**

Drawn:	Approved:	Date:
P.CIARMOLI	*	JULY.20,2011

JOINT TRENCH - POWER, COMMUNICATION & GAS DISTRIBUTION LINES - TYPICAL

Dwg. No. **DU-03-206.1** Rev. **02**

APPENDIX "K"

Growth Management Strategy & Master Servicing Study Update

VALDOR

Council Presentation

Township of Cavan Monaghan
October 18, 2021

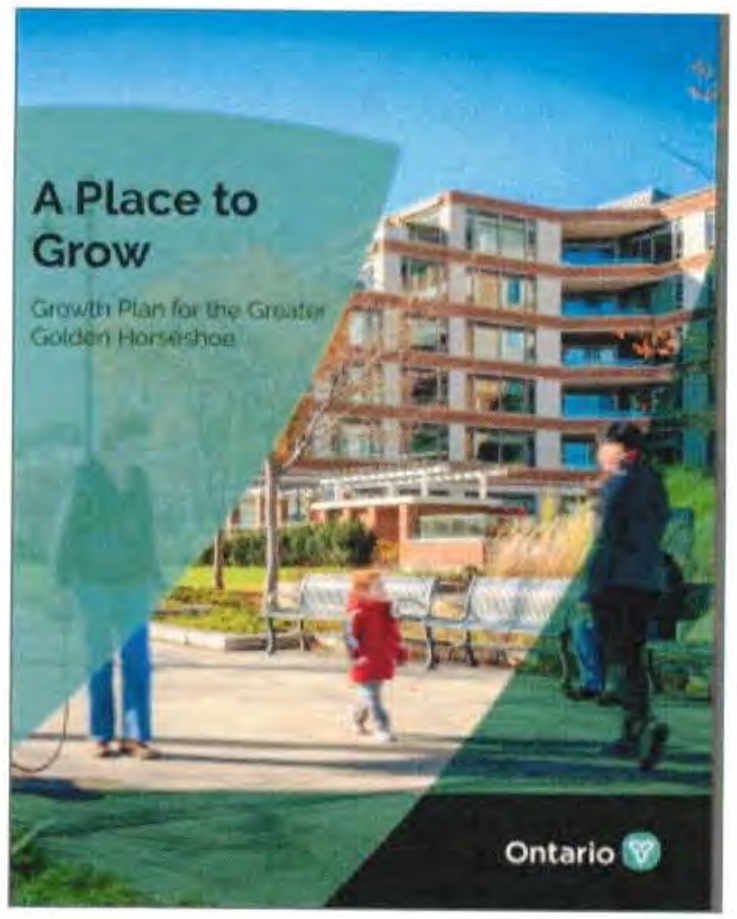
Growth Management Strategy & Master Servicing Study Update

arva
R.V. Anderson Associates Limited
engineering • environment • infrastructure
Watson & Associates ECONOMISTS LTD.

PURPOSE OF GROWTH MANAGEMENT STRATEGY (G.M.S.) UPDATE

- The Growth Plan (2019) now requires upper-tier municipalities to plan for long-term population and employment growth to the year 2051.
- To conform with the Growth Plan, upper-tier municipalities must have new Official Plans approved by July 2022.
- In addition to the above, Council have also requested that the scope of the G.M.S. be expanded to specially review Special Study Area No. 1 (SSA-1) as a potential location for future development in the Township over the long-term.
- As a part of this process, the Township of Cavan Monaghan is updating its population, housing and employment forecasts to include the 2041 to 2051 timeframe.

PETERBOROUGH COUNTY GROWTH FORECAST



Growth Plan Schedule 3 Growth Forecast for Peterborough County, 2016 to 2051

25,000 population

10,000 jobs

Annual population growth rate of **1%** and employment growth rate of **1.4%**

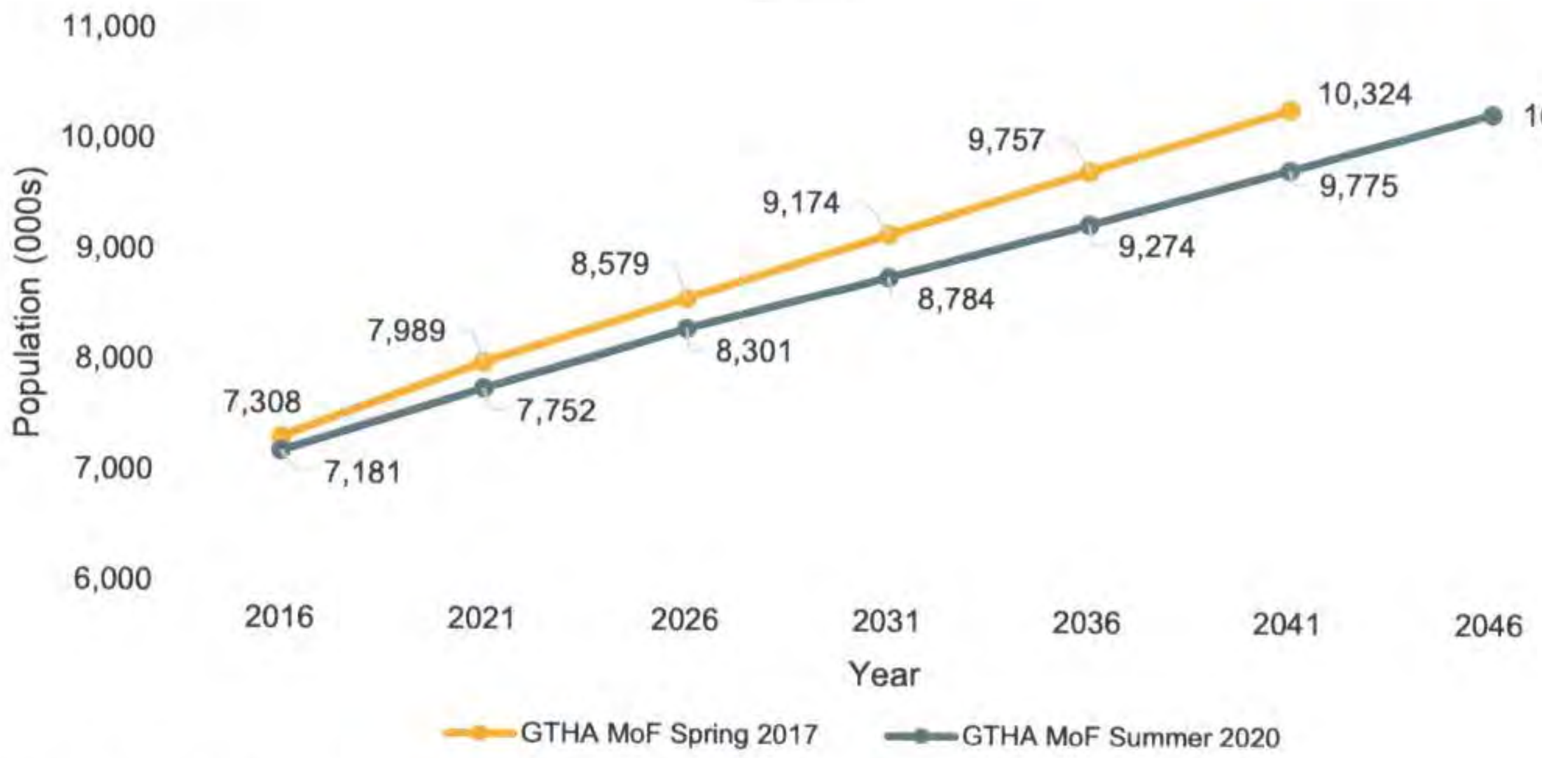
- Schedule 3 Growth Forecasts are to be treated as minimums.
- Higher growth forecast alternatives are permitted, providing that the Municipal Comprehensive Review (M.C.R.) demonstrate that the higher growth scenario meets the Growth Plan, 2020 policy objectives regarding housing choice and labour force supply.

Watson & Associates ECONOMISTS LTD.

PETERBOROUGH COUNTY GROWTH DRIVERS AND DISRUPTORS

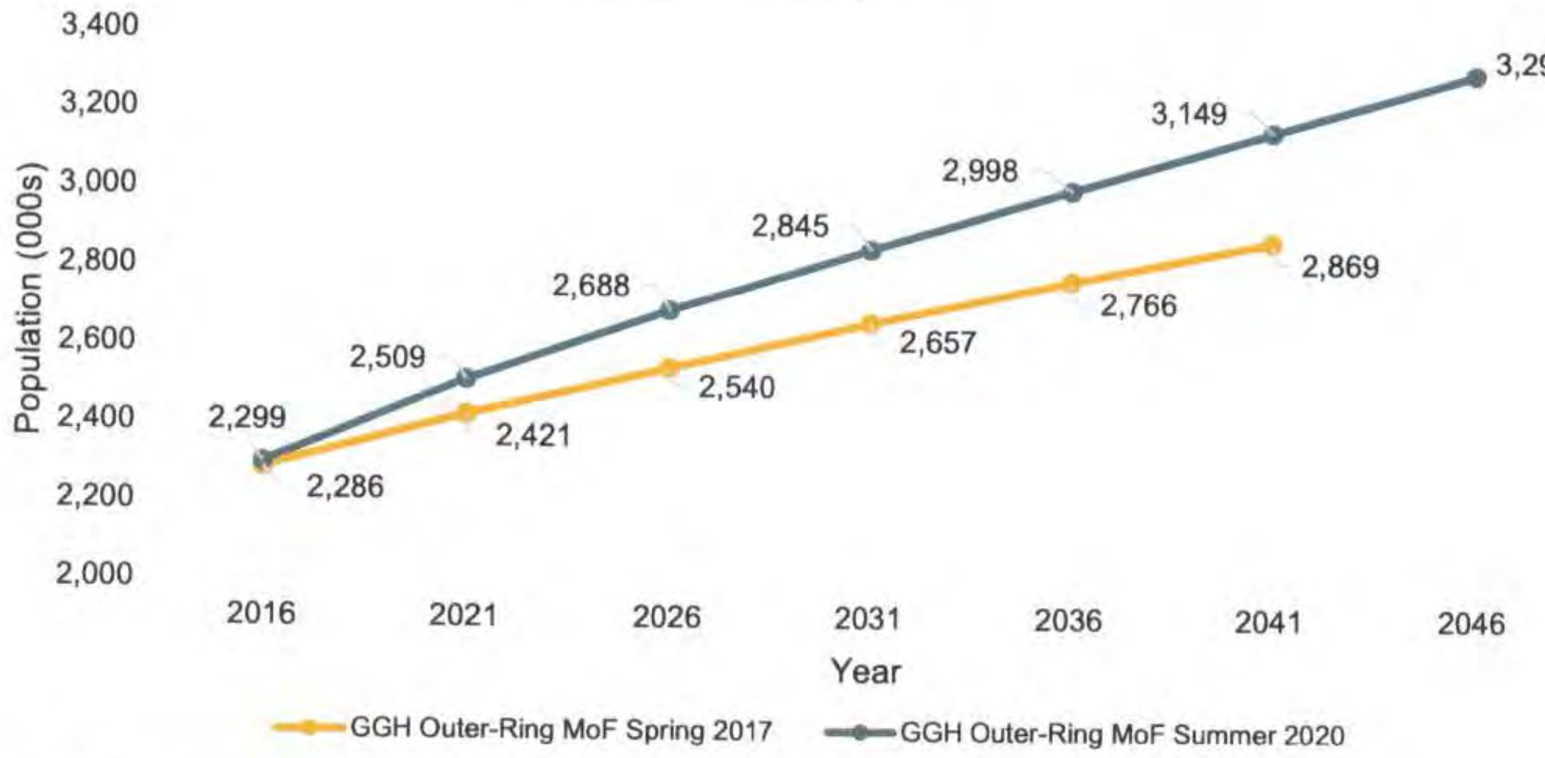
GTHA and GGH Outer Ring Ministry of Finance Population Forecasts

GTHA



Source: Derived from Ministry of Finance Ontario Population Projections Spring 2017 and Summer 2020 releases, by Watson & Associates Economists Ltd., 2020.

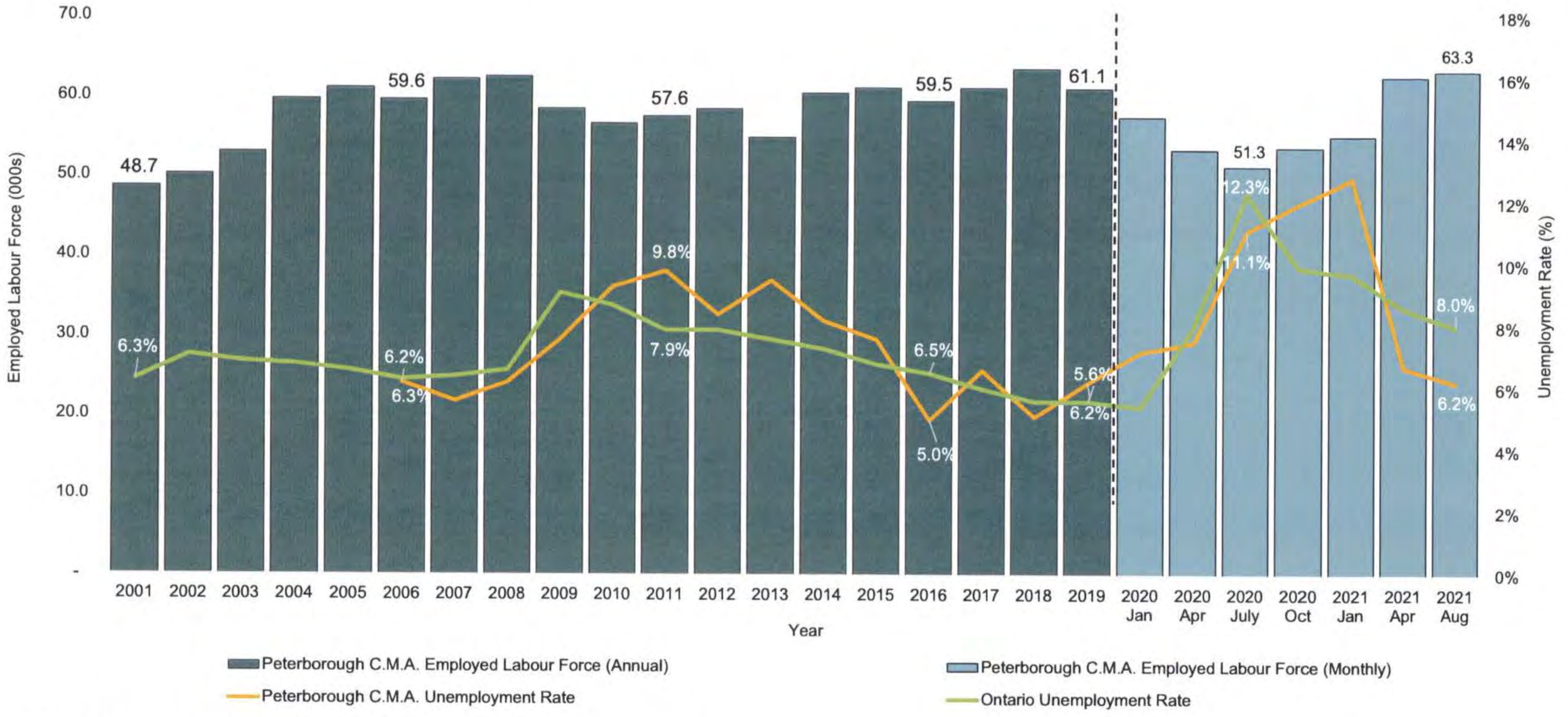
GGH Outer-Ring



Source: Derived from Ministry of Finance Ontario Population Projections Spring 2017 and Summer 2020 releases by Watson & Associates Economists Ltd., 2020.

Watson & Associates ECONOMISTS LTD.

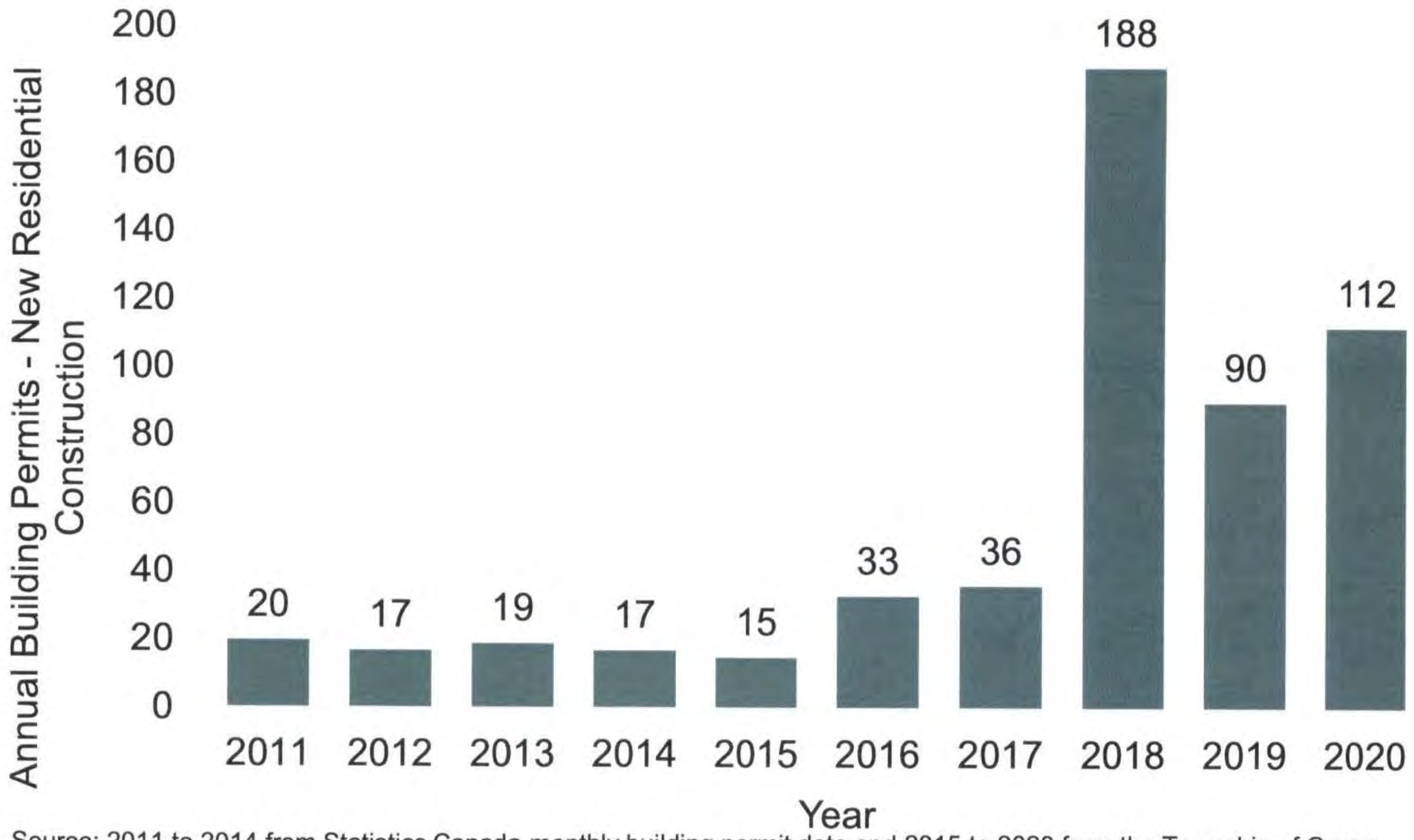
PETERBOROUGH C.M.A. LABOUR FORCE TRENDS, 2006 TO 2021 YTD



Note: Statistics Canada Labour Force Survey and Census labour force statistics may differ.
Source: Statistics Canada Data Tables 14-10-0098-01 and 14-10-0380-01. By Watson & Associates Economists Ltd., 2021.

Watson & Associates ECONOMISTS LTD.

CAVAN MONAGHAN HISTORICAL BUILDING PERMIT ACTIVITY, 2011 TO 2020



Source: 2011 to 2014 from Statistics Canada monthly building permit data and 2015 to 2020 from the Township of Cavan Monaghan. Figure by Watson & Associates Economists Ltd., 2021.
Note: Building permit activity does not account for demolitions.

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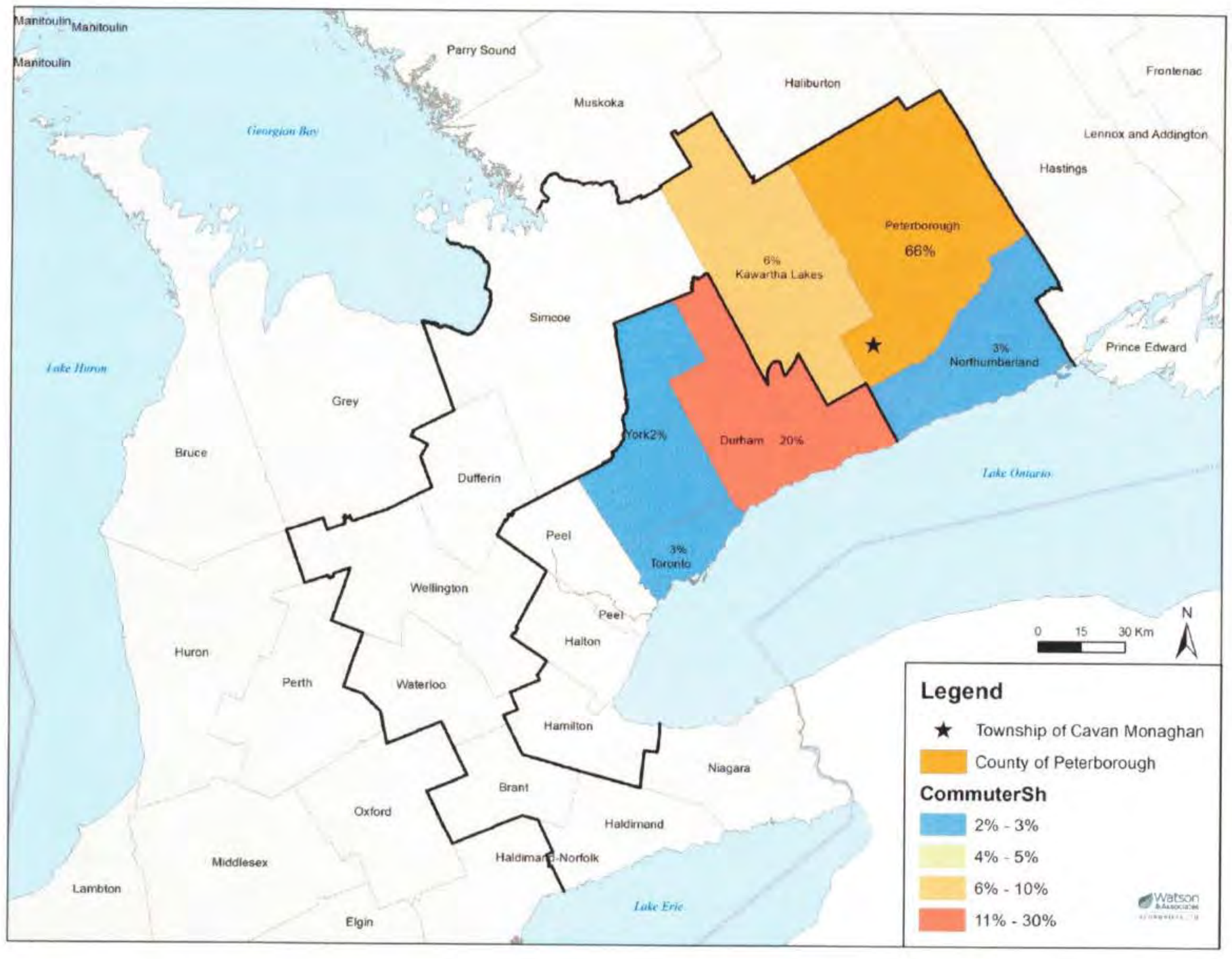
REGIONAL CONTEXT

- Township of Cavan Monaghan Commuter-Shed



- 1,078,000 increase in Primary Commuter Shed jobs from 2016-2051.
- 1.1% Annual employment growth rate 2016-2051.
- Primary commuter shed is 95% of the Townships' total commuter shed.

Township of Cavan Monaghan Primary Commuter Shed Employment Forecast		
2016	2051	2016-2051
2,435,000	3,513,000	1,078,000

Watson & Associates ECONOMISTS LTD.

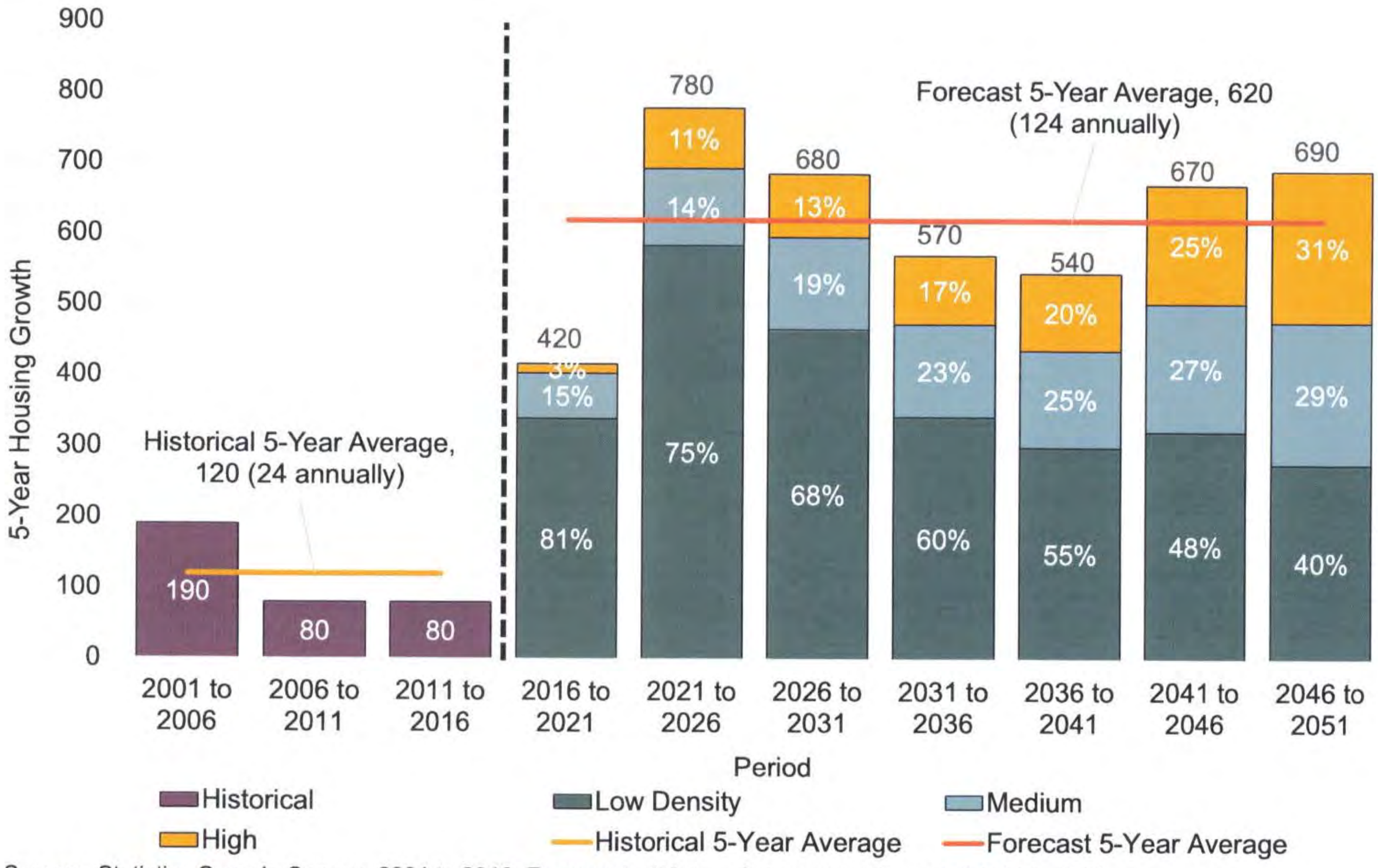
Preliminary Population, Housing, and Employment Forecasts

TOWNSHIP OF CAVAN MONAGHAN POPULATION GROWTH SCENARIOS, 2016 TO 2051

Source: 2001 to 2016 from Statistics Canada Census. Forecast by Watson & Associates Economists Ltd., 2021.
Note: Population includes the net Census undercount estimated at 2.5%.

Watson & Associates ECONOMISTS LTD.

CAVAN MONAGHAN HOUSING FORECAST BY TYPE, 2016 TO 2051



Source: Statistics Canada Census, 2001 to 2016. Forecast by Watson & Associates Economists Ltd., 2021.

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TOWNSHIP OF CAVAN MONAGHAN INTENSIFICATION OUTLOOK

Current Local Official Plan Intensification Target:

20%

Current Minimum Growth Plan Intensification Target:

40%

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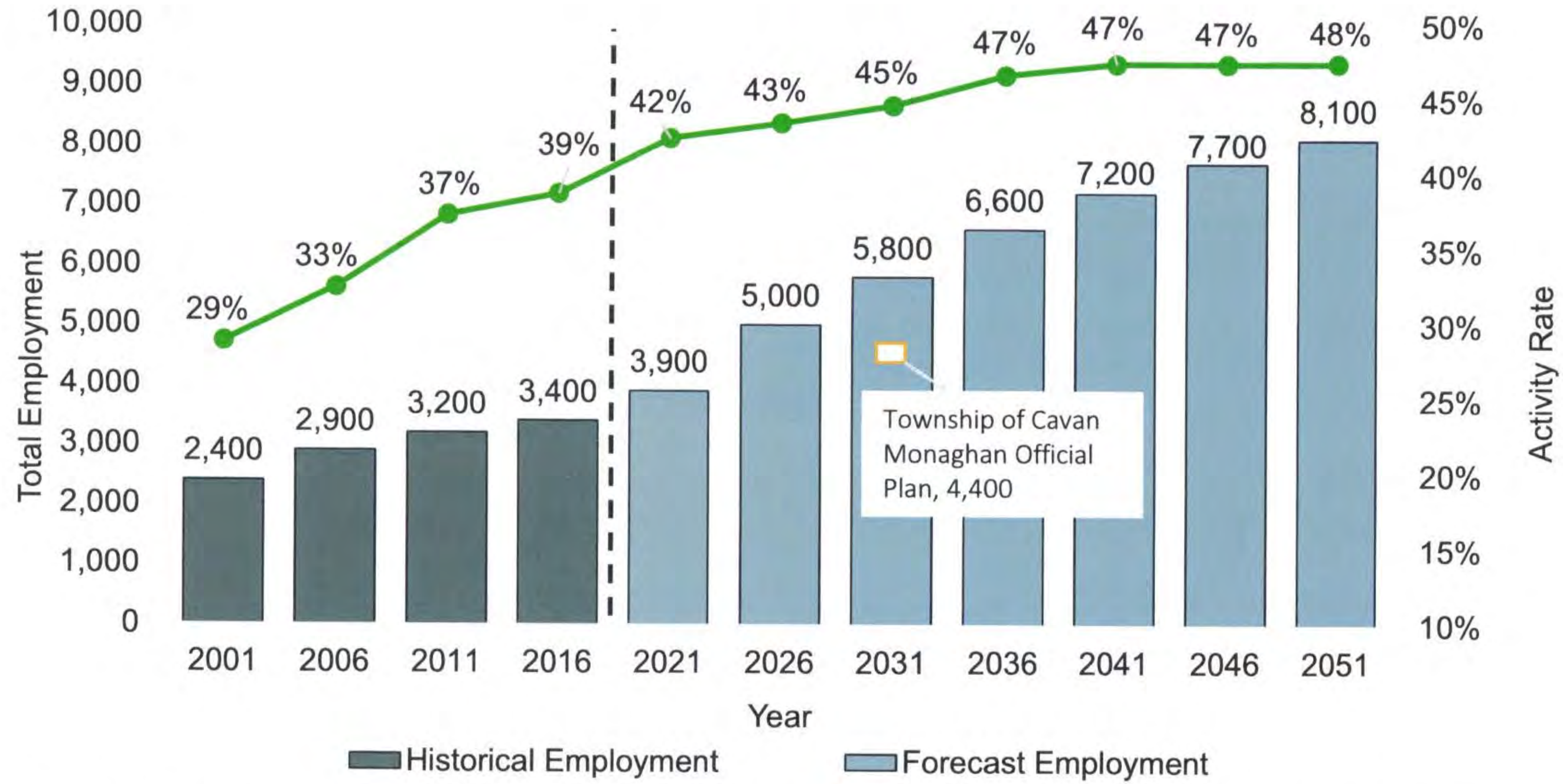
TOWNSHIP OF CAVAN MONAGHAN EMPLOYMENT FORECAST, 2016 TO 2051



Source: 2001 to 2016 from Statistics Canada place of work data including work at home and no fixed place of work. Forecast by Watson & Associates Economists Ltd., 2021.
Note: Numbers have been rounded.

Watson & Associates ECONOMISTS LTD.

TOWNSHIP OF CAVAN MONAGHAN GROWTH FORECAST, 2016 TO 2051

Total Population (Including Undercount)[1]	Historical		Incremental Growth	Forecast			Incremental Growth	Annual Growth Rate	
	2001	2016	2001-2016	2031	2041	2051	2016-2051	2001-2016	2016-2051
Peterborough County	56,600	57,200	600			82,000	24,800	0.1%	1.0%
Township of Cavan Monaghan	8,800	9,000	200	13,200	15,500	18,800	9,800	0.2%	2.1%
Cavan Monaghan Growth Share of Peterborough County			33%				40%		

[1] Includes the net Census undercount estimated at 2.5%.

Total Employment[1]	Historical		Incremental Growth	Forecast			Incremental Growth	Annual Growth Rate	
	2001	2016	2001-2016	2031	2041	2051	2016-2051	2001-2016	2016-2051
Peterborough County	15,000	15,900	900			26,000	10,100	0.4%	1.4%
Township of Cavan Monaghan	2,400	3,400	1,000	5,800	7,200	8,700	5,300	2.3%	2.7%
Cavan Monaghan Growth Share of Peterborough County			111%				52%		

[1] Includes 'no fixed place of work' employment.

Watson & Associates ECONOMISTS LTD.

Millbrook Master Servicing to 2041

OUTLINE

- Existing Conditions of Facilities (2019)
- Servicing of Short-Term Growth (~2026)
- Servicing of Long-Term Growth (2041)
- Growth Beyond 2041
- Questions and Comments

ACRONYMS

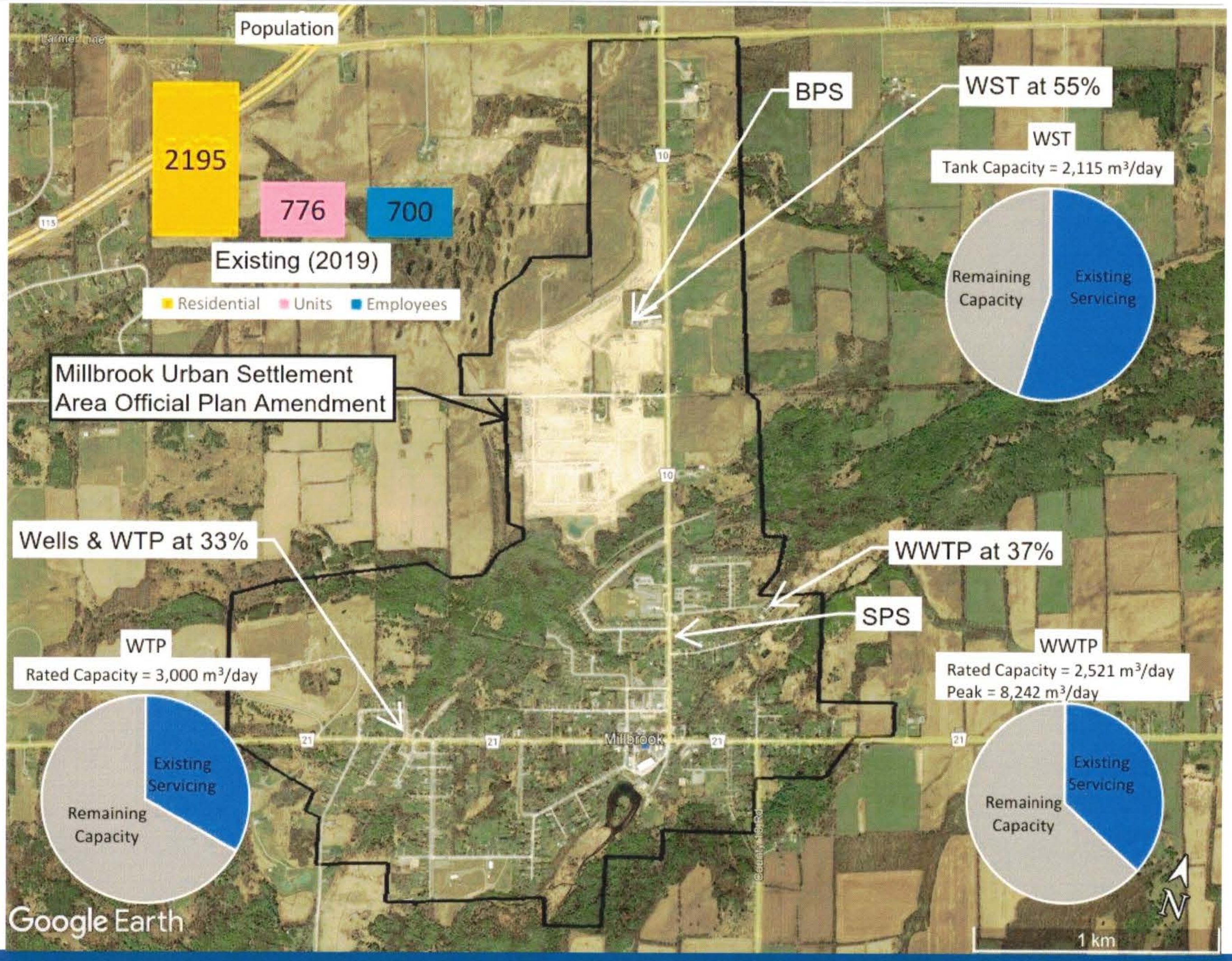
- TCM: Township of Cavan Monaghan
- WWTP: Wastewater Treatment Plant
- WTP: Water Treatment Plant
- WST: Water Storage Tank
- SPS: Sewage Pumping Station
- BPS: Booster Pumping Station
- ICI: Institutional, Commercial and Industrial

EXISTING CONDITIONS OF FACILITIES (2019)

- Servicing for:
  - 776 residential units
  - 2,195 residential population
  - 700 employees

- Servicing usage:
  - WWTP operating at 31% of rated capacity 2,521 m^3/day and 37% of peak capacity of 8,242 m^3/day
  - WTP operating at 33% of 3,000 m^3/day rated capacity
  - WST operating at 55% of 2,115 m^3 storage volume

EXISTING CONDITIONS OF FACILITIES (2019)



SERVICING OF SHORT-TERM GROWTH (~2026)

- Planned and in progress growth includes:
  - Towerhill South (345 units)
  - Towerhill North (718 units)
  - Coldbrook Drive (former Nina Court) (32 units)
  - Various ICI properties

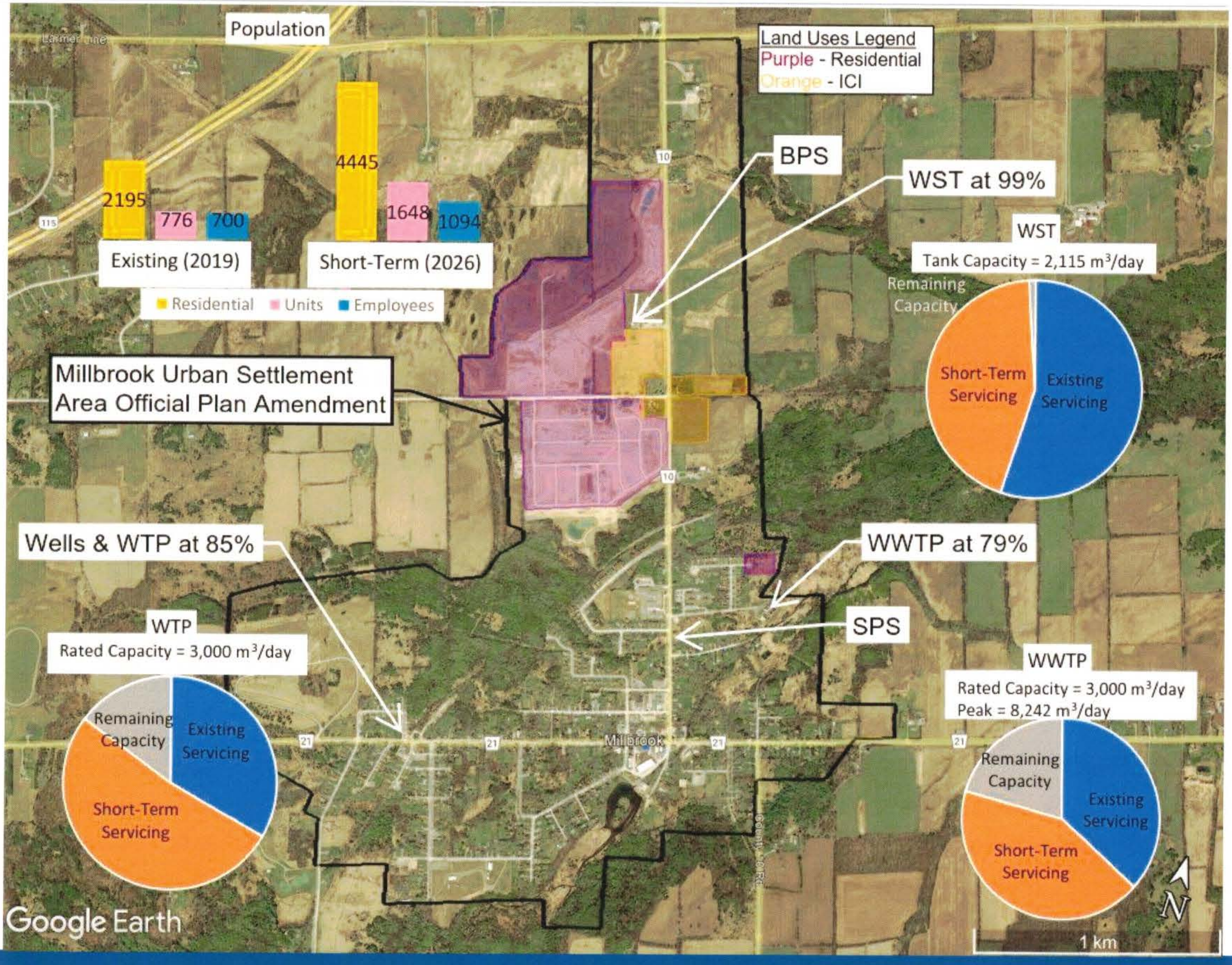
- Servicing for:
  - 1,648 residential units (872 additional from existing)
  - 4,445 residential population (2,250 additional from existing)
  - 1,094 employees (394 additional from existing)

SERVICING OF SHORT-TERM GROWTH (~2026)

- Required facility upgrades:
  - Stress testing and re-rating the WWTP to 3,000 m^3/day (with associated upgrades)
  - Possible upgrades to Tupper St. SPS
  - Booster Pumping Station capacity expansion
  - No further Class EA is required prior to design and construction, unless land acquisition or bldg. expansions are required
  - Total preliminary cost estimate (engineering + capital) of ~$1.4M (Anticipated to be funded by Development Charges)

- Servicing usage:
  - WWTP operating at 37% of 3,000 m^3/day rated capacity and 79% of 8,242 m^3/day peak capacity
  - WTP operating at 85% of 3,000 m^3/day rated capacity
  - WST operating at 99% of 2,115 m^3 storage volume

SERVICING OF SHORT-TERM GROWTH (~2026)



SERVICING OF LONG-TERM GROWTH (2041)

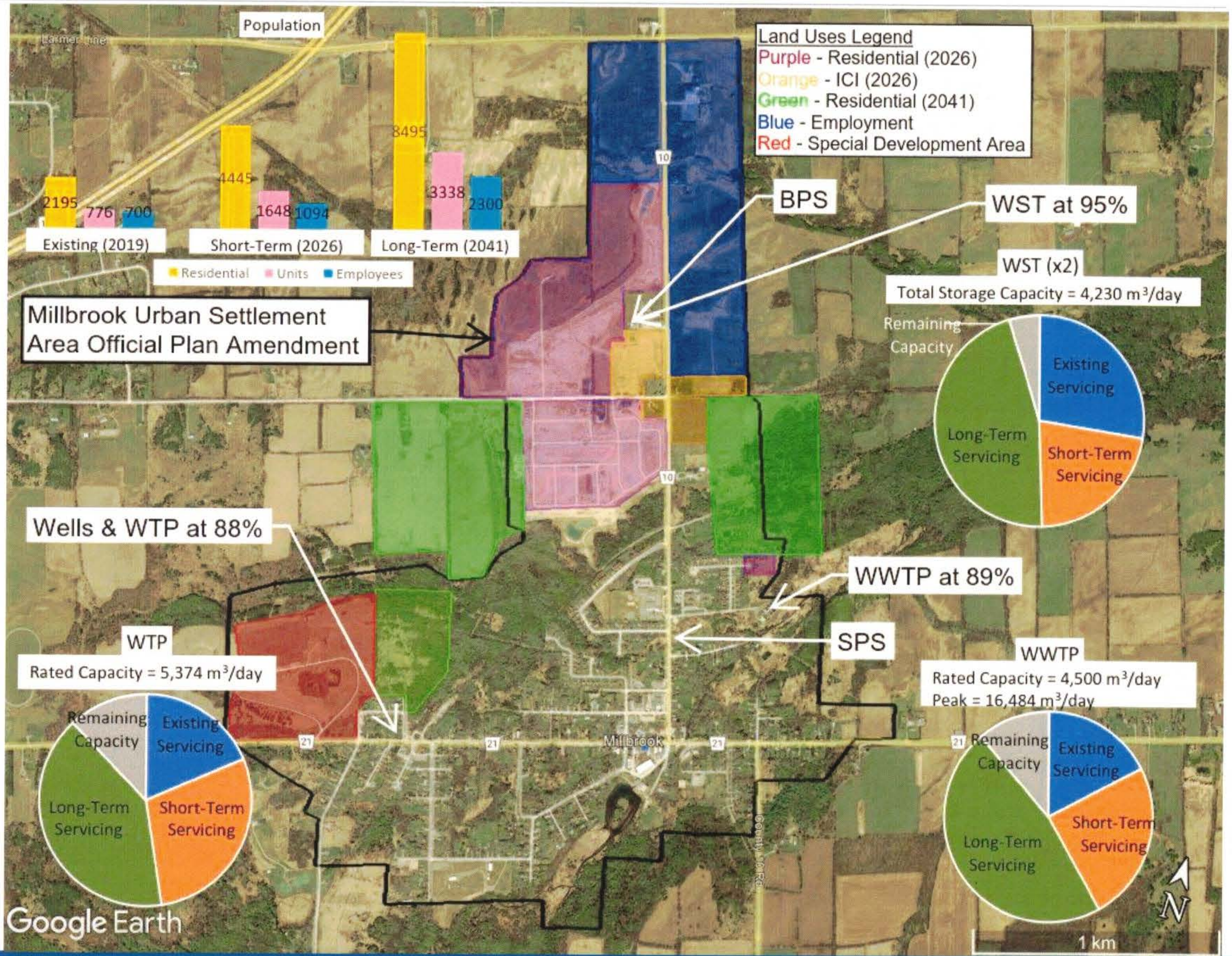
- Active and anticipated applications:
  - Fallis Line East (244 units) - active
  - Fallis Line West (696 units) - active
  - Turner Street (85 units) - active
  - Duke Street (192 units) - anticipated
  - Downtown intensification - ongoing
  - Northern employment areas – anticipated

- Servicing for:
  - 3,338 residential units (1,690 additional from 2026; 2,562 additional from existing)
  - 8,495 residential population (4,050 additional from 2026; 6,300 additional from existing)
  - 2,300 employees (1,206 additional from 2026; 1,600 additional from existing)

SERVICING OF LONG-TERM GROWTH (2041)

- Required facility upgrades:
  - WWTP expansion (addition of 3rd train)
  - Potential new SPS for North employment lands
  - Groundwater exploration, WTP expansion (well supply and treatment)
  - New BPS (depending where growth occurs)
  - Construction of new 2,115 m^3 WST (location dependent on where growth occurs)
  - These upgrades will require another Class EA prior to design and construction
  - Total project (engineering + capital) cost estimate of ~$38M (Anticipated to be funded by Development Charges)
- Servicing usage:
  - WWTP operating at 89% of expanded rated capacity of 4,500 m^3/day
  - WTP operating at 88% of expanded rated capacity of 5,374 m^3/day
  - WSTs operating at 95% of both tanks, with a total storage volume of 4,230 m^3

SERVICING OF LONG-TERM GROWTH (2041)



GROWTH BEYOND 2041

- Baxter creek assimilative capacity cannot support additional wastewater effluent beyond 2041 based on the current regulation requirements and limit of technology
  - Therefore, it will prevent any additional growth in Millbrook
  - However, the design criteria and technology may change over time and can be reassessed in future
    - Millbrook groundwater supply source (well field) near its capacity
    - Forecasted Township of Cavan Monaghan growth will need to occur outside of Millbrook
    - Further investigation and discussions are needed to consider growth beyond 2041 and where that might be located

NEXT STEPS

- Public Works to provide an updated report to Council on next steps.
- Peterborough County will be providing an update on local municipal growth projections on October 29th.
- Watson and Township Staff will work with Peterborough County to discuss the growth and land needs to 2051 in the Township of Cavan Monaghan.
- After these discussions, Watson will finalize the updated GMS that Staff will bring back to Council at a later date.
- Upcoming Water and Wastewater Master Servicing Study Public Information Centre at a later date.
- Public works to provide final Master Servicing recommendations to Council at a later date.

QUESTIONS AND COMMENTS

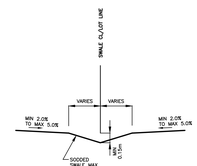
NOTE:

Distances Shown On This Plan Are In Metres And Can Be Converted To Feet By Dividing By 0.3048

The Position of Pole Lines, Conduits, Watermains, Sewers and Other Underground and Overground Utilities and Structures is Not Necessarily Shown On The Contract Drawing, And Where Shown, The Accuracy Of The Position of Such Utilities and Structures is Not Guaranteed Before Starting Work, The Contractor Shall Inform Himself Of The Exact Location of All Such Utilities and Structures, and Shall Assume All Liability For Damage To Them.

LEGEND

- SUBDIVISION BOUNDARY
- 225.14 PROPOSED ELEVATION
- 225.07 EXISTING ELEVATION
- 224.25 EXISTING CONTOUR ELEVATION
- PROPOSED OVERLAND FLOW DIRECTION
- PEDESTRIAN NETWORK
- GRAVEL TRAIL
- PROP. SANITARY MAINTENANCE HOLE
- PROP. STORM MAINTENANCE HOLE
- PROP. SANITARY SEWER
- PROP. STORM SEWER
- PROP. WATERMAIN



TYPICAL REAR YARD SWALE DETAIL

SCALE N.T.S.

NOTE

THIS PLAN HAS BEEN PREPARED TO DEMONSTRATE FEASIBILITY OF THE PROPOSED DEVELOPMENT WITH RESPECT TO GRADING IN CONJUNCTION WITH THE DRAFT PLAN APPLICATION. DETAILED GRADING DESIGN WILL BE PREPARED AT THE SUBDIVISION ENGINEERING STAGE.

No.	Revision	Date	By	Appr'd

CONSULTANT:

PRELIMINARY

MILLBROOK EAST SUBDIVISION

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TOWNSHIP OF CAVAN MONAGHAN

COUNTY OF PETERBOROUGH

PRELIMINARY SITE SERVICING AND GRADING PLAN

Surveyed by:	Checked by: P.S.Z.	Project No.	19121
Drawn by: V.L.	Approved by: D.G.		
Designed by: V.L.	Date: November 2022	Drawing No.	PSG-1
Scale: 1:750		Sheet No.	