Preliminary
Stormwater Management Report

Heritage Line Subdivision
Keene, ON.

Residential Subdivision Development

D.M. Wills Project No. 21-10985

D.M. Wills Associates Limited
PARTNERS IN ENGINEERING

Peterborough

September 2021

Prepared for:
2564669/520039 Ontario Limited

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1.0 Purpose

D.M. Wills Associates Limited (Wills) has been retained by 2564669/520039 Ontario Limited to prepare a Preliminary Stormwater Management (SWM) Report for the proposed residential subdivision located on Heritage Line in the Village of Keene, Ontario.

The purpose of this report is to evaluate the drainage characteristics of the existing site and proposed development, and to advance an integrated strategy for SWM that will permit the development to proceed with no adverse impacts to the receiving drainage system. A pre-consultation meeting was held March 4, 2021, to discuss the requirements for the Plan of Condominium and Zoning By-law Amendment for the development. It was determined that a Stormwater Management Plan would be required for review by Otonabee Region Conservation Authority (ORCA) and the County of Peterborough.

2.0 Site Description

The subject property is located on Lot 14, Concession 6 in the municipality of Otonabee-South Monaghan, with frontage on Heritage Line in Keene, ON. The subject site is legally described as Parts of Lot 13 and 14, Concession 6 in the Township of Otonabee-South Monaghan within the County of Peterborough. The property is 5.64 ha in area and is bound by a private gravel road to the north, a provincially significant wetland to the east, residential lots and Heritage Line to the west, and residential lots and farmland type lots to the south. Indian River Mouth, a provincially significant wetland feature, abuts the east property boundary. The location of the site is shown on **Figure 1**.

The proposed residential subdivision consists of 32-36 units of residential condominiums containing a mix of single-family homes and townhouses. The subject development will be accessed from Heritage Line to the west, with two cul-de-sacs. The proposed buildings and roadway will alter the existing drainage patterns, which may have adverse impact to the receiving drainage systems.

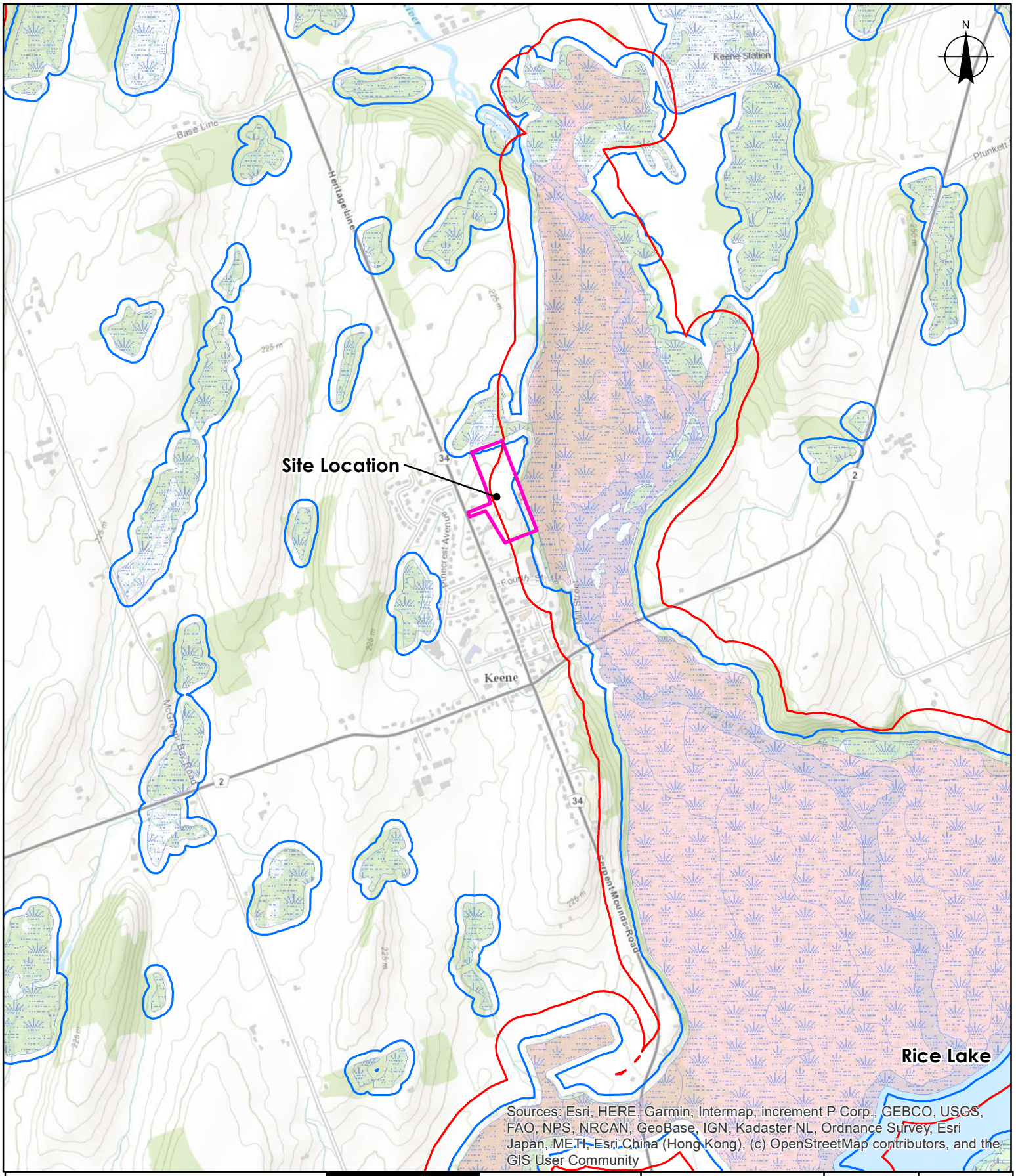

Figure - 01
Location Plan

NAD83 UTM Zone 18

0 155 310 620 930 1,24

Meters

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Legend

- Property Limits
- Wetland
- Provincial Significance
- UnEvaluated Wetland
- Non-Provincially Significant Wetland Evaluated
- Provincially Significant Wetland Evaluated
- Wetland_30mbuffer
- Wetland_120mbuffer

Drawn by: RC	Scale (Horz.) 1:20,000
Checked by: CPB	
Engineer: RC/CPB	Map Date June 2021
Project No. 19085	Map File No. 10985-DP01

According to the Soil Survey Complex of Ontario, the subject site is primarily composed of Otonabee Loam, a typical soil type observed in this region. This type of surficial soil correspond to Hydrologic Soils Group B, according to the SCS method of classifying soils.

A topographic survey was completed by Elliot and Parr Ltd. in April 2021 (Reference No. 21-19-079-00) and was used to determine existing elevations and the location of drainage features on the site. The Indian River Mouth Wetland was designated as provincially significant in 1984 by MNR (Ministry of Natural Resources) and the wetland boundary was obtained from the Land Information Ontario (LIO) database.

2.1 Geotechnical Investigation

PRI Engineering (PRI) and Wills conducted a detailed hydrogeological study in August 2021, which summarizes the expected soil profile and seasonal groundwater levels at the time of drilling. As a part of this study, twenty-one (21) boreholes were drilled and the soil column was investigated. Wills in coordination with PRI selected three (3) boreholes within the property limits for in-situ infiltration testing. The seasonal groundwater levels varies from 0.7 m to 4.6 m within the property. The following table summarizes the key findings that may impact the stormwater management design.

Table 1 – In-situ Infiltration Testing Summary

Test Location ID	Borehole Depth (mbeg)	Infiltration Rate (mm/hr)	Groundwater Depth (m)	Groundwater Elevation (m)
MW-09	1.70	24	4.00	209.23
MW-16	1.75	30	1.75	221.06
BH-08	1.70	-	2.70	219.86

As such, the native soil possess acceptable infiltration rates for infiltration-based features but considerations should be given for areas with shallow ground water levels. The preliminary grading plan considered the groundwater depths to ensure that a minimum of 1.0 m separation is achieved between the bottom of any proposed LID feature and the seasonally high groundwater table.

3.0 Methodology

The present hierarchy of watershed planning in Ontario can be described by the following in descending order: Watershed Plans, Sub-watershed Plans and individual SWM Plans.

The subject site is not covered by any Watershed or Sub-watershed Plans; therefore, this report has been prepared as an individual SWM plan.

On-site SWM facilities are typically required to provide both stormwater quantity and quality control for developments in accordance with municipal and provincial guidelines. In order to ensure that the flooding potential to downstream properties is not increased, stormwater quantity controls are typically required to control post-development peak flows to existing condition levels. To ensure that the development does not adversely impact water quality, stormwater quality controls are typically required to remove suspended sediments and other contaminants from stormwater runoff.

Stormwater quality control can be achieved using lot level controls, conveyance controls and end-of-pipe SWM facilities. There are also opportunities for the implementation of Low Impact Development (LID) measures. Examples of end-of-pipe systems include wet ponds, wetlands, dry ponds, infiltration basins, infiltration trenches, filter strips, sand filters, and Oil-Grit Separators (OGS). The effectiveness and maintenance requirements of each method will vary depending on the nature of the proposed development. Water quality features are designed to achieve MOE Enhanced (Level 1) protection. This level of protection requires the removal of 80% of total suspended solids (TSS) and treatment of 90% of the annual runoff volume. The most likely method for stormwater quality control for this development will be LID infiltration measures within the roadside ditches.

3.1 Catchment Characterization

3.1.1 Existing Condition

The existing drainage patterns were determined based on the existing topographic survey prepared by Elliott and Parr Ltd. (Reference No. 21-19-079-00), and aerial photography. The Site is delineated as three (3) catchment areas for the existing condition as shown on **Figure 2**.

- Catchment **EX-100** is 2.18 ha in area and consists of the northern portion of the site. **EX-100** is conveyed as sheet flow to the north boundary of the site (OUT-1), discharging to a wetland area.
- Catchment **EX-200** is 1.76 ha in area and consists of the south-eastern portion of the site. **EX-200** is conveyed as sheet flow south-easterly to the Indian River Mouth Wetland (OUT-2).
- Catchment **EX-300** is 1.70 ha in area and consists of the central portion of the site. EX-300 is conveyed as sheet flow to the south-west corner of the property (OUT-3).

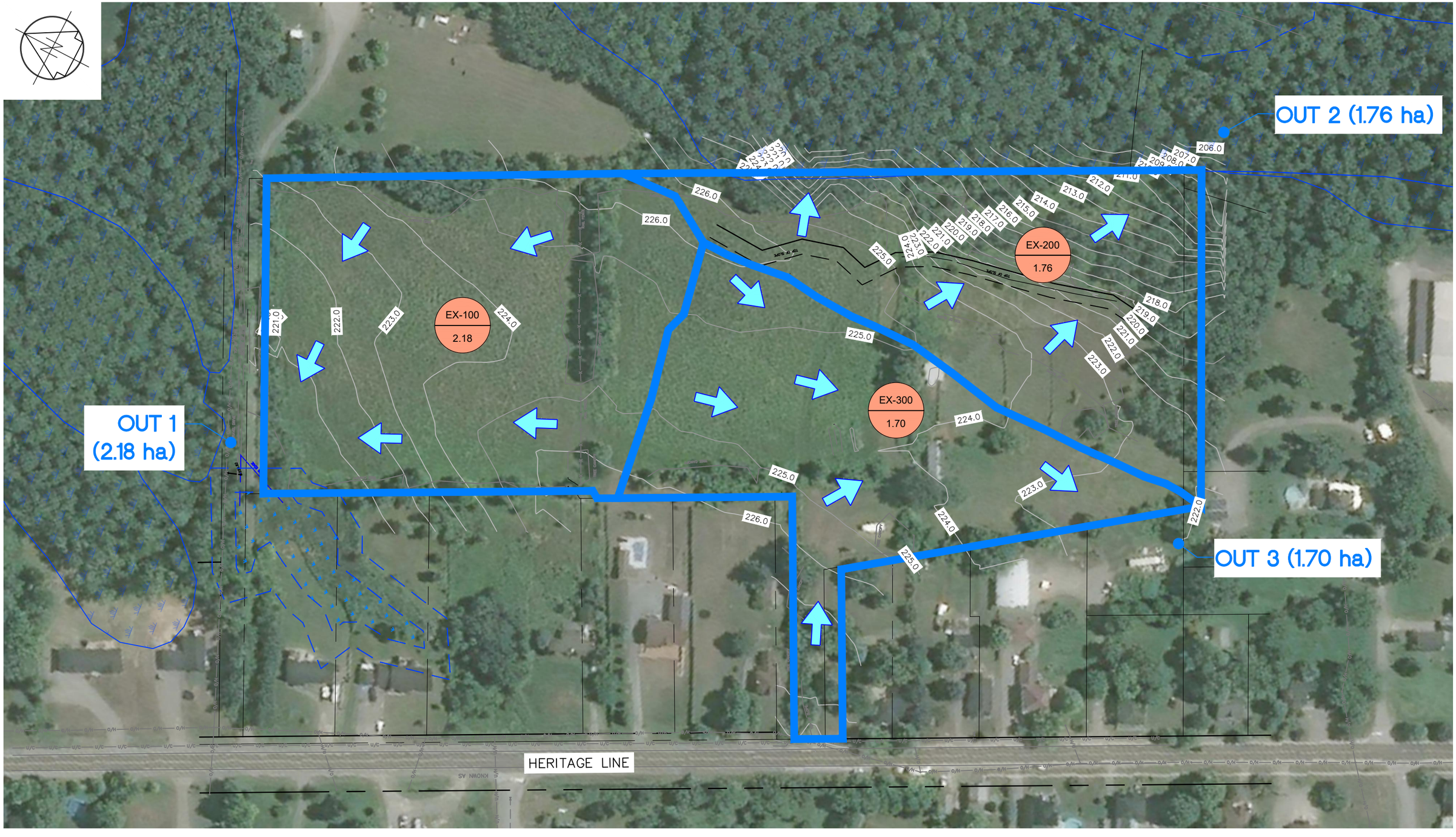
3.1.2 Proposed Condition

The proposed condition has been delineated as five (5) catchments as shown on **Figure 3**.

- Catchment **PR-100** is 0.56 ha in area and consists of the northern developed portion of the proposed development including the proposed roadway and

houses. In the proposed condition, stormwater runoff from **PR-100** will be collected and conveyed through an easement to **OUT-1**.

- Catchment **PR-101** is 0.96 ha in area and consists of northern uncontrolled landscape areas. In the proposed condition, stormwater runoff from **PR-101** will be collected and conveyed to **OUT-1**.
- Catchment **PR-200** is 2.13 ha in area and consists of the central portion of the proposed development. In the proposed condition, **PR-201** will be collected and conveyed through an easement into **PR-201** and **OUT-2**.
- Catchment **PR-201** is 1.75 ha in area and consists of uncontrolled sheet flow that will discharge to **OUT-2. PR-201** will receive controlled flows from **PR-200.**
- Catchment **PR-300** is 0.24 ha in area and consists of the south-western portion of the proposed development. In the proposed condition, **PR-300** will be conveyed as uncontrolled overland flow to **OUT-3**.



EX-100 — CATCHMENT ID
0.22 ha — CATCHMENT AREA
CATCHMENT BOUNDARY

OVERLAND FLOW DIRECTION
STORM SEWER FLOW DIRECTION

OUT — OUTLET LOCATION
WETLAND AREA

Sketch No.
FIGURE 2
HERITAGE LINE
PRE-DEVELOPMENT
DRAINAGE AREA PLAN

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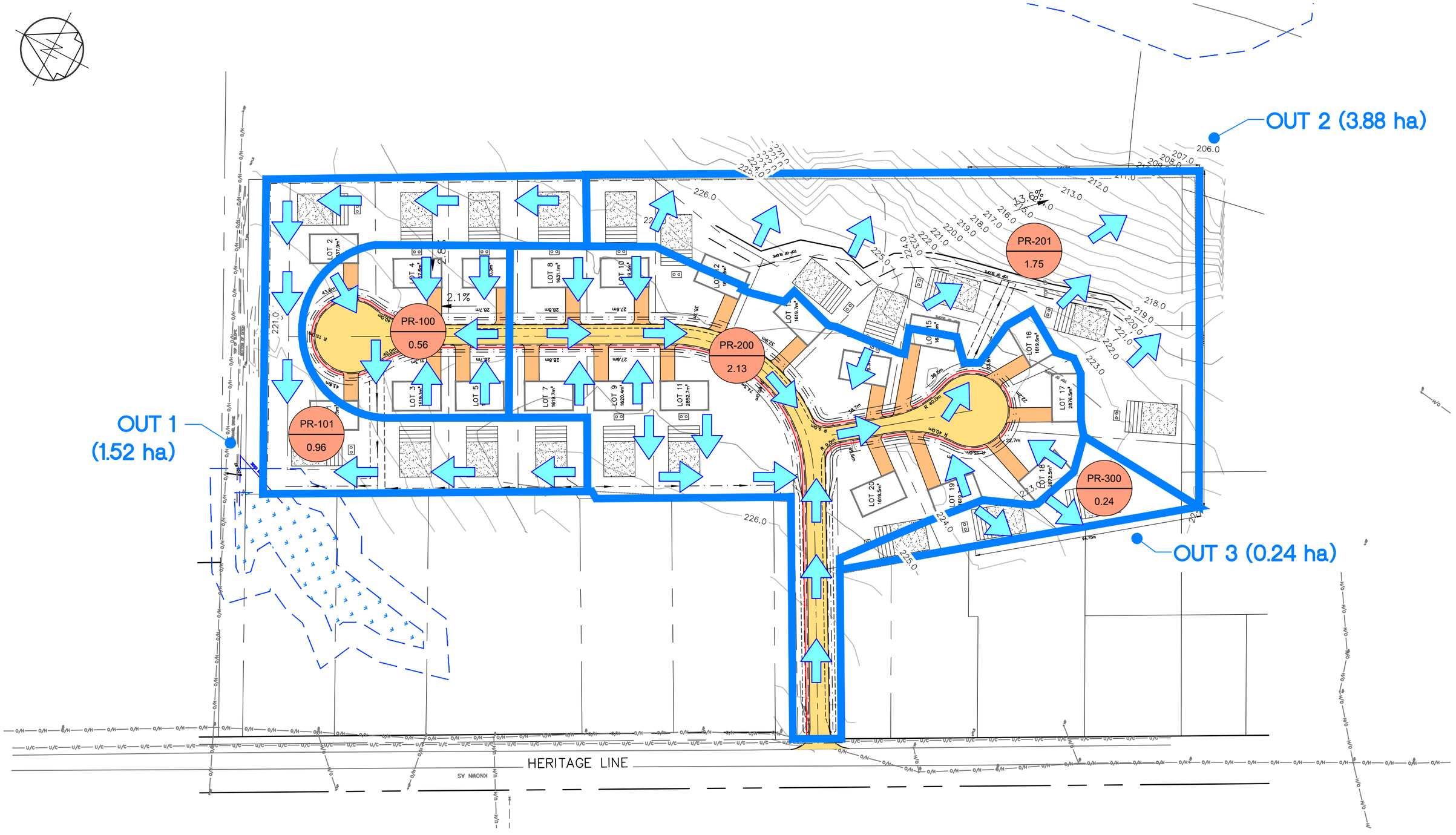
Drawn By: RC	Scale: 1:1500
Designed By: RC	Plot Date: SEPT 2021
Checked By: CPB	Project No.: 21-10985
Engineer: RC/CPB	Drawing File No.: SWM FIGURE 2



EX-100
0.22 ha
CATCHMENT ID
CATCHMENT AREA
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OVERLAND FLOW DIRECTION
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OUT OUTLET LOCATION
WETLAND AREA

Sketch No.
FIGURE 3
HERITAGE LINE
POST-DEVELOPMENT
DRAINAGE AREA PLAN

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4.0 Stormwater Management

4.1 Low Impact Development Design

As the practice of stormwater management has evolved, increasing emphasis has been placed on utilizing a treatment train approach to manage runoff as close to the source as possible. This design philosophy is often referred to as low impact development (LID), where the ultimate goal is to maintain and mimic the natural hydrologic conditions. LID designs accomplish this by reducing the runoff volume generated by a site and implementing features that infiltrate, filter, evaporate, harvest and detain runoff, while also preventing pollution. The conservation authority encourages the use of LID features as part of the water quality design for a site and, therefore, opportunities to utilize these features have been investigated.

For infiltration based LID features, a minimum separation of 1.0 m is required from the bottom of feature to the seasonally high groundwater level. A Hydrogeological investigation was completed by Wills (report dated September 2021), with twenty-one (21) boreholes completed on Site. Four (4) of the boreholes were outfitted as monitoring wells to facilitate groundwater level monitoring. The Hydrogeological investigation observed groundwater at depths ranging from 0.7 m to 3.99 m below existing grade. A digital groundwater elevation model was generated in AutoCAD Civil 3D 2019, and the preliminary grading ensured sufficient groundwater separation to consider the use of infiltration based LID features for the proposed development.

The native site soils are generally described as silty sand topsoil variably underlain by silty sand, gravelly sand, and sandy silt, and a basal layer of gravelly to silty sand till material. For the purposes of the preliminary LID design, an assumed infiltration rate of 15 mm / hour with a safety factor of 2.5 was applied.

A variety of LID features were considered for the development and evaluated based on site constraints, capital cost, maintenance considerations and water quality benefits. The final design selected is a grass detention basin with stone filled infiltration trench at the bottom for **OUT-2**. The grass basin with stone-filled trench will capture runoff from the developed areas of catchment **PR-201**. The provided volume of the stone trench was calculated, assuming the trench filled with 50 mm clear stone with at least 40 percent porosity. Supporting calculations provided in **Appendix C**.

4.2 Stormwater Quality Control

The proposed industrial subdivision may cause additional pollutants to be conveyed of site. As such, the selection and sizing of the water quality measures are based on the procedures set out in the *Stormwater Management Planning and Design Manual* (MOE, March 2003) for Enhanced (Level 1) protection. SWM measures should be assessed in the following order:

- Stormwater lot level controls
- Stormwater conveyance controls

- End-of-pipe SWM facilities

Stormwater lot level controls represent measures that are implemented on an individual lot basis such as soak-a-way pits, flatter grading and reduction of the impervious footprint. For the proposed development, lot level controls such as reduced grading will be used to supplement the proposed SWM strategy; however, these are not intended to become the primary means for stormwater quality control.

Stormwater conveyance controls represent the conveyance systems used to transport stormwater runoff from the lots to the receiving waters such as pervious pipes, catchbasin treatment and grassed swales.

End-of-pipe SWM facilities represent the common urban SWM measures used to service numerous lots or whole subdivisions including wet ponds, wetlands, dry ponds, infiltration based facilities, Oil and Grit separators and filter systems.

4.2.1 Quality Control Summary

Table 3.2 of the MOE SWM Planning and Design manual provides storage volume requirements to ensure Level 1 (Enhanced) protection for a given area and degree of imperviousness. The storage volume required for infiltration at 53% impervious is 30 m^3/ha. The drainage area for catchment area Pr. WS1 is 1.12 ha, which calculates to a total required infiltration volume requirement of 16.8 m^3 in **PR-100** and 63.9 m^3 in catchment **PR-200**.

An infiltration facility can be constructed to capture and infiltrate the required volume of stormwater runoff to further enhance stormwater quality for the Site. The ideal location of a facility would be within the roadside ditches throughout the development.

The preliminary size requirements for an infiltration facility filled with clear stone were calculated based on the roadway cross-sections shown on the Preliminary Servicing and Grading Plan. The total infiltration storage provided in the roadside ditches were estimated to be 16.9 m^3 and 96 m^3 for PR-100 and PR-200 respectively.

Based on the assumed infiltration rate of 15 mm/hr, including the 2.5 factor of safety, the infiltration trenches will drawdown in 40 hours, below the maximum of 48 hours as per the SWM Planning and Design Manual.

4.3 Stormwater Quantity Controls

4.4 Peak Flow Calculations

Peak flows were estimated using Visual Otthymo 3 (VO3) hydrologic modelling software for each of the 2, 5, 10, 25, 50 and 100 year storms at each outlet location (**OUT-1**, **OUT-2** and **OUT-3)**. These calculations consider the rainfall data for the City of Peterborough 6 hour SCS storm distribution. The rainfall data is included in **Appendix A.**

Hydrologic parameters such as soil infiltration properties and runoff response were determined based on literature review and watershed areas, land use and slope were determined based on the topographic survey data. The hydrologic parameters are provided in **Appendix A** and the peak flow calculations for the existing and proposed catchments are provided in **Appendix B**.

Table 2 - Existing and Proposed Uncontrolled Peak Flow Summary

Return Period	Peak Flow Rates (m^3/s)					
	OUT-1		OUT-2		OUT-3	
	EX[1]	UNC[2]	EX[1]	UNC[2]	EX[1]	UNC[2]
2-Year	0.028	**0.033**	0.040	**0.165**	0.018	0.003
5-Year	0.056	0.055	0.081	**0.245**	0.036	0.006
10-Year	0.079	0.070	0.114	**0.302**	0.050	0.009
25-Year	0.110	0.092	0.161	**0.379**	0.070	0.012
50-Year	0.136	0.109	0.199	**0.440**	0.086	0.015
100-Year	0.164	0.137	0.239	**0.503**	0.103	0.018

A review of **Table 2** indicates the uncontrolled peak flow rates are less than existing conditions at **OUT-1** and **OUT-3**, with the exception of the 2-year storm for OUT-1. This is due to the reduction in total drainage area to these outlets. As a result, stormwater quantity controls are not proposed for these outlets. However, uncontrolled peak flow rates discharging at **OUT-2** are increased in comparison to the existing condition due to the increase in drainage area (3.88 ha > 1.76 ha) and increase in impervious area. As a result, stormwater quantity controls are required for **OUT-2**.

4.5 Quantity Control Summary

A review of the preliminary hydrologic modelling indicates that quantity control will be required at **OUT-2.** In order to control the post-development peak flows to pre-development levels at **OUT-2,** an estimated 500 m^3 of storage volume will be required as determined by creating a theoretical storage-discharge curve. This storage can be achieved by a combination of infiltration and detention within the roadside ditches. A review of preliminary grading plan determined a storage volume of 672 m^3 is available within the **OUT-2** roadside ditches, exceeding the storage volume required. Outlet control structures will be designed during the detailed design phase.

4.6 Proposed Release Rates

The proposed peak flow rates to each outlet location, including the controlled flows from OUT-2 are shown in **Table 3** below.

Table 3 - Existing and Proposed Peak Flow Summary

Return Period	Peak Flow Rates (m^3/s)					
	OUT-1		OUT-2		OUT-3	
	EX[1]	PR[2]	EX[1]	PR[2]	EX[1]	PR[2]
2-Year	0.028	**0.033**	0.040	0.039	0.018	0.003
5-Year	0.056	0.055	0.081	0.077	0.036	0.006
10-Year	0.079	0.070	0.114	0.110	0.050	0.009
25-Year	0.110	0.092	0.161	0.158	0.070	0.012
50-Year	0.136	0.109	0.199	0.196	0.086	0.015
100-Year	0.164	0.137	0.239	0.235	0.103	0.018

5.0 Conclusion

Without appropriate stormwater management controls, the development of the proposed Heritage Line Subdivision will alter existing drainage patterns, increase the impervious area of the site and increase off-site peak flow rates at **OUT-2.** As such, stormwater quality and quantity controls are necessary to mitigate potential adverse impacts to downstream properties and the natural environment.

Water quality controls have been provided in the form of a stone filled infiltration trench for grass basin and check dams for grass swales to achieve "Enhanced" Level 1 protection as defined in the Stormwater Management Planning and Design Manual (March 2003).

Water quantity controls are provided in the form of a grassed swale basin and the runoff leaving the site will be regulated by the outlet control structure to match existing levels.

Respectfully submitted,

Raja Subramaniam Raja Chockalingam, M.Eng, P.Eng,
Water Resources Engineer

Chris Proctor-Bennett, P.Eng.
Stormwater Management Group Leader

RC/CPB

Statement of Limitations

This report has been prepared by D.M. Wills Associates Limited on behalf of 2564669/520039 Ontario Limited to provide a Preliminary Stormwater Management Plan for the proposed Heritage Line Subdivision.

The conclusions and recommendations in this report are based on available background documentation and discussions with applicable agencies at the time of preparation.

The report is intended to demonstrate the means whereby the existing site can be serviced with respect to stormwater management on a preliminary level. The report is applicable only to the project described in the text. The feasibility of this design has to be confirmed in accordance with appropriate studies and constructed substantially in accordance with the approved plans and details accompanying the storm water management report.

Any use which a third party makes of this report other than that of a preliminary stormwater management report for the Heritage Line subdivision development, is the responsibility of such third parties. D.M. Wills Associates Limited accepts no responsibility for damages, if any, suffered by a third party as a result of decisions made or actions taken based on using this report for purposes other than a preliminary stormwater management report for the Heritage Line Subdivision Development.

D.M. Wills Associates Limited is not responsible for any changes made to the stormwater management measures which are not in accordance with the design drawings. Any person(s) relying on the "as-constructed" stormwater measures should confirm that the field conditions are in accordance with the design drawings.

Appendix A

Rainfall Data and Hydrology

6 Hour SCS Type II Intensity Hyetographs
2006 Peterborough Airport Weather Station
(mm/hr)

Time (min.)	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
0	0	0	0	0	0	0
15	1.6	2.1	2.5	2.9	3.3	3.6
30	1.6	2.1	2.5	2.9	3.3	3.6
45	2.3	3.2	3.7	4.4	4.9	5.4
60	2.3	3.2	3.7	4.4	4.9	5.4
75	2.3	3.2	3.7	4.4	4.9	5.4
90	2.3	3.2	3.7	4.4	4.9	5.4
105	3.9	5.2	6.2	7.3	8.1	9.0
120	3.9	5.2	6.2	7.3	8.1	9.0
135	4.6	6.3	7.4	8.8	9.8	10.8
150	4.6	6.3	7.4	8.8	9.8	10.8
165	23.2	31.4	36.9	43.7	48.9	53.9
180	60.4	81.78	95.9	113.7	127.0	140.2
195	8.5	11.5	13.5	16.0	17.9	19.8
210	8.5	11.5	13.5	16.0	17.9	19.8
225	3.9	5.2	6.2	7.3	8.1	9.0
240	3.9	5.2	6.2	7.3	8.1	9.0
255	3.1	4.2	4.9	5.8	6.5	7.2
270	3.1	4.2	4.9	5.8	6.5	7.2
285	2.3	3.2	3.7	4.4	4.9	5.4
300	2.3	3.2	3.7	4.4	4.9	5.4
315	1.6	2.1	2.5	2.9	3.3	3.6
330	1.6	2.1	2.5	2.9	3.3	3.6
345	1.6	2.1	2.5	2.9	3.3	3.6
360	1.6	2.1	2.5	2.9	3.3	3.6

Hydrologic Parameters for EX-100

Sheet 1 of 1

WILLS

Project No: 21-10985
Project Name: Heritage Line Preliminary SWM
Designed/Checked By: RC/CPB
Date: 8-Sep-21

Land Use

Agriculture	0.00	ha
Range	1.99	ha
Grass	0.00	ha
Woods	0.19	ha
Wetland	0.00	ha
Gravel	0.00	ha
Impervious	0.00	ha
SUM	**2.18**	

Hydrologic Soil Group[1]	B
Soil Type	Otonobee Loam
C	0.21
CN (Nashyd)	64.4

Rainfall Data

Gauging Station = Peterborough
12 hr, 100 Yr Rainfall = 90.4 mm

Drainage Area	**2.18**	ha
Impervious Area	**0.00**	ha
Percent Impervious	**0.0%**	
Connected Impervious	0.0%	

Pervious		
Length	230	m
US Elev	226.2	m
DS Elev	220.3	m
Slope	2.6	%
	Rolling	

Parameter	Soil Group	Land Use							Weighted Value	
		Agriculture	Range	Grass	Woods	Wetland	Gravel	Imperv.	Incl. Imperv. NASHYD	Not Incl. Imperv. STANDHYD
Runoff Coefficient[2]**, C**	B	0.32	0.22	0.13	0.11	0.05	0.76	0.90	0.21	n.a.
SCS Curve No.[3]**, CN**	B	74	65	61	58	50	85	98	64.4	64.4
Initial Abstraction[5]**, mm**		6.0	8.0	5.0	10.0	10.0	2.5	2.0	8.2	8.2

Time of Concentration[6]

Total Length	230	m	
Average Slope	2.6	%	
Airport	**32.1**	min.	Flat: 0-2% Slopes Rolling: 2-6% Slopes Hilly: >6% Slopes
Bransby - Williams	10.0	min.	
Applicable Minimum[7]	10.0	min.	
Time to Peak	21.5	min.	
	0.36	**hr.**	

Composite Parameters

Drainage Area	2.18 ha	
Runoff Coefficient	0.21	
SCS Curve No.	64.4	64.4
Modified Curve No.[4]**, CN***	**67.7**	67.7
Initial Abstraction.	**8.2**	8.2

Notes:

1. Hydrologic Soil Group obtained from Design Chart H2-6A, M.T.O. Drainage Manual, 1980.
2. Runoff coefficient obtained from M.T.O. Design Chart 1.07, M.T.O. Drainage Management Manual, 1997, Hydrologic Analysis and Design, McCuen 2004 and New Jersey Technical Manual for Stream Encroachment, 1984.
3. SCS Curve No. obtained from M.T.O. Design Chart 1.09, M.T.O. Drainage Management Manual, 1997, and Table 2-2a, TR-55, page 2-5.
4. The modified curve number is adjusted as per Paul Wisner & Associates (1982) and represents anticedent moisture conditions Type II
5. Initial Abstraction values taken from the Environmental and Engineering Services Department, The Corporation of the City of London, Dec 2005
6. Use Airport Equation to calculate time of concentration for C <= 0.4, and Bransby-Williams for C > 0.4.
7. Minimum Time of Concentration for use in the Rational Method and Hydrologic Model has been set to 10 minutes
8. All impervious areas have been assumed to be directly connected.

Hydrologic Parameters for EX-200

Sheet 1 of 1

WILLS

Project No: 21-10985
Project Name: Heritage Line Preliminary SWM
Designed/Checked By: RC/CPB
Date: 8-Sep-21

Land Use

Agriculture	0.00	ha
Range	0.99	ha
Grass	0.00	ha
Woods	0.77	ha
Wetland	0.00	ha
Gravel	0.00	ha
Impervious	0.00	ha
SUM	**1.76**	

Hydrologic Soil Group[1]	B
Soil Type	Otonobee Loam
C	0.32
CN (Nashyd)	61.9

Rainfall Data

Gauging Station = Peterborough
12 hr, 100 Yr Rainfall = 90.4 mm

Drainage Area	**1.76**	ha
Impervious Area	**0.00**	ha
Percent Impervious	**0.0%**	
Connected Impervious	0.0%	

Pervious		
Length	100	m
US Elev	225.3	m
DS Elev	210.9	m
Slope	14.3	%
	Steep	

Parameter	Soil Group	Land Use							Weighted Value	
		Agriculture	Range	Grass	Woods	Wetland	Gravel	Imperv.	Incl. Imperv. NASHYD	Not Incl. Imperv. STANDHYD
Runoff Coefficient[2]**, C**	B	0.57	0.35	0.19	0.29	0.05	0.76	0.90	0.32	n.a.
SCS Curve No.[3]**, CN**	B	74	65	61	58	50	85	98	61.9	61.9
Initial Abstraction[5]**, mm**		6.0	8.0	5.0	10.0	10.0	2.5	2.0	8.9	8.9

Time of Concentration[6]

Total Length	100	m	
Average Slope	14.3	%	
Airport	**10.5**	min.	Flat: 0-2% Slopes Rolling: 2-6% Slopes Hilly: >6% Slopes
Bransby - Williams	3.2	min.	
Applicable Minimum[7]	10.0	min.	
Time to Peak	7.0	min.	
	0.12	**hr.**	

Composite Parameters

Drainage Area	1.76 ha	
Runoff Coefficient	0.32	
SCS Curve No.	61.9	61.9
Modified Curve No.[4]**, CN***	**64.3**	64.3
Initial Abstraction.	**8.9**	8.9

Notes:

1. Hydrologic Soil Group obtained from Design Chart H2-6A, M.T.O. Drainage Manual, 1980.
2. Runoff coefficient obtained from M.T.O. Design Chart 1.07, M.T.O. Drainage Management Manual, 1997, Hydrologic Analysis and Design, McCuen 2004 and New Jersey Technical Manual for Stream Encroachment, 1984.
3. SCS Curve No. obtained from M.T.O. Design Chart 1.09, M.T.O. Drainage Management Manual, 1997, and Table 2-2a, TR-55, page 2-5.
4. The modified curve number is adjusted as per Paul Wisner & Associates (1982) and represents anticedent moisture conditions Type II
5. Initial Abstraction values taken from the Environmental and Engineering Services Department, The Corporation of the City of London, Dec 2005
6. Use Airport Equation to calculate time of concentration for C <= 0.4, and Bransby-Williams for C > 0.4.
7. Minimum Time of Concentration for use in the Rational Method and Hydrologic Model has been set to 10 minutes
8. All impervious areas have been assumed to be directly connected.

Hydrologic Parameters for EX-300

Sheet 1 of 1

WILLS

Project No: 21-10985
Project Name: Heritage Line Preliminary SWM
Designed/Checked By: RC/CPB
Date: 8-Sep-21

Land Use

Agriculture	0.00	ha
Range	1.63	ha
Grass	0.00	ha
Woods	0.05	ha
Wetland	0.00	ha
Gravel	0.00	ha
Impervious	0.02	ha
SUM	**1.70**	

Hydrologic Soil Group[1]	B
Soil Type	Otonobee Loam
C	0.15
CN (Nashyd)	65.2

Rainfall Data

Gauging Station = Peterborough
12 hr, 100 Yr Rainfall = 90.4 mm

Drainage Area	**1.70**	ha
Impervious Area	**0.02**	ha
Percent Impervious	**1.2%**	
Connected Impervious	1.2%	

Pervious

Length	270	m
US Elev	226.2	m
DS Elev	222.4	m
Slope	1.4	%
	Flat	

Parameter	Soil Group	Land Use							Weighted Value	
		Agriculture	Range	Grass	Woods	Wetland	Gravel	Imperv.	Incl. Imperv. NASHYD	Not Incl. Imperv. STANDHYD
Runoff Coefficient[2]**, C**	B	0.26	0.14	0.08	0.08	0.05	0.76	0.90	0.15	n.a.
SCS Curve No.[3]**, CN**	B	74	65	61	58	50	85	98	65.2	64.8
Initial Abstraction[5]**, mm**		6.0	8.0	5.0	10.0	10.0	2.5	2.0	8.0	8.1

Time of Concentration[6]

Total Length	270	m	
Average Slope	1.4	%	
Airport	**45.8**	min.	Flat: 0-2% Slopes Rolling: 2-6% Slopes Hilly: >6% Slopes
Bransby - Williams	13.7	min.	
Applicable Minimum[7]	10.0	min.	
Time to Peak	30.7	min.	
	0.51	**hr.**	

Composite Parameters

Drainage Area	1.70 ha	
Runoff Coefficient	0.15	
SCS Curve No.	65.2	64.8
Modified Curve No.[4]**, CN***	**68.8**	68.2
Initial Abstraction.	**8.0**	8.1

Notes:

1. Hydrologic Soil Group obtained from Design Chart H2-6A, M.T.O. Drainage Manual, 1980.
2. Runoff coefficient obtained from M.T.O. Design Chart 1.07, M.T.O. Drainage Management Manual, 1997, Hydrologic Analysis and Design, McCuen 2004 and New Jersey Technical Manual for Stream Encroachment, 1984.
3. SCS Curve No. obtained from M.T.O. Design Chart 1.09, M.T.O. Drainage Management Manual, 1997, and Table 2-2a, TR-55, page 2-5.
4. The modified curve number is adjusted as per Paul Wisner & Associates (1982) and represents anticedent moisture conditions Type II
5. Initial Abstraction values taken from the Environmental and Engineering Services Department, The Corporation of the City of London, Dec 2005
6. Use Airport Equation to calculate time of concentration for C <= 0.4, and Bransby-Williams for C > 0.4.
7. Minimum Time of Concentration for use in the Rational Method and Hydrologic Model has been set to 10 minutes
8. All impervious areas have been assumed to be directly connected.

Hydrologic Parameters for PR-100

Sheet 1 of 1

WILLS

Project No: 21-10985
Project Name: Heritage Line Preliminary SWM
Designed/Checked By: RC/CPB
Date: 8-Sep-21

Land Use

Agriculture	0.00	ha
Range	0.00	ha
Grass	0.28	ha
Woods	0.00	ha
Wetland	0.00	ha
Gravel	0.00	ha
Impervious	0.28	ha
SUM	**0.56**	

Hydrologic Soil Group[1]	B
Soil Type	Otonobee Loam
C	0.52
CN (Nashyd)	79.5

Rainfall Data

Gauging Station = Peterborough
12 hr, 100 Yr Rainfall = 90.4 mm

Drainage Area	**0.56**	ha
Impervious Area	**0.28**	ha
Percent Impervious	**50.0%**	
Connected Impervious	25.0%	

	Pervious	Impervious	
Length	70	32	m
US Elev	226.3	227.1	m
DS Elev	224.2	226.2	m
Slope	3.0	3.1	%
	Rolling	Rolling	

Parameter	Soil Group	Land Use							Weighted Value	
		Agriculture	Range	Grass	Woods	Wetland	Gravel	Imperv.	Incl. Imperv. NASHYD	Not Incl. Imperv. STANDHYD
Runoff Coefficient[2]**, C**	B	0.32	0.22	0.13	0.11	0.05	0.76	0.90	0.52	n.a.
SCS Curve No.[3]**, CN**	B	74	65	61	58	50	85	98	79.5	61.0
Initial Abstraction[5]**, mm**		6.0	8.0	5.0	10.0	10.0	2.5	2.0	3.5	5.0

Time of Concentration[6]

Total Length	102	m	
Average Slope	3.0	%	
Airport	13.3	min.	Flat: 0-2% Slopes
Bransby - Williams	4.9	min.	Rolling: 2-6% Slopes Hilly: >6% Slopes
Applicable Minimum[7]	**10.0**	min.	
Time to Peak	6.7	min.	
	0.11	**hr.**	

Composite Parameters

Drainage Area	0.56 ha	
Runoff Coefficient	0.52	
SCS Curve No.	79.5	61.0
Modified Curve No.[4]**, CN***	79.8	**60.5**
Initial Abstraction.	3.5	**5.0**

Notes:

1. Hydrologic Soil Group obtained from Design Chart H2-6A, M.T.O. Drainage Manual, 1980.
2. Runoff coefficient obtained from M.T.O. Design Chart 1.07, M.T.O. Drainage Management Manual, 1997, Hydrologic Analysis and Design, McCuen 2004 and New Jersey Technical Manual for Stream Encroachment, 1984.
3. SCS Curve No. obtained from M.T.O. Design Chart 1.09, M.T.O. Drainage Management Manual, 1997, and Table 2-2a, TR-55, page 2-5.
4. The modified curve number is adjusted as per Paul Wisner & Associates (1982) and represents anticedent moisture conditions Type II
5. Initial Abstraction values taken from the Environmental and Engineering Services Department, The Corporation of the City of London, Dec 2005
6. Use Airport Equation to calculate time of concentration for C <= 0.4, and Bransby-Williams for C > 0.4.
7. Minimum Time of Concentration for use in the Rational Method and Hydrologic Model has been set to 10 minutes
8. Connected Impervious is estimated using the Sutherland Equation with a Watershed Selection Criteria of Mostly Disconnected

Hydrologic Parameters for PR-101

Sheet 1 of 1

WILLS

Project No: 21-10985
Project Name: Heritage Line Preliminary SWM
Designed/Checked By: RC/CPB
Date: 8-Sep-21

Land Use

Agriculture	0.00	ha
Range	0.00	ha
Grass	0.92	ha
Woods	0.00	ha
Wetland	0.00	ha
Gravel	0.00	ha
Impervious	0.04	ha
SUM	**0.96**	

Hydrologic Soil Group[1]	B
Soil Type	Otonobee Loam
C	0.11
CN (Nashyd)	62.5

Rainfall Data

Gauging Station = Peterborough
12 hr, 100 Yr Rainfall = 90.4 mm

Drainage Area	**0.96**	ha
Impervious Area	**0.04**	ha
Percent Impervious	**4.2%**	
Connected Impervious	0.2%	

Pervious		
Length	332	m
US Elev	226.2	m
DS Elev	220.1	m
Slope	1.9	%
	Flat	

Parameter	Soil Group	Land Use							Weighted Value	
		Agriculture	Range	Grass	Woods	Wetland	Gravel	Imperv.	Incl. Imperv. NASHYD	Not Incl. Imperv. STANDHYD
Runoff Coefficient[2]**, C**	B	0.26	0.14	0.08	0.08	0.05	0.76	0.90	0.11	n.a.
SCS Curve No.[3]**, CN**	B	74	65	61	58	50	85	98	62.5	61.0
Initial Abstraction[5]**, mm**		6.0	8.0	5.0	10.0	10.0	2.5	2.0	4.9	5.0

Time of Concentration[6]

Total Length	332	m	
Average Slope	1.9	%	
Airport	**47.8**	min.	Flat: 0-2% Slopes Rolling: 2-6% Slopes Hilly: >6% Slopes
Bransby - Williams	16.8	min.	
Applicable Minimum[7]	10.0	min.	
Time to Peak	32.0	min.	
	0.53	**hr.**	

Composite Parameters

Drainage Area	0.96 ha	
Runoff Coefficient	0.11	
SCS Curve No.	62.5	61.0
Modified Curve No.[4]**, CN***	**62.5**	60.5
Initial Abstraction.	**4.9**	5.0

Notes:

1. Hydrologic Soil Group obtained from Design Chart H2-6A, M.T.O. Drainage Manual, 1980.
2. Runoff coefficient obtained from M.T.O. Design Chart 1.07, M.T.O. Drainage Management Manual, 1997, Hydrologic Analysis and Design, McCuen 2004 and New Jersey Technical Manual for Stream Encroachment, 1984.
3. SCS Curve No. obtained from M.T.O. Design Chart 1.09, M.T.O. Drainage Management Manual, 1997, and Table 2-2a, TR-55, page 2-5.
4. The modified curve number is adjusted as per Paul Wisner & Associates (1982) and represents anticedent moisture conditions Type II
5. Initial Abstraction values taken from the Environmental and Engineering Services Department, The Corporation of the City of London, Dec 2005
6. Use Airport Equation to calculate time of concentration for C <= 0.4, and Bransby-Williams for C > 0.4.
7. Minimum Time of Concentration for use in the Rational Method and Hydrologic Model has been set to 10 minutes
8. Connected Impervious is estimated using the Sutherland Equation with a Watershed Selection Criteria of Mostly Disconnected

Hydrologic Parameters for PR-200

Sheet 1 of 1

WILLS

Project No: 21-10985
Project Name: Heritage Line Preliminary SWM
Designed/Checked By: RC/CPB
Date: 8-Sep-21

Land Use

Agriculture	0.00	ha
Range	0.00	ha
Grass	1.33	ha
Woods	0.00	ha
Wetland	0.00	ha
Gravel	0.00	ha
Impervious	0.80	ha
SUM	**2.13**	

Hydrologic Soil Group[1]	B
Soil Type	Otonobee Loam
C	0.39
CN (Nashyd)	74.9

Rainfall Data

Gauging Station = Peterborough
12 hr, 100 Yr Rainfall = 90.4 mm

Drainage Area	**2.13**	ha
Impervious Area	**0.80**	ha
Percent Impervious	**37.6%**	
Connected Impervious	37.6%	

	Pervious	Impervious	
Length	215	10	m
US Elev	226.2	226.2	m
DS Elev	225.6	226.1	m
Slope	0.3	1.5	%
	Flat	Flat	

Parameter	Soil Group	Land Use							Weighted Value	
		Agriculture	Range	Grass	Woods	Wetland	Gravel	Imperv.	Incl. Imperv. NASHYD	Not Incl. Imperv. STANDHYD
Runoff Coefficient[2]**, C**	B	0.26	0.14	0.08	0.08	0.05	0.76	0.90	0.39	n.a.
SCS Curve No.[3]**, CN**	B	74	65	61	58	50	85	98	74.9	61.0
Initial Abstraction[5]**, mm**		6.0	8.0	5.0	10.0	10.0	2.5	2.0	3.9	5.0

Time of Concentration[6]

Total Length	225	m	
Average Slope	0.3	%	
Airport	**50.3**	min.	Flat: 0-2% Slopes Rolling: 2-6% Slopes Hilly: >6% Slopes
Bransby - Williams	14.9	min.	
Applicable Minimum[7]	10.0	min.	
Time to Peak	33.7	min.	
	0.56	**hr.**	

Composite Parameters

Drainage Area	2.13 ha	
Runoff Coefficient	0.39	
SCS Curve No.	74.9	61.0
Modified Curve No.[4]**, CN***	75.3	**60.5**
Initial Abstraction.	3.9	**5.0**

Notes:

1. Hydrologic Soil Group obtained from Design Chart H2-6A, M.T.O. Drainage Manual, 1980.
2. Runoff coefficient obtained from M.T.O. Design Chart 1.07, M.T.O. Drainage Management Manual, 1997, Hydrologic Analysis and Design, McCuen 2004 and New Jersey Technical Manual for Stream Encroachment, 1984.
3. SCS Curve No. obtained from M.T.O. Design Chart 1.09, M.T.O. Drainage Management Manual, 1997, and Table 2-2a, TR-55, page 2-5.
4. The modified curve number is adjusted as per Paul Wisner & Associates (1982) and represents anticedent moisture conditions Type II
5. Initial Abstraction values taken from the Environmental and Engineering Services Department, The Corporation of the City of London, Dec 2005
6. Use Airport Equation to calculate time of concentration for C <= 0.4, and Bransby-Williams for C > 0.4.
7. Minimum Time of Concentration for use in the Rational Method and Hydrologic Model has been set to 10 minutes
8. All impervious areas have been assumed to be directly connected.

Hydrologic Parameters for PR-201

Sheet 1 of 1

WILLS

Project No: 21-10985
Project Name: Heritage Line Preliminary SWM
Designed/Checked By: RC/CPB
Date: 8-Sep-21

Land Use

Agriculture	0.00	ha
Range	0.42	ha
Grass	0.54	ha
Woods	0.77	ha
Wetland	0.00	ha
Gravel	0.00	ha
Impervious	0.02	ha
SUM	**1.75**	

Hydrologic Soil Group[1]	B
Soil Type	Otonobee Loam
C	0.28
CN (Nashyd)	61.1

Rainfall Data

Gauging Station = Peterborough
12 hr, 100 Yr Rainfall = 90.4 mm

Drainage Area	**1.75**	ha
Impervious Area	**0.02**	ha
Percent Impervious	**1.1%**	
Connected Impervious	0.0%	

Pervious

Length	160	m
US Elev	226.5	m
DS Elev	208.0	m
Slope	11.6	%
	Steep	

Parameter	Soil Group	Land Use							Weighted Value	
		Agriculture	Range	Grass	Woods	Wetland	Gravel	Imperv.	Incl. Imperv. NASHYD	Not Incl. Imperv. STANDHYD
Runoff Coefficient[2]**, C**	B	0.57	0.35	0.19	0.29	0.05	0.76	0.90	0.28	n.a.
SCS Curve No.[3]**, CN**	B	74	65	61	58	50	85	98	61.1	60.6
Initial Abstraction[5]**, mm**		6.0	8.0	5.0	10.0	10.0	2.5	2.0	7.9	8.0

Time of Concentration[6]

Total Length	160	m	
Average Slope	11.6	%	
Airport	**15.1**	min.	Flat: 0-2% Slopes Rolling: 2-6% Slopes Hilly: >6% Slopes
Bransby - Williams	5.3	min.	
Applicable Minimum[7]	10.0	min.	
Time to Peak	10.1	min.	
	0.17	**hr.**	

Composite Parameters

Drainage Area	1.75 ha	
Runoff Coefficient	0.28	
SCS Curve No.	61.1	60.6
Modified Curve No.[4]**, CN***	**62.7**	62.4
Initial Abstraction.	**7.9**	8.0

Notes:

1. Hydrologic Soil Group obtained from Design Chart H2-6A, M.T.O. Drainage Manual, 1980.
2. Runoff coefficient obtained from M.T.O. Design Chart 1.07, M.T.O. Drainage Management Manual, 1997, Hydrologic Analysis and Design, McCuen 2004 and New Jersey Technical Manual for Stream Encroachment, 1984.
3. SCS Curve No. obtained from M.T.O. Design Chart 1.09, M.T.O. Drainage Management Manual, 1997, and Table 2-2a, TR-55, page 2-5.
4. The modified curve number is adjusted as per Paul Wisner & Associates (1982) and represents anticedent moisture conditions Type II
5. Initial Abstraction values taken from the Environmental and Engineering Services Department, The Corporation of the City of London, Dec 2005
6. Use Airport Equation to calculate time of concentration for C <= 0.4, and Bransby-Williams for C > 0.4.
7. Minimum Time of Concentration for use in the Rational Method and Hydrologic Model has been set to 10 minutes
8. Connected Impervious is estimated using the Sutherland Equation with a Watershed Selection Criteria of Mostly Disconnected

Hydrologic Parameters for PR-300

Sheet 1 of 1

WILLS

Project No: 21-10985
Project Name: Heritage Line Preliminary SWM
Designed/Checked By: RC/CPB
Date: 8-Sep-21

Land Use

Agriculture	0.00	ha
Range	0.00	ha
Grass	0.24	ha
Woods	0.00	ha
Wetland	0.00	ha
Gravel	0.00	ha
Impervious	0.00	ha
SUM	**0.24**	

Hydrologic Soil Group[1]	B
Soil Type	Otonobee Loam
C	0.08
CN (Nashyd)	61.0

Rainfall Data

Gauging Station = Peterborough
12 hr, 100 Yr Rainfall = 90.4 mm

Drainage Area	**0.24**	ha
Impervious Area	**0.00**	ha
Percent Impervious	**0.0%**	
Connected Impervious	0.0%	

Pervious

Length	55	m
US Elev	223.0	m
DS Elev	222.6	m
Slope	0.8	%
	Flat	

Parameter	Soil Group	Land Use							Weighted Value	
		Agriculture	Range	Grass	Woods	Wetland	Gravel	Imperv.	Incl. Imperv. NASHYD	Not Incl. Imperv. STANDHYD
Runoff Coefficient[2]**, C**	B	0.26	0.14	0.08	0.08	0.05	0.76	0.90	0.08	n.a.
SCS Curve No.[3]**, CN**	B	74	65	61	58	50	85	98	61.0	61.0
Initial Abstraction[5]**, mm**		6.0	8.0	5.0	10.0	10.0	2.5	2.0	5.0	5.0

Time of Concentration[6]

Total Length	55	m	
Average Slope	0.8	%	
Airport	**26.5**	min.	Flat: 0-2% Slopes Rolling: 2-6% Slopes Hilly: >6% Slopes
Bransby - Williams	3.8	min.	
Applicable Minimum[7]	10.0	min.	
Time to Peak	17.8	min.	
	0.30	**hr.**	

Composite Parameters

Drainage Area	0.24 ha	
Runoff Coefficient	0.08	
SCS Curve No.	61.0	61.0
Modified Curve No.[4]**, CN***	**60.5**	60.5
Initial Abstraction.	**5.0**	5.0

Notes:

1. Hydrologic Soil Group obtained from Design Chart H2-6A, M.T.O. Drainage Manual, 1980.
2. Runoff coefficient obtained from M.T.O. Design Chart 1.07, M.T.O. Drainage Management Manual, 1997, Hydrologic Analysis and Design, McCuen 2004 and New Jersey Technical Manual for Stream Encroachment, 1984.
3. SCS Curve No. obtained from M.T.O. Design Chart 1.09, M.T.O. Drainage Management Manual, 1997, and Table 2-2a, TR-55, page 2-5.
4. The modified curve number is adjusted as per Paul Wisner & Associates (1982) and represents anticedent moisture conditions Type II
5. Initial Abstraction values taken from the Environmental and Engineering Services Department, The Corporation of the City of London, Dec 2005
6. Use Airport Equation to calculate time of concentration for C <= 0.4, and Bransby-Williams for C > 0.4.
7. Minimum Time of Concentration for use in the Rational Method and Hydrologic Model has been set to 10 minutes
8. All impervious areas have been assumed to be directly connected.

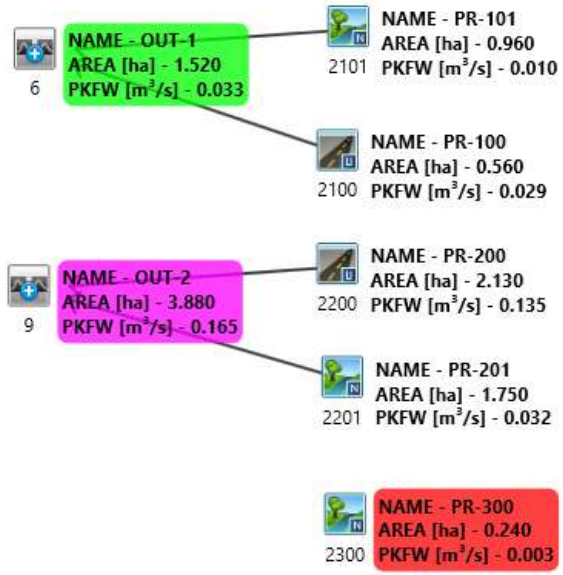
Appendix B

Hydrologic Modelling

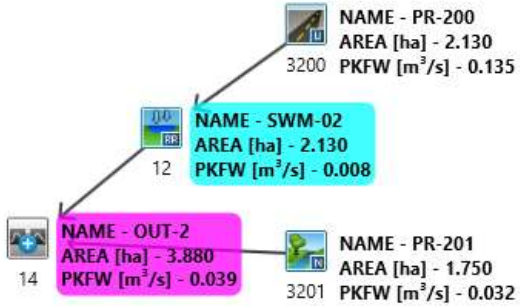
VO3 Model Schematic

Existing Conditions

Proposed Conditions - Uncontrolled



Proposed Conditions – Controlled



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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 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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  Output  filename: C:\Users\cproctorbennett\AppData\Local\Temp\2b9d8156-50db-4e2e-
821e-7ba7d7695dfe\Scenario.out
  Summary filename: C:\Users\cproctorbennett\AppData\Local\Temp\2b9d8156-50db-4e2e-
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DATE: 09-10-2021                          TIME: 01:46:03

USER:


COMMENTS: _____________________________________________________________

--------------------------------------------------------------------------------
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  ****************************
  ** SIMULATION NUMBER:   1 **
  ****************************


--------------------
|    READ STORM    |    Filename: C:\Users\cproctorbennett\AppD
|                  |              ata\Local\Temp\
|                  |              2b9d8156-50db-4e2e-821e-7ba7d7695dfe\e1b504c7
| Ptotal= 38.75 mm |    Comments: 2-Year, 6 hour SCS Type II - City of Pet
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.25    1.60 |  1.75    3.90 |  3.25    8.50 |  4.75    2.30
                0.50    1.60 |  2.00    3.90 |  3.50    8.50 |  5.00    2.30
                0.75    2.30 |  2.25    4.60 |  3.75    3.90 |  5.25    1.60
                1.00    2.30 |  2.50    4.60 |  4.00    3.90 |  5.50    1.60
                1.25    2.30 |  2.75   23.20 |  4.25    3.10 |  5.75    1.60
                1.50    2.30 |  3.00   60.40 |  4.50    3.10 |  6.00    1.60
```



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--------------------
| CALIB            |
| NASHYD    (1100) |   Area     (ha)=   2.18   Curve Number    (CN)= 67.7
|ID= 1 DT= 5.0 min |   Ia       (mm)=   8.20   # 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    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    1.60 | 1.583    3.90 | 3.083    8.50 |  4.58    2.30
               0.167    1.60 | 1.667    3.90 | 3.167    8.50 |  4.67    2.30
               0.250    1.60 | 1.750    3.90 | 3.250    8.50 |  4.75    2.30
               0.333    1.60 | 1.833    3.90 | 3.333    8.50 |  4.83    2.30
               0.417    1.60 | 1.917    3.90 | 3.417    8.50 |  4.92    2.30
               0.500    1.60 | 2.000    3.90 | 3.500    8.50 |  5.00    2.30
               0.583    2.30 | 2.083    4.60 | 3.583    3.90 |  5.08    1.60
               0.667    2.30 | 2.167    4.60 | 3.667    3.90 |  5.17    1.60
               0.750    2.30 | 2.250    4.60 | 3.750    3.90 |  5.25    1.60
               0.833    2.30 | 2.333    4.60 | 3.833    3.90 |  5.33    1.60
               0.917    2.30 | 2.417    4.60 | 3.917    3.90 |  5.42    1.60
               1.000    2.30 | 2.500    4.60 | 4.000    3.90 |  5.50    1.60
               1.083    2.30 | 2.583   23.20 | 4.083    3.10 |  5.58    1.60
               1.167    2.30 | 2.667   23.20 | 4.167    3.10 |  5.67    1.60
               1.250    2.30 | 2.750   23.20 | 4.250    3.10 |  5.75    1.60
               1.333    2.30 | 2.833   60.40 | 4.333    3.10 |  5.83    1.60
               1.417    2.30 | 2.917   60.40 | 4.417    3.10 |  5.92    1.60
               1.500    2.30 | 3.000   60.40 | 4.500    3.10 |  6.00    1.60

    Unit Hyd Qpeak  (cms)=   0.231

    PEAK FLOW       (cms)=   0.028 (i)
    TIME TO PEAK    (hrs)=   3.250
    RUNOFF VOLUME    (mm)=   6.149
    TOTAL RAINFALL   (mm)=  38.750
    RUNOFF COEFFICIENT   =   0.159

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

--------------------
| CALIB            |
| NASHYD    (1200) |   Area     (ha)=   1.76   Curve Number    (CN)= 64.3
|ID= 1 DT= 5.0 min |   Ia       (mm)=   8.90   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.12

    Unit Hyd Qpeak  (cms)=   0.560

    PEAK FLOW       (cms)=   0.040 (i)
    TIME TO PEAK    (hrs)=   3.000
    RUNOFF VOLUME    (mm)=   5.145
    TOTAL RAINFALL   (mm)=  38.750
    RUNOFF COEFFICIENT   =   0.133

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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--------------------
| CALIB            |
| NASHYD    (1300) |   Area     (ha)=   1.70   Curve Number   (CN)= 68.8
|ID= 1 DT= 5.0 min |   Ia       (mm)=   8.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.51

     Unit Hyd Qpeak  (cms)=   0.127

     PEAK FLOW       (cms)=   0.018 (i)
     TIME TO PEAK    (hrs)=   3.500
     RUNOFF VOLUME    (mm)=   6.478
     TOTAL RAINFALL   (mm)=  38.750
     RUNOFF COEFFICIENT   =   0.167

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (3200) |   Area     (ha)=   2.13
|ID= 1 DT= 5.0 min |   Total Imp(%)=  38.00   Dir. Conn.(%)=  38.00
--------------------

                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.81         1.32
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.50         0.27
     Length            (m)=     119.16       215.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      60.40         3.89
               over (min)        5.00       135.00
     Storage Coeff.  (min)=       3.07 (ii)  132.44 (ii)
     Unit Hyd. Tpeak (min)=       5.00       135.00
     Unit Hyd. peak  (cms)=       0.27         0.01
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.14         0.00          0.135 (iii)
     TIME TO PEAK    (hrs)=       3.00         5.17           3.00
     RUNOFF VOLUME    (mm)=      37.75         5.71          17.85
     TOTAL RAINFALL   (mm)=      38.75        38.75          38.75
     RUNOFF COEFFICIENT   =       0.97         0.15           0.46

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  60.5    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0012) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0370      0.0410
                         0.0080     0.0250   |   0.0460      0.0454
                         0.0170     0.0310   |   0.0550      0.0502
                         0.0250     0.0355   |   0.0000      0.0000
```



```
                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (3200)      2.130     0.135      3.00      17.85
     OUTFLOW: ID= 1 (0012)      2.130     0.008      6.00      17.48

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  5.81
                   TIME SHIFT OF PEAK FLOW          (min)=180.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.0246

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (3201) |   Area     (ha)=   1.75   Curve Number   (CN)= 62.7
|ID= 1 DT= 5.0 min |   Ia       (mm)=   7.90   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.17

     Unit Hyd Qpeak  (cms)=   0.393

     PEAK FLOW       (cms)=   0.032 (i)
     TIME TO PEAK    (hrs)=   3.083
     RUNOFF VOLUME    (mm)=   5.212
     TOTAL RAINFALL   (mm)=  38.750
     RUNOFF COEFFICIENT   =   0.134

     (i) 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 (0012):     2.13   0.008     6.00    17.48
        + ID2= 2 (3201):     1.75   0.032     3.08     5.21
          ================================================
          ID = 3 (0014):     3.88   0.039     3.08    11.94

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (2200) |   Area     (ha)=   2.13
|ID= 1 DT= 5.0 min |   Total Imp(%)=  38.00   Dir. Conn.(%)=  38.00
--------------------

                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.81         1.32
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.50         0.27
     Length            (m)=     119.16       215.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      60.40         3.89
               over (min)        5.00       135.00
     Storage Coeff.  (min)=       3.07 (ii)  132.44 (ii)
     Unit Hyd. Tpeak (min)=       5.00       135.00
     Unit Hyd. peak  (cms)=       0.27         0.01
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.14         0.00          0.135 (iii)
```

```
     TIME TO PEAK    (hrs)=       3.00         5.17          3.00
     RUNOFF VOLUME    (mm)=      37.75         5.71         17.85
     TOTAL RAINFALL   (mm)=      38.75        38.75         38.75
     RUNOFF COEFFICIENT   =       0.97         0.15          0.46

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  60.5    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            |
| NASHYD    (2201) |   Area     (ha)=   1.75   Curve Number   (CN)= 62.7
|ID= 1 DT= 5.0 min |   Ia       (mm)=   7.90   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.17

     Unit Hyd Qpeak  (cms)=   0.393

     PEAK FLOW       (cms)=   0.032 (i)
     TIME TO PEAK    (hrs)=   3.083
     RUNOFF VOLUME    (mm)=   5.212
     TOTAL RAINFALL   (mm)=  38.750
     RUNOFF COEFFICIENT   =   0.134

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

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

--------------------
| ADD HYD   (0009) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (2200):     2.13   0.135     3.00    17.85
        + ID2= 2 (2201):     1.75   0.032     3.08     5.21
          ================================================
          ID = 3 (0009):     3.88   0.165     3.00    12.15

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (2101) |   Area     (ha)=   0.96   Curve Number   (CN)= 62.5
|ID= 1 DT= 5.0 min |   Ia       (mm)=   4.90   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.53

     Unit Hyd Qpeak  (cms)=   0.069

     PEAK FLOW       (cms)=   0.010 (i)
     TIME TO PEAK    (hrs)=   3.500
     RUNOFF VOLUME    (mm)=   6.151
     TOTAL RAINFALL   (mm)=  38.750
     RUNOFF COEFFICIENT   =   0.159

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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--------------------
| CALIB            |
| STANDHYD  (2100) |   Area     (ha)=   0.56
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  25.00
--------------------

                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.28          0.28
     Dep. Storage     (mm)=       1.00          5.00
     Average Slope     (%)=       3.06          3.04
     Length            (m)=      61.10         70.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=      60.40         18.26
               over (min)         5.00         20.00
     Storage Coeff.  (min)=       1.66 (ii)    18.85 (ii)
     Unit Hyd. Tpeak (min)=       5.00         20.00
     Unit Hyd. peak  (cms)=       0.32          0.06
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.02          0.01          0.029 (iii)
     TIME TO PEAK    (hrs)=       3.00          3.25          3.00
     RUNOFF VOLUME    (mm)=      37.75          8.59         15.86
     TOTAL RAINFALL   (mm)=      38.75         38.75         38.75
     RUNOFF COEFFICIENT   =       0.97          0.22          0.41

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  60.5    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   (0006) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (2100):     0.56   0.029     3.00    15.86
        + ID2= 2 (2101):     0.96   0.010     3.50     6.15
          ================================================
          ID = 3 (0006):     1.52   0.033     3.00     9.73

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (2300) |   Area     (ha)=   0.24   Curve Number   (CN)= 60.5
|ID= 1 DT= 5.0 min |   Ia       (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.30

     Unit Hyd Qpeak  (cms)=   0.031

     PEAK FLOW       (cms)=   0.003 (i)
     TIME TO PEAK    (hrs)=   3.167
     RUNOFF VOLUME    (mm)=   5.702
     TOTAL RAINFALL   (mm)=  38.750
     RUNOFF COEFFICIENT   =   0.147
```

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

**** SIMULATION NUMBER: 2 ****

READ STORM	Filename: C:\Users\cproctorbennett\AppData\Local\Temp\2b9d8156-50db-4e2e-821e-7ba7d7695dfe\ca300faf
Ptotal= 52.45 mm	Comments: 5-Year, 6 hour SCS Type II - City of Pet

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	2.10	1.75	5.20	3.25	11.50	4.75	3.20
0.50	2.10	2.00	5.20	3.50	11.50	5.00	3.20
0.75	3.20	2.25	6.30	3.75	5.20	5.25	2.10
1.00	3.20	2.50	6.30	4.00	5.20	5.50	2.10
1.25	3.20	2.75	31.40	4.25	4.20	5.75	2.10
1.50	3.20	3.00	81.80	4.50	4.20	6.00	2.10

CALIB	
NASHYD (1100)	Area (ha)= 2.18 Curve Number (CN)= 67.7
ID= 1 DT= 5.0 min	Ia (mm)= 8.20 # 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	2.10	1.583	5.20	3.083	11.50	4.58	3.20
0.167	2.10	1.667	5.20	3.167	11.50	4.67	3.20
0.250	2.10	1.750	5.20	3.250	11.50	4.75	3.20
0.333	2.10	1.833	5.20	3.333	11.50	4.83	3.20
0.417	2.10	1.917	5.20	3.417	11.50	4.92	3.20
0.500	2.10	2.000	5.20	3.500	11.50	5.00	3.20
0.583	3.20	2.083	6.30	3.583	5.20	5.08	2.10
0.667	3.20	2.167	6.30	3.667	5.20	5.17	2.10
0.750	3.20	2.250	6.30	3.750	5.20	5.25	2.10
0.833	3.20	2.333	6.30	3.833	5.20	5.33	2.10
0.917	3.20	2.417	6.30	3.917	5.20	5.42	2.10
1.000	3.20	2.500	6.30	4.000	5.20	5.50	2.10
1.083	3.20	2.583	31.40	4.083	4.20	5.58	2.10
1.167	3.20	2.667	31.40	4.167	4.20	5.67	2.10
1.250	3.20	2.750	31.40	4.250	4.20	5.75	2.10
1.333	3.20	2.833	81.80	4.333	4.20	5.83	2.10
1.417	3.20	2.917	81.80	4.417	4.20	5.92	2.10
1.500	3.20	3.000	81.80	4.500	4.20	6.00	2.10

Unit Hyd Qpeak (cms)= 0.231

PEAK FLOW (cms)= 0.056 (i)

TIME TO PEAK (hrs)= 3.250
RUNOFF VOLUME (mm)= 11.833
TOTAL RAINFALL (mm)= 52.450
RUNOFF COEFFICIENT = 0.226

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

CALIB	
NASHYD (1200)	Area (ha)= 1.76 Curve Number (CN)= 64.3
ID= 1 DT= 5.0 min	Ia (mm)= 8.90 # of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= 0.12

Unit Hyd Qpeak (cms)= 0.560

PEAK FLOW (cms)= 0.081 (i)
TIME TO PEAK (hrs)= 3.000
RUNOFF VOLUME (mm)= 10.138
TOTAL RAINFALL (mm)= 52.450
RUNOFF COEFFICIENT = 0.193

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

CALIB	
NASHYD (1300)	Area (ha)= 1.70 Curve Number (CN)= 68.8
ID= 1 DT= 5.0 min	Ia (mm)= 8.00 # of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= 0.51

Unit Hyd Qpeak (cms)= 0.127

PEAK FLOW (cms)= 0.036 (i)
TIME TO PEAK (hrs)= 3.500
RUNOFF VOLUME (mm)= 12.376
TOTAL RAINFALL (mm)= 52.450
RUNOFF COEFFICIENT = 0.236

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

CALIB	
STANDHYD (3200)	Area (ha)= 2.13
ID= 1 DT= 5.0 min	Total Imp(%)= 38.00 Dir. Conn.(%)= 38.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.81	1.32
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.50	0.27
Length	(m)=	119.16	215.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.	(mm/hr)=	81.80	7.30
over	(min)	5.00	105.00
Storage Coeff.	(min)=	2.72 (ii)	103.31 (ii)
Unit Hyd. Tpeak	(min)=	5.00	105.00
Unit Hyd. peak	(cms)=	0.29	0.01

TOTALS

```
     PEAK FLOW       (cms)=       0.18         0.01          0.184 (iii)
     TIME TO PEAK    (hrs)=       3.00         4.67           3.00
     RUNOFF VOLUME    (mm)=      51.45        10.56          26.07
     TOTAL RAINFALL   (mm)=      52.45        52.45          52.45
     RUNOFF COEFFICIENT   =       0.98         0.20           0.50

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  60.5     Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0012) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0370      0.0410
                          0.0080     0.0250   |   0.0460      0.0454
                          0.0170     0.0310   |   0.0550      0.0502
                          0.0250     0.0355   |   0.0000      0.0000

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (3200)     2.130     0.184      3.00      26.07
     OUTFLOW: ID= 1 (0012)     2.130     0.018      4.83      25.70

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  9.51
                  TIME SHIFT OF PEAK FLOW         (min)=110.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0313

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (3201) |   Area    (ha)=   1.75   Curve Number   (CN)= 62.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.90   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.17

     Unit Hyd Qpeak  (cms)=   0.393

     PEAK FLOW       (cms)=   0.064 (i)
     TIME TO PEAK    (hrs)=   3.083
     RUNOFF VOLUME    (mm)=  10.107
     TOTAL RAINFALL   (mm)=  52.450
     RUNOFF COEFFICIENT   =   0.193

     (i) 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 (0012):     2.13   0.018     4.83    25.70
        + ID2= 2 (3201):     1.75   0.064     3.08    10.11
          ================================================
```



```
          ID = 3 (0014):     3.88   0.077     3.08    18.67

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (2200) |   Area    (ha)=   2.13
|ID= 1 DT= 5.0 min |   Total Imp(%)=  38.00   Dir. Conn.(%)=  38.00
--------------------

                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.81         1.32
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.50         0.27
     Length            (m)=     119.16       215.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      81.80         7.30
               over (min)         5.00       105.00
     Storage Coeff.  (min)=       2.72 (ii)  103.31 (ii)
     Unit Hyd. Tpeak (min)=       5.00       105.00
     Unit Hyd. peak  (cms)=       0.29         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.18         0.01          0.184 (iii)
     TIME TO PEAK    (hrs)=       3.00         4.67           3.00
     RUNOFF VOLUME    (mm)=      51.45        10.56          26.07
     TOTAL RAINFALL   (mm)=      52.45        52.45          52.45
     RUNOFF COEFFICIENT   =       0.98         0.20           0.50

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  60.5     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            |
| NASHYD    (2201) |   Area    (ha)=   1.75   Curve Number   (CN)= 62.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.90   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.17

     Unit Hyd Qpeak  (cms)=   0.393

     PEAK FLOW       (cms)=   0.064 (i)
     TIME TO PEAK    (hrs)=   3.083
     RUNOFF VOLUME    (mm)=  10.107
     TOTAL RAINFALL   (mm)=  52.450
     RUNOFF COEFFICIENT   =   0.193

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

--------------------------------------------------------------------------------
--------------------
| ADD HYD   (0009) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
```

```
          ID1= 1 (2200):     2.13   0.184     3.00    26.07
        + ID2= 2 (2201):     1.75   0.064     3.08    10.11
          ================================================
          ID = 3 (0009):     3.88   0.245     3.00    18.87

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (2101) |   Area     (ha)=   0.96   Curve Number    (CN)= 62.5
|ID= 1 DT= 5.0 min |   Ia       (mm)=   4.90   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.53

     Unit Hyd Qpeak  (cms)=   0.069

     PEAK FLOW       (cms)=   0.018 (i)
     TIME TO PEAK    (hrs)=   3.500
     RUNOFF VOLUME    (mm)=  11.306
     TOTAL RAINFALL   (mm)=  52.450
     RUNOFF COEFFICIENT   =   0.216

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (2100) |   Area     (ha)=   0.56
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  25.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.28         0.28
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       3.06         3.04
     Length            (m)=      61.10        70.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      81.80        40.30
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       1.47 (ii)   14.00 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.33         0.08
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.02          0.048 (iii)
     TIME TO PEAK    (hrs)=       3.00         3.08           3.00
     RUNOFF VOLUME    (mm)=      51.45        15.11          24.18
     TOTAL RAINFALL   (mm)=      52.45        52.45          52.45
     RUNOFF COEFFICIENT   =       0.98         0.29           0.46

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  60.5    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   (0006) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)      (mm)
          ID1= 1 (2100):     0.56   0.048     3.00    24.18
        + ID2= 2 (2101):     0.96   0.018     3.50    11.31
          ================================================
          ID = 3 (0006):     1.52   0.055     3.00    16.05

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (2300) |   Area     (ha)=   0.24   Curve Number    (CN)= 60.5
|ID= 1 DT= 5.0 min |   Ia       (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.30

     Unit Hyd Qpeak  (cms)=   0.031

     PEAK FLOW       (cms)=   0.006 (i)
     TIME TO PEAK    (hrs)=   3.167
     RUNOFF VOLUME    (mm)=  10.550
     TOTAL RAINFALL   (mm)=  52.450
     RUNOFF COEFFICIENT   =   0.201

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

--------------------------------------------------------------------------------
  ****************************
  ** SIMULATION NUMBER:   3 **
  ****************************


--------------------
|    READ STORM    |    Filename: C:\Users\cproctorbennett\AppD
|                  |              ata\Local\Temp\
|                  |              2b9d8156-50db-4e2e-821e-7ba7d7695dfe\5a8c4647
| Ptotal= 61.60 mm |    Comments: 10-Year, 6 hour SCS Type II - City of Pe
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.25    2.50 |  1.75    6.20 |  3.25   13.50 |  4.75    3.70
                0.50    2.50 |  2.00    6.20 |  3.50   13.50 |  5.00    3.70
                0.75    3.70 |  2.25    7.40 |  3.75    6.20 |  5.25    2.50
                1.00    3.70 |  2.50    7.40 |  4.00    6.20 |  5.50    2.50
                1.25    3.70 |  2.75   36.90 |  4.25    4.90 |  5.75    2.50
                1.50    3.70 |  3.00   95.90 |  4.50    4.90 |  6.00    2.50

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (1100) |   Area     (ha)=   2.18   Curve Number    (CN)= 67.7
|ID= 1 DT= 5.0 min |   Ia       (mm)=   8.20   # 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	2.50	1.583	6.20	3.083	13.50	4.58	3.70
0.167	2.50	1.667	6.20	3.167	13.50	4.67	3.70
0.250	2.50	1.750	6.20	3.250	13.50	4.75	3.70
0.333	2.50	1.833	6.20	3.333	13.50	4.83	3.70
0.417	2.50	1.917	6.20	3.417	13.50	4.92	3.70
0.500	2.50	2.000	6.20	3.500	13.50	5.00	3.70
0.583	3.70	2.083	7.40	3.583	6.20	5.08	2.50
0.667	3.70	2.167	7.40	3.667	6.20	5.17	2.50
0.750	3.70	2.250	7.40	3.750	6.20	5.25	2.50
0.833	3.70	2.333	7.40	3.833	6.20	5.33	2.50
0.917	3.70	2.417	7.40	3.917	6.20	5.42	2.50
1.000	3.70	2.500	7.40	4.000	6.20	5.50	2.50
1.083	3.70	2.583	36.90	4.083	4.90	5.58	2.50
1.167	3.70	2.667	36.90	4.167	4.90	5.67	2.50
1.250	3.70	2.750	36.90	4.250	4.90	5.75	2.50
1.333	3.70	2.833	95.90	4.333	4.90	5.83	2.50
1.417	3.70	2.917	95.90	4.417	4.90	5.92	2.50
1.500	3.70	3.000	95.90	4.500	4.90	6.00	2.50

Unit Hyd Qpeak (cms)= 0.231

PEAK FLOW (cms)= 0.079 (i)
TIME TO PEAK (hrs)= 3.250
RUNOFF VOLUME (mm)= 16.330
TOTAL RAINFALL (mm)= 61.600
RUNOFF COEFFICIENT = 0.265

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

CALIB					
NASHYD (1200)	Area	(ha)=	1.76	Curve Number	(CN)= 64.3
ID= 1 DT= 5.0 min	Ia	(mm)=	8.90	# of Linear Res.	(N)= 3.00
	U.H. Tp	(hrs)=	0.12		

Unit Hyd Qpeak (cms)= 0.560

PEAK FLOW (cms)= 0.114 (i)
TIME TO PEAK (hrs)= 3.000
RUNOFF VOLUME (mm)= 14.145
TOTAL RAINFALL (mm)= 61.600
RUNOFF COEFFICIENT = 0.230

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

CALIB					
NASHYD (1300)	Area	(ha)=	1.70	Curve Number	(CN)= 68.8
ID= 1 DT= 5.0 min	Ia	(mm)=	8.00	# of Linear Res.	(N)= 3.00
	U.H. Tp	(hrs)=	0.51		

Unit Hyd Qpeak (cms)= 0.127

PEAK FLOW (cms)= 0.050 (i)
TIME TO PEAK (hrs)= 3.500
RUNOFF VOLUME (mm)= 17.020

TOTAL RAINFALL (mm)= 61.600
RUNOFF COEFFICIENT = 0.276

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

CALIB					
STANDHYD (3200)	Area	(ha)=	2.13		
ID= 1 DT= 5.0 min	Total Imp	(%)=	38.00	Dir. Conn.	(%)= 38.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.81	1.32	
Dep. Storage	(mm)=	1.00	5.00	
Average Slope	(%)=	1.50	0.27	
Length	(m)=	119.16	215.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.	(mm/hr)=	95.90	10.00	
over	(min)	5.00	95.00	
Storage Coeff.	(min)=	2.56 (ii)	91.24 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	95.00	
Unit Hyd. peak	(cms)=	0.29	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.22	0.02	0.217 (iii)
TIME TO PEAK	(hrs)=	3.00	4.50	3.00
RUNOFF VOLUME	(mm)=	60.60	14.40	31.93
TOTAL RAINFALL	(mm)=	61.60	61.60	61.60
RUNOFF COEFFICIENT	=	0.98	0.23	0.52

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 60.5 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR (0012)				
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0370	0.0410
	0.0080	0.0250	0.0460	0.0454
	0.0170	0.0310	0.0550	0.0502
	0.0250	0.0355	0.0000	0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (3200)	2.130	0.217	3.00	31.93
OUTFLOW: ID= 1 (0012)	2.130	0.025	3.58	31.56

PEAK FLOW REDUCTION [Qout/Qin](%)= 11.63
TIME SHIFT OF PEAK FLOW (min)= 35.00
MAXIMUM STORAGE USED (ha.m.)= 0.0357

```
| CALIB             |
| NASHYD    (3201) |   Area     (ha)=   1.75   Curve Number    (CN)= 62.7
|ID= 1 DT= 5.0 min |   Ia       (mm)=   7.90   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.17

     Unit Hyd Qpeak  (cms)=   0.393

     PEAK FLOW       (cms)=   0.089 (i)
     TIME TO PEAK    (hrs)=   3.083
     RUNOFF VOLUME    (mm)=  14.030
     TOTAL RAINFALL   (mm)=  61.600
     RUNOFF COEFFICIENT   =   0.228

     (i) 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 (0012):     2.13   0.025     3.58    31.56
        + ID2= 2 (3201):     1.75   0.089     3.08    14.03
          ================================================
          ID = 3 (0014):     3.88   0.110     3.08    23.65

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

```
--------------------
| CALIB             |
| STANDHYD  (2200) |   Area     (ha)=   2.13
|ID= 1 DT= 5.0 min |   Total Imp(%)=  38.00   Dir. Conn.(%)=  38.00
--------------------

                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.81         1.32
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.50         0.27
     Length            (m)=     119.16       215.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      95.90        10.00
                 over (min)       5.00        95.00
     Storage Coeff.  (min)=       2.56 (ii)   91.24 (ii)
     Unit Hyd. Tpeak (min)=       5.00        95.00
     Unit Hyd. peak  (cms)=       0.29         0.01
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.22         0.02          0.217 (iii)
     TIME TO PEAK    (hrs)=       3.00         4.50           3.00
     RUNOFF VOLUME    (mm)=      60.60        14.40          31.93
     TOTAL RAINFALL   (mm)=      61.60        61.60          61.60
     RUNOFF COEFFICIENT   =       0.98         0.23           0.52

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  60.5    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             |
| NASHYD    (2201) |   Area     (ha)=   1.75   Curve Number    (CN)= 62.7
|ID= 1 DT= 5.0 min |   Ia       (mm)=   7.90   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.17

     Unit Hyd Qpeak  (cms)=   0.393

     PEAK FLOW       (cms)=   0.089 (i)
     TIME TO PEAK    (hrs)=   3.083
     RUNOFF VOLUME    (mm)=  14.030
     TOTAL RAINFALL   (mm)=  61.600
     RUNOFF COEFFICIENT   =   0.228

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

```
--------------------
| ADD HYD   (0009) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (2200):     2.13   0.217     3.00    31.93
        + ID2= 2 (2201):     1.75   0.089     3.08    14.03
          ================================================
          ID = 3 (0009):     3.88   0.302     3.00    23.86

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

```
--------------------
| CALIB             |
| NASHYD    (2101) |   Area     (ha)=   0.96   Curve Number    (CN)= 62.5
|ID= 1 DT= 5.0 min |   Ia       (mm)=   4.90   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.53

     Unit Hyd Qpeak  (cms)=   0.069

     PEAK FLOW       (cms)=   0.025 (i)
     TIME TO PEAK    (hrs)=   3.500
     RUNOFF VOLUME    (mm)=  15.373
     TOTAL RAINFALL   (mm)=  61.600
     RUNOFF COEFFICIENT   =   0.250

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

```
--------------------
| CALIB             |
| STANDHYD  (2100) |   Area     (ha)=   0.56
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  25.00
--------------------

                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.28         0.28
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       3.06         3.04
     Length            (m)=      61.10        70.00
     Mannings n           =      0.013        0.250
```

```
     Max.Eff.Inten.(mm/hr)=      95.90        53.72
               over (min)         5.00        15.00
     Storage Coeff.  (min)=       1.38 (ii)   12.55 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.33         0.08
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.03          0.060 (iii)
     TIME TO PEAK    (hrs)=       3.00         3.08           3.00
     RUNOFF VOLUME    (mm)=      60.60        20.11          30.22
     TOTAL RAINFALL   (mm)=      61.60        61.60          61.60
     RUNOFF COEFFICIENT   =       0.98         0.33           0.49

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  60.5     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   (0006) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (2100):     0.56   0.060     3.00    30.22
        + ID2= 2 (2101):     0.96   0.025     3.50    15.37
          ================================================
          ID = 3 (0006):     1.52   0.070     3.00    20.84

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

```
--------------------
| CALIB            |
| NASHYD    (2300) |   Area     (ha)=   0.24   Curve Number    (CN)= 60.5
|ID= 1 DT= 5.0 min |   Ia       (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.30

     Unit Hyd Qpeak  (cms)=   0.031

     PEAK FLOW       (cms)=   0.009 (i)
     TIME TO PEAK    (hrs)=   3.167
     RUNOFF VOLUME    (mm)=  14.393
     TOTAL RAINFALL   (mm)=  61.600
     RUNOFF COEFFICIENT   =   0.234

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

```
  **************************
  ** SIMULATION NUMBER:   4 **
  **************************


--------------------
|    READ STORM    |    Filename: C:\Users\cproctorbennett\AppD
|                  |              ata\Local\Temp\
```



```
|                  |              2b9d8156-50db-4e2e-821e-7ba7d7695dfe\58ef2753
| Ptotal= 72.90 mm |    Comments: 25-Year, 6 hour SCS Type II - City of Pe
--------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	2.90	1.75	7.30	3.25	16.00	4.75	4.40
0.50	2.90	2.00	7.30	3.50	16.00	5.00	4.40
0.75	4.40	2.25	8.80	3.75	7.30	5.25	2.90
1.00	4.40	2.50	8.80	4.00	7.30	5.50	2.90
1.25	4.40	2.75	43.70	4.25	5.80	5.75	2.90
1.50	4.40	3.00	113.70	4.50	5.80	6.00	2.90

```
--------------------
| CALIB            |
| NASHYD    (1100) |   Area     (ha)=   2.18   Curve Number    (CN)= 67.7
|ID= 1 DT= 5.0 min |   Ia       (mm)=   8.20   # 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	2.90	1.583	7.30	3.083	16.00	4.58	4.40
0.167	2.90	1.667	7.30	3.167	16.00	4.67	4.40
0.250	2.90	1.750	7.30	3.250	16.00	4.75	4.40
0.333	2.90	1.833	7.30	3.333	16.00	4.83	4.40
0.417	2.90	1.917	7.30	3.417	16.00	4.92	4.40
0.500	2.90	2.000	7.30	3.500	16.00	5.00	4.40
0.583	4.40	2.083	8.80	3.583	7.30	5.08	2.90
0.667	4.40	2.167	8.80	3.667	7.30	5.17	2.90
0.750	4.40	2.250	8.80	3.750	7.30	5.25	2.90
0.833	4.40	2.333	8.80	3.833	7.30	5.33	2.90
0.917	4.40	2.417	8.80	3.917	7.30	5.42	2.90
1.000	4.40	2.500	8.80	4.000	7.30	5.50	2.90
1.083	4.40	2.583	43.70	4.083	5.80	5.58	2.90
1.167	4.40	2.667	43.70	4.167	5.80	5.67	2.90
1.250	4.40	2.750	43.70	4.250	5.80	5.75	2.90
1.333	4.40	2.833	113.70	4.333	5.80	5.83	2.90
1.417	4.40	2.917	113.70	4.417	5.80	5.92	2.90
1.500	4.40	3.000	113.70	4.500	5.80	6.00	2.90

```
     Unit Hyd Qpeak  (cms)=   0.231

     PEAK FLOW       (cms)=   0.110 (i)
     TIME TO PEAK    (hrs)=   3.250
     RUNOFF VOLUME    (mm)=  22.515
     TOTAL RAINFALL   (mm)=  72.900
     RUNOFF COEFFICIENT   =   0.309

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

```
--------------------
| CALIB            |
| NASHYD    (1200) |   Area     (ha)=   1.76   Curve Number    (CN)= 64.3
|ID= 1 DT= 5.0 min |   Ia       (mm)=   8.90   # of Linear Res.(N)= 3.00
```

```
--------------------   U.H. Tp(hrs)=   0.12

     Unit Hyd Qpeak  (cms)=   0.560

     PEAK FLOW       (cms)=   0.161 (i)
     TIME TO PEAK    (hrs)=   3.000
     RUNOFF VOLUME    (mm)=  19.711
     TOTAL RAINFALL   (mm)=  72.900
     RUNOFF COEFFICIENT   =   0.270

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

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (1300) |   Area    (ha)=   1.70   Curve Number    (CN)= 68.8
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.51

     Unit Hyd Qpeak  (cms)=   0.127

     PEAK FLOW       (cms)=   0.070 (i)
     TIME TO PEAK    (hrs)=   3.417
     RUNOFF VOLUME    (mm)=  23.387
     TOTAL RAINFALL   (mm)=  72.900
     RUNOFF COEFFICIENT   =   0.321

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

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (3200) |   Area    (ha)=   2.13
|ID= 1 DT= 5.0 min |   Total Imp(%)=  38.00   Dir. Conn.(%)=  38.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.81         1.32
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.50         0.27
     Length            (m)=     119.16       215.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     113.70        13.79
               over (min)         5.00        85.00
     Storage Coeff.  (min)=       2.39 (ii)   80.36 (ii)
     Unit Hyd. Tpeak (min)=       5.00        85.00
     Unit Hyd. peak  (cms)=       0.30         0.01
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.26         0.02          0.258 (iii)
     TIME TO PEAK    (hrs)=       3.00         4.33           3.00
     RUNOFF VOLUME    (mm)=      71.90        19.72          39.53
     TOTAL RAINFALL   (mm)=      72.90        72.90          72.90
     RUNOFF COEFFICIENT   =       0.99         0.27           0.54

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  60.5    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
```



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

-------------------------------------------------------------------------------
--------------------
| RESERVOIR (0012) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0370     0.0410
                          0.0080     0.0250   |   0.0460     0.0454
                          0.0170     0.0310   |   0.0550     0.0502
                          0.0250     0.0355   |   0.0000     0.0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (3200)      2.130     0.258      3.00      39.53
     OUTFLOW: ID= 1 (0012)      2.130     0.037      3.58      39.16

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)= 14.39
                    TIME SHIFT OF PEAK FLOW         (min)= 35.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.0412

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (3201) |   Area    (ha)=   1.75   Curve Number    (CN)= 62.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.90   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.17

     Unit Hyd Qpeak  (cms)=   0.393

     PEAK FLOW       (cms)=   0.124 (i)
     TIME TO PEAK    (hrs)=   3.083
     RUNOFF VOLUME    (mm)=  19.481
     TOTAL RAINFALL   (mm)=  72.900
     RUNOFF COEFFICIENT   =   0.267

     (i) 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 (0012):     2.13    0.037     3.58    39.16
        + ID2= 2 (3201):     1.75    0.124     3.08    19.48
          ==========================================
          ID = 3 (0014):     3.88    0.158     3.08    30.28

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (2200) |   Area    (ha)=   2.13
|ID= 1 DT= 5.0 min |   Total Imp(%)=  38.00   Dir. Conn.(%)=  38.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.81         1.32
```

```
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.50         0.27
     Length            (m)=     119.16       215.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     113.70        13.79
               over (min)         5.00        85.00
     Storage Coeff.  (min)=       2.39 (ii)   80.36 (ii)
     Unit Hyd. Tpeak (min)=       5.00        85.00
     Unit Hyd. peak  (cms)=       0.30         0.01
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.26         0.02      0.258 (iii)
     TIME TO PEAK    (hrs)=       3.00         4.33       3.00
     RUNOFF VOLUME    (mm)=      71.90        19.72      39.53
     TOTAL RAINFALL   (mm)=      72.90        72.90      72.90
     RUNOFF COEFFICIENT   =       0.99         0.27       0.54

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  60.5    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            |
| NASHYD    (2201) |   Area    (ha)=   1.75   Curve Number   (CN)= 62.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.90   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.17

     Unit Hyd Qpeak  (cms)=   0.393

     PEAK FLOW       (cms)=   0.124 (i)
     TIME TO PEAK    (hrs)=   3.083
     RUNOFF VOLUME    (mm)=  19.481
     TOTAL RAINFALL   (mm)=  72.900
     RUNOFF COEFFICIENT   =   0.267

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

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

--------------------
| ADD HYD   (0009) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (2200):     2.13   0.258     3.00    39.53
        + ID2= 2 (2201):     1.75   0.124     3.08    19.48
          ================================================
          ID = 3 (0009):     3.88   0.379     3.00    30.49

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (2101) |   Area    (ha)=   0.96   Curve Number   (CN)= 62.5
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.90   # of Linear Res.(N)= 3.00
```



```
--------------------   U.H. Tp(hrs)=   0.53

     Unit Hyd Qpeak  (cms)=   0.069

     PEAK FLOW       (cms)=   0.034 (i)
     TIME TO PEAK    (hrs)=   3.500
     RUNOFF VOLUME    (mm)=  20.978
     TOTAL RAINFALL   (mm)=  72.900
     RUNOFF COEFFICIENT   =   0.288

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (2100) |   Area    (ha)=   0.56
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  25.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.28         0.28
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       3.06         3.04
     Length            (m)=      61.10        70.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     113.70        78.76
               over (min)         5.00        15.00
     Storage Coeff.  (min)=       1.29 (ii)   10.87 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.33         0.09
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.04       0.077 (iii)
     TIME TO PEAK    (hrs)=       3.00         3.08       3.00
     RUNOFF VOLUME    (mm)=      71.90        26.87      38.11
     TOTAL RAINFALL   (mm)=      72.90        72.90      72.90
     RUNOFF COEFFICIENT   =       0.99         0.37       0.52

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  60.5    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   (0006) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (2100):     0.56   0.077     3.00    38.11
        + ID2= 2 (2101):     0.96   0.034     3.50    20.98
          ================================================
          ID = 3 (0006):     1.52   0.092     3.00    27.29

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

```
| CALIB            |
| NASHYD    (2300) |   Area     (ha)=   0.24   Curve Number    (CN)= 60.5
|ID= 1 DT= 5.0 min |   Ia       (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.30

     Unit Hyd Qpeak  (cms)=   0.031

     PEAK FLOW       (cms)=   0.012 (i)
     TIME TO PEAK    (hrs)=   3.167
     RUNOFF VOLUME    (mm)=  19.714
     TOTAL RAINFALL   (mm)=  72.900
     RUNOFF COEFFICIENT   =   0.270

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

```
  ****************************
  ** SIMULATION NUMBER:   5 **
  ****************************


--------------------
|    READ STORM    |    Filename: C:\Users\cproctorbennett\AppD
|                  |              ata\Local\Temp\
|                  |              2b9d8156-50db-4e2e-821e-7ba7d7695dfe\242769fc
| Ptotal= 81.47 mm |    Comments: 50-Year, 6 hour SCS Type II - City of Pe
--------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	3.30	1.75	8.10	3.25	17.90	4.75	4.90
0.50	3.30	2.00	8.10	3.50	17.90	5.00	4.90
0.75	4.90	2.25	9.80	3.75	8.10	5.25	3.30
1.00	4.90	2.50	9.80	4.00	8.10	5.50	3.30
1.25	4.90	2.75	48.90	4.25	6.50	5.75	3.30
1.50	4.90	3.00	127.00	4.50	6.50	6.00	3.30

```
--------------------
| CALIB            |
| NASHYD    (1100) |   Area     (ha)=   2.18   Curve Number    (CN)= 67.7
|ID= 1 DT= 5.0 min |   Ia       (mm)=   8.20   # 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	3.30	1.583	8.10	3.083	17.90	4.58	4.90
0.167	3.30	1.667	8.10	3.167	17.90	4.67	4.90
0.250	3.30	1.750	8.10	3.250	17.90	4.75	4.90
0.333	3.30	1.833	8.10	3.333	17.90	4.83	4.90
0.417	3.30	1.917	8.10	3.417	17.90	4.92	4.90
0.500	3.30	2.000	8.10	3.500	17.90	5.00	4.90
0.583	4.90	2.083	9.80	3.583	8.10	5.08	3.30
0.667	4.90	2.167	9.80	3.667	8.10	5.17	3.30
0.750	4.90	2.250	9.80	3.750	8.10	5.25	3.30
0.833	4.90	2.333	9.80	3.833	8.10	5.33	3.30

0.917	4.90	2.417	9.80	3.917	8.10	5.42	3.30
1.000	4.90	2.500	9.80	4.000	8.10	5.50	3.30
1.083	4.90	2.583	48.90	4.083	6.50	5.58	3.30
1.167	4.90	2.667	48.90	4.167	6.50	5.67	3.30
1.250	4.90	2.750	48.90	4.250	6.50	5.75	3.30
1.333	4.90	2.833	127.00	4.333	6.50	5.83	3.30
1.417	4.90	2.917	127.00	4.417	6.50	5.92	3.30
1.500	4.90	3.000	127.00	4.500	6.50	6.00	3.30

```
     Unit Hyd Qpeak  (cms)=   0.231

     PEAK FLOW       (cms)=   0.136 (i)
     TIME TO PEAK    (hrs)=   3.250
     RUNOFF VOLUME    (mm)=  27.606
     TOTAL RAINFALL   (mm)=  81.475
     RUNOFF COEFFICIENT   =   0.339

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

```
--------------------
| CALIB            |
| NASHYD    (1200) |   Area     (ha)=   1.76   Curve Number    (CN)= 64.3
|ID= 1 DT= 5.0 min |   Ia       (mm)=   8.90   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.12

     Unit Hyd Qpeak  (cms)=   0.560

     PEAK FLOW       (cms)=   0.199 (i)
     TIME TO PEAK    (hrs)=   3.000
     RUNOFF VOLUME    (mm)=  24.330
     TOTAL RAINFALL   (mm)=  81.475
     RUNOFF COEFFICIENT   =   0.299

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

```
--------------------
| CALIB            |
| NASHYD    (1300) |   Area     (ha)=   1.70   Curve Number    (CN)= 68.8
|ID= 1 DT= 5.0 min |   Ia       (mm)=   8.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.51

     Unit Hyd Qpeak  (cms)=   0.127

     PEAK FLOW       (cms)=   0.086 (i)
     TIME TO PEAK    (hrs)=   3.417
     RUNOFF VOLUME    (mm)=  28.613
     TOTAL RAINFALL   (mm)=  81.475
     RUNOFF COEFFICIENT   =   0.351

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

```
--------------------
| CALIB            |
| STANDHYD  (3200) |   Area     (ha)=   2.13
|ID= 1 DT= 5.0 min |   Total Imp(%)=  38.00   Dir. Conn.(%)=  38.00
--------------------

                           IMPERVIOUS    PERVIOUS (i)
```

```
     Surface Area     (ha)=       0.81         1.32
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.50         0.27
     Length            (m)=     119.16       215.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     127.00        16.92
               over (min)         5.00        75.00
     Storage Coeff.  (min)=       2.28 (ii)   74.13 (ii)
     Unit Hyd. Tpeak (min)=       5.00        75.00
     Unit Hyd. peak  (cms)=       0.30         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.29         0.03          0.290 (iii)
     TIME TO PEAK    (hrs)=       3.00         4.17           3.00
     RUNOFF VOLUME    (mm)=      80.47        24.14          45.52
     TOTAL RAINFALL   (mm)=      81.48        81.48          81.48
     RUNOFF COEFFICIENT   =       0.99         0.30           0.56

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  60.5    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0012) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0370     0.0410
                          0.0080     0.0250   |   0.0460     0.0454
                          0.0170     0.0310   |   0.0550     0.0502
                          0.0250     0.0355   |   0.0000     0.0000

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (3200)    2.130     0.290      3.00      45.52
     OUTFLOW: ID= 1 (0012)    2.130     0.046      3.58      45.15

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)= 15.92
                    TIME SHIFT OF PEAK FLOW         (min)= 35.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.0456

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (3201) |   Area    (ha)=   1.75   Curve Number   (CN)= 62.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.90   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.17

     Unit Hyd Qpeak  (cms)=   0.393

     PEAK FLOW       (cms)=   0.153 (i)
     TIME TO PEAK    (hrs)=   3.083
     RUNOFF VOLUME    (mm)=  24.007
     TOTAL RAINFALL   (mm)=  81.475
     RUNOFF COEFFICIENT   =   0.295
```



```
     (i) 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 (0012):     2.13   0.046     3.58    45.15
        + ID2= 2 (3201):     1.75   0.153     3.08    24.01
          ================================================
          ID = 3 (0014):     3.88   0.196     3.08    35.62

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (2200) |   Area    (ha)=   2.13
|ID= 1 DT= 5.0 min |   Total Imp(%)=  38.00   Dir. Conn.(%)=  38.00
--------------------

                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.81          1.32
     Dep. Storage     (mm)=       1.00          5.00
     Average Slope     (%)=       1.50          0.27
     Length            (m)=     119.16        215.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     127.00         16.92
               over (min)         5.00         75.00
     Storage Coeff.  (min)=       2.28 (ii)    74.13 (ii)
     Unit Hyd. Tpeak (min)=       5.00         75.00
     Unit Hyd. peak  (cms)=       0.30          0.02
                                                         *TOTALS*
     PEAK FLOW       (cms)=       0.29          0.03          0.290 (iii)
     TIME TO PEAK    (hrs)=       3.00          4.17           3.00
     RUNOFF VOLUME    (mm)=      80.47         24.14          45.52
     TOTAL RAINFALL   (mm)=      81.48         81.48          81.48
     RUNOFF COEFFICIENT   =       0.99          0.30           0.56

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  60.5    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            |
| NASHYD    (2201) |   Area    (ha)=   1.75   Curve Number   (CN)= 62.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.90   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.17

     Unit Hyd Qpeak  (cms)=   0.393

     PEAK FLOW       (cms)=   0.153 (i)
     TIME TO PEAK    (hrs)=   3.083
```

```
     RUNOFF VOLUME    (mm)=  24.007
     TOTAL RAINFALL   (mm)=  81.475
     RUNOFF COEFFICIENT   =   0.295

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

```
--------------------
| ADD HYD   (0009) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (2200):     2.13   0.290     3.00    45.52
       + ID2= 2 (2201):     1.75   0.153     3.08    24.01
         ================================================
         ID = 3 (0009):     3.88   0.440     3.00    35.82

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

```
--------------------
| CALIB            |
| NASHYD    (2101) |   Area    (ha)=   0.96   Curve Number   (CN)= 62.5
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.90   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.53

     Unit Hyd Qpeak  (cms)=   0.069

     PEAK FLOW       (cms)=   0.042 (i)
     TIME TO PEAK    (hrs)=   3.500
     RUNOFF VOLUME    (mm)=  25.606
     TOTAL RAINFALL   (mm)=  81.475
     RUNOFF COEFFICIENT   =   0.314

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

```
--------------------
| CALIB            |
| STANDHYD  (2100) |   Area    (ha)=   0.56
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  25.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.28         0.28
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       3.06         3.04
     Length            (m)=      61.10        70.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=     127.00        94.52
                 over (min)        5.00        15.00
     Storage Coeff.  (min)=       1.24 (ii)   10.14 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.33         0.10
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.05         0.05          0.091 (iii)
     TIME TO PEAK    (hrs)=       3.00         3.08           3.00
     RUNOFF VOLUME    (mm)=      80.47        32.36          44.38
     TOTAL RAINFALL   (mm)=      81.48        81.48          81.48
     RUNOFF COEFFICIENT   =       0.99         0.40           0.54
```



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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  60.5    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   (0006) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (2100):     0.56   0.091     3.00    44.38
       + ID2= 2 (2101):     0.96   0.042     3.50    25.61
         ================================================
         ID = 3 (0006):     1.52   0.109     3.00    32.52

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

```
--------------------
| CALIB            |
| NASHYD    (2300) |   Area    (ha)=   0.24   Curve Number   (CN)= 60.5
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.30

     Unit Hyd Qpeak  (cms)=   0.031

     PEAK FLOW       (cms)=   0.015 (i)
     TIME TO PEAK    (hrs)=   3.167
     RUNOFF VOLUME    (mm)=  24.123
     TOTAL RAINFALL   (mm)=  81.475
     RUNOFF COEFFICIENT   =   0.296

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

```
  ****************************
  ** SIMULATION NUMBER:   6 **
  ****************************


--------------------
|    READ STORM    |    Filename: C:\Users\cproctorbennett\AppD
|                  |              ata\Local\Temp\
|                  |              2b9d8156-50db-4e2e-821e-7ba7d7695dfe\74475312
| Ptotal= 89.93 mm |    Comments: 100-Year, 6 hour SCS Type II - City of P
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.25    3.60 |  1.75    9.00 |  3.25   19.80 |  4.75    5.40
                0.50    3.60 |  2.00    9.00 |  3.50   19.80 |  5.00    5.40
                0.75    5.40 |  2.25   10.80 |  3.75    9.00 |  5.25    3.60
                1.00    5.40 |  2.50   10.80 |  4.00    9.00 |  5.50    3.60
                1.25    5.40 |  2.75   53.90 |  4.25    7.20 |  5.75    3.60
                1.50    5.40 |  3.00  140.20 |  4.50    7.20 |  6.00    3.60
```

CALIB					
NASHYD (1100)	Area (ha)=	2.18	Curve Number (CN)=	67.7	
ID= 1 DT= 5.0 min	Ia (mm)=	8.20	# 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	3.60	1.583	9.00	3.083	19.80	4.58	5.40
0.167	3.60	1.667	9.00	3.167	19.80	4.67	5.40
0.250	3.60	1.750	9.00	3.250	19.80	4.75	5.40
0.333	3.60	1.833	9.00	3.333	19.80	4.83	5.40
0.417	3.60	1.917	9.00	3.417	19.80	4.92	5.40
0.500	3.60	2.000	9.00	3.500	19.80	5.00	5.40
0.583	5.40	2.083	10.80	3.583	9.00	5.08	3.60
0.667	5.40	2.167	10.80	3.667	9.00	5.17	3.60
0.750	5.40	2.250	10.80	3.750	9.00	5.25	3.60
0.833	5.40	2.333	10.80	3.833	9.00	5.33	3.60
0.917	5.40	2.417	10.80	3.917	9.00	5.42	3.60
1.000	5.40	2.500	10.80	4.000	9.00	5.50	3.60
1.083	5.40	2.583	53.90	4.083	7.20	5.58	3.60
1.167	5.40	2.667	53.90	4.167	7.20	5.67	3.60
1.250	5.40	2.750	53.90	4.250	7.20	5.75	3.60
1.333	5.40	2.833	140.20	4.333	7.20	5.83	3.60
1.417	5.40	2.917	140.20	4.417	7.20	5.92	3.60
1.500	5.40	3.000	140.20	4.500	7.20	6.00	3.60

Unit Hyd Qpeak (cms)= 0.231

PEAK FLOW (cms)= 0.164 (i)
TIME TO PEAK (hrs)= 3.250
RUNOFF VOLUME (mm)= 32.910
TOTAL RAINFALL (mm)= 89.925
RUNOFF COEFFICIENT = 0.366

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

CALIB					
NASHYD (1200)	Area (ha)=	1.76	Curve Number (CN)=	64.3	
ID= 1 DT= 5.0 min	Ia (mm)=	8.90	# of Linear Res.(N)=	3.00	
	U.H. Tp(hrs)=	0.12			

Unit Hyd Qpeak (cms)= 0.560

PEAK FLOW (cms)= 0.239 (i)
TIME TO PEAK (hrs)= 3.000
RUNOFF VOLUME (mm)= 29.171
TOTAL RAINFALL (mm)= 89.925
RUNOFF COEFFICIENT = 0.324

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

CALIB					
NASHYD (1300)	Area (ha)=	1.70	Curve Number (CN)=	68.8	
ID= 1 DT= 5.0 min	Ia (mm)=	8.00	# of Linear Res.(N)=	3.00	
	U.H. Tp(hrs)=	0.51			

Unit Hyd Qpeak (cms)= 0.127

PEAK FLOW (cms)= 0.103 (i)
TIME TO PEAK (hrs)= 3.417
RUNOFF VOLUME (mm)= 34.048
TOTAL RAINFALL (mm)= 89.925
RUNOFF COEFFICIENT = 0.379

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

CALIB					
STANDHYD (3200)	Area (ha)=	2.13			
ID= 1 DT= 5.0 min	Total Imp(%)=	38.00	Dir. Conn.(%)=	38.00	

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.81	1.32	
Dep. Storage	(mm)=	1.00	5.00	
Average Slope	(%)=	1.50	0.27	
Length	(m)=	119.16	215.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		140.20	20.22	
over (min)		5.00	70.00	
Storage Coeff. (min)=		2.20 (ii)	69.10 (ii)	
Unit Hyd. Tpeak (min)=		5.00	70.00	
Unit Hyd. peak (cms)=		0.30	0.02	
				TOTALS
PEAK FLOW	(cms)=	0.32	0.04	0.322 (iii)
TIME TO PEAK	(hrs)=	3.00	4.08	3.00
RUNOFF VOLUME	(mm)=	88.92	28.76	51.61
TOTAL RAINFALL	(mm)=	89.93	89.93	89.93
RUNOFF COEFFICIENT	=	0.99	0.32	0.57

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 60.5 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR (0012)				
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0370	0.0410
	0.0080	0.0250	0.0460	0.0454
	0.0170	0.0310	0.0550	0.0502
	0.0250	0.0355	0.0000	0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (3200)	2.130	0.322	3.00	51.61
OUTFLOW: ID= 1 (0012)	2.130	0.055	4.17	51.24

PEAK FLOW REDUCTION [Qout/Qin](%)= 17.04
TIME SHIFT OF PEAK FLOW (min)= 70.00
MAXIMUM STORAGE USED (ha.m.)= 0.0503

CALIB					
NASHYD (3201)	Area	(ha)=	1.75	Curve Number (CN)=	62.7
ID= 1 DT= 5.0 min	Ia	(mm)=	7.90	# of Linear Res.(N)=	3.00
	U.H. Tp	(hrs)=	0.17		

Unit Hyd Qpeak (cms)= 0.393

PEAK FLOW (cms)= 0.184 (i)
TIME TO PEAK (hrs)= 3.083
RUNOFF VOLUME (mm)= 28.757
TOTAL RAINFALL (mm)= 89.925
RUNOFF COEFFICIENT = 0.320

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

ADD HYD (0014)		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
1 + 2 = 3	ID1= 1 (0012):	2.13	0.055	4.17	51.24
	+ ID2= 2 (3201):	1.75	0.184	3.08	28.76
	ID = 3 (0014):	3.88	0.235	3.08	41.10

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB					
STANDHYD (2200)	Area	(ha)=	2.13		
ID= 1 DT= 5.0 min	Total Imp	(%)=	38.00	Dir. Conn.(%)=	38.00

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.81	1.32	
Dep. Storage (mm)=	1.00	5.00	
Average Slope (%)=	1.50	0.27	
Length (m)=	119.16	215.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	140.20	20.22	
over (min)	5.00	70.00	
Storage Coeff. (min)=	2.20 (ii)	69.10 (ii)	
Unit Hyd. Tpeak (min)=	5.00	70.00	
Unit Hyd. peak (cms)=	0.30	0.02	
			TOTALS
PEAK FLOW (cms)=	0.32	0.04	0.322 (iii)

TIME TO PEAK (hrs)=	3.00	4.08	3.00
RUNOFF VOLUME (mm)=	88.92	28.76	51.61
TOTAL RAINFALL (mm)=	89.93	89.93	89.93
RUNOFF COEFFICIENT =	0.99	0.32	0.57

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 60.5 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					
NASHYD (2201)	Area	(ha)=	1.75	Curve Number (CN)=	62.7
ID= 1 DT= 5.0 min	Ia	(mm)=	7.90	# of Linear Res.(N)=	3.00
	U.H. Tp	(hrs)=	0.17		

Unit Hyd Qpeak (cms)= 0.393

PEAK FLOW (cms)= 0.184 (i)
TIME TO PEAK (hrs)= 3.083
RUNOFF VOLUME (mm)= 28.757
TOTAL RAINFALL (mm)= 89.925
RUNOFF COEFFICIENT = 0.320

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

ADD HYD (0009)		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
1 + 2 = 3	ID1= 1 (2200):	2.13	0.322	3.00	51.61
	+ ID2= 2 (2201):	1.75	0.184	3.08	28.76
	ID = 3 (0009):	3.88	0.503	3.00	41.30

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB					
NASHYD (2101)	Area	(ha)=	0.96	Curve Number (CN)=	62.5
ID= 1 DT= 5.0 min	Ia	(mm)=	4.90	# of Linear Res.(N)=	3.00
	U.H. Tp	(hrs)=	0.53		

Unit Hyd Qpeak (cms)= 0.069

PEAK FLOW (cms)= 0.050 (i)
TIME TO PEAK (hrs)= 3.500
RUNOFF VOLUME (mm)= 30.446
TOTAL RAINFALL (mm)= 89.925
RUNOFF COEFFICIENT = 0.339

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

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--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (2100) |   Area    (ha)=   0.56
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  25.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.28         0.28
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       3.06         3.04
     Length            (m)=      61.10        70.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     140.20       110.82
               over (min)          5.00        10.00
     Storage Coeff.  (min)=       1.19 (ii)    9.55 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.33         0.12
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.05         0.06          0.115 (iii)
     TIME TO PEAK    (hrs)=       3.00         3.00           3.00
     RUNOFF VOLUME    (mm)=      88.92        38.03          50.75
     TOTAL RAINFALL   (mm)=      89.93        89.93          89.93
     RUNOFF COEFFICIENT   =       0.99         0.42           0.56

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  60.5    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   (0006) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)      (mm)
          ID1= 1 (2100):     0.56   0.115     3.00    50.75
        + ID2= 2 (2101):     0.96   0.050     3.50    30.45
          ================================================
          ID = 3 (0006):     1.52   0.137     3.00    37.93

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (2300) |   Area    (ha)=   0.24   Curve Number   (CN)= 60.5
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.30

     Unit Hyd Qpeak  (cms)=   0.031

     PEAK FLOW       (cms)=   0.018 (i)
     TIME TO PEAK    (hrs)=   3.167
     RUNOFF VOLUME    (mm)=  28.748
     TOTAL RAINFALL   (mm)=  89.925
     RUNOFF COEFFICIENT   =   0.320
```



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

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Appendix C

Quality Control

3.3.2 Water Quality Sizing Criteria

The volumetric water quality criteria are presented in Table 3.2. The values are based on a 24 hour drawdown time and a design which conforms to the guidance provided in this manual. Requirements differ with SWMP type to reflect differences in removal efficiencies. Of the specified storage volume for wet facilities, 40 m³/ha is extended detention, while the remainder represents the permanent pool.

Table 3.2 Water Quality Storage Requirements based on Receiving Waters[1, 2]

Protection Level	SWMP Type	Storage Volume (m³/ha) for Impervious Level			
		35%	55%	70%	85%
Enhanced 80% long-term S.S. removal	Infiltration	25	30	35	40
	Wetlands	80	105	120	140
	Hybrid Wet Pond/Wetland	110	150	175	195
	Wet Pond	140	190	225	250
Normal 70% long-term S.S. removal	Infiltration	20	20	25	30
	Wetlands	60	70	80	90
	Hybrid Wet Pond/Wetland	75	90	105	120
	Wet Pond	90	110	130	150
Basic 60% long-term S.S. removal	Infiltration	20	20	20	20
	Wetlands	60	60	60	60
	Hybrid Wet Pond/Wetland	60	70	75	80
	Wet Pond	60	75	85	95
	Dry Pond (Continuous Flow)	90	150	200	240

[1]Table 3.2 does not include every available SWMP type. Any SWMP type that can be demonstrated to the approval agencies to meet the required long-term suspended solids removal for the selected protection levels under the conditions of the site is acceptable for water quality objectives. The sizing for these SWMP types is to be determined based on performance results that have been peer-reviewed. The designer and those who review the design should be fully aware of the assumptions and sampling methodologies used in formulating performance predictions and their implications for the design.

[2]Hybrid Wet Pond/Wetland systems have 50-60% of their permanent pool volume in deeper portions of the facility (e.g., forebay, wet pond).

Infiltration Facility Design - PR-100

Project No: 10985
Project Name: Heritage Line Condos
Designed/Checked By: RC / CPB
Date: Sept 10, 2021

Site Characteristics		
Contributing Area	0.56	ha
Water Quality Storm	25	mm
Runoff Coefficient	0.52	
Groundwater Elevation	221.06	m
Bedrock Elevation	N/A	

Infiltration Characteristics		
Native Soil Infiltration Rate	15.0	mm/hr
Safety Correction Factor	2.5	
Adjusted Infiltration Rate	6.0	mm/hr

Design Constraints & Assumptions		
Water Quality Control Volume	16.8	m^3
Quantity Control Volume	0.0	m^3
Quantity Control Volume Includes Infiltration Storage?	N/A	
Max Allowable Drawdown Time	48	hours
Seperation to Groundwater	1.00	m
Stone Void Ratio	0.40	

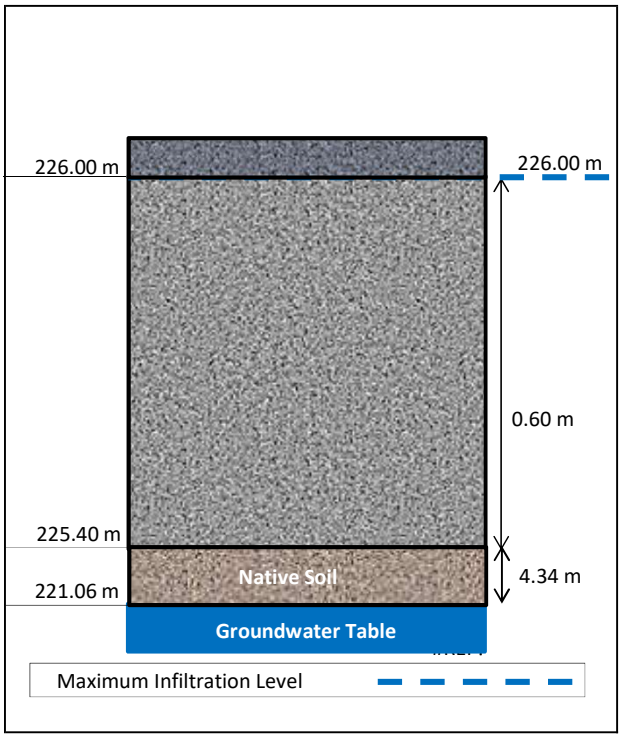
Surface Storage	
Surface Storage Type	None

Underground Storage		
Underground Storage Type	Stone Trench	
Pretreatment	None	
Underground Storage Footprint	70	m^2
Bottom Elevation	225.40	m
Inlet Elevation	226.00	m
Outlet Elevation	226.00	m
Top Elevation	226.00	m
Underground Storage Volume	16.9	m^3

Infiltration Design		
Infiltration Footprint	70	m^2
Max Infiltration Storage Depth	0.60	m
Estimated Drawdown Time	40.0	hours
Infiltration Storage Volume	16.9	m^3

Provided Storage Summary		
Total Storage Depth	0.60	m
Groundwater Separation	4.34	m
Quality Control Volume	16.9	m^3
Quantity Control Volume	118.3	m^3
Total Storage Volume	16.9	m^3

Infiltration Facility Typical Section



Notes:

1. Runoff Coefficient determined based on the Hydrologic Parameters of the contributing drainage area
   Water Quality Control Volume based on MOE Table 3.2 for Infiltration Facilities
2. Native soil infiltration rate incorporates a safety correction factor in accordance with the method outlined in the LID Design Manual Appendix C, Table C2
3. Infiltration Storage Drawdown Time calculated using the following equation, rearranged from the BMP Sizing formula with in the LID Design Manual:

$$t_d = \frac{d_i V_r}{i}$$

t_d = Drawdown Time (hours)
d_i = Max infiltration storage depth (m)
i = Adjusted Infiltration Rate (mm/hr)
V_r = Void Space of Stone

Infiltration Facility Design - PR-200

Project No: 10985
Project Name: Heritage Line Condos
Designed/Checked By: RC / CPB
Date: Sept 10, 2021

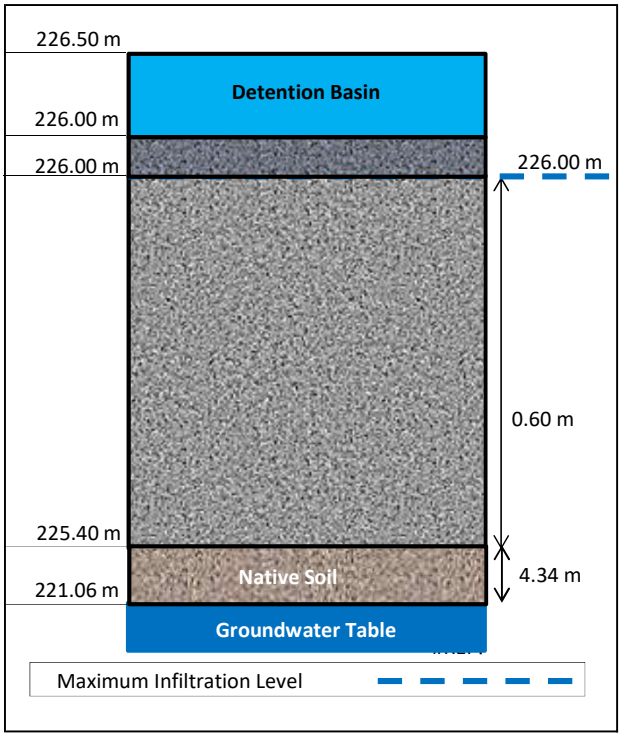
Site Characteristics		
Contributing Area	2.13	ha
Water Quality Storm	25	mm
Runoff Coefficient	0.39	
Groundwater Elevation	221.06	m
Bedrock Elevation	N/A	
Infiltration Characteristics		
Native Soil Infiltration Rate	15.0	mm/hr
Safety Correction Factor	2.5	
Adjusted Infiltration Rate	6.0	mm/hr

Design Constraints & Assumptions		
Water Quality Control Volume	63.9	m^3
Quantity Control Volume	500.0	m^3
Quantity Control Volume Includes Infiltration Storage?	No	
Max Allowable Drawdown Time	48	hours
Seperation to Groundwater	1.00	m
Stone Void Ratio	0.40	

Surface Storage		
Surface Storage Type	Detention Basin	
Pretreatment	Grassed Swale	
Starting Elevation	226.00	m
Maximum Elevation	226.50	m
Max Surface Ponding Depth	0.50	m
Surface Storage Volume	672.0	m^3
Underground Storage		
Underground Storage Type	Stone Trench	
Pretreatment	None	
Underground Storage Footprint	400	m^2
Bottom Elevation	225.40	m
Inlet Elevation	226.00	m
Outlet Elevation	226.00	m
Top Elevation	226.00	m
Underground Storage Volume	96.0	m^3
Infiltration Design		
Infiltration Footprint	400	m^2
Max Infiltration Storage Depth	0.60	m
Estimated Drawdown Time	40.0	hours
Infiltration Storage Volume	96.0	m^3

Provided Storage Summary		
Total Storage Depth	1.10	m
Groundwater Separation	4.34	m
Quality Control Volume	96.0	m^3
Quantity Control Volume	672.0	m^3
Total Storage Volume	768.0	m^3

Infiltration Facility Typical Section



Notes:

1. Runoff Coefficient determined based on the Hydrologic Parameters of the contributing drainage area
   Water Quality Control Volume based on MOE Table 3.2 for Infiltration Facilities
2. Native soil infiltration rate incorporates a safety correction factor in accordance with the method outlined in the LID Design Manual Appendix C, Table C2
3. Infiltration Storage Drawdown Time calculated using the following equation, rearranged from the BMP Sizing formula with in the LID Design Manual:

$$t_d = \frac{d_i V_r}{i}$$

t_d = Drawdown Time (hours)
d_i = Max infiltration storage depth (m)
i = Adjusted Infiltration Rate (mm/hr)
V_r = Void Space of Stone

Appendix D

Quantity Control

```
**************************
** SIMULATION NUMBER:   1 **
**************************
--------------------
| RESERVOIR (0012) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0370      0.0410
                          0.0080     0.0250   |   0.0460      0.0454
                          0.0170     0.0310   |   0.0550      0.0502
                          0.0250     0.0355   |   0.0000      0.0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (3200)      2.130      0.135      3.00      17.85
     OUTFLOW: ID= 1 (0012)      2.130      0.008      6.00      17.48

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=  5.81
                    TIME SHIFT OF PEAK FLOW         (min)=180.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.0246

--------------------------------------------------------------------------------
**************************
** SIMULATION NUMBER:   2 **
**************************
--------------------
| RESERVOIR (0012) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0370      0.0410
                          0.0080     0.0250   |   0.0460      0.0454
                          0.0170     0.0310   |   0.0550      0.0502
                          0.0250     0.0355   |   0.0000      0.0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (3200)      2.130      0.184      3.00      26.07
     OUTFLOW: ID= 1 (0012)      2.130      0.018      4.83      25.70

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=  9.51
                    TIME SHIFT OF PEAK FLOW         (min)=110.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.0313

--------------------------------------------------------------------------------
**************************
** SIMULATION NUMBER:   3 **
**************************
--------------------
| RESERVOIR (0012) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0370      0.0410
                          0.0080     0.0250   |   0.0460      0.0454
                          0.0170     0.0310   |   0.0550      0.0502
                          0.0250     0.0355   |   0.0000      0.0000

                                AREA     QPEAK     TPEAK       R.V.
```

```
                                (ha)      (cms)      (hrs)       (mm)
     INFLOW : ID= 2 (3200)      2.130      0.217      3.00       31.93
     OUTFLOW: ID= 1 (0012)      2.130      0.025      3.58       31.56

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 11.63
                   TIME SHIFT OF PEAK FLOW         (min)= 35.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.0357

--------------------------------------------------------------------------------
****************************
** SIMULATION NUMBER:   4 **
****************************
--------------------
| RESERVOIR (0012) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0370      0.0410
                         0.0080     0.0250   |   0.0460      0.0454
                         0.0170     0.0310   |   0.0550      0.0502
                         0.0250     0.0355   |   0.0000      0.0000

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (3200)      2.130      0.258      3.00       39.53
     OUTFLOW: ID= 1 (0012)      2.130      0.037      3.58       39.16

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 14.39
                   TIME SHIFT OF PEAK FLOW         (min)= 35.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.0412

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****************************
** SIMULATION NUMBER:   5 **
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| RESERVOIR (0012) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0370      0.0410
                         0.0080     0.0250   |   0.0460      0.0454
                         0.0170     0.0310   |   0.0550      0.0502
                         0.0250     0.0355   |   0.0000      0.0000

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (3200)      2.130      0.290      3.00       45.52
     OUTFLOW: ID= 1 (0012)      2.130      0.046      3.58       45.15

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 15.92
                   TIME SHIFT OF PEAK FLOW         (min)= 35.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.0456

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** SIMULATION NUMBER:   6 **
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| RESERVOIR (0012) |
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IN= 2---> OUT= 1
DT= 5.0 min

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.0370	0.0410
0.0080	0.0250	0.0460	0.0454
0.0170	0.0310	0.0550	0.0502
0.0250	0.0355	0.0000	0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (3200)	2.130	0.322	3.00	51.61
OUTFLOW: ID= 1 (0012)	2.130	0.055	4.17	51.24

PEAK FLOW REDUCTION [Qout/Qin](%)= 17.04
TIME SHIFT OF PEAK FLOW (min)= 70.00
MAXIMUM STORAGE USED (ha.m.)= 0.0503

Appendix E

Geotechnical Information

Soil Investigation Results OG

Project No: 10985
Project Name: Heritage Lane
Designed/Checked By: RC/CPB
Date: August 19, 2021

Borehole / Test Pit Elevations

Borehole/ Test Pit ID	Assumed Benchmark (mbeg)			Geodetic Benchmark (m)			
	Existing Ground Elevation	Groundwater Depth	Termination Depth	Existing Ground Elevation	Groundwater Elevation	Termination Elevation	LID Base Elevation[1]
BH-01	225.24	Dry	6.55	225.24	-	218.69	219.69
MW-02	224.33	0.7	6.55	224.33	223.63	217.78	224.63
BH-03	225.11	1.3	2.00	225.11	223.81	223.11	224.81
BH-04	224.39	Dry	2.00	224.39	-	222.39	223.39
BH-05	224.78	1.2	2.00	224.78	223.58	222.78	224.58
BH-06	224.77	Dry	2.00	224.77	-	222.77	223.77
BH-07	227.56	Dry	2.00	227.56	-	225.56	226.56
BH-08	222.56	2.7	6.55	222.56	219.86	216.01	220.86
MW-09	213.23	4	6.55	213.23	209.23	206.68	210.23
BH-10	224.30	Dry	2.00	224.30	-	222.30	223.30
BH-11	223.70	4.6	5.05	223.70	219.10	218.65	220.10
BH-12	225.31	2.1	6.55	225.31	223.21	218.76	224.21
BH-13	224.05	1.2	2.00	224.05	222.85	222.05	223.85
BH-14	222.71	Dry	2.00	222.71	-	220.71	221.71
MW-15	225.34	0.9	6.55	225.34	224.44	218.79	225.44
MW-16	222.81	1.75	6.55	222.81	221.06	216.26	222.06
BH-17	220.53	Dry	6.55	220.53	-	213.98	214.98
BH-18	223.69	4.6	6.55	223.69	219.09	217.14	220.09

1. Low Impact Development design guidelines require a minimum 1.0 m separation from the base of an infiltration feature to the greater of the seasonally high groundwater elevation and the bedrock elevation. As such, the LID Base Elevation represents the lowest possible

In-Situ Infiltration Analysis

Borehole / Test Pit ID	Testing Depth (mbeg)	Testing Elevation (m)	Observed Infiltration Rate (mm/hr)	Recorded Infiltration Rate (mm/hr)	OBC Table 2 Percolation Rate (mm/hr)	Selected Infiltration Rate (mm/hr)	Recommended Safety Factor
MW-09	1.7	211.53	24.0			24.0	
MW-16	1.75	221.06	30.0			30.0	
BH-08	1.7	220.86					

Borehole / Test Pit Locations