

STORMWATER MANAGEMENT REPORT
PREVIN COURT HOMES
180 & 190 FERNDALE DRIVE NORTH
CITY OF BARRIE
November 2019



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REAR JACKET

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1.0 Introduction

KSGS Engineering has been retained by Previn Court Homes to prepare an updated stormwater management (SWM) report for 180 and 190 Ferndale Drive North. A functional servicing report entitled “Functional Servicing Report Previn Court Homes Residential & Commercial Development 180 & 190 Ferndale Drive North” was prepared for these lands by Pearson Engineering Ltd. in August 2018. Comments were received from the City of Barrie (City) and the Lake Simcoe Region Conservation Authority (LSRCA). In order to deal with the various comments, the stormwater management portion of the report has been separated from the functional servicing report (FSR). The FSR less the stormwater management component will be submitted under separate cover by Urban Ecosystems Ltd (UEL).

This updated SWM report will address the comments provided by the City and LSRCA and also included input from the environmental consultant as it deals with development limits, hydrogeological consultant as it deals with water table, geotechnical investigations as it deals with soil types, updated land use plan for the site, and input from the LSRCA.

1.1 Background Information

The following background information has been reviewed in preparation of this SWM report for 180 & 190 Ferndale Drive North:

- Function Servicing Report, prepared by Pearson Engineering Ltd, August 2018
- Geotechnical Investigation Report, prepared by Soil Engineers Ltd, July 2003
- Hydrogeological Report, prepared by Azimuth Environmental Consulting Inc, September 2008
- Hydrogeological Assessment, prepared by Azimuth Environmental Consulting Inc, April 2010
- Scoped Environmental Impact Study, prepared by Orion Environmental Solutions, October 2018
- City of Barrie Storm Drainage and Stormwater Management Policies and Design Guidelines, November 2009
- City of Barrie Infiltration Low Impact Development Screening Process
- Lake Simcoe Protection Plan, June 2018
- Lake Simcoe Phosphorus Offsetting Policy (LSPOP), September 2017
- LSRCA Technical Guideline for Stormwater Management Submissions, September 2016
- The Ministry of the Environment’s Stormwater Management Planning and Design Manual, March 2003
- Water Level Monitoring, prepared by Azimuth Environmental Consulting Inc, October 2019

2.0 Stormwater Management

2.1 Design Criteria

The design criteria for stormwater management for 180 & 190 Ferndale Drive North are as follows:

- Water quality treatment to Level 1 Enhanced Protection as per MOE Stormwater Management Practices Planning and Design Manual (2003)
- Water quantity control to limit post-development peak flows to pre-development release rates for design storms ranging from 2-year to 100-year events. Based on the comments provided by LSRCA (2019), consideration will be given to the 4-hour Chicago, 6-hour SCS, 12-hour SCS and 24-hour SCS rainfall distributions for modeling the design storms.
- Extended detention for the runoff from the 25mm 4-hour Chicago storm (24-48 hours)
- Volume control through capturing post-construction runoff volume and retaining on-site from a 25mm rainfall event from the total impervious area. Due to the City's restriction on the type of runoff that can be infiltrated, this criterion cannot be met for this site.
- Water Balance for the site. Ensure infiltration volumes after development will not be less than pre-development. The Thornwaite and Mather method will be used to calculate the infiltration volume deficit and on-site infiltration will be utilized to achieve a balance.
- Phosphorus removal rate of 80% from proposed development area

2.2 Existing Condition

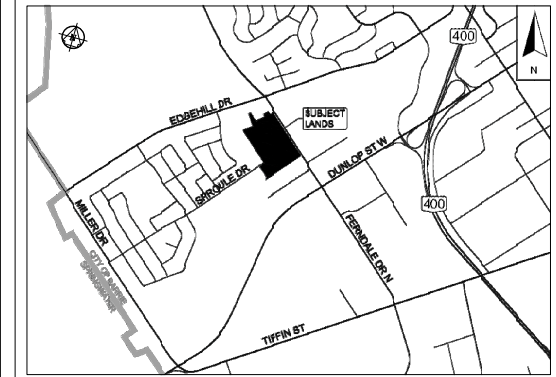
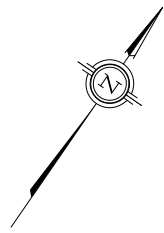
The project site with an area of 7.90 hectares was initially a heavily vegetated area with portions of the site being forested. It has since been cleared of vegetation and a temporary sediment control pond has been constructed at the southwest portion of the site. Dyment's Creek runs from north to south along the west limit of the site and then goes west of the site. Dyment's Creek is conveyed via a series of culvert under Sproule Drive.

Based on the topography, the existing site consisted of two major drainage areas as shown in Figure 2.1. Upon review of City of Barrie contours, there is an existing external drainage area of 2.05 hectares, composed of low-density residential lots coming into the site. The total area draining directly to Dyment's Creek is 4.63 hectares and 3.20 hectares drains to the Ferndale Road storm sewer system. The drainage area to Ferndale Road closely matches the area identified by the City of Barrie in their redesign of Ferndale Road.

There is an existing 375 mm storm pipe extending into the site from Ferndale Drive, near the south limit of the site, that will take flows from the site. Based on the attached storm design sheet, the storm sewer connection to Ferndale Drive will accept up to 250 l/s from the site. The storm design sheet and calculations showing the available pipe and downstream capacity is shown in Appendix A1. However, as per LSRCA requirements, the total flow from the site will not exceed predevelopment rates and as per the City of Barrie standards, the flows to Ferndale Drive will not exceed the design flow rate.

2.3 Proposed Development

The proposed development consists of residential development and a park for the north portion of the site, and a commercial development, south of the site. Sproule Drive is proposed to be extended out to Ferndale Drive North, dividing the residential and commercial development.



LEGEND

- EXT-1 SUB-CATCHMENT AREA ID No.
- 1.11 DRAINAGE AREA (Ha)
- OVERLAND DRAINAGE DIRECTION

No.					By					Date					Revision					Checked									
APPROVED AS TO FORM IN RELIANCE UPON THE PROFESSIONAL SKILL AND ABILITY OF URBAN ECOSYSTEMS LIMITED AS TO DESIGN AND SPECIFICATION.																													
Director of Development Engineering																				Date									
FERNDALE PREVIN COURT HOMES																													
URBAN ECOSYSTEMS LIMITED 7050 WESTON ROAD, SUITE 705 WOODBRIDGE, ONTARIO L4L 8G7 u@urbanecosystems.com t. (905) 856-0629 f. (905) 856-0698																													
HORIZONTAL																													
CITY OF BARRIE ENGINEERING DEPARTMENT																													
FILE No 19T-XXXXX																													
PRE-DEVELOPMENT DRAINAGE SCENARIO																													
Designed By D.J.S.					Date OCT. 2019					Checked By R.S.																			
Drawn By V.T.										Approved By																			
Scale: 1:1500					Project No. 07002					Drawing No. 2.1 (SWM-3)																			

2.4 Hydrological Modeling

Visual OTTHYMO (VO5) was used to estimate existing and proposed flows from the site and related external drainage areas.

2.4.1 Existing Condition

A portion of the site drains towards Dymont's Creek and a portion of the site drains towards Ferndale Drive. The total area directly tributary to Dymont's Creek is 6.04 hectares comprised of 1.34 hectare of external existing low density residential and 4.70 of Previn Court Home. The area tributary to Ferndale Road is 3.91 hectares. It is comprised of 0.71 hectares of existing low density residential and 3.20 hectares of Previn Court Homes. Ferndale Road storm sewer eventually outlets into Dymont's Creek further downstream. The drainage areas are shown on the attached Figure 2.1. This figure has been created from the City of Barrie's storm drainage plan for their reconstruction of Ferndale Road.

The site soils are considered fine sand as outlined in the Soil Engineer's report. Based on the soil type, site topography and existing land use the modelling parameters have been calculated and are included in Appendix A2. The following storms were used to calculate the existing condition flow rates:

- i. 4-hour Chicago
- ii. 12-hour SCS
- iii. 6-hour SCS
- iv. 24-hour SCS

The 4-hour Chicago storm generated the lowest runoff rates as outlined in Table 2.1 below. Flows are shown draining to Ferndale Drive, Dymont's Creek and total flows from the combined areas. The design will ensure that the combined total release and flow to Ferndale Drive does not exceed the storm sewer design capacity.

Table 2.1 Pre-Development Flow Targets

Return Period	4-hour Chicago Peak Flows ¹			6-hour SCS Peak Flows ¹			12-hour SCS Peak Flows ¹			24-hour SCS Peak Flows ¹		
	A	B	Total	A	B	Total	A	B	Total	A	B	Total
2-yr	0.155	0.089	0.244	0.137	0.105	0.242	0.134	0.101	0.235	0.142	0.107	0.249
5-yr	0.222	0.130	0.352	0.230	0.174	0.404	0.219	0.162	0.381	0.237	0.176	0.412
10-yr	0.272	0.162	0.434	0.303	0.227	0.530	0.286	0.210	0.496	0.309	0.228	0.537
25-yr	0.340	0.206	0.546	0.410	0.305	0.715	0.383	0.279	0.662	0.416	0.305	0.722
50-yr	0.393	0.240	0.633	0.496	0.367	0.863	0.460	0.333	0.794	0.502	0.367	0.868
100-yr	0.448	0.278	0.726	0.587	0.434	1.021	0.542	0.391	0.933	0.593	0.432	1.025
Note: ¹ Flows at 'A' refer to drainage area discharging to Dymont's Creek; Flows at 'B' refer to drainage area discharging to Ferndale Drive North. Both are ultimately tributary to Dymont's Creek; hence they are combined to give pre-development peak flow targets.												

Copies of the model input, and output summary files are attached in Appendix A3 for the 4-hour Chicago run. Other results were not included in the appendix for brevity, but digital copies of the model have been included on a CD in the rear jacket.

2.4.2 Proposed Condition

The proposed condition will be comprised of three drainage systems and is shown in Figure 2.2. Most of the site (7.62 ha.) will drain to a SWM facility to be located south of Sproule along the west limit of the property. A portion of the commercial area south Sproule (1.68 ha.) will have on-site controls and be released to the existing storm sewer on Ferndale Drive. A small portion of the Park block (0.08 ha.) will outlet directly to Dymont's Creek. A portion of Sproule Road (0.42 ha.) and a portion of the residential lands north of Sproule Road (0.17 ha.) will drain to Ferndale Drive uncontrolled. A portion of the pond block (0.07 ha) will also drain uncontrolled. These uncontrolled areas (0.74 ha.) will be included in the total allowable release from the site. The developed condition total area is 0.11 ha. larger than the existing condition area. This is the case as 0.11 ha. of the existing Sproule Road can now drain to the SWM facility.

The 7.62 ha. area tributary to the SWM Facility is comprised of the following:

- i. 2.05 ha. of existing residential with an impervious ratio of 55 percent with a directly connected ratio of 45%,
- ii. 0.94 hectares of open space/park analyzed as undeveloped land,
- iii. 3.39 hectares of high-density residential development with an impervious ratio of 83 percent
- iv. 0.46 hectares of SWM pond with an impervious ratio of 40 percent,
- v. 0.31 hectares of future Sproule Road with an impervious ratio of 67 percent, and
- vi. 0.47 hectares of commercial. The commercial area has an imperviousness of 80 percent.

The 1.68 ha of commercial area using on-site storage to control flows has been designed with an impervious ratio of 93 percent

The 0.74 ha. of uncontrolled area has been analyzed as follows:

- i. 0.08 ha. of open space/park analyzed as landscaped area,
- ii. 0.41 ha. of Sproule Road (which includes some landscaped areas on the north side of Sproule) with an impervious ratio of 54 percent, and
- iii. 0.17 ha. of grassed area adjacent to the high-density residential lands north of Sproule draining to Ferndale Drive as landscaped area
- iv. 0.07 ha of pond area draining southerly away from the Pond

The parameter calculations are attached in Appendix A4.

2.5 Permanent Pool

In order to achieve 80% total suspended solids (TSS) removal, the area tributary to the SWM facility will be designed to Level 1 TSS removal. Based on an overall impervious ratio of 62 %, and a tributary area to the SWM facility of 7.62 hectares, Table 3.1 from the 2003 MOE SWMPDM, a volume of 166 m³/ha. is required. This would result in 1267 m³ of permanent pool volume. Based on the pond configuration, 1432 m³ of volume has been provided. This exceeds the requirement of 1264 m³.

For the commercial area south of Sproule, quality control will be provided in the commercial area via the use of a manhole separator. Based on the commercial area of 1.68 hectares, a Stormceptor STC 5000 would be sufficient.

Enclosed in Appendix A5 are the permanent pool calculations and Stormceptor sizing.

2.6 Extended Detention/Erosion Control

The extended detention requirements would be the larger of 40 m³/hectares or the runoff generated by a 25mm storm. The VO5 model was run for a 25mm storm. The runoff generated was 13.98 mm or 139.8 m³/ha. Since this volume was greater than 40 m³/hectare, it was used to calculate the required extended detention volume of 1062 m³. This SWM facility between the permanent pool elevation 237.8 m to 238.4 m will be used to provide 1265 m³ of extended detention storage, which is greater than the 1062 m³ required. The elevation of 237.8m was used as the permanent pool elevation. This would provide an outfall elevation into Dyment's Creek at or above the 100-year water level.

Enclosed in Appendix A5 are the calculations for the extended detention volumes.

2.7 Quantity Control

As outlined in Section 2.2, the Previn Court lands presently drains in two directions. Some of the lands drains towards Ferndale Drive and some of the lands towards Dyment's Creek. The Ferndale storm sewer eventually outlets into Dyment's Creek. Table 2.2 shows the uncontrolled post-development peak flows for the various storms modeled. The total flows from the site will not exceed predevelopment rates shown in Table 2.1 and in addition, the anticipated design flows to Ferndale Drive from the site will not exceed the original design flow rates.

Table 2.2 Uncontrolled Post-Development Peak Flows

Return Period	4-hour Chicago Peak Flows ¹			6-hour SCS Peak Flows ¹			12-hour SCS Peak Flows ¹			24-hour SCS Peak Flows ¹		
	A	B	Total	A	B	Total	A	B	Total	A	B	Total
2-yr	1.012	0.406	1.418	0.836	0.329	1.165	0.783	0.307	1.090	0.775	0.303	1.078
5-yr	1.349	0.538	1.887	1.199	0.466	1.664	1.099	0.426	1.525	1.097	0.422	1.519
10-yr	1.583	0.627	2.210	1.445	0.557	2.002	1.317	0.506	1.822	1.316	0.502	1.818
25-yr	1.873	0.738	2.611	1.772	0.673	2.445	1.595	0.607	2.202	1.608	0.603	2.212
50-yr	2.091	0.820	2.911	2.018	0.761	2.779	1.817	0.684	2.500	1.827	0.681	2.508
100-yr	2.312	0.902	3.214	2.263	0.848	3.111	2.030	0.759	2.789	2.047	0.757	2.804
Note: ¹ Flows at 'A' refer to drainage area discharging to Dyment's Creek; Flows at 'B' refer to drainage area discharging to Ferndale Drive North.												

Due to the split drainage situation, runoff from the site will be directed to two outfall locations. In order to provide the greatest amount of quality and quantity control, as much drainage area as grading and servicing will allow will be directed to the SWM facility located at the south west corner of the lands adjacent to Dyment's Creek. This includes all lands north of Sproule Road, a portion of Sproule Road and the runoff from the rooftop of a commercial building south of Sproule Road. The remaining commercial lands and a portion of Sproule Road will drain to

Ferndale Drive. The drainage areas are shown in Figure 2.2. Rooftop storage with a release rate of 42 l/s/ha has been assumed for Building 1 within the commercial lands.

2.7.1 SWM Facility

The drainage area tributary to the SWM facility is 7.62 hectares as noted in Section 2.4.2.

The west limit of the SWM facility was based on the discussions with LSRCA and the limits set out in the Scoped Environmental Impact Study, prepared by Orion Environmental Solutions, October 2018, updated to address comments from LSRCA in June 2019. As outlined in Sections 2.5 and 2.6, the permanent pool volume and extended detention volume were calculated. The permanent pool has been set at elevation 237.8m. The combination of a 125 mm orifice at elevation 237.8 m, a 350mm wide and 150mm high rectangular orifice at elevation 238.4 m and a third rectangular orifice of 400 mm width and 250mm height at elevation 238.65 m will be used to control the 2-year to 100-year flows from the SWM facility. The stage-storage-discharge curve was input into the VO5 model and the 2-year to 100-year storm was run for all four rainfall distributions.

A 10 m wide emergency spillway has been placed at elevation 239.2 m to provide for runoff greater than the 100-year storm and in the unlikely situation that the control orifices become inoperable.

Outlined below in Table 2.3 are the peak runoff rates, controlled flow rates and storage volumes for the 24-hour SCS Storm. The 24-hour SCS storm is shown here as it generates the largest storage volumes and controlled discharges.

Table 2.3 Peak Runoff and Storage Volumes during 24-hour SCS Storm

Return Period	Peak Runoff Rate [m ³ /s]	Controlled Flow Rate [m ³ /s]	Storage Volume [m ³]
2-yr	0.727	0.054	1,503
5-yr	1.023	0.120	1,977
10-yr	1.224	0.182	2,262
25-yr	1.493	0.239	2,686
50-yr	1.695	0.282	3,013
100-yr	1.897	0.337	3,341

Enclosed in Appendix A6 are the Tables showing the peak runoff rates, storage volumes and controlled flow rates for the 2-year to 100-year storms for the 4 rainfall distributions. The modelling for the 4 rainfall distributions for the 2 to 100-year return periods are included in the CD enclosed in the rear jacket of the report.

A sediment forebay has been set aside on the north side of the SWM facility. It has been set above the 2-year storage level at 238.51 m. the drying area will provide for 160 m³ of storage, which exceeds the 10-year sediment accumulation of 145 m³. Please refer to Appendix A7 for the sediment accumulation calculations. Outlet design calculations have also been provided in Appendix A7. SWM-1 and SWM-2 are enclosed in the rear jacket of the report.

2.7.2 On-Site Storage

For the 1.68 hectare of commercial area outletting to the existing 375 mm storm sewer to Ferndale Drive, onsite storage will be utilized to provide quantity control. The VO5 hydrologic

model was used to calculate the storage volumes for the 2-year to 100-year storms for the 4 rainfall distributions. Shown on Drawing GR-2 is the area that will be used for storage with a maximum storage depth of 0.3 m.

Outlined in Table 2.4 below are the peak flow rates, storage volumes and controlled flows for the various storms. The 6-hour SCS storm is shown here as it generates the largest storage volumes and discharges.

Table 2.4 Peak Runoff and On-Site Storage for 6-hour SCS Storm

Return Period	Peak Flow Rates [m ³ /s]	Controlled Flow Rate [m ³ /s]	Storage Volume [m ³]
2-year	0.286	0.158	105
5-year	0.405	0.167	213
10-year	0.483	0.174	299
25-year	0.583	0.184	413
50-year	0.658	0.191	499
100-year	0.732	0.199	585

Enclosed in Appendix A8 are the Tables showing the peak runoff rates, storage volumes and controlled flow rates for the 2-year to 100-year storms for the 4 rainfall distributions. The modelling for the 4 rainfall distributions for the 2 to 100-year return periods are included in the CD enclosed in the rear jacket of the report.

2.7.3 Uncontrolled Flows and Total Flows to Ferndale Drive

There is a small portion of the site (0.59 hectares) that will drain to Ferndale Drive uncontrolled. The VO5 hydrologic model was used to calculate the peak flows for the 2-year to 100-year storms for the 4 rainfall distributions. Outlined in Table 2.5 below are the peak flow rates for the various storms. The 6-hour SCS storm is shown here as it generates the largest peak flow to Ferndale.

Table 2.5 Uncontrolled and Total Peak Flows to Ferndale Drive North (6-hour SCS)

Return Period	Peak Runoff Rate 4-Hour Chicago [m ³ /s]	Total Peak Flows to Ferndale 4-hour Chicago [m ³ /s]
2-yr	0.043	0.200
5-yr	0.061	0.226
10-yr	0.074	0.245
25-yr	0.09	0.270
50-yr	0.104	0.290
100-yr	0.117	0.309

As outlined in the Storm Design Sheet, Drawing STM-1 and Drawing PP3 (enclosed in Appendix A1) for the redesign of Ferndale Drive North there are two sub areas tributary to Ferndale Drive North from the Previn Court site. They are shown as Area 4 (2.8 Ha.) and Area 6 (1.2 Ha.) with a combined area of 4.0 Ha. The peak flow from those areas for the 5-year storm was 0.36 cms (0.26 cms for Area 4 and 0.1 cms for Area 6). As noted in Table 2.4, the 100-year storm is lower than the design flow of 0.36 cms. Although the controlled flows to the storm sewer connection at Area 6 (Prop. HW to DDDYO1403 on the City's Storm Design Sheet) is

greater than the design flow (0.1 cms design compared to 100-year release of 0.107 cms) the sewer has sufficient capacity for this larger flow. As mentioned earlier the total flow (0.309 for the 100-year) to Ferndale Drive is still below the design flow (0.36 cms).

Enclosed in Appendix A9 are the Tables showing the peak runoff rates for the 2-year to 100-year storms for the 4 rainfall distributions. The modelling for the 4 rainfall distributions for the 2 to 100-year return periods are included in the CD enclosed in the rear jacket of the report.

2.7.4 Total Controlled Runoff Rates

Since this development has two different means of runoff control and a number of small uncontrolled area, the various outflow hydrographs were combined to determine the total outfall from the site. These controlled outflows were compared to the existing condition flow rates to ensure that there were no increases in peak runoff as a result of development of these lands. Outlined in Table 2.6 below are the peak flow rates for the various storms.

Table 2.6 Post-Development Flows with Control

Return Period	Post-Development Flows				Pre-Development Flow Target [m ³ /s]
	4-hour Chicago [m ³ /s]	6-hour SCS [m ³ /s]	12-hour SCS [m ³ /s]	24-hour SCS [m ³ /s]	
2-yr	0.225	0.222	0.219	0.219	0.244
5-yr	0.250	0.280	0.277	0.288	0.353
10-yr	0.268	0.349	0.341	0.368	0.435
25-yr	0.343	0.445	0.433	0.458	0.547
50-yr	0.382	0.506	0.490	0.517	0.635
100-yr	0.423	0.565	0.545	0.576	0.732

As can be seen from Table 2.5, the combination of the SWM facility and on-site storage provides sufficient storage to ensure that there is no increase in the total peak flow from the site.

3.0 Runoff Volume Control and Water Balance

Based on the LSRCA's Technical Guideline for Stormwater Management Submissions, September 2016, there is a requirement to provide a water balance and runoff volume control for all developments. The aim of the runoff volume control guidelines is to retain the first 25mm of rainfall. The water balance requirement is that infiltration into the groundwater system is maintained at pre-development level after development. Both of these requirements are usually met with the use of Low Impact Development (LID) measures.

The City of Barrie through their "Infiltration Low Impact Development Screening Process" identifies the approach to be taken for LIDs in development areas. They identify four sources of runoff as outlined below:

- Vegetated Areas
- Rooftop runoff
- Pollution hot spots (i.e. gas stations or other areas with high potential for pollutant generation)
- Paved area runoff.

Table 1.2 (attached in Appendix B1) from their screening process outlines what type of infiltration is permitted based on Land Use and Vulnerable Areas. Ms. Katie Thompson in a memorandum to Mr. Larry Klein on January 28, 2019 (copy attached in Appendix B2) indicates that the development site is located within:

- Wellhead Protection Area B and C,
- Issues Contributing Area (due to increasing chlorides and sodium concentrations)
- Highly Vulnerable Aquifer

Based on Table 1.2 mentioned above and the January 28, 2019 memorandum, the following types of LIDs will not be permitted within the development lands as outlined in Table 3.1 below

Table 3.1 Paved Area Runoff

Land Use	Vulnerable Area	Requirement
Commercial & Institutional	Wellhead Protection Area A and B	Infiltration based practices are not permitted
	Issues Contributing Area	Infiltration based practices are not permitted
	Highly Vulnerable Aquifers	
Mixed Use and High Density Residential	Wellhead Protection Area A and B	Infiltration based practices are not permitted
	Issues Contributing Area	Infiltration based practices are permitted with conditions
	Highly Vulnerable Aquifers	Infiltration based practices are permitted with conditions
Open Spaces and Environmental Protection Areas	Wellhead Protection Area A and B	Infiltration based practices are permitted with conditions
	Issues Contributing Area	
	Highly Vulnerable Aquifers	
NOTE: This table outlines requirements for paved area runoff only. Runoff from vegetated areas and rooftop are always permitted to be infiltrated, while runoff from pollution hot spot is never permitted.		

In addition, Figure 3 (attached in Appendix B3) from their screening process outlines where paved areas are permitted for infiltration throughout the City. This development area does not permit infiltration of runoff from paved areas. Runoff from roof areas and vegetation areas will be used for infiltration where practical.

3.1 Review of LID Measures

A slew of LIDs is available to reduce storm runoff and to keep runoff on site to reduce the volume of runoff entering the storm drainage system and increase infiltration onto the ground. The LID measures are outlined below and their applicability to this project outlined:

- Rainwater harvesting – This is a technique that can be implemented by homeowners. This will reduce discharge of water to the downstream system but will not help during spring runoff when water levels are high. Homeowners can be encouraged to use rainwater harvesting
- Green Roofs – For the residential high-rise buildings, this is a possible means of runoff reduction. Due to the relatively low heights of the proposed high rises and significant cost for green roofs, building, with much higher heights, would be more appropriate candidates. The commercial buildings being single storey building would not be a candidate due to the increased costs.
- Roof Downspout Disconnection – Roof downspout disconnection is clearly an option for these buildings. Since roof runoff is considered clean runoff, infiltration of roof runoff in areas of lower water table should be investigated.
- Soakaway Pits, Infiltration Trenches and Chambers --- The soils in this area are general very receptive to this type of LID. Based on initial review, this LID was one that was highly possible for this area. However, water level measurements to date have indicated that the water table is in close proximity to the surface south of Sproule Road and would not be conducive to these types of measures. These LIDs require a water table that is 1 m below the bottom of the LID. As such, a water table depth 3.2 m or more below the surface would be required. Site water table measurements indicates that the water table is within 2 m of the surface south of Sproule. For nonpaved areas north of Sproule Road, this LID will be investigated.
- Bio retention areas or swales – This is a measure that would be applicable for roof runoff from commercial and high-rise buildings and will be investigated for this site. Runoff would collect in a landscaped area. Once the area's holding capacity is exceeded, flow will spill out to the regular drainage system. The high-water table will limit its application on this site.
- Vegetated Filter Strips – Directing of storm runoff to a vegetated surface before entering the sewer system will be investigated. Due to grading constraints and limited area of vegetation on site, this may have limited application on this development
- Permeable Pavement – Permeable pavement would be an effective means to reduce runoff. However, infiltration of paved surfaces into the ground is not permitted in this area.
- Dry Swales – Dry swales could be used in a similar manner as vegetated filter strips.
- Perforated Pipe Systems ---Since infiltration of paved surfaces are not permitted, perforated pipe has not been considered.

3.2 Runoff Volume Control

In Section 2.2.2 of LSRCA's Technical Guideline for Stormwater Management Submissions, September 2016, outlines the requirement for runoff volume control. In general, any works that results in 0.5 hectares or more of new impervious surface shall be subject to runoff volume control. For new developments volume control requirements are as follows:

- For new, nonlinear development that creates more than 0.5 hectares of new impervious surface on sites without restrictions, stormwater runoff volume will be controlled, and the post-construction runoff volume shall be captured and retained/treated on site from a 25 mm rainfall event from the total impervious area.

Clearly this development will have greater than 0.5 hectare of new impervious surface. However, based on Table 3.1 above, only rooftop and vegetated area runoff can be infiltrated. The runoff from the paved areas will be treated either in the SWM facility or in a manhole separator before entering Dymet's Creek.

Azimuth Environmental Consulting Inc, in their letter report dated October 2, 2019 undertook a water table analysis for the site. The report is included in Appendix B4. The high-water table lines have been included in the attached Drawing INF-1. This drawing shows the preliminary design grades for the site and the water table contours from the Azimuth report. For the implementation of infiltration there is generally a requirement of frost clearance (1.2 m minimum), infiltration gallery thickness (typically 1.0 m) and clearance from bottom of infiltration facility to water table (typically 1.0m). As such, the typical minimum difference between the ground surface and water table would be 3.2m.

Runoff from the roof areas and as much of the vegetated areas as possible has been collected and drained to infiltration and/or vegetated filter strips and/or filtration system. Shown on Drawing INF-1 are the proposed locations for the various infiltration and filtration system for Previn Court Homes. Shown in Appendix B5 is the runoff volume calculations and in Table 3.2 below are the achieved runoff volumes. Due to the restrictions for the various LIDs for this development, only 13 mm of runoff volume control can be achieved. Although overcontrol has been achieved for the roof and vegetated areas, it is not sufficient to make up for the paved areas that has limited runoff control.

Table 3.2 Runoff Volume Calculation Summary

Description	Area [m ²]	Runoff Control Vol. [m ³]	Notes
Building 'A' and 'B' Roof	2180	65	Volume based on collecting 30mm runoff (Infiltrated)
Building 'C' Roof	1090	33	Volume based on collecting 30mm runoff (Infiltrated)
Building 'D' & 'E' Roof and Landscaped Area	3650	110	Volume based on collecting 30mm runoff (Infiltrated)
Park	9400	282	Volume based on collecting 30mm runoff (Infiltrated)
Commercial Roof and Landscaped Area (to pond)	4655	116	Volume based on collecting 25mm runoff (Infiltrated)

Description	Area [m ²]	Runoff Control Vol. [m ³]	Notes
Commercial Roofs (North-East)	1220	31	Volume based on collecting 25mm runoff (Filtered only)
Commercial Roof (South-East)	1290	32	Volume based on collecting 25mm runoff (Filtered only)
TOTAL		669	

Based on the runoff volume control achieved, it is requested that for this development that LSRCA consider that applicability of Section 2.2.2.2, Alternative #1 of their technical guidelines. This would permit the infiltration of 12.5 mm of runoff instead of 25 mm.

3.3 Water Balance

A water balance calculation was completed based on the Thornthwaite & Mather method for pre- and post-development conditions. A water deficiency of 157 m³ will need to be made up through site infiltration. As part of the runoff volume control requirements, more than sufficient infiltration is provided to satisfy a water balance. Based on collecting 25 mm of runoff from the roof and vegetated areas, a yearly total of 524 m³ of infiltration is provided. This volume exceeds the deficit.

Shown in Appendix B6 is the water balance calculations.

4.0 Phosphorus Budget

In January 2018, the LSRCA adopted a “Phosphorus Offsetting Policy” (LSPOP). The policy requires that all new development must control 100% of the phosphorus from leaving the site. For any reduction below 100 %, an offset cost must be calculated. The cost is based on an offset value of \$35,000 per kg/yr and an offset ratio of 2.5:1. In addition, all site shall attempt to achieve 80% reduction before offset as a minimum

The information provided within the Hutchinson Environmental Sciences Ltd report entitled, “Phosphorus Budget Tool in Support of Sustainable Development for the Lake Simcoe Watershed” Version 2 Report (2012) was used to calculate the phosphorous load. For the purposes of determining the Land -Use specific phosphorous export coefficients, Dymont’s Creek is considered an unmonitored sub-watershed within Barrie Creeks as outlined in Table 2 of the Hutchinson report (Table 2 from the report is attached in Appendix C1). Using the phosphorous export coefficients for the various land uses, the phosphorous loading can be calculated. Shown below in Table 4.1 is the various land uses, their associated phosphorous generation rate and the total phosphorous generated.

Table 4.1 Phosphorous Coefficients

Land Use	Area (ha)	Phosphorous Coefficient	Phosphorous Loading
High Intensity Development - Townhouse & Parking	3.63	1.32	4.79
Low Intensity Development - Park Block	1.02	0.13	0.13
High Intensity Development - Commercial	2.15	1.82	3.91
Road	0.52	1.82	0.95
SWM Pond	0.53	0.26	0.14
Total Phosphorous Load (kg/yr) =			9.92

A number of measures will be implemented to reduce the phosphorous leaving the development site. They include the use of infiltration, vegetated filter strips and filtration measures for roof and vegetated areas. The SWM facility will be used for all areas draining to the SWM facility. A sorbtive filtration medium will be use for the paved areas within the commercial sites. Due to the restrictions of paved area runoff as outlined in Table 3.1, there was a limited ability to reduce phosphorous from pavement areas.

Based on the above information, a phosphorus load was calculated for the Previn Court lands and determined to be 3.71 kg/yr. Since the LSPOP requires a zero discharge of phosphorus, an offset cost is required., the required payment would be determined during detailed design. It is estimated to be approximately \$326,000. The calculations are attached in Appendix C2.

5.0 Floodplain Mapping

The Previn Court Homes site is on the west side of Dymont's Creek. It is KSGS' understanding that the City of Barrie is presently updating the hydrologic model for Dymont's Creek and they will be updating the hydraulic model in due time. KSGS was able to obtain the present hydraulic model from LSRCA as the base to undertake the hydraulic analysis.

The existing model was adjusted to include an additional section upstream of Sproule to better reflect the existing topographic information and the sections within Previn Court lands updated to reflect field topographic data. The proposed model was then run with the Previn Court lands developed. Shown on Table 5.1 are the existing and proposed floodlines. The volumes within the floodplain was also compared between the existing and proposed condition. The result is no change in Regional Floodlines and a slight increase in incremental or total storage volumes after development. The obtained existing model anticipated that the future development will be in fill immediately adjacent to the Dymont's Creek (Section 483.33). However, under the proposed (actual) condition for Previn Court, the fill for the site occurs further East of the creek. This difference in fill explains the slight increase in storage volumes.

Table 5.1 Existing and Proposed Floodlines

Cross Section		Incremental Vol. (1000 m ³)		Cumul. Vol. (1000 m ³)		Diff. Between Proposed and Existing		Elevation (m)	
Exist.	Prop.	Exist.	Prop.	Exist.	Prop.	Incret.	Cumul.	Exist.	Prop.
479	479							237.87	237.87
		1.22	1.22	1.22	1.22	0	0		
480	480							237.99	237.99
		0.38	0.38	1.6	1.6	0	0		
481	481							238.2	238.2
Sproule Culvert		0.23	0.23	1.83	1.83	0	0		
482	482							239.49	239.49
		3.53	3.72	5.36	5.55	0.19	0.19		
483.33	483.33							239.49	239.49
		6.41	6.94	11.77	12.49	0.53	0.72		
485	485							241.09	241.09
		1.45	1.45	13.22	13.94	0	0.72		
486.66	486.66							242.86	242.86

Enclosed in Appendix D is the summary printout for existing and proposed conditions as well as the updated model has been included in the enclosed CD. Drawing HEC-1 shows the development limits and the regional floodlines.

6.0 Conclusions and Recommendations

The following conclusions and recommendations can be made for the Previn Court lands:

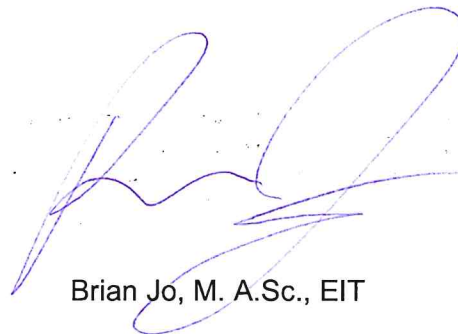
- The combination of a SWM facility and on-site storage would be able to control post development flows to pre-development levels;
- For the SWM facility adequate permanent pool volume can be provided below elevation 237.8 m;
- For the SWM facility adequate extended detention volume can be provided between elevations 237.8 and 238.4 m;
- For quantity control 3,468 m³ of volume is available between elevation 237.8 m and 239.2 m;
- For a portion of the commercial area, on-site controls will provide the required quantity control;
- A water balance will be achieved for the site with the implementation of infiltration of the roof and vegetated areas;
- A target of 12.5 mm of runoff volume control can be achieved from this site;
- Due to the various site restrictions, total phosphorous reduction will not be achieved. The difference will be made up in a phosphorous offset payment. That payment will be determined at detailed design but will be about \$326,000.
- Floodplain mapping for the Dymont's Creek has been updated based on additional topographic information and no development will take place within the floodplain.

Respectfully Submitted

KSGS Engineering Corp.



Ken Chow, P. Eng.,



Brian Jo, M. A.Sc., EIT

APPENDIX A

A1 – Existing Stormsewer Capacity

CITY of BARRIE

STORM SEWER DESIGN FERNDAL DRIVE RECONSTRUCTION DUNLOP ST. TO EDGEHILL DR.

DESIGN SHEET

1 OF 1

FILE NO

2011-032T

CONTRACT / PROJECT

2011-032T

$I = 0.0028^{\circ}C \cdot 1^{\circ}A$ (cms)

C: RUNOFF COEFFICIENT

I: RAINFALL INTENSITY

A: AREA (ha)

STREETS	AREA	MANHOLE		LENGTH (m)	INCREMENT		TOTAL CA	FLOW TIME (min)		I (mm/h)	TOTAL Q (cms)	S (%)	D (mm)	Q FULL (cms)	V FULL (m/s)
		FROM	TO		C	A		TO	IN						
FERNDAL DRIVE	1	DDDY01395	DDDY01394	90.00	0.50	0.63	0.32	5.0	0.5	119.0	0.10	4.10	300	0.20	2.77
FERNDAL DRIVE	2	DDDY01394	DDDY01393	90.00	0.50	0.41	0.52	5.5	0.6	116.0	0.17	2.50	375	0.28	2.51
FERNDAL DRIVE	3	DDDY01393	DDDY01392	61.50	0.35	0.45	0.68	6.1	0.5	111.0	0.21	1.40	375	0.21	1.88
FERNDAL DRIVE	4	FUT. DEV.	DDDY01392	19.00	0.40	2.80	1.20	15.0	0.1	76.0	0.26	1.50	450	0.35	2.20
FERNDAL DRIVE	5	DDDY01392	DDDY03191	133.90	0.50	0.24	1.98	15.1	1.1	75.0	0.42	1.00	525	0.43	1.99
FERNDAL DRIVE	6	Prop. HW	DDDY01403	5.00	0.40	1.20	0.40	10.0	0.0	90.0	0.10	2.00	375	0.25	2.25
FERNDAL DRIVE		DDDY01403	DDDY03191	10.00			0.40	10.0	0.0	90.0	0.10	2.00	450	0.40	2.54
FERNDAL DRIVE	7	DDDY03191	DDDY01390	67.00	0.50	0.81	2.78	15.7	0.6	74.0	0.58	0.60	675	0.65	1.82
FERNDAL DRIVE	8	DDDY01390	DDDY01388	39.60	0.50	0.60	3.08	16.3	0.3	73.0	0.63	0.60	750	0.86	1.95
FERNDAL IND. DR.	9	Prop. DICB	DDDY01389	9.50	0.50	1.07	0.54	5.0		119.0	0.18	6.70	375	0.45	4.11
FERNDAL IND. DR.	10	Prop. DICB	DDDY01389	4.50	0.50	0.49	0.25	5.0		119.0	0.08	10.00	375	0.55	5.02
FERNDAL DRIVE		DDDY01389	DDDY01388	18.50			0.79	5.0		119.0	0.26	1.00	450	0.29	1.79
FERNDAL DRIVE	11	DDDY01388	EX. DDDY00143	73.00	0.50	0.70	4.22	16.6		71.0	0.84	0.35	825	0.85	1.59

DATE: 2011 02 15

CALCULATED BY: RM

CHECKED BY: BK

A2 – Model Parameters and Soils Report



KSGS Engineering Corp

Project Name Previn Court
Project No. 19011
Subject CN Calculation - Pre-Development Conditions

Estimation of CN* based on API

Soil Description¹

Soil Type

Cover Description

Hydrologic Condition

$CN_{AMCII}^2 =$

$CN_{AMCIII} =$

$S =$

$I_a^* =$

Total 100yr Rainfall 4-hour Chicago, $P =^3$

$Q =$

$I_a =$

S^*

CN_{AMCIII}^*

CN_{AMCII}^*

Site
Fine Sand
A
See Composite CN Calc
See Composite CN Calc
36
56
196.33
14.72
87.58
19.72
7
248.71
51
31

Composite CN

Area

Soil Type

Cover Type

Hydrologic Condition

CN_{AMCII}

$I_a =$

Area 1	Area 2
2.72	5.52
A	A
Woods	Pasture
Good	Good
30	39

7 7

Composite CN_{AMCII}

Composite $I_a =$

36
7

Note:

¹Soil Investigation for Proposed Residential Subdivision, Soil Engineers, 2003

²Composite CN Calculation

³Changed to 106.5mm, 112.5mm and 133.6mm for 6-hour SCS, 12-hour SCS and 24-hour SCS respectively



KSGS Engineering Corp

Project Name Previn Court
Project No. 19011
Subject CN Calculation - External Area

Estimation of CN* based on API

Soil Description¹

Soil Type

Cover Description

Hydrologic Condition

CN_{AMCII}² =

CN_{AMCIII} =

S =

I_a* =

Total 100yr Rainfall, P =

Q =

I_a =

S*

CN_{AMCIII}*

CN_{AMCII}*

External Area, Pervious Areas
Fine Sand
A
Open Space
Good
36
56
196.33
14.72
87.58
19.72
5
263.26
49
30

Note:

¹Assumed HSGS A as site report shows fine sand, external area modeled as StandHYD, CN calculation is for pervious areas only

²Changed to 106.5mm, 112.5mm and 133.6mm for 6-hour SCS, 12-hour SCS and 24-hour SCS respectively



KSGS Engineering Corp

Project Name Previn Court
Project No. 19011
Subject Time to Peak Estimation (Hymo Method)

Parameters

Area ID	Area, A [ha]	Slope, S_w [%]	Length, L [m]	Width, W [m]	C
1001	4.75	1.8	320	148	0.25
1002	3.10	1.8	320	97	0.25

HYMO - Rural Watershed with watershed slope less than 2%

$$t_p = 0.0086A^{0.422}S^{-0.46}[L/W]^{0.133}$$

Area ID	Time to Peak, t_p [hr]
1001	0.12
1002	0.10



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FAX: (705) 645-1646

**A REPORT TO
PREVIN COURT HOMES**

**A SOIL INVESTIGATION FOR PROPOSED
RESIDENTIAL SUBDIVISION**

FERNDALE DRIVE AND EDGEHILL DRIVE

CITY OF BARRIE

Reference No. 0304-S37

JULY 2003

DISTRIBUTION

3 Copies - R.G. Robinson & Associates Ltd.
1 Copy - Previn Court Homes
1 Copy - Soil-Eng Limited (Barrie)
1 Copy - Soil-Eng Limited (Toronto)



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1.0 INTRODUCTION

In accordance with written authorization dated April 11, 2003, from Mr. Nisio Rizzardo of Previn Court Homes, a soil investigation was carried out on a plot of land at the southwest corner of Ferndale Drive and Edgehill Drive, City of Barrie, for a proposed Residential Subdivision.

The purpose of the investigation was to reveal the subsurface conditions and to determine the engineering properties of the disclosed soils for the design and construction of the proposed project.

The findings and resulting geotechnical recommendations are presented in this Report.



2.0 **SITE AND PROJECT DESCRIPTION**

The site is located within the Lake Simcoe basin where, in places, the glacial till has been partly eroded by glacial Lake Algonquin, filled with lacustrine clay and overlain by glaciofluvial sand and gravel.

The property is bounded by Ferndale Drive to the east, existing commercial development to the south, existing residential houses fronting Edgehill Drive to the north and open, weed-covered fields to the west. The property is heavily wooded and the surface condition of the southerly section is wet, with localized surficial ponding at the time of excavation. The ground surface slopes from north to south in the northerly portion of the property, with a total relief of approximately 6.0 m. The southerly portion of the property is relatively flat.

The proposed project will consist of 50 single-family lots and a high-density 74-unit apartment block. The project will be provided with municipal services and roadways meeting the current urban standards.



3.0 **FIELD WORK**

The field work, consisting of 6 boreholes to depths of 5.0 m and 6.6 m, was performed on May 6, 2003, at the locations shown on the Borehole and Probe Location Plan and Subsurface Profile, Drawing No. 1.

Two boreholes were not drilled due to wet and soft ground conditions at the southerly portion of the property. Accordingly, a series of probes were carried out throughout the southerly portion of the property to determine the depth of the soft condition.

The boreholes were advanced at intervals to the sampling depths by a track-mounted, continuous-flight power-auger machine equipped for soil sampling. Standard Penetration tests, using the procedures described on the enclosed "List of Abbreviations and Terms", were performed at the sampling depths. The test results are recorded as the Standard Penetration Resistance (or 'N' values) of the subsoil. The relative density of the granular strata and the consistency of the cohesive strata are inferred from the 'N' values. Split-spoon samples were recovered for soil classification and laboratory testing.

The probes were carried out using a 2.1 m long 10-mm steel reinforcing bar which was advanced by hand on a 30 m grid spacing. The depth of peat was inferred from the resistance to penetration of the probe. The locations of the probes and the approximate thickness of the peat at each location are shown on Drawing No. 1.



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The field work was supervised and the findings recorded by a Senior Geotechnical Technician.

The elevation at each of the borehole locations was interpolated from the contours on the topographic survey provided by R.G. Robinson & Associates Ltd., dated March 2002.



4.0 SUBSURFACE CONDITIONS

Detailed descriptions of the encountered subsurface conditions are presented on the Borehole Logs, comprising Figures 1 to 6, inclusive. The revealed stratigraphy is plotted on the subsurface profile on Drawing No. 1, and the engineering properties of the disclosed soils are discussed herein.

Beneath a layer of topsoil or peat, the site is underlain by a stratum of fine sand overlying a stratum of silty clay at the central portion of the property.

4.1 Topsoil (Boreholes 1, 2 and 3) and Peat (Boreholes 4, 5 and 6)

A layer of sandy topsoil 23 cm and 60 cm thick, was encountered on the higher ground in the northerly portion of the property. A peat deposit, ranging from 50 to 90 cm thick in the boreholes, and from 50 to 210 cm + thick, as inferred from resistance to penetration in the probes, was encountered through the central and southerly portions of the property. The water content in the boreholes ranged from 372% to 614%, indicating that the peat is extremely compressible, with appreciable consolidation under surcharge loads.

It should be noted that resistance to penetration was encountered at frequent intervals in the probes, indicating that the peat is laden with wood debris. Additionally, peat thicker than 2.1 m may occur between probe locations. This warrants that additional investigation is required to accurately determine the extent of the peat deposit and the subsurface condition beneath the peat. Therefore, a test pit program should be carried out once the property is dry enough, or the ground is hardened by frost in the winter months, to support an excavator.



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It should also be noted that in low-lying drainage areas, thicker topsoil may also occur. The topsoil may, therefore, vary randomly in thickness and thicker topsoil than that found in the boreholes may occur in places. This renders it difficult to estimate the quantity of topsoil to be stripped. In order to prevent overstripping, diligent control of the stripping operation will be required.

The topsoil and peat are dark brown in colour, indicating that they contain fine roots, humus and/or decaying vegetation. These materials may generate volatile gases and will produce an offensive odour under anaerobic conditions; therefore, the topsoil and peat must not be buried within the building envelopes or deeper than 1.2 m below finished grade. This is to avoid an adverse impact on the environmental well-being of the project. The topsoil and peat can be used for normal landscaping purposes. For sodding and planting applications, they should be assessed by fertility analyses.

4.2 **Fine Sand** (All Boreholes)

The fine sand was encountered beneath the topsoil and peat deposits and dominated the upper section of the soil stratigraphy. It consists of fine sand with a trace of silt and gravel and is laminated with occasional layers of fine to coarse sand, indicating that it is a glaciofluvial deposit.

Sample examinations revealed that the fine sand is non-cohesive and in a moist to saturated condition.

The water content of the fine sand was found to range from 3% to 27%, with a median of 17%, confirming that the fine sand is generally saturated.



The obtained 'N' values range from 5 to 38 blows per 30 cm of penetration, with a median of 14, which indicates that the relative density of the sand is loose to dense, being generally compact. The loose sand occurred within a depth of $2.0 \pm$ m from the prevailing ground surface.

Grain size analyses were performed on 3 representative samples of the fine sand and 1 sample of a fine to coarse sand seam. The results are plotted on Figures 7 and 8, respectively.

According to the above findings, the following engineering properties are deduced:

- Low frost susceptibility and low soil-adfreezing potential.
- High water erodibility; susceptible to migration through small openings under seepage pressure.
- Pervious, with an estimated coefficient of permeability of 10^{-2} cm/sec and runoff coefficients of:

Slope	
0% - 2%	0.04
2% - 6%	0.09
6% +	0.13

- A frictional soil, its shear strength is derived from its internal angle of friction and is, therefore, directly dependent on soil density.
- In cuts, the fine sand will run readily with water seepage and boil under a piezometric head of 0.3 m.
- A fair pavement-supportive material, with an estimated California Bearing ratio (CBR) of 20%.



- Moderately low corrosivity to buried metal, with an estimated electrical resistivity of 6000 ohm/cm.

4.3 Silty Clay (Boreholes 4, 5 and 6)

The silty clay was encountered beneath the fine sand and dominates the lower portion of the soil stratigraphy at the central or possibly in the southern portion of the property.

It consists of silt and clay, with clay exerting the dominant influence on the soil properties, and contains trace amounts of sand. Occasional layers of silty fine sand and silt were found embedded within the silty clay deposit, indicating that it is a lacustrine deposit.

The obtained 'N' values range from 12 to 33, with a median of 17, showing that the consistency of the silty clay is very stiff to hard, being generally very stiff.

The Atterberg Limits and the natural water content of the silty clay were determined; the results are plotted on the Borehole Logs and summarized below:

Liquid Limit.	30%
Plastic Limit	18%
Natural Water Content	22% to 29% (median 27%)

The results indicate that the clay is a cohesive material with low plasticity. The natural water content lies between the plastic and liquid limits, confirming the generally very stiff consistency.



Reference No. 0304-S37

A grain size analysis was performed on a representative sample of the silty clay and the result is plotted on Figure 9.

According to the above findings, the following engineering properties are deduced.

- High frost susceptibility and moderate water erodibility.
- Low permeability, with an estimated coefficient of permeability of 10^{-7} cm/sec and runoff coefficients of:

Slope

0% -2%	0.15
2%-6%	0.20
6% +	0.28

- A cohesive soil, its shear strength is derived from consistency and is inversely moisture dependant. It will be susceptible to a reduction in shear strength if remoulded.
- The clay will be stable with relatively steep slopes for a short duration; however, prolonged exposure will allow infiltrating precipitation to saturate the sand seams in the clay, causing the sides to slough, and sheet collapse may occur without warning.
- A very poor pavement-supportive material, with an estimated CBR value of 3% or less.
- Moderate corrosivity to buried metal, with an estimated electrical resistivity of 4000 ohm/cm.



4.4 Compaction Characteristics of the Revealed Soils

The obtainable degree of compaction is primarily dependent on the soil moisture and, to a lesser extent, on the type of compactor used and the effort applied.

As a general guide, the typical water content values of the revealed soils for Standard Proctor compaction are presented in Table 1.

Table 1 - Estimated Water Content for Compaction

Soil Type	Determined Natural Water Content (%)	Water Content (%) for Standard Proctor Compaction	
		100% (optimum)	Range for 95% or +
Fine Sand	3 to 27 (median 17)	11	6 to 17
Silty Clay	22 to 29 (median 27)	15	10 to 20

The above findings show that the majority of the occurring soils are excessively wet and some of the fine sand is too dry, for Standard Proctor compaction. The dry sand can be mixed with wet soils, and the wet sand can be drained of excessive water by proper stockpiling. The wet silty clay will need to be aerated by being spread thinly on the ground during dry, warm weather, or mixed with dry soils, prior to use as structural fill.

A heavy, kneading-type roller will be required to compact the silty clay. A vibratory compactor will be required to compact the sand. The degree of vibration must be adjusted inversely to the moisture content of the soils being compacted. The lifts for



compaction should be limited to 20 cm, or to a suitable thickness assessed by test strips performed by the equipment which will be used at the time of construction.

One should be aware that a $90\% \pm$ Standard Proctor compaction of the sand with the water content within 25% is achievable. Further densification is prevented by the pore pressure induced by the compactive effort; however, large random voids will have been expelled and, with time, the pore pressure will dissipate and the percentage of compaction will increase. There are many cases on record where, after days of rest, the density of the compacted mantle has increased to over 95% of its maximum Standard Proctor dry density.

If the compaction of the soils is carried out with the water content within the range for 95% Standard Proctor dry density but on the wet side of optimum, the surface of the compacted soil mantle will roll under the dynamic compactive load. This is unsuitable for pavement construction since each component of the pavement structure is to be placed under dynamic conditions which will induce the rolling action of the subgrade surface and cause structural failure of the new pavement. The foundations or bedding of the sewer and slab-on-grade, on the other hand, will be placed on a subgrade which will not be subjected to impact loads. Therefore, the structurally compacted soil mantle with the water content on the wet side or dry side of optimum will provide an adequate subgrade for the construction.



5.0 GROUNDWATER CONDITIONS

The boreholes were checked for the presence of groundwater upon their completion. The data are plotted on the Borehole and listed in Table 2.

Table 2 - Groundwater Levels

BH No.	Borehole Depth (m)	Soil Colour Changes from Brown to Grey	Measured Groundwater/ Cave-in * Level On Completion	
		Depth (m)	Depth (m)	Elevation (m)
1	5.0	N/A	1.1	239.9
2	5.0	N/A	3.7*	240.8
3	5.0	N/A	3.7*	239.6
4	6.6	N/A	0.6*	238.7
5	6.6	5.6	0.9*	238.1
6	6.6	5.6	0.6*	238.4

* Cave-in level (In wet sands, the level generally represents the groundwater regime at the borehole location.)

The above shows that groundwater and cave-in levels occurred in the fine sand at elevations ranging from 238.1 m in the central portion of the property to 240.8 m in the northerly portion of the property.

The groundwater yield from the sand is expected to be appreciable and persistent. The yield from the silty clay, due to its low permeability, will be small.



6.0 DISCUSSION AND RECOMMENDATIONS

The investigation has disclosed that beneath a layer of topsoil or peat, the site is underlain by layers of loose to dense, generally compact fine sand and very stiff to hard, generally very stiff silty clay which extend to the maximum investigated depth.

Peat, extending to depths of 0.5 to 2.1 m or +, was encountered throughout the central and southerly portions of the property. This warrants that further investigation be carried out at the southern portion to determine the subsurface condition beneath the peat deposit.

Groundwater was encountered at El. 239.0± m and its yield from the fine sand is expected to be appreciable and persistent.

The geotechnical findings which warrant special consideration are presented below:

1. The topsoil and peat are unsuitable for structural usage; they can, however, be used for landscaping purposes. They may produce volatile gases under anaerobic conditions and must not be buried in the vicinity of the houses and underground conduits.
2. The foundations and underground services must extend onto the sound natural soils below the weathered zone. As a general guide, a Maximum Allowable Soil Pressure of 150 kPa can be used for the design of the foundations. The suitable founding depth occurs at or below the observed groundwater level, in places. This dictates that the subgrade must be carefully examined to ensure its condition is compatible with the foundation design.



3. The sides of the excavation in the water-bearing sand will run, and the bottom will boil under a piezometric head of 0.3 m. Therefore, a well-point dewatering system will likely be required for construction extending into the water-bearing sand.
4. The *in situ* soils generally have a high water content and will require proper stockpiling or prior aeration before they can be used as structural backfill and for backfilling operations.
5. As noted, groundwater occurs at shallow depths. In order to avoid wetting the basement or the continuous operation of the sump pumps, the basement floor slab should be constructed at a level at least 0.5 m above the groundwater level. This dictates that grading in the central and southern portions need to be raised by filling.
6. Where earth fill is required to raise the grade it is generally economical to place engineered fill for normal foundations, floor slabs and underground services construction. This, however, must be implemented during the rough grade stage.
7. Services constructed in the water-bearing sand should be stabilized by a well-point dewatering system. The joints of services must be leak-proof or wrapped with an appropriate water proof membrane.

The recommendations appropriate for the project described in Section 2.0 are presented herein. One must be aware that the subsurface conditions may vary between boreholes. Should this become apparent during construction, a geotechnical engineer must be consulted to determine whether the following recommendations require revision.



6.1 **Building Foundation**

The building foundations should be placed onto sound natural soils or onto engineered fill. As a guide, a Maximum Allowable Soil Pressure of 150 kPa can be used for the design of the foundation.

The appropriate founding levels on the natural soils, as inferred from the borehole findings, are generally at a depth of 1.2 m and, in places, 3.0 m from the prevailing ground surface.

All of the footing subgrade should be inspected by a geotechnical engineer, or a geotechnical technician under the supervision of a geotechnical engineer, or a building inspector who has geotechnical experience, to ensure that the revealed soil conditions are compatible with the foundation design requirements.

The above recommended soil pressure incorporates a factor of safety of 3 against shear failure of the underlying soils. The total and differential settlement of the footings is estimated to be 25 mm and 15 mm, respectively.

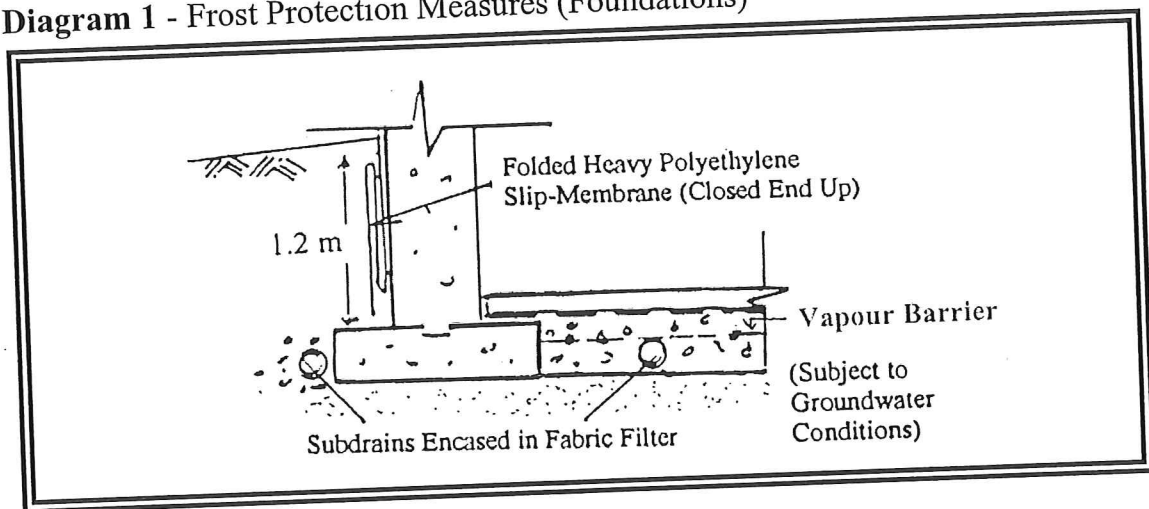
Where groundwater seepage is encountered within 0.5 m of the underside of the floor slab, perimeter subdrains and dampproofing of the basement walls will be required. The floor slabs should be provided with floor subdrains and sump-pits. All the subdrains should be encased in a fabric filter to protect them against blockage.

The foundations exposed to weathering, or in unheated areas, must have at least 1.4 m of earth cover, or equivalent, for protection against frost action. Where foundation



walls are backfilled with soils having a high silt content (over 10% by weight), they should be shielded with a polyethylene slip-membrane for protection against soil adfreezing. The recommended measures are schematically illustrated in diagram 1.

Diagram 1 - Frost Protection Measures (Foundations)



It should be noted that if water seepage is encountered from the sand, the subgrade must be protected immediately after exposure by a concrete mud-slab. This will prevent disturbance during construction and costly rectification.

The footings should meet the minimum size requirements specified by the Ontario Building Code, and the building structure should be designed to resist a minimum earthquake force calculated using the following:

F - Foundation Factor	1.3
v - Zonal Velocity Ratio	0.05



6.2 Engineered Fill

The engineering requirements for a certifiable fill for footings, floor slab, road and municipal services construction with a Maximum Allowable Soil Pressure of 150 kPa are presented below:

1. All of the topsoil and peat must be removed, and the subgrade surface must be inspected and proof-rolled prior to any fill placement. Badly weathered soils must be subexcavated and recompact. Where the subgrade is under groundwater, a layer of granular 'A' must be placed, extending to 0.3 m above the groundwater. This layer acts as a base on which the engineered fill is to be implemented.
2. Inorganic soils must be used, and they must be uniformly compacted in lifts 20 cm thick to 98% or + of their maximum Standard Proctor dry density up to the proposed lot/road subgrade. The soil moisture must be properly controlled on the wet side of the optimum.
3. If imported fill is to be used, the hauler is responsible for its environmental quality and must provide a document to certify that the material is free of hazardous contaminants.
4. If the engineered fill is to be left over the winter months, adequate earth cover, or equivalent, must be provided for protection against frost action.
5. The engineered fill must extend over the entire graded area, and the fill envelope must be clearly and accurately defined in the field and documented by qualified surveyors. Footings constructed partially on engineered fill must be designed to tolerate an abrupt differential settlement (approximately 15 mm) between the native soil and engineered fill, or the footings and upper



- section of the foundation or basement walls at the transition zone must be reinforced by two 20-mm steel reinforcing bars.
6. The engineered fill must not be performed during the period from late November to early April, when freezing ambient temperatures occur either persistently or intermittently. This is to ensure that the fill is free of frozen soils, ice and snow.
 7. Where the ground is wet due to water seepage, an appropriate subdrain scheme must be implemented prior to the fill placement.
 8. The fill operation must be fully supervised and monitored by a technician under the direction of a geotechnical engineer.
 9. The footing and underground services subgrade must be inspected by the geotechnical consulting firm that supervised the engineered fill placement. This is to ensure that the foundations are constructed within the engineered fill envelope, and that the integrity of the fill has not been compromised by interim construction, environmental degradation, and/or disturbance by the footing excavations. If construction on the engineered fill does not commence within a period of 2 years from the date of certification, the condition of the engineered fill must be assessed for re-certification.
 10. Any excavations carried out in the engineered fill envelope must be reported to the geotechnical consultant who supervised the fill placement in order to document locations of excavation and/or supervise reinstatement of the excavated areas to engineered fill status.
 11. Despite stringent control in the placement of the engineered fill, occasional minor variations in the soil density may occur in the fill mantle. Therefore, the strip footings and upper section of the foundation walls constructed on the fill mantle may require continuous reinforcement with steel reinforcing bars,



depending on the uniformity of the soils in the fill and thickness of the fill mantle underlying the foundations. Should the foundations require reinforcement, the required number and size of reinforcing bars must be assessed by consideration of uniformity as well as the thickness of the fill mantle beneath the foundations. In sewer construction, the engineered fill is considered to have the same structural proficiency as sound natural soils.

6.3 Underground Services

The subgrade for the underground services should consist of properly compacted inorganic earth fill or sound natural soils. A Class 'B' bedding is recommended for the design of the underground services construction. The bedding material should consist of compacted 20-mm Crusher-Run Limestone, or equivalent. Lean concrete, concrete dry mix, or thickening of the Crusher-Run Limestone bedding, may be used for subgrade stabilization.

The pipe joints should be leak-proof or they should be provided with a waterproof membrane. This is to prevent migration of fines due to leaks from inadvertent faulty joints.

In order to prevent pipe floatation when the sewer trench is deluged with water, a soil cover with a thickness equal to the diameter of the pipe should be in place at all times after completion of the pipe installation.

Openings to subdrains and catch basins should be shielded by a filter fabric to prevent silting.



6.4 Trench Backfilling

The backfill in the trenches should be compacted to at least 95% of its maximum Standard Proctor dry density. The material in the road subgrade within 1.0 m below the pavement surface should be compacted to at least 98% of the maximum Standard Proctor dry density, with the water content 2% to 3% drier than the optimum. This is to provide the required stiffness for pavement construction.

The *in situ* inorganic soils are suitable for use as trench and foundation wall backfill; however, the water content of the silty clay, as determined, is generally too wet and some of the fine sand is too wet for a 95% or + Standard Proctor compaction. Therefore, the sand will require proper stockpiling to drain the excess water, and the silty clay will have to be aerated by being spread thinly on the ground during dry, warm weather.

In normal sewer and building construction practice, the problem areas of road settlement largely occur adjacent to manholes, catch basins and services crossings. In areas, which are inaccessible to a heavy compactor, sand backfill should be used. Unless compaction of the backfill is carefully performed, settlement will occur. Often, the interface of the native soils and sand backfill will have to be flooded for a period of at least 1 day.

One must be aware of possible consequences during trench backfilling and exercise caution as described below:



- When construction is carried out in freezing winter weather, allowance should be made for these following conditions. Despite stringent backfill monitoring, frozen soil layers may inadvertently be mixed with the structural trench backfill. Should the *in situ* soil have a water content on the dry side of the optimum, it would be impossible to wet the soil due to the freezing condition, rendering difficulties in obtaining uniform and proper compaction. Furthermore, the freezing condition will prevent flooding of the backfill when it is required, such as when the trench box is removed or when backfill consists of shale mixture. The above will invariably cause backfill settlement that may become evident within one to several years, depending on the depth of the trench which has been backfilled.
- In areas where the underground services construction is carried out during winter months, prolonged exposure of the trench walls will result in frost heave within the soil mantle of the walls. In spite of close monitoring, some frozen material will inadvertently be left in the trench backfill. This may result in some settlement as the frost recedes, and repair costs will be incurred prior to final surfacing of the new pavement.
- Compaction monitoring of the backfill in the lower vertical section of a deep trench is not always possible due to safety concerns. Therefore, this zone must be backfilled with sand and flooded prior to placement of the backfill which will be monitored. This measure is necessary in order to prevent consolidation of inadvertent voids and loose backfill which will compromise the compaction of the monitored backfill. In areas where groundwater movement is expected in the sand fill mantle, a seepage collar should be provided.



- One should be aware that some settlement of the structural fill in vertical trenches stabilized by a trench box may occur as the void left by the removal of the box is slowly filled by the fill. In order to avoid settlement, or minimize it to a tolerable level, the box should be backfilled with compacted sands and the fill should be flooded for a period of 1 day.

6.5 Pavement Design

The subgrade will generally consist of fine sand which is a good pavement-supportive material. Using a CBR design approach, the recommended pavement design is given in Table 3.

Table 3 - Pavement Design

Course	Thickness (mm)	OPS Specifications
Asphalt Surface	40	HL-3
Asphalt Binder	70	HL-8
Granular Base	150	19-mm Crusher Run Limestone

According to the results of the grain size analyses of the fine sand, the samples conform to the OPS Gradation Specification for Granular 'B' Type I. Therefore, for roads being built on the sand deposit, the granular sub-base can be eliminated.

In order to provide a stable subgrade for pavement construction, it is imperative that the subgrade within the zone 1.0 m below the underside of the granular base be compacted to at least 98% of its maximum Standard Proctor dry density, with the



moisture content 2% to 3% drier than its optimum. This is to provide adequate stability for the pavement construction.

The subgrade will suffer a strength regression if water is allowed to saturate the mantle. The following measures should, therefore, be incorporated in the construction procedures and road design:

- If paving does not immediately follow the preparation of the subgrade, it should be properly crowned and smooth-rolled to allow interim precipitation to be properly drained.
- Prior to the placement of the granular base, the subgrade should be proof-rolled and any soft spots should be rectified.
- If the pavement is to be constructed in the wet seasons, the granular base may need to be thickened. The additional thickness required for the sub-base can be determined at the time of construction.
- Curb subdrains will be required.

6.6 Timing of Construction

As noted, the fine sand is water erodible. Therefore, bare surfaces should be sodded immediately, particularly where the surface grade is steeper than 5%.

The sod can effectively protect the soil against water erosion only if the roots are allowed to become properly secured in the underlying soils. This dictates that the sodding should be carried out by late September, at the latest. Otherwise, the sod may be washed out during the wet seasons, resulting in serious soil erosion on sloping ground, and costly rectification would be unavoidable.



6.7 Soil Parameters

The recommended soil parameters for the project design are given in Table 4.

Table 4 - Soil Parameters

Table 4 - Soil Parameters				
<u>Unit Weight and Bulk Factor</u>				
	<u>Unit Weight (kN/m³)</u>		<u>Estimated Bulk Factor</u>	
	Bulk	Submerged	Loose	Compacted
Fine Sand	18	10.0	1.20	1.00
Silty Clay	20	10.0	1.30	1.00
<u>Lateral Earth Pressure Coefficients</u>				
	Active K _a	At Rest K _o	Passive K _p	
Fine Sand	0.30	0.35	3.33	
Silty Clay	0.40	0.50	2.50	
<u>Runoff Coefficients</u>				
Slope				
0% - 2%		0.04		
2% - 6%		0.09		
6% +		0.13		
<u>Maximum Allowable Soil Pressure For Thrust Block Design</u>				
Engineered Fill and Compact Sand		100 kPa		



6.8 Excavation

Excavation should be carried out in accordance with Ontario Regulation 213/91.

For excavation purposes, the types of soils are classified in Table 5.

Table 5 - Classification of Soils for Excavation

Material	Type
Silty Clay and Sand above Groundwater	2
Water-bearing Sand	4

Where excavations are to be carried out in the water-bearing sand, the possibility of flowing sides and bottom boiling dictates that the ground be predrained. Groundwater in shallow excavations may be controllable by pumping from closely spaced sump-wells. In deep excavations, the use of a well-point dewatering system will be required. In order to provide a stable subgrade for the services construction, the groundwater should be depressed to at least 0.5 m below the subgrade.

Prospective contractors should assess the status of the subsoil by performing test excavations to at least 0.5 m below the sewer subgrade. The test pits should be allowed to remain open for a period of at least 4 hours to assess the trenching conditions.



7.0 LIMITATIONS OF REPORT

It should be noted that no tests have been carried out to determine whether environmental contaminants are present in the soils. Therefore, this report deals only with a study of the geotechnical aspects of the proposed project.

This report was prepared by Soil-Eng Limited for the account of Previn Court Homes, and for review by their designated consultants and government agencies. The material in it reflects the judgement of Peter Healy, C.E.T., and Victor S. Chan, P.Eng., in light of the information available to it at the time of preparation. Any use which a Third Party makes of this report, or any reliance on decisions to be made based on it, are the responsibility of such Third Parties. Soil-Eng Limited accepts no responsibility for damages, if any, suffered by any Third Party as a result of decisions made or actions based on this report.

SOIL-ENG LIMITED

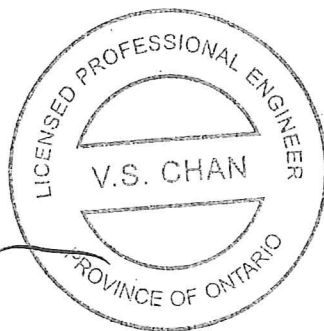
Per
Peter Healy

Peter Healy, C.E.T.

Per David Chan

Victor S. Chan, P.Eng.

PH/VSC:jp



LIST OF ABBREVIATIONS & DESCRIPTION OF TERMS

The abbreviations and terms commonly employed on the borehole logs and figures, and in the text of the report are as follows:

1. SAMPLE TYPES

AS	Auger sample
CS	Chunk sample
DO	Drive open
DS	Denison type sample
FS	Foil sample
RC	Rock core with size and percentage of recovery
ST	Slotted tube
TO	Thin-walled, open
TP	Thin-walled, piston
WS	Wash sample

2. PENETRATION RESISTANCE/'N'

Dynamic Cone Penetration Resistance:

A continuous profile showing the number of blows for each foot of penetration of a 2" diameter 90° point cone driven by a 140-pound hammer falling 30 inches.
Plotted as _____

Standard Penetration Resistance or 'N' value:

The number of blows of a 140-pound hammer falling 30 inches required to advance a 2-inch O.D. drive open sampler one foot into undisturbed soil.
Plotted as 'O'.

WH	Sampler advanced by static weight
PH	Sampler advanced by hydraulic pressure
PM	Sampler advanced by manual pressure
NP	No penetration

3. SOIL DESCRIPTION

a) Cohesionless Soils:

<u>'N' (Blows/ft)</u>	<u>Relative Density</u>
0 to 4	very loose
4 to 10	loose
10 to 30	compact
30 to 50	dense
over 50	very dense

b) Cohesive Soils:

<u>Undrained Shear Strength (ksf)</u>	<u>Consistency</u>
Less than 0.25	very soft
0.25 to 0.50	soft
0.50 to 1.0	firm
1.0 to 2.0	stiff
2.0 to 4.0	very stiff
over 4.0	hard

c) Method of Determination of Undrained Shear Strength of Cohesive Soils:

x 0.0 - Field vane test in borehole.
The number denotes the sensitivity to remoulding.

△ - Laboratory vane test

□ - Compression test in laboratory.

For a saturated cohesive soil, the undrained shear strength is taken as one half of the undrained compressive strength.

METRIC CONVERSION FACTORS

1 ft. = 0.3048 metres
1 lb. = 0.453 kg

1 inch = 25.4 mm
1 ksf = 47.88 kN/m²



**Soil-Eng
Limited**

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JOB NO.: 0304-S37

LOG OF BOREHOLE NO.: 1

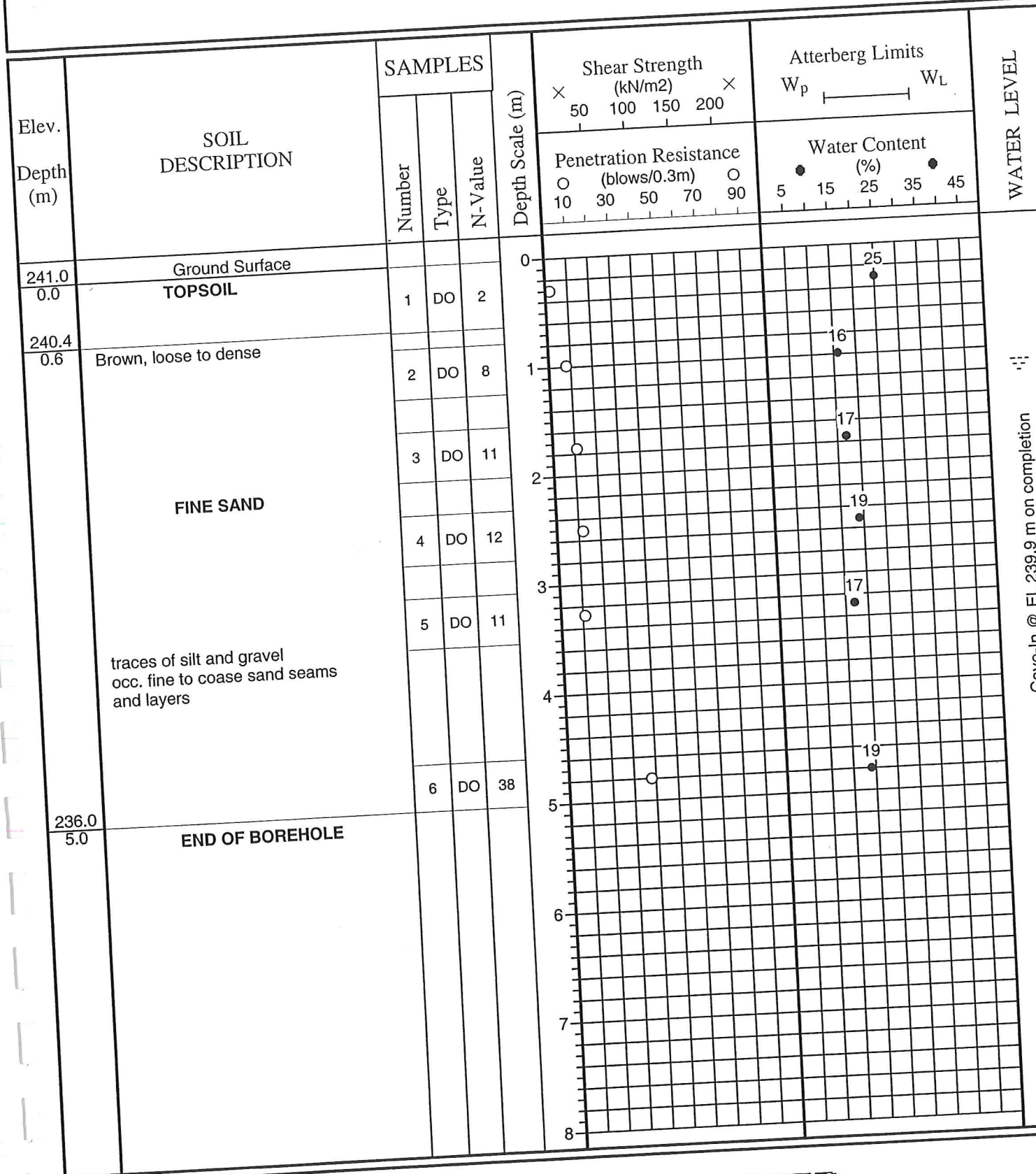
FIGURE NO.: 1

JOB DESCRIPTION: Proposed Residential Subdivision

METHOD OF BORING: Flight-Auger

JOB LOCATION: Ferndale Dr./Edgehill Dr., City of Barrie

DATE: May 6, 2003



JOB NO.: 0304-S37

LOG OF BOREHOLE NO.: 2

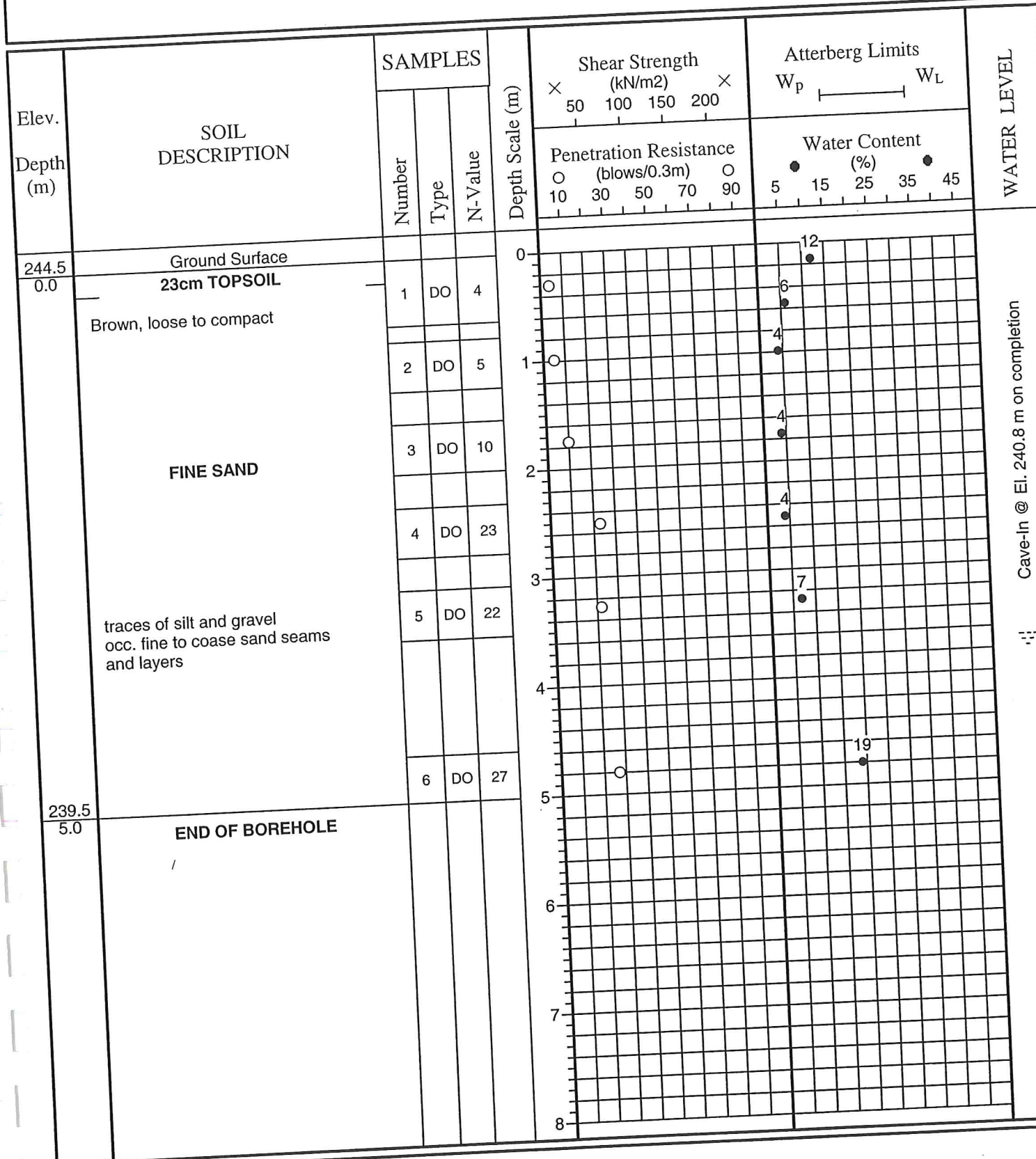
FIGURE NO.: 2

JOB DESCRIPTION: Proposed Residential Subdivision

JOB LOCATION: Ferndale Dr./Edgehill Dr., City of Barrie

METHOD OF BORING: Flight-Auger

DATE: May 6, 2003



JOB NO.: 0304-S37

LOG OF BOREHOLE NO.: 3

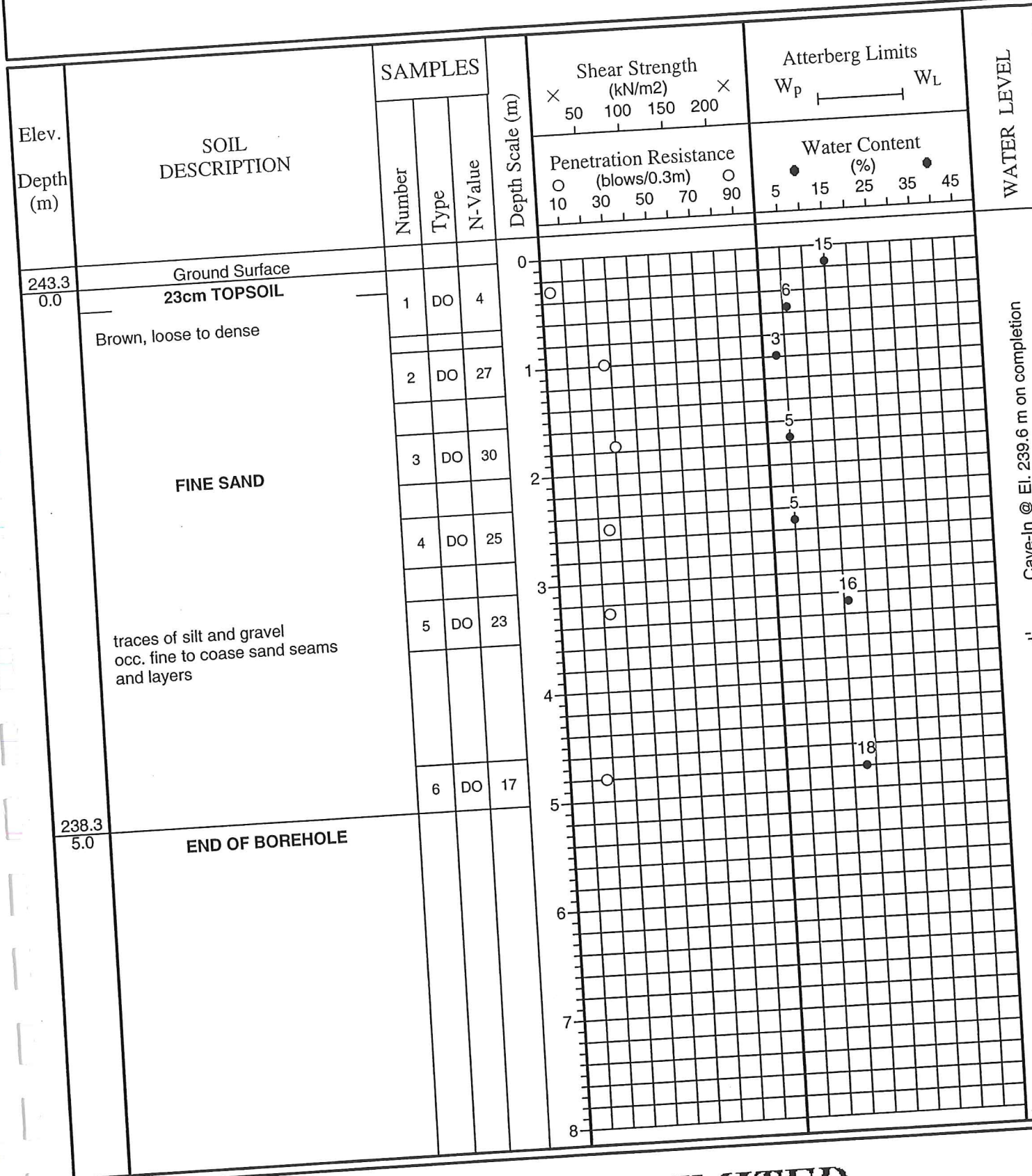
FIGURE NO.: 3

JOB DESCRIPTION: Proposed Residential Subdivision

JOB LOCATION: Ferndale Dr./Edgehill Dr., City of Barrie

METHOD OF BORING: Flight-Auger

DATE: May 6, 2003



JOB NO.: 0304-S37

LOG OF BOREHOLE NO.: 4

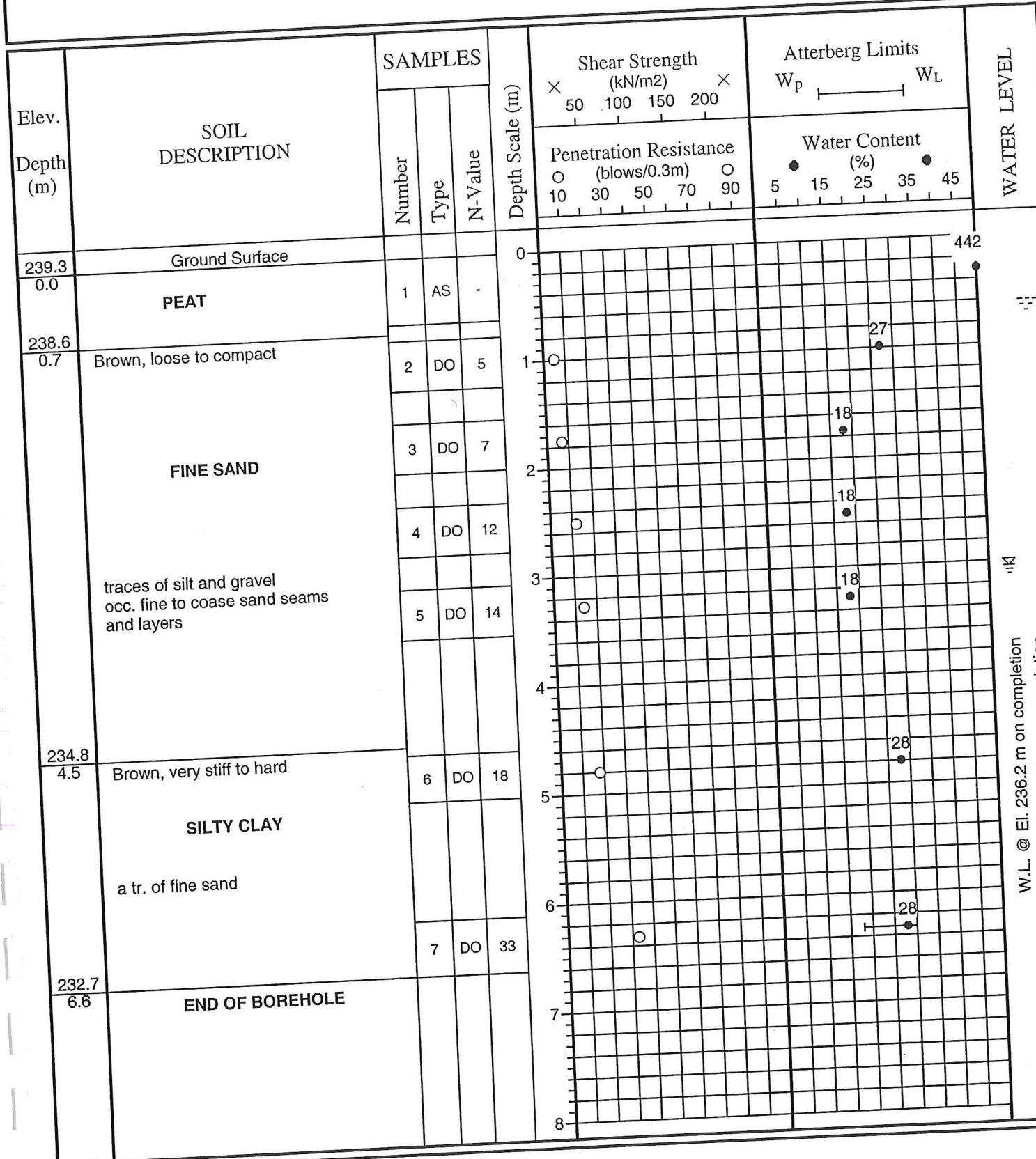
FIGURE NO.: 4

JOB DESCRIPTION: Proposed Residential Subdivision

JOB LOCATION: Ferndale Dr./Edgehill Dr., City of Barrie

METHOD OF BORING: Flight-Auger

DATE: May 6, 2003



JOB NO.: 0304-S37

LOG OF BOREHOLE NO.: 5

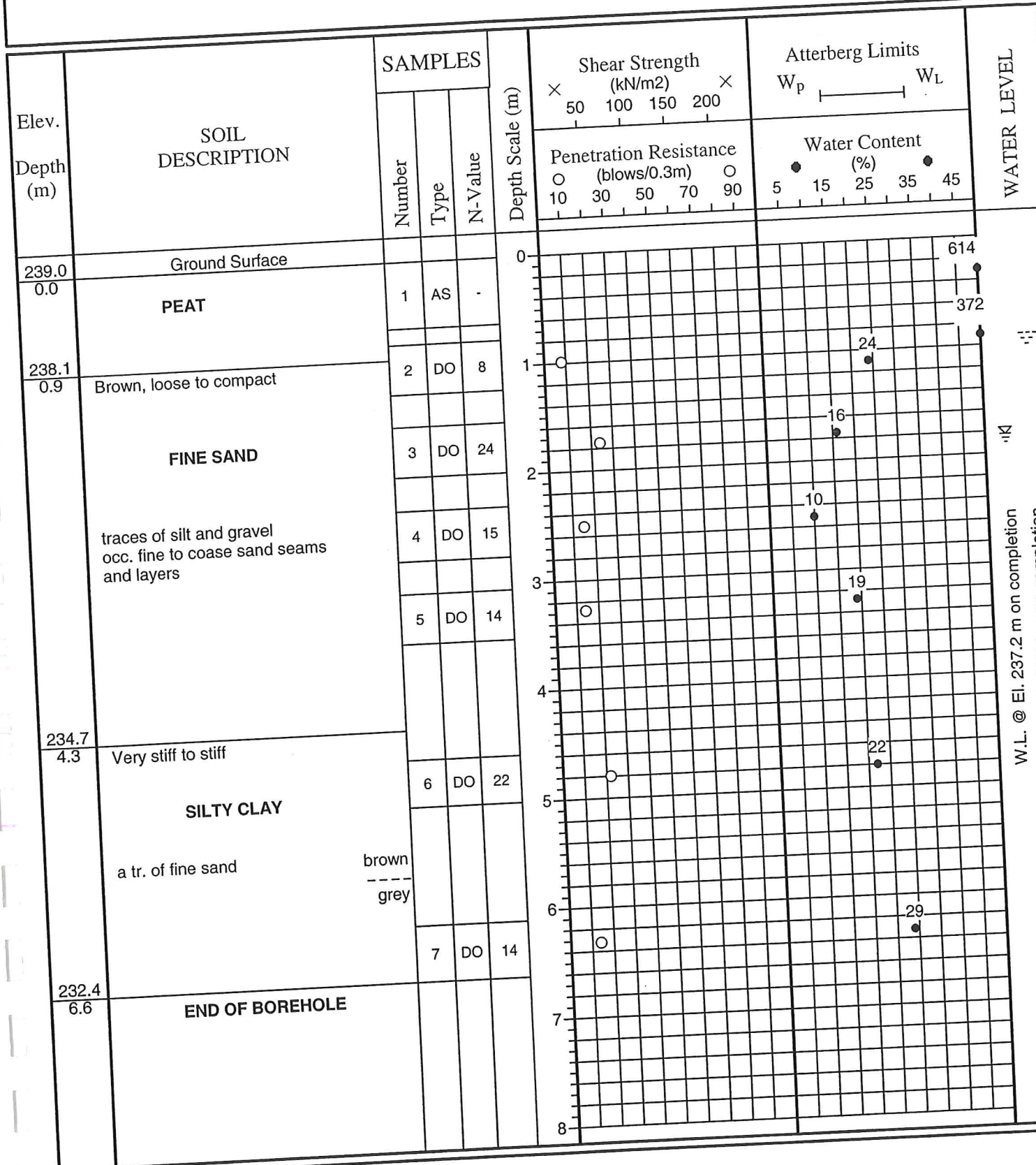
FIGURE NO.: 5

JOB DESCRIPTION: Proposed Residential Subdivision

JOB LOCATION: Ferndale Dr./Edgehill Dr., City of Barrie

METHOD OF BORING: Flight-Auger

DATE: May 6, 2003



JOB NO.: 0304-S37

LOG OF BOREHOLE NO.: 6

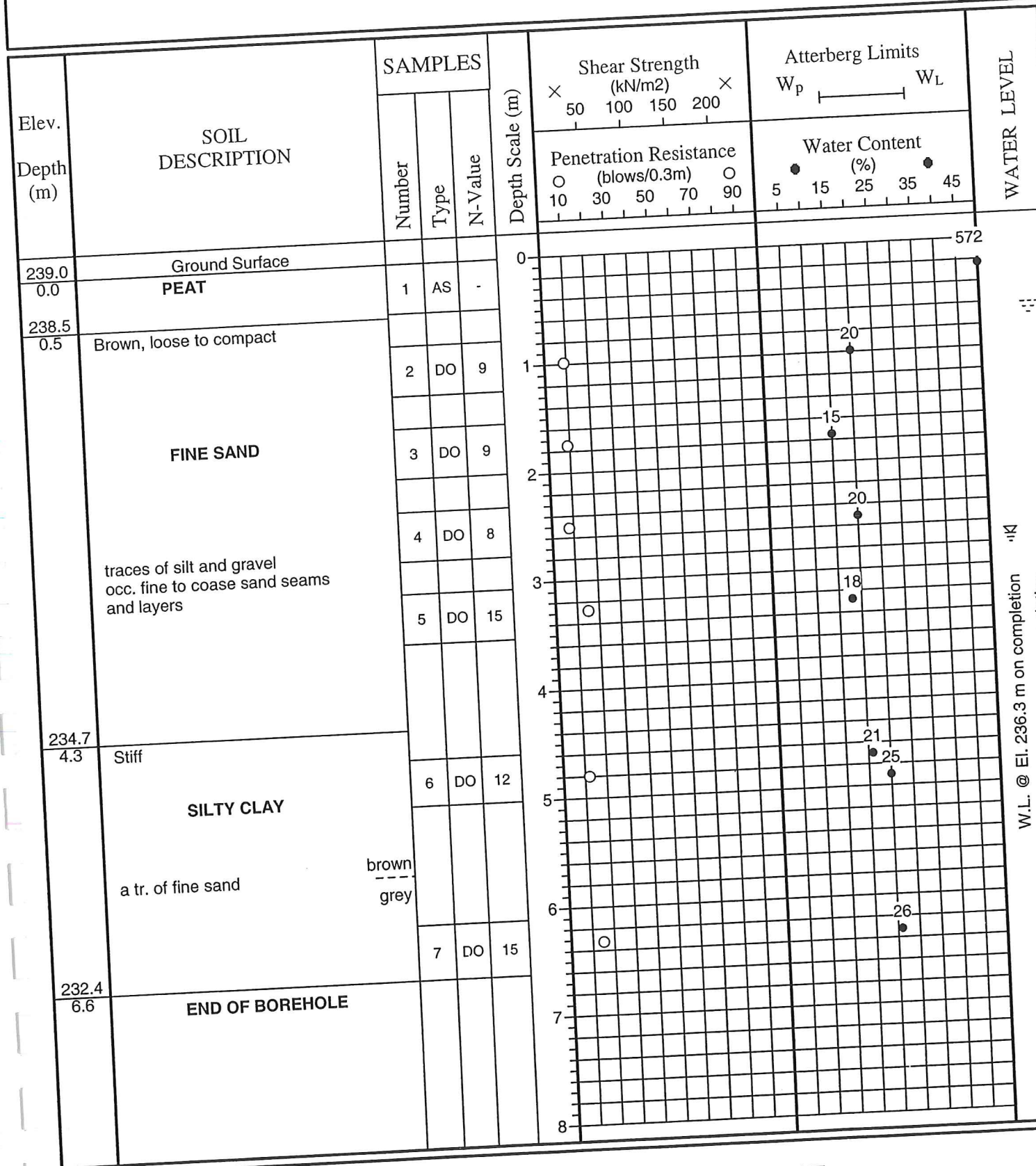
FIGURE NO.: 6

JOB DESCRIPTION: Proposed Residential Subdivision

METHOD OF BORING: Flight-Auger

JOB LOCATION: Ferndale Dr./Edgehill Dr., City of Barrie

DATE: May 6, 2003





Soil-Eng Limited

REFERENCE N° 0304-S37

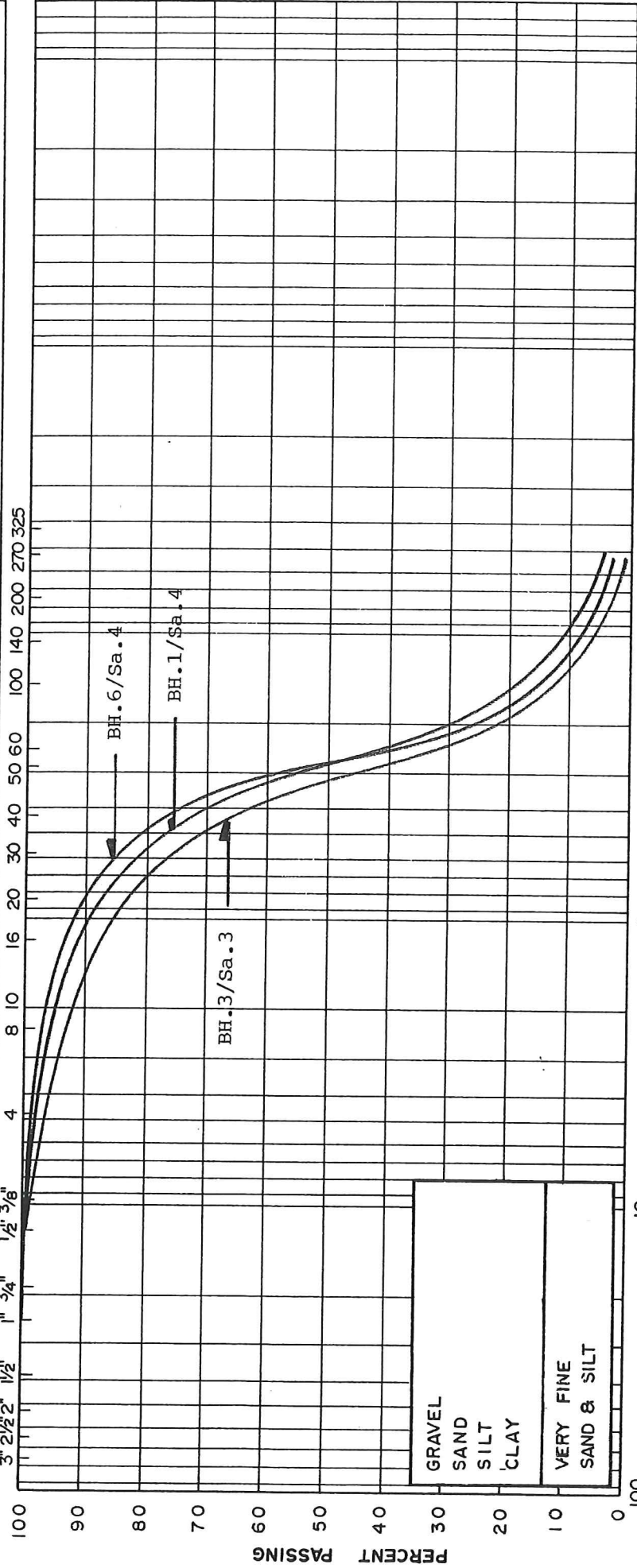
U.S. BUREAU OF SOILS CLASSIFICATION

GRAVEL		SAND		SILT		CLAY	
COARSE	FINE	COARSE	FINE				

GRAIN SIZE DISTRIBUTION

UNIFIED SOIL CLASSIFICATION

GRAVEL		SAND		SILT & CLAY	
COARSE	FINE	COARSE	FINE		



PROJECT: Proposed Residential Subdivision
LOCATION: Ferndale Dr./Edgehill Dr.
LOCATION: City of Barrie
BOREHOLE N°: 1 3 6
SAMPLE N°: 4 3 4
DEPTH: (m) 2.5 1.8 2.5
ELEVATION: (m) 238.5 241.5 236.5

GRAIN SIZE IN MILLIMETERS
COEFFICIENT OF UNIFORMITY:
COEFFICIENT OF CURVATURE:

BH./Sa.
LIQUID LIMIT
PLASTIC LIMIT
PLASTICITY INDEX
MOISTURE CONTENT
PERMEABILITY (Estimated)

1/4 3/3 6/4
% =
% =
% =
% = 19 5 20
(cm./sec.) = 10⁻²

FIGURE: 7

Classification of Sample and Group Symbol:

FINE SAND
traces of silt and gravel



Soil-Eng Limited

REFERENCE No 0304-S37

U.S. BUREAU OF SOILS CLASSIFICATION

GRAVEL
COARSE

GRAIN SIZE DISTRIBUTION

FINE	COARSE	MEDIUM	FINE	V. FINE
SAND				

CLAY

SILT

UNIFIED SOIL CLASSIFICATION

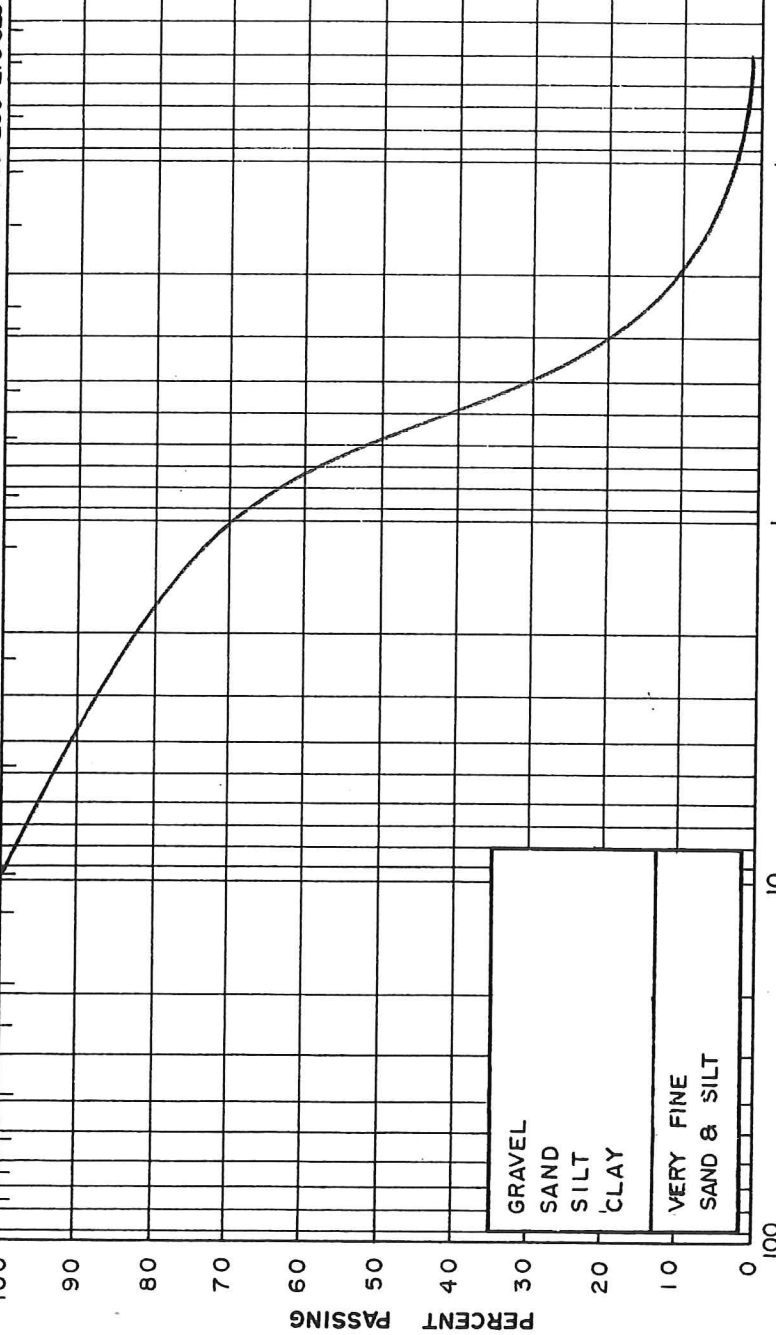
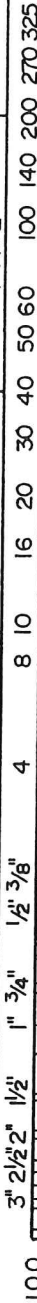
GRAVEL

COARSE	FINE
3" 2 1/2"	1/2" 3/8"

SAND

FINE

SILT & CLAY



10

100

1

0.1

0.01

0.001

GRAIN SIZE IN MILLIMETERS

PROJECT: Proposed Residential Subdivision

LOCATION: Ferndale Dr./Edgehill Dr.

LOCATION: City of Barrie

BOREHOLE No: 4

SAMPLE No: 3

DEPTH: (m) 1.8

ELEVATION: (m) 237.5

COEFFICIENT OF UNIFORMITY:

COEFFICIENT OF CURVATURE:

% =

% =

% =

% =

% =

% =

% =

LIQUID LIMIT

PLASTIC LIMIT

PLASTICITY INDEX

MOISTURE CONTENT

PERMEABILITY

(cm./sec.) = 10⁻²

(Estimated)

Classification of Sample and Group Symbol:

FINE TO COARSE SAND

FIGURE: 8



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REFERENCE No 0304-S37

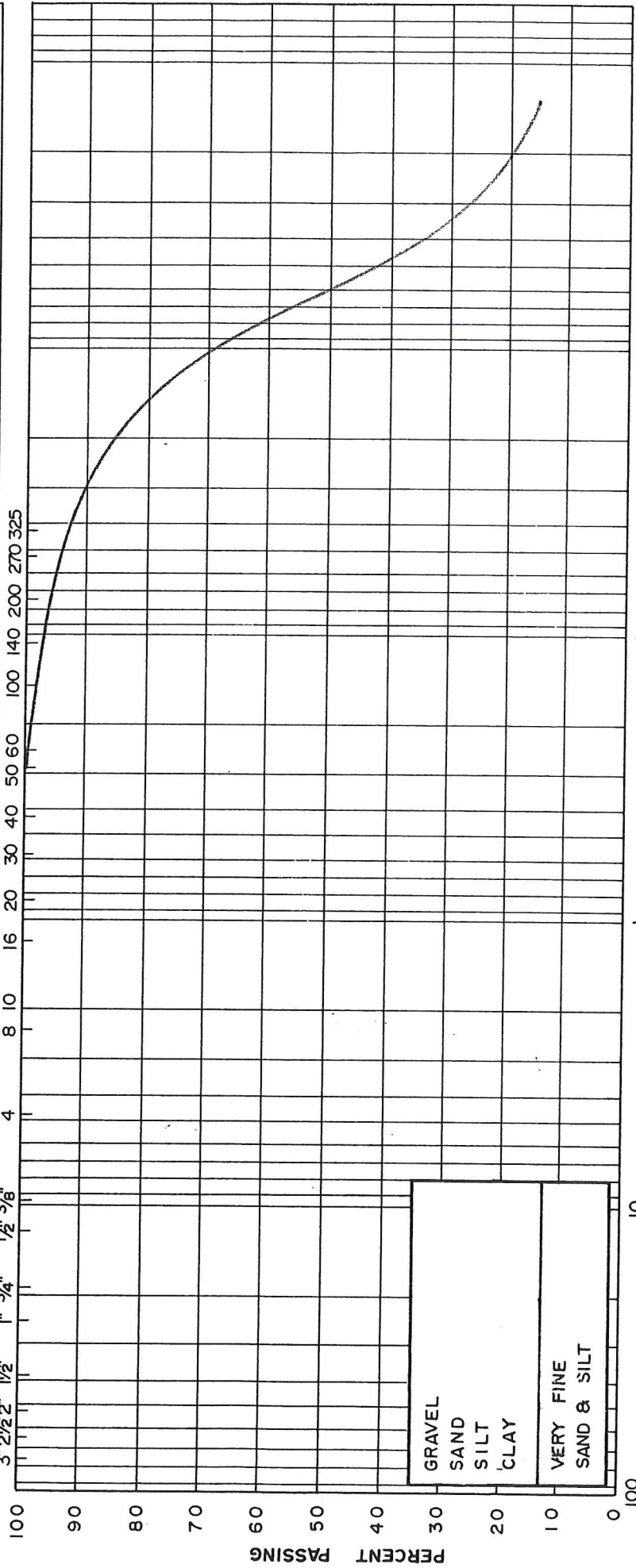
U.S. BUREAU OF SOILS CLASSIFICATION

GRAVEL		SAND				SILT		CLAY	
COARSE		FINE		COARSE	MEDIUM	FINE	V. FINE		

UNIFIED SOIL CLASSIFICATION

GRAVEL		SAND				SILT & CLAY			
COARSE	FINE	COARSE	MEDIUM	FINE					

3" 2 1/2" 2" 1 1/2" 1" 3/4" 1/2" 3/8"



COEFFICIENT OF UNIFORMITY:

COEFFICIENT OF CURVATURE:

LIQUID LIMIT % = 30

PLASTIC LIMIT % = 18

PLASTICITY INDEX % = 12

MOISTURE CONTENT % = 28

PERMEABILITY (cm./sec.) = 10^{-7}

(Estimated)

PROJECT: Proposed Residential Subdivision
LOCATION: Ferndale Dr./Edgehill Dr.

LOCATION: City of Barrie

BOREHOLE No: 4

SAMPLE No: 7

DEPTH: (m) 6.3

ELEVATION: (m) 233.0

Classification of Sample and Group Symbol:

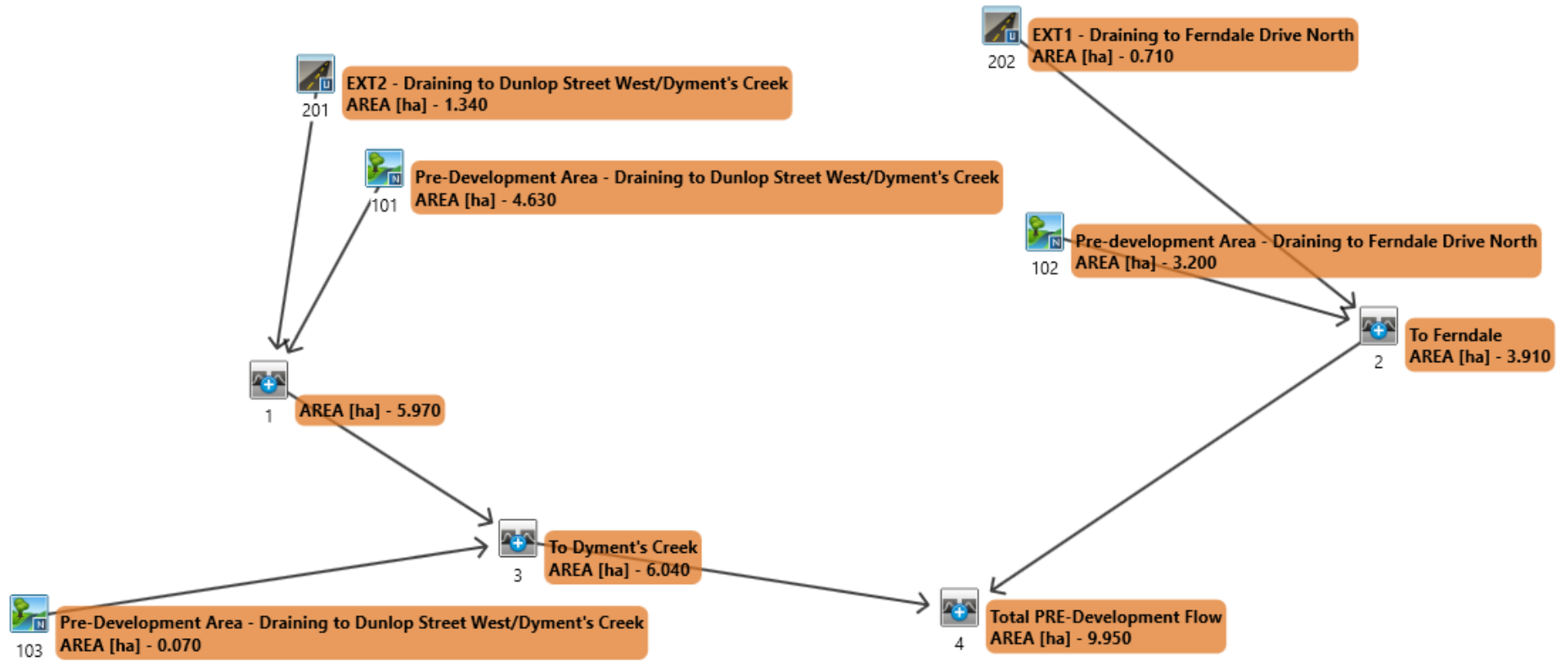
SILTY CLAY
a tr. of fine sand

FIGURE: 9



A3 – VO5 Model Input & Output

VO5 - PREDEVELOPMENT MODEL SCHEMATIC



4-hour Chicago
2-yr

=====

```
V   V   I   SSSSS U   U   A   L           (v 5.1.2004)
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
  WV   I   SSSSS UUUUU A   A   LLLLL
```

```
  000   TTTTT   TTTTT H   H   Y   Y   M   M   000   TM
O   O   T       T   H   H   Y Y   MM MM   O   O
O   O   T       T   H   H   Y   M   M   O   O
  000   T       T   H   H   Y   M   M   000
```

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

Input filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\V02\voin.dat

Output filename:

C:\Users\bjo\AppData\Local\Civica\XH5\e91bc6c1-1ed6-4e95-932d-66b6211c2905\7e1a2553-78bc-4565-9ad5-216eb6749b71\scenario

Summary filename:

C:\Users\bjo\AppData\Local\Civica\XH5\e91bc6c1-1ed6-4e95-932d-66b6211c2905\7e1a2553-78bc-4565-9ad5-216eb6749b71\scenario

DATE: 10/30/2019

TIME: 02:02:55

USER:

COMMENTS: _____

```
*****
** SIMULATION : Run 01           **
*****
```

| READ STORM |

Filename: C:\Users\bjo\AppData\Local\Temp\

cf7c36e8-a37b-4556-880d-0858c28119a3\ec889e4b
 Ptotal= 36.95 mm | Comments: Barrie_2yr_4hour_Chicago_v2

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.17	0.00	1.33	18.78	2.50	4.89	3.67	2.55
0.33	2.47	1.50	83.11	2.67	4.28	3.83	2.39
0.50	2.82	1.67	24.57	2.83	3.82	4.00	2.26
0.67	3.31	1.83	13.01	3.00	3.46	4.17	2.15
0.83	4.05	2.00	9.01	3.17	3.17		
1.00	5.30	2.17	6.97	3.33	2.93		
1.17	7.98	2.33	5.73	3.50	2.72		

CALIB
 NASHYD (1001) | Area (ha)= 4.63 Curve Number (CN)= 31.0
 ID= 1 DT= 5.0 min | Ia (mm)= 7.00 # of Linear Res.(N)= 3.00
 U.H. Tp(hrs)= 0.12

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	1.167	7.98	2.250	5.73	3.33	2.93
0.167	0.00	1.250	18.78	2.333	5.73	3.42	2.72
0.250	2.47	1.333	18.78	2.417	4.89	3.50	2.72
0.333	2.47	1.417	83.11	2.500	4.89	3.58	2.55
0.417	2.82	1.500	83.11	2.583	4.28	3.67	2.55
0.500	2.82	1.583	24.57	2.667	4.28	3.75	2.39
0.583	3.31	1.667	24.57	2.750	3.82	3.83	2.39
0.667	3.31	1.750	13.01	2.833	3.82	3.92	2.26
0.750	4.05	1.833	13.01	2.917	3.46	4.00	2.26
0.833	4.05	1.917	9.01	3.000	3.46	4.08	2.15
0.917	5.30	2.000	9.01	3.083	3.17	4.17	2.15
1.000	5.30	2.083	6.97	3.167	3.17		
1.083	7.98	2.167	6.97	3.250	2.93		

Unit Hyd Qpeak (cms)= 1.474

PEAK FLOW (cms)= 0.021 (i)
 TIME TO PEAK (hrs)= 1.583
 RUNOFF VOLUME (mm)= 1.487
 TOTAL RAINFALL (mm)= 36.955
 RUNOFF COEFFICIENT = 0.040

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

READ STORM	Filename: C:\Users\bjo\AppData\Local\Temp\cf7c36e8-a37b-4556-880d-0858c28119a3\ec889e4b
Ptotal= 36.95 mm	Comments: Barrie_2yr_4hour_Chicago_v2

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	18.78	2.50	4.89	3.67	2.55
0.33	2.47	1.50	83.11	2.67	4.28	3.83	2.39
0.50	2.82	1.67	24.57	2.83	3.82	4.00	2.26
0.67	3.31	1.83	13.01	3.00	3.46	4.17	2.15
0.83	4.05	2.00	9.01	3.17	3.17		
1.00	5.30	2.17	6.97	3.33	2.93		
1.17	7.98	2.33	5.73	3.50	2.72		

CALIB	Area (ha)= 1.34
STANDHYD (2001)	Total Imp(%)= 55.00 Dir. Conn.(%)= 45.00
ID= 1 DT= 5.0 min	

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.74	0.60
Dep. Storage (mm)=	2.00	5.00
Average Slope (%)=	1.00	2.00
Length (m)=	94.52	40.00
Mannings n =	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	7.98	2.250	5.73	3.33	2.93
0.167	0.00	1.250	18.78	2.333	5.73	3.42	2.72
0.250	2.47	1.333	18.78	2.417	4.89	3.50	2.72
0.333	2.47	1.417	83.11	2.500	4.89	3.58	2.55
0.417	2.82	1.500	83.11	2.583	4.28	3.67	2.55
0.500	2.82	1.583	24.57	2.667	4.28	3.75	2.39
0.583	3.31	1.667	24.57	2.750	3.82	3.83	2.39
0.667	3.31	1.750	13.01	2.833	3.82	3.92	2.26
0.750	4.05	1.833	13.01	2.917	3.46	4.00	2.26
0.833	4.05	1.917	9.01	3.000	3.46	4.08	2.15
0.917	5.30	2.000	9.01	3.083	3.17	4.17	2.15

1.000	5.30		2.083	6.97		3.167	3.17	
1.083	7.98		2.167	6.97		3.250	2.93	

Max.Eff.Inten.(mm/hr)=	83.11		2.37	
over (min)	5.00		35.00	
Storage Coeff. (min)=	2.66 (ii)		34.21 (ii)	
Unit Hyd. Tpeak (min)=	5.00		35.00	
Unit Hyd. peak (cms)=	0.29		0.03	
				TOTALS
PEAK FLOW (cms)=	0.14		0.00	0.137 (iii)
TIME TO PEAK (hrs)=	1.50		2.17	1.50
RUNOFF VOLUME (mm)=	34.95		2.09	16.86
TOTAL RAINFALL (mm)=	36.95		36.95	36.95
RUNOFF COEFFICIENT =	0.95		0.06	0.46

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 30.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0001)				
1 + 2 = 3				
	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (1001):	4.63	0.021	1.58	1.49
+ ID2= 2 (2001):	1.34	0.137	1.50	16.86
=====				
ID = 3 (0001):	5.97	0.155	1.50	4.94

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

READ STORM	Filename: C:\Users\bjo\AppData\
	Local\Temp\
	cf7c36e8-a37b-4556-880d-0858c28119a3\ec889e4b
Ptotal= 36.95 mm	Comments: Barrie_2yr_4hour_Chicago_v2

TIME	RAIN		TIME	RAIN		TIME	RAIN		TIME	RAIN
hrs	mm/hr		hrs	mm/hr		hrs	mm/hr		hrs	mm/hr
0.17	0.00		1.33	18.78		2.50	4.89		3.67	2.55
0.33	2.47		1.50	83.11		2.67	4.28		3.83	2.39
0.50	2.82		1.67	24.57		2.83	3.82		4.00	2.26
0.67	3.31		1.83	13.01		3.00	3.46		4.17	2.15

0.83	4.05	2.00	9.01	3.17	3.17
1.00	5.30	2.17	6.97	3.33	2.93
1.17	7.98	2.33	5.73	3.50	2.72

```

-----
| CALIB |
| NASHYD ( 3001) | Area (ha)= 0.07 Curve Number (CN)= 31.0
| ID= 1 DT= 5.0 min | Ia (mm)= 7.00 # of Linear Res.(N)= 3.00
-----
| U.H. Tp(hrs)= 0.20

```

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	7.98	2.250	5.73	3.33	2.93
0.167	0.00	1.250	18.78	2.333	5.73	3.42	2.72
0.250	2.47	1.333	18.78	2.417	4.89	3.50	2.72
0.333	2.47	1.417	83.11	2.500	4.89	3.58	2.55
0.417	2.82	1.500	83.11	2.583	4.28	3.67	2.55
0.500	2.82	1.583	24.57	2.667	4.28	3.75	2.39
0.583	3.31	1.667	24.57	2.750	3.82	3.83	2.39
0.667	3.31	1.750	13.01	2.833	3.82	3.92	2.26
0.750	4.05	1.833	13.01	2.917	3.46	4.00	2.26
0.833	4.05	1.917	9.01	3.000	3.46	4.08	2.15
0.917	5.30	2.000	9.01	3.083	3.17	4.17	2.15
1.000	5.30	2.083	6.97	3.167	3.17		
1.083	7.98	2.167	6.97	3.250	2.93		

Unit Hyd Qpeak (cms)= 0.013

PEAK FLOW (cms)= 0.000 (i)
 TIME TO PEAK (hrs)= 1.750
 RUNOFF VOLUME (mm)= 1.495
 TOTAL RAINFALL (mm)= 36.955
 RUNOFF COEFFICIENT = 0.040

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

```

-----
| ADD HYD ( 0003) |
| 1 + 2 = 3 |
-----
| ID1= 1 ( 0001): | AREA QPEAK TPEAK R.V.
| + ID2= 2 ( 3001): | (ha) (cms) (hrs) (mm)
|                   | 5.97 0.155 1.50 4.94
|                   | 0.07 0.000 1.75 1.50

```

=====

ID = 3 (0003): 6.04 0.155 1.50 4.90

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

READ STORM	Filename: C:\Users\bjo\AppData\Local\Temp\cf7c36e8-a37b-4556-880d-0858c28119a3\ec889e4b
Ptotal= 36.95 mm	Comments: Barrie_2yr_4hour_Chicago_v2

TIME	RAIN	TIME	RAIN	'	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	'	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	18.78		2.50	4.89	3.67	2.55
0.33	2.47	1.50	83.11		2.67	4.28	3.83	2.39
0.50	2.82	1.67	24.57		2.83	3.82	4.00	2.26
0.67	3.31	1.83	13.01		3.00	3.46	4.17	2.15
0.83	4.05	2.00	9.01		3.17	3.17		
1.00	5.30	2.17	6.97		3.33	2.93		
1.17	7.98	2.33	5.73		3.50	2.72		

CALIB	
NASHYD (1002)	Area (ha)= 3.20 Curve Number (CN)= 31.0
ID= 1 DT= 5.0 min	Ia (mm)= 7.00 # of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= 0.10

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

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

TIME	RAIN	TIME	RAIN	'	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	'	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	7.98		2.250	5.73	3.33	2.93
0.167	0.00	1.250	18.78		2.333	5.73	3.42	2.72
0.250	2.47	1.333	18.78		2.417	4.89	3.50	2.72
0.333	2.47	1.417	83.11		2.500	4.89	3.58	2.55
0.417	2.82	1.500	83.11		2.583	4.28	3.67	2.55
0.500	2.82	1.583	24.57		2.667	4.28	3.75	2.39
0.583	3.31	1.667	24.57		2.750	3.82	3.83	2.39
0.667	3.31	1.750	13.01		2.833	3.82	3.92	2.26
0.750	4.05	1.833	13.01		2.917	3.46	4.00	2.26
0.833	4.05	1.917	9.01		3.000	3.46	4.08	2.15
0.917	5.30	2.000	9.01		3.083	3.17	4.17	2.15
1.000	5.30	2.083	6.97		3.167	3.17		
1.083	7.98	2.167	6.97		3.250	2.93		

Unit Hyd Qpeak (cms)= 1.222

PEAK FLOW (cms)= 0.015 (i)

TIME TO PEAK (hrs)= 1.583

RUNOFF VOLUME (mm)= 1.468

TOTAL RAINFALL (mm)= 36.955

RUNOFF COEFFICIENT = 0.040

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

```
-----
| READ STORM |      Filename: C:\Users\bjo\AppData\
|             |      Local\Temp\
|             |      cf7c36e8-a37b-4556-880d-0858c28119a3\ec889e4b
| Ptotal= 36.95 mm |      Comments: Barrie_2yr_4hour_Chicago_v2
|             |
-----
```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	18.78	2.50	4.89	3.67	2.55
0.33	2.47	1.50	83.11	2.67	4.28	3.83	2.39
0.50	2.82	1.67	24.57	2.83	3.82	4.00	2.26
0.67	3.31	1.83	13.01	3.00	3.46	4.17	2.15
0.83	4.05	2.00	9.01	3.17	3.17		
1.00	5.30	2.17	6.97	3.33	2.93		
1.17	7.98	2.33	5.73	3.50	2.72		

```
-----
| CALIB      |
| STANDHYD ( 2002) |      Area (ha)= 0.71
| ID= 1 DT= 5.0 min |      Total Imp(%)= 55.00 Dir. Conn.(%)= 45.00
|             |
-----
```

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.39	0.32
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	68.80	40.00
Mannings n	=	0.013	0.250

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

```
----- TRANSFORMED HYETOGRAPH -----
TIME    RAIN | TIME    RAIN | TIME    RAIN | TIME    RAIN
hrs     mm/hr | hrs     mm/hr | hrs     mm/hr | hrs     mm/hr
0.083   0.00 | 1.167   7.98 | 2.250   5.73 | 3.33    2.93
```

0.167	0.00	1.250	18.78	2.333	5.73	3.42	2.72
0.250	2.47	1.333	18.78	2.417	4.89	3.50	2.72
0.333	2.47	1.417	83.11	2.500	4.89	3.58	2.55
0.417	2.82	1.500	83.11	2.583	4.28	3.67	2.55
0.500	2.82	1.583	24.57	2.667	4.28	3.75	2.39
0.583	3.31	1.667	24.57	2.750	3.82	3.83	2.39
0.667	3.31	1.750	13.01	2.833	3.82	3.92	2.26
0.750	4.05	1.833	13.01	2.917	3.46	4.00	2.26
0.833	4.05	1.917	9.01	3.000	3.46	4.08	2.15
0.917	5.30	2.000	9.01	3.083	3.17	4.17	2.15
1.000	5.30	2.083	6.97	3.167	3.17		
1.083	7.98	2.167	6.97	3.250	2.93		

Max.Eff.Inten.(mm/hr)= 83.11 2.37
over (min) 5.00 35.00
Storage Coeff. (min)= 2.20 (ii) 33.75 (ii)
Unit Hyd. Tpeak (min)= 5.00 35.00
Unit Hyd. peak (cms)= 0.30 0.03

TOTALS

PEAK FLOW (cms)= 0.07 0.00 0.073 (iii)
TIME TO PEAK (hrs)= 1.50 2.08 1.50
RUNOFF VOLUME (mm)= 34.95 2.09 16.85
TOTAL RAINFALL (mm)= 36.95 36.95 36.95
RUNOFF COEFFICIENT = 0.95 0.06 0.46

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 30.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0002)				
1 + 2 = 3				
	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (1002):	3.20	0.015	1.58	1.47
+ ID2= 2 (2002):	0.71	0.073	1.50	16.85
=====				
ID = 3 (0002):	3.91	0.089	1.50	4.26

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0004)

1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.
-----	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0002):	3.91	0.089	1.50	4.26
+ ID2= 2 (0003):	6.04	0.155	1.50	4.90
=====				
ID = 3 (0004):	9.95	0.244	1.50	4.65

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

4-hour Chicago
5-yr

=====

```
V   V   I   SSSSS U   U   A   L           (v 5.1.2004)
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
  WV   I   SSSSS UUUUU A   A   LLLLL
```

```
  000   TTTTT   TTTTT H   H   Y   Y   M   M   000   TM
O   O   T       T   H   H   Y Y   MM MM   O   O
O   O   T       T   H   H   Y   M   M   O   O
  000   T       T   H   H   Y   M   M   000
```

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

Input filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\V02\voin.dat

Output filename:

C:\Users\bjo\AppData\Local\Civica\XH5\e91bc6c1-1ed6-4e95-932d-66b6211c2905\bec61276-0161-4b9c-a965-f65ac2e101aa\scenario

Summary filename:

C:\Users\bjo\AppData\Local\Civica\XH5\e91bc6c1-1ed6-4e95-932d-66b6211c2905\bec61276-0161-4b9c-a965-f65ac2e101aa\scenario

DATE: 10/30/2019

TIME: 02:02:55

USER:

COMMENTS: _____

```
*****
** SIMULATION : Run 02           **
*****
```

| READ STORM |
|

Filename: C:\Users\bjo\AppData\
Local\Temp\

	cf7c36e8-a37b-4556-880d-0858c28119a3\863046e4
Ptotal= 50.52 mm	Comments: Barrie_5yr_4hour_Chicago_v2

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	25.64	2.50	6.96	3.67	3.68
0.33	3.57	1.50	108.92	2.67	6.12	3.83	3.47
0.50	4.07	1.67	33.31	2.83	5.48	4.00	3.28
0.67	4.76	1.83	17.99	3.00	4.97	4.17	3.12
0.83	5.79	2.00	12.60	3.17	4.56		
1.00	7.53	2.17	9.82	3.33	4.22		
1.17	11.20	2.33	8.12	3.50	3.93		

CALIB	
NASHYD (1001)	Area (ha)= 4.63 Curve Number (CN)= 31.0
ID= 1 DT= 5.0 min	Ia (mm)= 7.00 # of Linear Res.(N)= 3.00
-----	U.H. Tp(hrs)= 0.12

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

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

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	11.20	2.250	8.12	3.33	4.22
0.167	0.00	1.250	25.64	2.333	8.12	3.42	3.93
0.250	3.57	1.333	25.64	2.417	6.96	3.50	3.93
0.333	3.57	1.417	108.92	2.500	6.96	3.58	3.68
0.417	4.07	1.500	108.92	2.583	6.12	3.67	3.68
0.500	4.07	1.583	33.31	2.667	6.12	3.75	3.47
0.583	4.76	1.667	33.31	2.750	5.48	3.83	3.47
0.667	4.76	1.750	17.99	2.833	5.48	3.92	3.28
0.750	5.79	1.833	17.99	2.917	4.97	4.00	3.28
0.833	5.79	1.917	12.60	3.000	4.97	4.08	3.12
0.917	7.53	2.000	12.60	3.083	4.56	4.17	3.12
1.000	7.53	2.083	9.82	3.167	4.56		
1.083	11.20	2.167	9.82	3.250	4.22		

Unit Hyd Qpeak (cms)= 1.474

PEAK FLOW (cms)= 0.045 (i)

TIME TO PEAK (hrs)= 1.583

RUNOFF VOLUME (mm)= 3.069

TOTAL RAINFALL (mm)= 50.518

RUNOFF COEFFICIENT = 0.061

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

```

-----
| READ STORM | Filename: C:\Users\bjo\AppData\
|             | Local\Temp\
|             | cf7c36e8-a37b-4556-880d-0858c28119a3\863046e4
| Ptotal= 50.52 mm | Comments: Barrie_5yr_4hour_Chicago_v2
-----

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	25.64	2.50	6.96	3.67	3.68
0.33	3.57	1.50	108.92	2.67	6.12	3.83	3.47
0.50	4.07	1.67	33.31	2.83	5.48	4.00	3.28
0.67	4.76	1.83	17.99	3.00	4.97	4.17	3.12
0.83	5.79	2.00	12.60	3.17	4.56		
1.00	7.53	2.17	9.82	3.33	4.22		
1.17	11.20	2.33	8.12	3.50	3.93		

```

-----
| CALIB |
| STANDHYD ( 2001) | Area (ha)= 1.34
| ID= 1 DT= 5.0 min | Total Imp(%)= 55.00 Dir. Conn.(%)= 45.00
-----

```

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.74	0.60
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	94.52	40.00
Mannings n	=	0.013	0.250

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

```

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

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	11.20	2.250	8.12	3.33	4.22
0.167	0.00	1.250	25.64	2.333	8.12	3.42	3.93
0.250	3.57	1.333	25.64	2.417	6.96	3.50	3.93
0.333	3.57	1.417	108.92	2.500	6.96	3.58	3.68
0.417	4.07	1.500	108.92	2.583	6.12	3.67	3.68
0.500	4.07	1.583	33.31	2.667	6.12	3.75	3.47
0.583	4.76	1.667	33.31	2.750	5.48	3.83	3.47
0.667	4.76	1.750	17.99	2.833	5.48	3.92	3.28
0.750	5.79	1.833	17.99	2.917	4.97	4.00	3.28
0.833	5.79	1.917	12.60	3.000	4.97	4.08	3.12
0.917	7.53	2.000	12.60	3.083	4.56	4.17	3.12

1.000	7.53		2.083	9.82		3.167	4.56	
1.083	11.20		2.167	9.82		3.250	4.22	

Max.Eff.Inten.(mm/hr)=	108.92		5.41	
over (min)	5.00		30.00	
Storage Coeff. (min)=	2.39 (ii)		25.05 (ii)	
Unit Hyd. Tpeak (min)=	5.00		30.00	
Unit Hyd. peak (cms)=	0.30		0.04	
				TOTALS
PEAK FLOW (cms)=	0.18		0.01	0.181 (iii)
TIME TO PEAK (hrs)=	1.50		2.00	1.50
RUNOFF VOLUME (mm)=	48.52		4.06	24.05
TOTAL RAINFALL (mm)=	50.52		50.52	50.52
RUNOFF COEFFICIENT =	0.96		0.08	0.48

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 30.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0001)				
1 + 2 = 3				
	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (1001):	4.63	0.045	1.58	3.07
+ ID2= 2 (2001):	1.34	0.181	1.50	24.05
=====				
ID = 3 (0001):	5.97	0.222	1.50	7.78

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

READ STORM	Filename: C:\Users\bjo\AppData\
	Local\Temp\
	cf7c36e8-a37b-4556-880d-0858c28119a3\863046e4
Ptotal= 50.52 mm	Comments: Barrie_5yr_4hour_Chicago_v2

TIME	RAIN		TIME	RAIN		TIME	RAIN		TIME	RAIN
hrs	mm/hr		hrs	mm/hr		hrs	mm/hr		hrs	mm/hr
0.17	0.00		1.33	25.64		2.50	6.96		3.67	3.68
0.33	3.57		1.50	108.92		2.67	6.12		3.83	3.47
0.50	4.07		1.67	33.31		2.83	5.48		4.00	3.28
0.67	4.76		1.83	17.99		3.00	4.97		4.17	3.12

0.83	5.79	2.00	12.60	3.17	4.56
1.00	7.53	2.17	9.82	3.33	4.22
1.17	11.20	2.33	8.12	3.50	3.93

CALIB			
NASHYD (3001)	Area (ha)=	0.07	Curve Number (CN)= 31.0
ID= 1 DT= 5.0 min	Ia (mm)=	7.00	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	0.20	

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	11.20	2.250	8.12	3.33	4.22
0.167	0.00	1.250	25.64	2.333	8.12	3.42	3.93
0.250	3.57	1.333	25.64	2.417	6.96	3.50	3.93
0.333	3.57	1.417	108.92	2.500	6.96	3.58	3.68
0.417	4.07	1.500	108.92	2.583	6.12	3.67	3.68
0.500	4.07	1.583	33.31	2.667	6.12	3.75	3.47
0.583	4.76	1.667	33.31	2.750	5.48	3.83	3.47
0.667	4.76	1.750	17.99	2.833	5.48	3.92	3.28
0.750	5.79	1.833	17.99	2.917	4.97	4.00	3.28
0.833	5.79	1.917	12.60	3.000	4.97	4.08	3.12
0.917	7.53	2.000	12.60	3.083	4.56	4.17	3.12
1.000	7.53	2.083	9.82	3.167	4.56		
1.083	11.20	2.167	9.82	3.250	4.22		

Unit Hyd Qpeak (cms)= 0.013

PEAK FLOW (cms)= 0.001 (i)

TIME TO PEAK (hrs)= 1.667

RUNOFF VOLUME (mm)= 3.096

TOTAL RAINFALL (mm)= 50.518

RUNOFF COEFFICIENT = 0.061

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

ADD HYD (0003)				
1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0001):	5.97	0.222	1.50	7.78
+ ID2= 2 (3001):	0.07	0.001	1.67	3.10

=====

ID = 3 (0003): 6.04 0.222 1.50 7.72

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

READ STORM	Filename: C:\Users\bjo\AppData\
	Local\Temp\
	cf7c36e8-a37b-4556-880d-0858c28119a3\863046e4
Ptotal= 50.52 mm	Comments: Barrie_5yr_4hour_Chicago_v2

TIME	RAIN	TIME	RAIN	'	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	'	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	25.64		2.50	6.96	3.67	3.68
0.33	3.57	1.50	108.92		2.67	6.12	3.83	3.47
0.50	4.07	1.67	33.31		2.83	5.48	4.00	3.28
0.67	4.76	1.83	17.99		3.00	4.97	4.17	3.12
0.83	5.79	2.00	12.60		3.17	4.56		
1.00	7.53	2.17	9.82		3.33	4.22		
1.17	11.20	2.33	8.12		3.50	3.93		

CALIB	
NASHYD (1002)	Area (ha)= 3.20 Curve Number (CN)= 31.0
ID= 1 DT= 5.0 min	Ia (mm)= 7.00 # of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= 0.10

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

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

TIME	RAIN	TIME	RAIN	'	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	'	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	11.20		2.250	8.12	3.33	4.22
0.167	0.00	1.250	25.64		2.333	8.12	3.42	3.93
0.250	3.57	1.333	25.64		2.417	6.96	3.50	3.93
0.333	3.57	1.417	108.92		2.500	6.96	3.58	3.68
0.417	4.07	1.500	108.92		2.583	6.12	3.67	3.68
0.500	4.07	1.583	33.31		2.667	6.12	3.75	3.47
0.583	4.76	1.667	33.31		2.750	5.48	3.83	3.47
0.667	4.76	1.750	17.99		2.833	5.48	3.92	3.28
0.750	5.79	1.833	17.99		2.917	4.97	4.00	3.28
0.833	5.79	1.917	12.60		3.000	4.97	4.08	3.12
0.917	7.53	2.000	12.60		3.083	4.56	4.17	3.12
1.000	7.53	2.083	9.82		3.167	4.56		
1.083	11.20	2.167	9.82		3.250	4.22		

PEAK FLOW	(cms)=	0.033	(i)
TIME TO PEAK	(hrs)=	1.500	
RUNOFF VOLUME	(mm)=	3.030	
TOTAL RAINFALL	(mm)=	50.518	
RUNOFF COEFFICIENT	=	0.060	

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	25.64	2.50	6.96	3.67	3.68
0.33	3.57	1.50	108.92	2.67	6.12	3.83	3.47
0.50	4.07	1.67	33.31	2.83	5.48	4.00	3.28
0.67	4.76	1.83	17.99	3.00	4.97	4.17	3.12
0.83	5.79	2.00	12.60	3.17	4.56		
1.00	7.53	2.17	9.82	3.33	4.22		
1.17	11.20	2.33	8.12	3.50	3.93		

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.39	0.32
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	68.80	40.00
Mannings n	=	0.013	0.250

----- TRANSFORMED HYETOGRAPH -----								
TIME	RAIN	TIME	RAIN	'	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	'	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	11.20		2.250	8.12	3.33	4.22

0.167	0.00	1.250	25.64	2.333	8.12	3.42	3.93
0.250	3.57	1.333	25.64	2.417	6.96	3.50	3.93
0.333	3.57	1.417	108.92	2.500	6.96	3.58	3.68
0.417	4.07	1.500	108.92	2.583	6.12	3.67	3.68
0.500	4.07	1.583	33.31	2.667	6.12	3.75	3.47
0.583	4.76	1.667	33.31	2.750	5.48	3.83	3.47
0.667	4.76	1.750	17.99	2.833	5.48	3.92	3.28
0.750	5.79	1.833	17.99	2.917	4.97	4.00	3.28
0.833	5.79	1.917	12.60	3.000	4.97	4.08	3.12
0.917	7.53	2.000	12.60	3.083	4.56	4.17	3.12
1.000	7.53	2.083	9.82	3.167	4.56		
1.083	11.20	2.167	9.82	3.250	4.22		

Max.Eff.Inten.(mm/hr)= 108.92 5.41
over (min) 5.00 25.00
Storage Coeff. (min)= 1.97 (ii) 24.64 (ii)
Unit Hyd. Tpeak (min)= 5.00 25.00
Unit Hyd. peak (cms)= 0.31 0.05

TOTALS

PEAK FLOW (cms)= 0.10 0.00 0.097 (iii)
TIME TO PEAK (hrs)= 1.50 1.92 1.50
RUNOFF VOLUME (mm)= 48.52 4.06 24.04
TOTAL RAINFALL (mm)= 50.52 50.52 50.52
RUNOFF COEFFICIENT = 0.96 0.08 0.48

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 30.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0002)				
1 + 2 = 3				
	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (1002):	3.20	0.033	1.50	3.03
+ ID2= 2 (2002):	0.71	0.097	1.50	24.04
=====				
ID = 3 (0002):	3.91	0.130	1.50	6.85

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0004)

1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.
-----	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0002):	3.91	0.130	1.50	6.85
+ ID2= 2 (0003):	6.04	0.222	1.50	7.72
=====				
ID = 3 (0004):	9.95	0.352	1.50	7.38

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

4-hour Chicago
10-yr

=====

```
V   V   I   SSSSS U   U   A   L           (v 5.1.2004)
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
```

```
  000   TTTT   TTTT   H   H   Y   Y   M   M   000   TM
O   O   T       T   H   H   Y Y   MM MM   O   O
O   O   T       T   H   H   Y   M   M   O   O
  000   T       T   H   H   Y   M   M   000
```

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

Input filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\V02\voin.dat

Output filename:

C:\Users\bjo\AppData\Local\Civica\XH5\e91bc6c1-1ed6-4e95-932d-66b6211c2905\53bb738e-ab8f-404b-80af-fa06e8fd4f2d\scenario

Summary filename:

C:\Users\bjo\AppData\Local\Civica\XH5\e91bc6c1-1ed6-4e95-932d-66b6211c2905\53bb738e-ab8f-404b-80af-fa06e8fd4f2d\scenario

DATE: 10/30/2019

TIME: 02:02:55

USER:

COMMENTS: _____

```
*****
** SIMULATION : Run 03           **
*****
```

Filename: C:\Users\bjo\AppData\Local\Temp\

cf7c36e8-a37b-4556-880d-0858c28119a3\742c3208
 Ptotal= 59.69 mm | Comments: Barrie_10yr_4hour_Chicago_v2

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.17	0.00	1.33	30.27	2.50	8.35	3.67	4.45
0.33	4.32	1.50	126.55	2.67	7.35	3.83	4.19
0.50	4.91	1.67	39.22	2.83	6.59	4.00	3.97
0.67	5.73	1.83	21.35	3.00	5.99	4.17	3.77
0.83	6.96	2.00	15.01	3.17	5.50		
1.00	9.03	2.17	11.74	3.33	5.09		
1.17	13.36	2.33	9.72	3.50	4.74		

CALIB
 NASHYD (1001) | Area (ha)= 4.63 Curve Number (CN)= 31.0
 ID= 1 DT= 5.0 min | Ia (mm)= 7.00 # of Linear Res.(N)= 3.00
 U.H. Tp(hrs)= 0.12

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	1.167	13.36	2.250	9.72	3.33	5.09
0.167	0.00	1.250	30.27	2.333	9.72	3.42	4.74
0.250	4.32	1.333	30.27	2.417	8.35	3.50	4.74
0.333	4.32	1.417	126.55	2.500	8.35	3.58	4.45
0.417	4.91	1.500	126.55	2.583	7.35	3.67	4.45
0.500	4.91	1.583	39.22	2.667	7.35	3.75	4.19
0.583	5.73	1.667	39.22	2.750	6.59	3.83	4.19
0.667	5.73	1.750	21.35	2.833	6.59	3.92	3.97
0.750	6.96	1.833	21.35	2.917	5.99	4.00	3.97
0.833	6.96	1.917	15.01	3.000	5.99	4.08	3.77
0.917	9.03	2.000	15.01	3.083	5.50	4.17	3.77
1.000	9.03	2.083	11.74	3.167	5.50		
1.083	13.36	2.167	11.74	3.250	5.09		

Unit Hyd Qpeak (cms)= 1.474

PEAK FLOW (cms)= 0.066 (i)

TIME TO PEAK (hrs)= 1.583

RUNOFF VOLUME (mm)= 4.432

TOTAL RAINFALL (mm)= 59.693

RUNOFF COEFFICIENT = 0.074

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


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-----
| READ STORM | Filename: C:\Users\bjo\AppData\
|            | Local\Temp\
|            | cf7c36e8-a37b-4556-880d-0858c28119a3\742c3208
| Ptotal= 59.69 mm | Comments: Barrie_10yr_4hour_Chicago_v2
-----

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	30.27	2.50	8.35	3.67	4.45
0.33	4.32	1.50	126.55	2.67	7.35	3.83	4.19
0.50	4.91	1.67	39.22	2.83	6.59	4.00	3.97
0.67	5.73	1.83	21.35	3.00	5.99	4.17	3.77
0.83	6.96	2.00	15.01	3.17	5.50		
1.00	9.03	2.17	11.74	3.33	5.09		
1.17	13.36	2.33	9.72	3.50	4.74		

```

-----
| CALIB |
| STANDHYD ( 2001) | Area (ha)= 1.34
| ID= 1 DT= 5.0 min | Total Imp(%)= 55.00 Dir. Conn.(%)= 45.00
-----

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		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.74	0.60
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	94.52	40.00
Mannings n	=	0.013	0.250

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

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

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	13.36	2.250	9.72	3.33	5.09
0.167	0.00	1.250	30.27	2.333	9.72	3.42	4.74
0.250	4.32	1.333	30.27	2.417	8.35	3.50	4.74
0.333	4.32	1.417	126.55	2.500	8.35	3.58	4.45
0.417	4.91	1.500	126.55	2.583	7.35	3.67	4.45
0.500	4.91	1.583	39.22	2.667	7.35	3.75	4.19
0.583	5.73	1.667	39.22	2.750	6.59	3.83	4.19
0.667	5.73	1.750	21.35	2.833	6.59	3.92	3.97
0.750	6.96	1.833	21.35	2.917	5.99	4.00	3.97
0.833	6.96	1.917	15.01	3.000	5.99	4.08	3.77
0.917	9.03	2.000	15.01	3.083	5.50	4.17	3.77

1.000	9.03		2.083	11.74		3.167	5.50	
1.083	13.36		2.167	11.74		3.250	5.09	

Max.Eff.Inten.(mm/hr)=	126.55	8.59	
over (min)	5.00	25.00	
Storage Coeff. (min)=	2.25 (ii)	21.09 (ii)	
Unit Hyd. Tpeak (min)=	5.00	25.00	
Unit Hyd. peak (cms)=	0.30	0.05	
			TOTALS
PEAK FLOW (cms)=	0.21	0.01	0.212 (iii)
TIME TO PEAK (hrs)=	1.50	1.83	1.50
RUNOFF VOLUME (mm)=	57.69	5.72	29.10
TOTAL RAINFALL (mm)=	59.69	59.69	59.69
RUNOFF COEFFICIENT =	0.97	0.10	0.49

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 30.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0001)				
1 + 2 = 3				
	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (1001):	4.63	0.066	1.58	4.43
+ ID2= 2 (2001):	1.34	0.212	1.50	29.10
=====				
ID = 3 (0001):	5.97	0.272	1.50	9.97

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

READ STORM	Filename: C:\Users\bjo\AppData\
	Local\Temp\
	cf7c36e8-a37b-4556-880d-0858c28119a3\742c3208
Ptotal= 59.69 mm	Comments: Barrie_10yr_4hour_Chicago_v2

TIME	RAIN		TIME	RAIN		TIME	RAIN		TIME	RAIN
hrs	mm/hr		hrs	mm/hr		hrs	mm/hr		hrs	mm/hr
0.17	0.00		1.33	30.27		2.50	8.35		3.67	4.45
0.33	4.32		1.50	126.55		2.67	7.35		3.83	4.19
0.50	4.91		1.67	39.22		2.83	6.59		4.00	3.97
0.67	5.73		1.83	21.35		3.00	5.99		4.17	3.77

0.83	6.96	2.00	15.01	3.17	5.50
1.00	9.03	2.17	11.74	3.33	5.09
1.17	13.36	2.33	9.72	3.50	4.74

CALIB			
NASHYD (3001)	Area (ha)=	0.07	Curve Number (CN)= 31.0
ID= 1 DT= 5.0 min	Ia (mm)=	7.00	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	0.20	

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	13.36	2.250	9.72	3.33	5.09
0.167	0.00	1.250	30.27	2.333	9.72	3.42	4.74
0.250	4.32	1.333	30.27	2.417	8.35	3.50	4.74
0.333	4.32	1.417	126.55	2.500	8.35	3.58	4.45
0.417	4.91	1.500	126.55	2.583	7.35	3.67	4.45
0.500	4.91	1.583	39.22	2.667	7.35	3.75	4.19
0.583	5.73	1.667	39.22	2.750	6.59	3.83	4.19
0.667	5.73	1.750	21.35	2.833	6.59	3.92	3.97
0.750	6.96	1.833	21.35	2.917	5.99	4.00	3.97
0.833	6.96	1.917	15.01	3.000	5.99	4.08	3.77
0.917	9.03	2.000	15.01	3.083	5.50	4.17	3.77
1.000	9.03	2.083	11.74	3.167	5.50		
1.083	13.36	2.167	11.74	3.250	5.09		

Unit Hyd Qpeak (cms)= 0.013

PEAK FLOW (cms)= 0.001 (i)
 TIME TO PEAK (hrs)= 1.667
 RUNOFF VOLUME (mm)= 4.476
 TOTAL RAINFALL (mm)= 59.693
 RUNOFF COEFFICIENT = 0.075

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

ADD HYD (0003)				
1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0001):	5.97	0.272	1.50	9.97
+ ID2= 2 (3001):	0.07	0.001	1.67	4.48

=====

ID = 3 (0003): 6.04 0.272 1.50 9.91

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

READ STORM	Filename: C:\Users\bjo\AppData\
	Local\Temp\
	cf7c36e8-a37b-4556-880d-0858c28119a3\742c3208
Ptotal= 59.69 mm	Comments: Barrie_10yr_4hour_Chicago_v2

TIME	RAIN	TIME	RAIN	'	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	'	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	30.27		2.50	8.35	3.67	4.45
0.33	4.32	1.50	126.55		2.67	7.35	3.83	4.19
0.50	4.91	1.67	39.22		2.83	6.59	4.00	3.97
0.67	5.73	1.83	21.35		3.00	5.99	4.17	3.77
0.83	6.96	2.00	15.01		3.17	5.50		
1.00	9.03	2.17	11.74		3.33	5.09		
1.17	13.36	2.33	9.72		3.50	4.74		

CALIB	
NASHYD (1002)	Area (ha)= 3.20 Curve Number (CN)= 31.0
ID= 1 DT= 5.0 min	Ia (mm)= 7.00 # of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= 0.10

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

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

TIME	RAIN	TIME	RAIN	'	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	'	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	13.36		2.250	9.72	3.33	5.09
0.167	0.00	1.250	30.27		2.333	9.72	3.42	4.74
0.250	4.32	1.333	30.27		2.417	8.35	3.50	4.74
0.333	4.32	1.417	126.55		2.500	8.35	3.58	4.45
0.417	4.91	1.500	126.55		2.583	7.35	3.67	4.45
0.500	4.91	1.583	39.22		2.667	7.35	3.75	4.19
0.583	5.73	1.667	39.22		2.750	6.59	3.83	4.19
0.667	5.73	1.750	21.35		2.833	6.59	3.92	3.97
0.750	6.96	1.833	21.35		2.917	5.99	4.00	3.97
0.833	6.96	1.917	15.01		3.000	5.99	4.08	3.77
0.917	9.03	2.000	15.01		3.083	5.50	4.17	3.77
1.000	9.03	2.083	11.74		3.167	5.50		
1.083	13.36	2.167	11.74		3.250	5.09		

Unit Hyd Qpeak (cms)= 1.222

PEAK FLOW (cms)= 0.049 (i)

TIME TO PEAK (hrs)= 1.500

RUNOFF VOLUME (mm)= 4.376

TOTAL RAINFALL (mm)= 59.693

RUNOFF COEFFICIENT = 0.073

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

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| READ STORM |      Filename: C:\Users\bjo\AppData\
|             |      Local\Temp\
|             |      cf7c36e8-a37b-4556-880d-0858c28119a3\742c3208
| Ptotal= 59.69 mm |      Comments: Barrie_10yr_4hour_Chicago_v2
|             |
-----
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TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	30.27	2.50	8.35	3.67	4.45
0.33	4.32	1.50	126.55	2.67	7.35	3.83	4.19
0.50	4.91	1.67	39.22	2.83	6.59	4.00	3.97
0.67	5.73	1.83	21.35	3.00	5.99	4.17	3.77
0.83	6.96	2.00	15.01	3.17	5.50		
1.00	9.03	2.17	11.74	3.33	5.09		
1.17	13.36	2.33	9.72	3.50	4.74		

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-----
| CALIB      |
| STANDHYD ( 2002) |      Area (ha)= 0.71
| ID= 1 DT= 5.0 min |      Total Imp(%)= 55.00 Dir. Conn.(%)= 45.00
|             |
-----
```

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.39	0.32
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	68.80	40.00
Mannings n	=	0.013	0.250

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

```
----- TRANSFORMED HYETOGRAPH -----
TIME    RAIN | TIME    RAIN | TIME    RAIN | TIME    RAIN
hrs     mm/hr | hrs     mm/hr | hrs     mm/hr | hrs     mm/hr
0.083   0.00 | 1.167   13.36 | 2.250   9.72 | 3.33    5.09
```


0.167	0.00	1.250	30.27	2.333	9.72	3.42	4.74
0.250	4.32	1.333	30.27	2.417	8.35	3.50	4.74
0.333	4.32	1.417	126.55	2.500	8.35	3.58	4.45
0.417	4.91	1.500	126.55	2.583	7.35	3.67	4.45
0.500	4.91	1.583	39.22	2.667	7.35	3.75	4.19
0.583	5.73	1.667	39.22	2.750	6.59	3.83	4.19
0.667	5.73	1.750	21.35	2.833	6.59	3.92	3.97
0.750	6.96	1.833	21.35	2.917	5.99	4.00	3.97
0.833	6.96	1.917	15.01	3.000	5.99	4.08	3.77
0.917	9.03	2.000	15.01	3.083	5.50	4.17	3.77
1.000	9.03	2.083	11.74	3.167	5.50		
1.083	13.36	2.167	11.74	3.250	5.09		

Max.Eff.Inten.(mm/hr)= 126.55 8.59
over (min) 5.00 25.00
Storage Coeff. (min)= 1.86 (ii) 20.70 (ii)
Unit Hyd. Tpeak (min)= 5.00 25.00
Unit Hyd. peak (cms)= 0.32 0.05

TOTALS

PEAK FLOW (cms)= 0.11 0.00 0.113 (iii)
TIME TO PEAK (hrs)= 1.50 1.83 1.50
RUNOFF VOLUME (mm)= 57.69 5.72 29.09
TOTAL RAINFALL (mm)= 59.69 59.69 59.69
RUNOFF COEFFICIENT = 0.97 0.10 0.49

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 30.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0002)				
1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (1002):	3.20	0.049	1.50	4.38
+ ID2= 2 (2002):	0.71	0.113	1.50	29.09
=====				
ID = 3 (0002):	3.91	0.162	1.50	8.86

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0004)

1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.
-----	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0002):	3.91	0.162	1.50	8.86
+ ID2= 2 (0003):	6.04	0.272	1.50	9.91
=====				
ID = 3 (0004):	9.95	0.434	1.50	9.50

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

=====

=====

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

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

C:\Users\bjo\AppData\Local\Civica\XH5\91bc6c1-1ed6-4e95-932d-66b6211c2905\df335300-5db3-4b27-8d44-bca6a6eec0b8\scenario

USER:

READ STORM	Filename: C:\Users\bjo\AppData\Local\Temp\
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cf7c36e8-a37b-4556-880d-0858c28119a3\b95ed81c
 Ptotal= 71.24 mm | Comments: Barrie_25yr_4hour_Chicago_v2

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.17	0.00	1.33	36.37	2.50	10.09	3.67	5.38
0.33	5.22	1.50	148.15	2.67	8.89	3.83	5.08
0.50	5.94	1.67	47.06	2.83	7.96	4.00	4.80
0.67	6.93	1.83	25.72	3.00	7.24	4.17	4.57
0.83	8.42	2.00	18.11	3.17	6.65		
1.00	10.91	2.17	14.17	3.33	6.15		
1.17	16.13	2.33	11.74	3.50	5.74		

CALIB
 NASHYD (1001) | Area (ha)= 4.63 Curve Number (CN)= 31.0
 ID= 1 DT= 5.0 min | Ia (mm)= 7.00 # of Linear Res.(N)= 3.00
 U.H. Tp(hrs)= 0.12

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	1.167	16.13	2.250	11.74	3.33	6.15
0.167	0.00	1.250	36.37	2.333	11.74	3.42	5.74
0.250	5.22	1.333	36.37	2.417	10.09	3.50	5.74
0.333	5.22	1.417	148.15	2.500	10.09	3.58	5.38
0.417	5.94	1.500	148.15	2.583	8.89	3.67	5.38
0.500	5.94	1.583	47.06	2.667	8.89	3.75	5.08
0.583	6.93	1.667	47.06	2.750	7.96	3.83	5.08
0.667	6.93	1.750	25.72	2.833	7.96	3.92	4.80
0.750	8.42	1.833	25.72	2.917	7.24	4.00	4.80
0.833	8.42	1.917	18.11	3.000	7.24	4.08	4.57
0.917	10.91	2.000	18.11	3.083	6.65	4.17	4.57
1.000	10.91	2.083	14.17	3.167	6.65		
1.083	16.13	2.167	14.17	3.250	6.15		

Unit Hyd Qpeak (cms)= 1.474

PEAK FLOW (cms)= 0.096 (i)
 TIME TO PEAK (hrs)= 1.583
 RUNOFF VOLUME (mm)= 6.466
 TOTAL RAINFALL (mm)= 71.237
 RUNOFF COEFFICIENT = 0.091

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

READ STORM	Filename: C:\Users\bjo\AppData\Local\Temp\cf7c36e8-a37b-4556-880d-0858c28119a3\b95ed81c
Ptotal= 71.24 mm	Comments: Barrie_25yr_4hour_Chicago_v2

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.17	0.00	1.33	36.37	2.50	10.09	3.67	5.38
0.33	5.22	1.50	148.15	2.67	8.89	3.83	5.08
0.50	5.94	1.67	47.06	2.83	7.96	4.00	4.80
0.67	6.93	1.83	25.72	3.00	7.24	4.17	4.57
0.83	8.42	2.00	18.11	3.17	6.65		
1.00	10.91	2.17	14.17	3.33	6.15		
1.17	16.13	2.33	11.74	3.50	5.74		

CALIB	Area (ha)= 1.34
STANDHYD (2001)	Total Imp(%)= 55.00 Dir. Conn.(%)= 45.00
ID= 1 DT= 5.0 min	

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.74	0.60
Dep. Storage (mm)=	2.00	5.00
Average Slope (%)=	1.00	2.00
Length (m)=	94.52	40.00
Mannings n =	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----							
TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	1.167	16.13	2.250	11.74	3.33	6.15
0.167	0.00	1.250	36.37	2.333	11.74	3.42	5.74
0.250	5.22	1.333	36.37	2.417	10.09	3.50	5.74
0.333	5.22	1.417	148.15	2.500	10.09	3.58	5.38
0.417	5.94	1.500	148.15	2.583	8.89	3.67	5.38
0.500	5.94	1.583	47.06	2.667	8.89	3.75	5.08
0.583	6.93	1.667	47.06	2.750	7.96	3.83	5.08
0.667	6.93	1.750	25.72	2.833	7.96	3.92	4.80
0.750	8.42	1.833	25.72	2.917	7.24	4.00	4.80
0.833	8.42	1.917	18.11	3.000	7.24	4.08	4.57
0.917	10.91	2.000	18.11	3.083	6.65	4.17	4.57

1.000	10.91		2.083	14.17		3.167	6.65	
1.083	16.13		2.167	14.17		3.250	6.15	

Max.Eff.Inten.(mm/hr)=	148.15		12.21	
over (min)	5.00		20.00	
Storage Coeff. (min)=	2.11 (ii)		18.48 (ii)	
Unit Hyd. Tpeak (min)=	5.00		20.00	
Unit Hyd. peak (cms)=	0.31		0.06	
				TOTALS
PEAK FLOW (cms)=	0.25		0.01	0.251 (iii)
TIME TO PEAK (hrs)=	1.50		1.75	1.50
RUNOFF VOLUME (mm)=	69.24		8.17	35.64
TOTAL RAINFALL (mm)=	71.24		71.24	71.24
RUNOFF COEFFICIENT =	0.97		0.11	0.50

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 30.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0001)				
1 + 2 = 3				
	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (1001):	4.63	0.096	1.58	6.47
+ ID2= 2 (2001):	1.34	0.251	1.50	35.64
=====				
ID = 3 (0001):	5.97	0.339	1.50	13.01

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

READ STORM	Filename: C:\Users\bjo\AppData\
	Local\Temp\
	cf7c36e8-a37b-4556-880d-0858c28119a3\b95ed81c
Ptotal= 71.24 mm	Comments: Barrie_25yr_4hour_Chicago_v2

TIME	RAIN		TIME	RAIN		TIME	RAIN		TIME	RAIN
hrs	mm/hr		hrs	mm/hr		hrs	mm/hr		hrs	mm/hr
0.17	0.00		1.33	36.37		2.50	10.09		3.67	5.38
0.33	5.22		1.50	148.15		2.67	8.89		3.83	5.08
0.50	5.94		1.67	47.06		2.83	7.96		4.00	4.80
0.67	6.93		1.83	25.72		3.00	7.24		4.17	4.57

0.83	8.42	2.00	18.11	3.17	6.65
1.00	10.91	2.17	14.17	3.33	6.15
1.17	16.13	2.33	11.74	3.50	5.74

CALIB					
NASHYD (3001)	Area (ha)=	0.07	Curve Number (CN)=	31.0	
ID= 1 DT= 5.0 min	Ia (mm)=	7.00	# of Linear Res.(N)=	3.00	
	U.H. Tp(hrs)=	0.20			

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	16.13	2.250	11.74	3.33	6.15
0.167	0.00	1.250	36.37	2.333	11.74	3.42	5.74
0.250	5.22	1.333	36.37	2.417	10.09	3.50	5.74
0.333	5.22	1.417	148.15	2.500	10.09	3.58	5.38
0.417	5.94	1.500	148.15	2.583	8.89	3.67	5.38
0.500	5.94	1.583	47.06	2.667	8.89	3.75	5.08
0.583	6.93	1.667	47.06	2.750	7.96	3.83	5.08
0.667	6.93	1.750	25.72	2.833	7.96	3.92	4.80
0.750	8.42	1.833	25.72	2.917	7.24	4.00	4.80
0.833	8.42	1.917	18.11	3.000	7.24	4.08	4.57
0.917	10.91	2.000	18.11	3.083	6.65	4.17	4.57
1.000	10.91	2.083	14.17	3.167	6.65		
1.083	16.13	2.167	14.17	3.250	6.15		

Unit Hyd Qpeak (cms)= 0.013

PEAK FLOW (cms)= 0.001 (i)

TIME TO PEAK (hrs)= 1.667

RUNOFF VOLUME (mm)= 6.532

TOTAL RAINFALL (mm)= 71.237

RUNOFF COEFFICIENT = 0.092

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

ADD HYD (0003)				
1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0001):	5.97	0.339	1.50	13.01
+ ID2= 2 (3001):	0.07	0.001	1.67	6.53

```
=====
ID = 3 ( 0003):      6.04   0.340   1.50   12.94
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| READ STORM |      Filename: C:\Users\bjo\AppData\
|            |      Local\Temp\
|            |      cf7c36e8-a37b-4556-880d-0858c28119a3\b95ed81c
| Ptotal= 71.24 mm |      Comments: Barrie_25yr_4hour_Chicago_v2
-----
```

TIME	RAIN	TIME	RAIN	'	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	'	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	36.37		2.50	10.09	3.67	5.38
0.33	5.22	1.50	148.15		2.67	8.89	3.83	5.08
0.50	5.94	1.67	47.06		2.83	7.96	4.00	4.80
0.67	6.93	1.83	25.72		3.00	7.24	4.17	4.57
0.83	8.42	2.00	18.11		3.17	6.65		
1.00	10.91	2.17	14.17		3.33	6.15		
1.17	16.13	2.33	11.74		3.50	5.74		

```
-----
| CALIB      |
| NASHYD ( 1002) |      Area (ha)= 3.20   Curve Number (CN)= 31.0
| ID= 1 DT= 5.0 min |      Ia (mm)= 7.00   # of Linear Res.(N)= 3.00
-----
| U.H. Tp(hrs)= 0.10
```

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

```
----- TRANSFORMED HYETOGRAPH -----
```

TIME	RAIN	TIME	RAIN	'	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	'	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	16.13		2.250	11.74	3.33	6.15
0.167	0.00	1.250	36.37		2.333	11.74	3.42	5.74
0.250	5.22	1.333	36.37		2.417	10.09	3.50	5.74
0.333	5.22	1.417	148.15		2.500	10.09	3.58	5.38
0.417	5.94	1.500	148.15		2.583	8.89	3.67	5.38
0.500	5.94	1.583	47.06		2.667	8.89	3.75	5.08
0.583	6.93	1.667	47.06		2.750	7.96	3.83	5.08
0.667	6.93	1.750	25.72		2.833	7.96	3.92	4.80
0.750	8.42	1.833	25.72		2.917	7.24	4.00	4.80
0.833	8.42	1.917	18.11		3.000	7.24	4.08	4.57
0.917	10.91	2.000	18.11		3.083	6.65	4.17	4.57
1.000	10.91	2.083	14.17		3.167	6.65		
1.083	16.13	2.167	14.17		3.250	6.15		

Unit Hyd Qpeak (cms)= 1.222

PEAK FLOW (cms)= 0.073 (i)

TIME TO PEAK (hrs)= 1.500

RUNOFF VOLUME (mm)= 6.384

TOTAL RAINFALL (mm)= 71.237

RUNOFF COEFFICIENT = 0.090

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

```
-----
| READ STORM |      Filename: C:\Users\bjo\AppData\
|             |      Local\Temp\
|             |      cf7c36e8-a37b-4556-880d-0858c28119a3\b95ed81c
| Ptotal= 71.24 mm |      Comments: Barrie_25yr_4hour_Chicago_v2
-----
```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	36.37	2.50	10.09	3.67	5.38
0.33	5.22	1.50	148.15	2.67	8.89	3.83	5.08
0.50	5.94	1.67	47.06	2.83	7.96	4.00	4.80
0.67	6.93	1.83	25.72	3.00	7.24	4.17	4.57
0.83	8.42	2.00	18.11	3.17	6.65		
1.00	10.91	2.17	14.17	3.33	6.15		
1.17	16.13	2.33	11.74	3.50	5.74		

```
-----
| CALIB      |
| STANDHYD ( 2002) |      Area (ha)= 0.71
| ID= 1 DT= 5.0 min |      Total Imp(%)= 55.00 Dir. Conn.(%)= 45.00
-----
```

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.39	0.32
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	68.80	40.00
Mannings n	=	0.013	0.250

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

```
----- TRANSFORMED HYETOGRAPH -----
TIME    RAIN | TIME    RAIN | TIME    RAIN | TIME    RAIN
hrs     mm/hr | hrs     mm/hr | hrs     mm/hr | hrs     mm/hr
0.083   0.00 | 1.167   16.13 | 2.250   11.74 | 3.33    6.15
```

0.167	0.00	1.250	36.37	2.333	11.74	3.42	5.74
0.250	5.22	1.333	36.37	2.417	10.09	3.50	5.74
0.333	5.22	1.417	148.15	2.500	10.09	3.58	5.38
0.417	5.94	1.500	148.15	2.583	8.89	3.67	5.38
0.500	5.94	1.583	47.06	2.667	8.89	3.75	5.08
0.583	6.93	1.667	47.06	2.750	7.96	3.83	5.08
0.667	6.93	1.750	25.72	2.833	7.96	3.92	4.80
0.750	8.42	1.833	25.72	2.917	7.24	4.00	4.80
0.833	8.42	1.917	18.11	3.000	7.24	4.08	4.57
0.917	10.91	2.000	18.11	3.083	6.65	4.17	4.57
1.000	10.91	2.083	14.17	3.167	6.65		
1.083	16.13	2.167	14.17	3.250	6.15		

Max.Eff.Inten.(mm/hr)= 148.15 12.21
over (min) 5.00 20.00
Storage Coeff. (min)= 1.74 (ii) 18.11 (ii)
Unit Hyd. Tpeak (min)= 5.00 20.00
Unit Hyd. peak (cms)= 0.32 0.06

TOTALS

PEAK FLOW (cms)= 0.13 0.01 0.133 (iii)
TIME TO PEAK (hrs)= 1.50 1.75 1.50
RUNOFF VOLUME (mm)= 69.24 8.17 35.63
TOTAL RAINFALL (mm)= 71.24 71.24 71.24
RUNOFF COEFFICIENT = 0.97 0.11 0.50

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 30.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0002)				
1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (1002):	3.20	0.073	1.50	6.38
+ ID2= 2 (2002):	0.71	0.133	1.50	35.63
=====				
ID = 3 (0002):	3.91	0.206	1.50	11.69

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0004)

1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0002):	3.91	0.206	1.50	11.69
+ ID2= 2 (0003):	6.04	0.340	1.50	12.94
=====				
ID = 3 (0004):	9.95	0.546	1.50	12.45

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

4-hour Chicago
50-yr

=====

```
V   V   I   SSSSS U   U   A   L           (v 5.1.2004)
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
  WV   I   SSSSS UUUUU A   A   LLLLL
```

```
  000   TTTTT   TTTTT H   H   Y   Y   M   M   000   TM
O   O   T       T   H   H   Y Y   MM MM   O   O
O   O   T       T   H   H   Y   M   M   O   O
  000   T       T   H   H   Y   M   M   000
```

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

Input filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\V02\voin.dat

Output filename:

C:\Users\bjo\AppData\Local\Civica\XH5\e91bc6c1-1ed6-4e95-932d-66b6211c2905\5ffa6c5d-a29a-4dab-acb5-36f27458c723\scenario

Summary filename:

C:\Users\bjo\AppData\Local\Civica\XH5\e91bc6c1-1ed6-4e95-932d-66b6211c2905\5ffa6c5d-a29a-4dab-acb5-36f27458c723\scenario

DATE: 10/30/2019

TIME: 02:02:55

USER:

COMMENTS: _____

```
*****
** SIMULATION : Run 05           **
*****
```

| READ STORM |

Filename: C:\Users\bjo\AppData\Local\Temp\

	cf7c36e8-a37b-4556-880d-0858c28119a3\0563787d
Ptotal= 79.45 mm	Comments: Barrie_50yr_4hour_Chicago_v2

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	40.22	2.50	11.37	3.67	6.11
0.33	5.93	1.50	164.22	2.67	10.03	3.83	5.77
0.50	6.74	1.67	51.92	2.83	9.00	4.00	5.46
0.67	7.85	1.83	28.58	3.00	8.19	4.17	5.19
0.83	9.50	2.00	20.23	3.17	7.53		
1.00	12.27	2.17	15.88	3.33	6.98		
1.17	18.04	2.33	13.20	3.50	6.51		

CALIB	
NASHYD (1001)	Area (ha)= 4.63 Curve Number (CN)= 31.0
ID= 1 DT= 5.0 min	Ia (mm)= 7.00 # of Linear Res.(N)= 3.00
-----	U.H. Tp(hrs)= 0.12

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

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

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	18.04	2.250	13.20	3.33	6.98
0.167	0.00	1.250	40.22	2.333	13.20	3.42	6.51
0.250	5.93	1.333	40.22	2.417	11.37	3.50	6.51
0.333	5.93	1.417	164.22	2.500	11.37	3.58	6.11
0.417	6.74	1.500	164.22	2.583	10.03	3.67	6.11
0.500	6.74	1.583	51.92	2.667	10.03	3.75	5.77
0.583	7.85	1.667	51.92	2.750	9.00	3.83	5.77
0.667	7.85	1.750	28.58	2.833	9.00	3.92	5.46
0.750	9.50	1.833	28.58	2.917	8.19	4.00	5.46
0.833	9.50	1.917	20.23	3.000	8.19	4.08	5.19
0.917	12.27	2.000	20.23	3.083	7.53	4.17	5.19
1.000	12.27	2.083	15.88	3.167	7.53		
1.083	18.04	2.167	15.88	3.250	6.98		

Unit Hyd Qpeak (cms)= 1.474

PEAK FLOW (cms)= 0.121 (i)

TIME TO PEAK (hrs)= 1.583

RUNOFF VOLUME (mm)= 8.121

TOTAL RAINFALL (mm)= 79.453

RUNOFF COEFFICIENT = 0.102

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

```

-----
| READ STORM | Filename: C:\Users\bjo\AppData\
|             | Local\Temp\
|             | cf7c36e8-a37b-4556-880d-0858c28119a3\0563787d
| Ptotal= 79.45 mm | Comments: Barrie_50yr_4hour_Chicago_v2
-----

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	40.22	2.50	11.37	3.67	6.11
0.33	5.93	1.50	164.22	2.67	10.03	3.83	5.77
0.50	6.74	1.67	51.92	2.83	9.00	4.00	5.46
0.67	7.85	1.83	28.58	3.00	8.19	4.17	5.19
0.83	9.50	2.00	20.23	3.17	7.53		
1.00	12.27	2.17	15.88	3.33	6.98		
1.17	18.04	2.33	13.20	3.50	6.51		

```

-----
| CALIB |
| STANDHYD ( 2001) | Area (ha)= 1.34
| ID= 1 DT= 5.0 min | Total Imp(%)= 55.00 Dir. Conn.(%)= 45.00
-----

```

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.74	0.60
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	94.52	40.00
Mannings n	=	0.013	0.250

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

```

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

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	18.04	2.250	13.20	3.33	6.98
0.167	0.00	1.250	40.22	2.333	13.20	3.42	6.51
0.250	5.93	1.333	40.22	2.417	11.37	3.50	6.51
0.333	5.93	1.417	164.22	2.500	11.37	3.58	6.11
0.417	6.74	1.500	164.22	2.583	10.03	3.67	6.11
0.500	6.74	1.583	51.92	2.667	10.03	3.75	5.77
0.583	7.85	1.667	51.92	2.750	9.00	3.83	5.77
0.667	7.85	1.750	28.58	2.833	9.00	3.92	5.46
0.750	9.50	1.833	28.58	2.917	8.19	4.00	5.46
0.833	9.50	1.917	20.23	3.000	8.19	4.08	5.19
0.917	12.27	2.000	20.23	3.083	7.53	4.17	5.19

1.000	12.27		2.083	15.88		3.167	7.53	
1.083	18.04		2.167	15.88		3.250	6.98	

Max.Eff.Inten.(mm/hr)=	164.22		16.60	
over (min)	5.00		20.00	
Storage Coeff. (min)=	2.03 (ii)		16.50 (ii)	
Unit Hyd. Tpeak (min)=	5.00		20.00	
Unit Hyd. peak (cms)=	0.31		0.06	
				TOTALS
PEAK FLOW (cms)=	0.27		0.02	0.279 (iii)
TIME TO PEAK (hrs)=	1.50		1.75	1.50
RUNOFF VOLUME (mm)=	77.45		10.14	40.42
TOTAL RAINFALL (mm)=	79.45		79.45	79.45
RUNOFF COEFFICIENT =	0.97		0.13	0.51

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 30.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0001)				
1 + 2 = 3				
	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (1001):	4.63	0.121	1.58	8.12
+ ID2= 2 (2001):	1.34	0.279	1.50	40.42
=====				
ID = 3 (0001):	5.97	0.392	1.50	15.37

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

READ STORM	Filename: C:\Users\bjo\AppData\
	Local\Temp\
	cf7c36e8-a37b-4556-880d-0858c28119a3\0563787d
Ptotal= 79.45 mm	Comments: Barrie_50yr_4hour_Chicago_v2

TIME	RAIN		TIME	RAIN		TIME	RAIN		TIME	RAIN
hrs	mm/hr		hrs	mm/hr		hrs	mm/hr		hrs	mm/hr
0.17	0.00		1.33	40.22		2.50	11.37		3.67	6.11
0.33	5.93		1.50	164.22		2.67	10.03		3.83	5.77
0.50	6.74		1.67	51.92		2.83	9.00		4.00	5.46
0.67	7.85		1.83	28.58		3.00	8.19		4.17	5.19

0.83	9.50	2.00	20.23	3.17	7.53
1.00	12.27	2.17	15.88	3.33	6.98
1.17	18.04	2.33	13.20	3.50	6.51

CALIB			
NASHYD (3001)	Area (ha)=	0.07	Curve Number (CN)= 31.0
ID= 1 DT= 5.0 min	Ia (mm)=	7.00	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	0.20	

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	18.04	2.250	13.20	3.33	6.98
0.167	0.00	1.250	40.22	2.333	13.20	3.42	6.51
0.250	5.93	1.333	40.22	2.417	11.37	3.50	6.51
0.333	5.93	1.417	164.22	2.500	11.37	3.58	6.11
0.417	6.74	1.500	164.22	2.583	10.03	3.67	6.11
0.500	6.74	1.583	51.92	2.667	10.03	3.75	5.77
0.583	7.85	1.667	51.92	2.750	9.00	3.83	5.77
0.667	7.85	1.750	28.58	2.833	9.00	3.92	5.46
0.750	9.50	1.833	28.58	2.917	8.19	4.00	5.46
0.833	9.50	1.917	20.23	3.000	8.19	4.08	5.19
0.917	12.27	2.000	20.23	3.083	7.53	4.17	5.19
1.000	12.27	2.083	15.88	3.167	7.53		
1.083	18.04	2.167	15.88	3.250	6.98		

Unit Hyd Qpeak (cms)= 0.013

PEAK FLOW (cms)= 0.001 (i)

TIME TO PEAK (hrs)= 1.667

RUNOFF VOLUME (mm)= 8.208

TOTAL RAINFALL (mm)= 79.453

RUNOFF COEFFICIENT = 0.103

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

ADD HYD (0003)				
1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0001):	5.97	0.392	1.50	15.37
+ ID2= 2 (3001):	0.07	0.001	1.67	8.21

=====

ID = 3 (0003): 6.04 0.393 1.50 15.29

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

READ STORM	Filename: C:\Users\bjo\AppData\
	Local\Temp\
	cf7c36e8-a37b-4556-880d-0858c28119a3\0563787d
Ptotal= 79.45 mm	Comments: Barrie_50yr_4hour_Chicago_v2

TIME	RAIN	TIME	RAIN	'	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	'	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	40.22		2.50	11.37	3.67	6.11
0.33	5.93	1.50	164.22		2.67	10.03	3.83	5.77
0.50	6.74	1.67	51.92		2.83	9.00	4.00	5.46
0.67	7.85	1.83	28.58		3.00	8.19	4.17	5.19
0.83	9.50	2.00	20.23		3.17	7.53		
1.00	12.27	2.17	15.88		3.33	6.98		
1.17	18.04	2.33	13.20		3.50	6.51		

CALIB	
NASHYD (1002)	Area (ha)= 3.20 Curve Number (CN)= 31.0
ID= 1 DT= 5.0 min	Ia (mm)= 7.00 # of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= 0.10

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

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

TIME	RAIN	TIME	RAIN	'	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	'	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	18.04		2.250	13.20	3.33	6.98
0.167	0.00	1.250	40.22		2.333	13.20	3.42	6.51
0.250	5.93	1.333	40.22		2.417	11.37	3.50	6.51
0.333	5.93	1.417	164.22		2.500	11.37	3.58	6.11
0.417	6.74	1.500	164.22		2.583	10.03	3.67	6.11
0.500	6.74	1.583	51.92		2.667	10.03	3.75	5.77
0.583	7.85	1.667	51.92		2.750	9.00	3.83	5.77
0.667	7.85	1.750	28.58		2.833	9.00	3.92	5.46
0.750	9.50	1.833	28.58		2.917	8.19	4.00	5.46
0.833	9.50	1.917	20.23		3.000	8.19	4.08	5.19
0.917	12.27	2.000	20.23		3.083	7.53	4.17	5.19
1.000	12.27	2.083	15.88		3.167	7.53		
1.083	18.04	2.167	15.88		3.250	6.98		

Unit Hyd Qpeak (cms)= 1.222

PEAK FLOW (cms)= 0.092 (i)

TIME TO PEAK (hrs)= 1.500

RUNOFF VOLUME (mm)= 8.017

TOTAL RAINFALL (mm)= 79.453

RUNOFF COEFFICIENT = 0.101

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

```
-----
| READ STORM |      Filename: C:\Users\bjo\AppData\
|             |      Local\Temp\
|             |      cf7c36e8-a37b-4556-880d-0858c28119a3\0563787d
| Ptotal= 79.45 mm |      Comments: Barrie_50yr_4hour_Chicago_v2
|             |
-----
```

TIME	RAIN	TIME	RAIN	'	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr		hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	40.22		2.50	11.37	3.67	6.11
0.33	5.93	1.50	164.22		2.67	10.03	3.83	5.77
0.50	6.74	1.67	51.92		2.83	9.00	4.00	5.46
0.67	7.85	1.83	28.58		3.00	8.19	4.17	5.19
0.83	9.50	2.00	20.23		3.17	7.53		
1.00	12.27	2.17	15.88		3.33	6.98		
1.17	18.04	2.33	13.20		3.50	6.51		

```
-----
| CALIB      |
| STANDHYD ( 2002) |      Area (ha)= 0.71
| ID= 1 DT= 5.0 min |      Total Imp(%)= 55.00      Dir. Conn.(%)= 45.00
|             |
-----
```

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.39	0.32
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	68.80	40.00
Mannings n	=	0.013	0.250

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

```
----- TRANSFORMED HYETOGRAPH -----
TIME    RAIN | TIME    RAIN | ' TIME    RAIN | TIME    RAIN
hrs      mm/hr | hrs      mm/hr | ' hrs      mm/hr | hrs      mm/hr
0.083    0.00 | 1.167    18.04 | 2.250    13.20 | 3.33     6.98
```

0.167	0.00	1.250	40.22	2.333	13.20	3.42	6.51
0.250	5.93	1.333	40.22	2.417	11.37	3.50	6.51
0.333	5.93	1.417	164.22	2.500	11.37	3.58	6.11
0.417	6.74	1.500	164.22	2.583	10.03	3.67	6.11
0.500	6.74	1.583	51.92	2.667	10.03	3.75	5.77
0.583	7.85	1.667	51.92	2.750	9.00	3.83	5.77
0.667	7.85	1.750	28.58	2.833	9.00	3.92	5.46
0.750	9.50	1.833	28.58	2.917	8.19	4.00	5.46
0.833	9.50	1.917	20.23	3.000	8.19	4.08	5.19
0.917	12.27	2.000	20.23	3.083	7.53	4.17	5.19
1.000	12.27	2.083	15.88	3.167	7.53		
1.083	18.04	2.167	15.88	3.250	6.98		

Max.Eff.Inten.(mm/hr)= 164.22 16.60
over (min) 5.00 20.00
Storage Coeff. (min)= 1.67 (ii) 16.15 (ii)
Unit Hyd. Tpeak (min)= 5.00 20.00
Unit Hyd. peak (cms)= 0.32 0.06

TOTALS

PEAK FLOW (cms)= 0.15 0.01 0.148 (iii)
TIME TO PEAK (hrs)= 1.50 1.75 1.50
RUNOFF VOLUME (mm)= 77.45 10.14 40.42
TOTAL RAINFALL (mm)= 79.45 79.45 79.45
RUNOFF COEFFICIENT = 0.97 0.13 0.51

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 30.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0002)				
1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (1002):	3.20	0.092	1.50	8.02
+ ID2= 2 (2002):	0.71	0.148	1.50	40.42
=====				
ID = 3 (0002):	3.91	0.240	1.50	13.90

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| ADD HYD (0004) |

1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.
-----	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0002):	3.91	0.240	1.50	13.90
+ ID2= 2 (0003):	6.04	0.393	1.50	15.29
=====				
ID = 3 (0004):	9.95	0.633	1.50	14.74

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

4-hour Chicago
100-yr

=====

```
V   V   I   SSSSS U   U   A   L           (v 5.1.2004)
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
  WV   I   SSSSS UUUUU A   A   LLLLL
```

```
  000   TTTTT   TTTTT H   H   Y   Y   M   M   000   TM
O   O   T       T   H   H   Y Y   MM MM   O   O
O   O   T       T   H   H   Y   M   M   O   O
  000   T       T   H   H   Y   M   M   000
```

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

Input filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\V02\voin.dat

Output filename:

C:\Users\bjo\AppData\Local\Civica\XH5\e91bc6c1-1ed6-4e95-932d-66b6211c2905\f82203a8-be55-4366-bbfb-72f6c6029dfd\scenario

Summary filename:

C:\Users\bjo\AppData\Local\Civica\XH5\e91bc6c1-1ed6-4e95-932d-66b6211c2905\f82203a8-be55-4366-bbfb-72f6c6029dfd\scenario

DATE: 10/30/2019

TIME: 02:02:56

USER:

COMMENTS: _____

```
*****
** SIMULATION : Run 06           **
*****
```

READ STORM

Filename: C:\Users\bjo\AppData\Local\Temp\

	cf7c36e8-a37b-4556-880d-0858c28119a3\55aad7a0
Ptotal= 87.58 mm	Comments: Barrie_100yr_4hour_Chicago_v2

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	45.22	2.50	12.44	3.67	6.60
0.33	6.41	1.50	180.15	2.67	10.94	3.83	6.22
0.50	7.29	1.67	58.54	2.83	9.80	4.00	5.89
0.67	8.52	1.83	31.96	3.00	8.90	4.17	5.59
0.83	10.36	2.00	22.45	3.17	8.16		
1.00	13.45	2.17	17.52	3.33	7.56		
1.17	19.96	2.33	14.50	3.50	7.04		

CALIB	
NASHYD (1001)	Area (ha)= 4.63 Curve Number (CN)= 31.0
ID= 1 DT= 5.0 min	Ia (mm)= 7.00 # of Linear Res.(N)= 3.00
-----	U.H. Tp(hrs)= 0.12

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

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

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	19.96	2.250	14.50	3.33	7.56
0.167	0.00	1.250	45.22	2.333	14.50	3.42	7.04
0.250	6.41	1.333	45.22	2.417	12.44	3.50	7.04
0.333	6.41	1.417	180.15	2.500	12.44	3.58	6.60
0.417	7.29	1.500	180.15	2.583	10.94	3.67	6.60
0.500	7.29	1.583	58.54	2.667	10.94	3.75	6.22
0.583	8.52	1.667	58.54	2.750	9.80	3.83	6.22
0.667	8.52	1.750	31.96	2.833	9.80	3.92	5.89
0.750	10.36	1.833	31.96	2.917	8.90	4.00	5.89
0.833	10.36	1.917	22.45	3.000	8.90	4.08	5.59
0.917	13.45	2.000	22.45	3.083	8.16	4.17	5.59
1.000	13.45	2.083	17.52	3.167	8.16		
1.083	19.96	2.167	17.52	3.250	7.56		

Unit Hyd Qpeak (cms)= 1.474

PEAK FLOW (cms)= 0.150 (i)

TIME TO PEAK (hrs)= 1.583

RUNOFF VOLUME (mm)= 9.918

TOTAL RAINFALL (mm)= 87.578

RUNOFF COEFFICIENT = 0.113

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

```

-----
| READ STORM | Filename: C:\Users\bjo\AppData\
|            | Local\Temp\
|            | cf7c36e8-a37b-4556-880d-0858c28119a3\55aad7a0
| Ptotal= 87.58 mm | Comments: Barrie_100yr_4hour_Chicago_v2
-----

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	45.22	2.50	12.44	3.67	6.60
0.33	6.41	1.50	180.15	2.67	10.94	3.83	6.22
0.50	7.29	1.67	58.54	2.83	9.80	4.00	5.89
0.67	8.52	1.83	31.96	3.00	8.90	4.17	5.59
0.83	10.36	2.00	22.45	3.17	8.16		
1.00	13.45	2.17	17.52	3.33	7.56		
1.17	19.96	2.33	14.50	3.50	7.04		

```

-----
| CALIB |
| STANDHYD ( 2001) | Area (ha)= 1.34
| ID= 1 DT= 5.0 min | Total Imp(%)= 55.00 Dir. Conn.(%)= 45.00
-----

```

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.74	0.60
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	94.52	40.00
Mannings n	=	0.013	0.250

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

```

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

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	19.96	2.250	14.50	3.33	7.56
0.167	0.00	1.250	45.22	2.333	14.50	3.42	7.04
0.250	6.41	1.333	45.22	2.417	12.44	3.50	7.04
0.333	6.41	1.417	180.15	2.500	12.44	3.58	6.60
0.417	7.29	1.500	180.15	2.583	10.94	3.67	6.60
0.500	7.29	1.583	58.54	2.667	10.94	3.75	6.22
0.583	8.52	1.667	58.54	2.750	9.80	3.83	6.22
0.667	8.52	1.750	31.96	2.833	9.80	3.92	5.89
0.750	10.36	1.833	31.96	2.917	8.90	4.00	5.89
0.833	10.36	1.917	22.45	3.000	8.90	4.08	5.59
0.917	13.45	2.000	22.45	3.083	8.16	4.17	5.59

1.000	13.45		2.083	17.52		3.167	8.16	
1.083	19.96		2.167	17.52		3.250	7.56	

Max.Eff.Inten.(mm/hr)=	180.15		20.24	
over (min)	5.00		20.00	
Storage Coeff. (min)=	1.95 (ii)		15.32 (ii)	
Unit Hyd. Tpeak (min)=	5.00		20.00	
Unit Hyd. peak (cms)=	0.31		0.07	
				TOTALS
PEAK FLOW (cms)=	0.30		0.02	0.308 (iii)
TIME TO PEAK (hrs)=	1.50		1.75	1.50
RUNOFF VOLUME (mm)=	85.58		12.26	45.25
TOTAL RAINFALL (mm)=	87.58		87.58	87.58
RUNOFF COEFFICIENT =	0.98		0.14	0.52

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 30.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0001)				
1 + 2 = 3				
	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (1001):	4.63	0.150	1.58	9.92
+ ID2= 2 (2001):	1.34	0.308	1.50	45.25
=====				
ID = 3 (0001):	5.97	0.447	1.50	17.85

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

READ STORM	Filename: C:\Users\bjo\AppData\Local\Temp\cf7c36e8-a37b-4556-880d-0858c28119a3\55aad7a0
Ptotal= 87.58 mm	Comments: Barrie_100yr_4hour_Chicago_v2

TIME	RAIN		TIME	RAIN		TIME	RAIN		TIME	RAIN
hrs	mm/hr		hrs	mm/hr		hrs	mm/hr		hrs	mm/hr
0.17	0.00		1.33	45.22		2.50	12.44		3.67	6.60
0.33	6.41		1.50	180.15		2.67	10.94		3.83	6.22
0.50	7.29		1.67	58.54		2.83	9.80		4.00	5.89
0.67	8.52		1.83	31.96		3.00	8.90		4.17	5.59

0.83	10.36	2.00	22.45	3.17	8.16
1.00	13.45	2.17	17.52	3.33	7.56
1.17	19.96	2.33	14.50	3.50	7.04

```

-----
| CALIB |
| NASHYD ( 3001) | Area (ha)= 0.07 Curve Number (CN)= 31.0
| ID= 1 DT= 5.0 min | Ia (mm)= 7.00 # of Linear Res.(N)= 3.00
-----
| U.H. Tp(hrs)= 0.20

```

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	19.96	2.250	14.50	3.33	7.56
0.167	0.00	1.250	45.22	2.333	14.50	3.42	7.04
0.250	6.41	1.333	45.22	2.417	12.44	3.50	7.04
0.333	6.41	1.417	180.15	2.500	12.44	3.58	6.60
0.417	7.29	1.500	180.15	2.583	10.94	3.67	6.60
0.500	7.29	1.583	58.54	2.667	10.94	3.75	6.22
0.583	8.52	1.667	58.54	2.750	9.80	3.83	6.22
0.667	8.52	1.750	31.96	2.833	9.80	3.92	5.89
0.750	10.36	1.833	31.96	2.917	8.90	4.00	5.89
0.833	10.36	1.917	22.45	3.000	8.90	4.08	5.59
0.917	13.45	2.000	22.45	3.083	8.16	4.17	5.59
1.000	13.45	2.083	17.52	3.167	8.16		
1.083	19.96	2.167	17.52	3.250	7.56		

Unit Hyd Qpeak (cms)= 0.013

PEAK FLOW (cms)= 0.002 (i)

TIME TO PEAK (hrs)= 1.667

RUNOFF VOLUME (mm)= 10.024

TOTAL RAINFALL (mm)= 87.578

RUNOFF COEFFICIENT = 0.114

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

```

-----
| ADD HYD ( 0003) |
| 1 + 2 = 3 |
-----
| ID1= 1 ( 0001): | AREA QPEAK TPEAK R.V.
| + ID2= 2 ( 3001): | (ha) (cms) (hrs) (mm)
| | 5.97 0.447 1.50 17.85
| | 0.07 0.002 1.67 10.02

```

=====

ID = 3 (0003): 6.04 0.448 1.50 17.76

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

READ STORM	Filename: C:\Users\bjo\AppData\
	Local\Temp\
	cf7c36e8-a37b-4556-880d-0858c28119a3\55aad7a0
Ptotal= 87.58 mm	Comments: Barrie_100yr_4hour_Chicago_v2

TIME	RAIN	TIME	RAIN	'	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	'	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	45.22		2.50	12.44	3.67	6.60
0.33	6.41	1.50	180.15		2.67	10.94	3.83	6.22
0.50	7.29	1.67	58.54		2.83	9.80	4.00	5.89
0.67	8.52	1.83	31.96		3.00	8.90	4.17	5.59
0.83	10.36	2.00	22.45		3.17	8.16		
1.00	13.45	2.17	17.52		3.33	7.56		
1.17	19.96	2.33	14.50		3.50	7.04		

CALIB	
NASHYD (1002)	Area (ha)= 3.20 Curve Number (CN)= 31.0
ID= 1 DT= 5.0 min	Ia (mm)= 7.00 # of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= 0.10

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

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

TIME	RAIN	TIME	RAIN	'	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	'	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	19.96		2.250	14.50	3.33	7.56
0.167	0.00	1.250	45.22		2.333	14.50	3.42	7.04
0.250	6.41	1.333	45.22		2.417	12.44	3.50	7.04
0.333	6.41	1.417	180.15		2.500	12.44	3.58	6.60
0.417	7.29	1.500	180.15		2.583	10.94	3.67	6.60
0.500	7.29	1.583	58.54		2.667	10.94	3.75	6.22
0.583	8.52	1.667	58.54		2.750	9.80	3.83	6.22
0.667	8.52	1.750	31.96		2.833	9.80	3.92	5.89
0.750	10.36	1.833	31.96		2.917	8.90	4.00	5.89
0.833	10.36	1.917	22.45		3.000	8.90	4.08	5.59
0.917	13.45	2.000	22.45		3.083	8.16	4.17	5.59
1.000	13.45	2.083	17.52		3.167	8.16		
1.083	19.96	2.167	17.52		3.250	7.56		

PEAK FLOW	(cms)=	0.113	(i)
TIME TO PEAK	(hrs)=	1.500	
RUNOFF VOLUME	(mm)=	9.791	
TOTAL RAINFALL	(mm)=	87.578	
RUNOFF COEFFICIENT	=	0.112	

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	45.22	2.50	12.44	3.67	6.60
0.33	6.41	1.50	180.15	2.67	10.94	3.83	6.22
0.50	7.29	1.67	58.54	2.83	9.80	4.00	5.89
0.67	8.52	1.83	31.96	3.00	8.90	4.17	5.59
0.83	10.36	2.00	22.45	3.17	8.16		
1.00	13.45	2.17	17.52	3.33	7.56		
1.17	19.96	2.33	14.50	3.50	7.04		

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.39	0.32
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	68.80	40.00
Mannings n	=	0.013	0.250

----- TRANSFORMED HYETOGRAPH -----								
TIME	RAIN	TIME	RAIN	'	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	'	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	19.96		2.250	14.50	3.33	7.56

0.167	0.00	1.250	45.22	2.333	14.50	3.42	7.04
0.250	6.41	1.333	45.22	2.417	12.44	3.50	7.04
0.333	6.41	1.417	180.15	2.500	12.44	3.58	6.60
0.417	7.29	1.500	180.15	2.583	10.94	3.67	6.60
0.500	7.29	1.583	58.54	2.667	10.94	3.75	6.22
0.583	8.52	1.667	58.54	2.750	9.80	3.83	6.22
0.667	8.52	1.750	31.96	2.833	9.80	3.92	5.89
0.750	10.36	1.833	31.96	2.917	8.90	4.00	5.89
0.833	10.36	1.917	22.45	3.000	8.90	4.08	5.59
0.917	13.45	2.000	22.45	3.083	8.16	4.17	5.59
1.000	13.45	2.083	17.52	3.167	8.16		
1.083	19.96	2.167	17.52	3.250	7.56		

Max.Eff.Inten.(mm/hr)= 180.15 20.24
over (min) 5.00 15.00
Storage Coeff. (min)= 1.61 (ii) 14.98 (ii)
Unit Hyd. Tpeak (min)= 5.00 15.00
Unit Hyd. peak (cms)= 0.32 0.08

TOTALS

PEAK FLOW (cms)= 0.16 0.01 0.165 (iii)
TIME TO PEAK (hrs)= 1.50 1.67 1.50
RUNOFF VOLUME (mm)= 85.58 12.26 45.24
TOTAL RAINFALL (mm)= 87.58 87.58 87.58
RUNOFF COEFFICIENT = 0.98 0.14 0.52

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 30.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| ADD HYD ( 0002) |
| 1 + 2 = 3 |
-----
          AREA    QPEAK    TPEAK    R.V.
          (ha)    (cms)    (hrs)    (mm)
ID1= 1 ( 1002):  3.20  0.113  1.50  9.79
+ ID2= 2 ( 2002):  0.71  0.165  1.50  45.24
=====
ID = 3 ( 0002):  3.91  0.278  1.50  16.23

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| ADD HYD ( 0004) |

```

1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0002):	3.91	0.278	1.50	16.23
+ ID2= 2 (0003):	6.04	0.448	1.50	17.76
=====				
ID = 3 (0004):	9.95	0.726	1.50	17.16

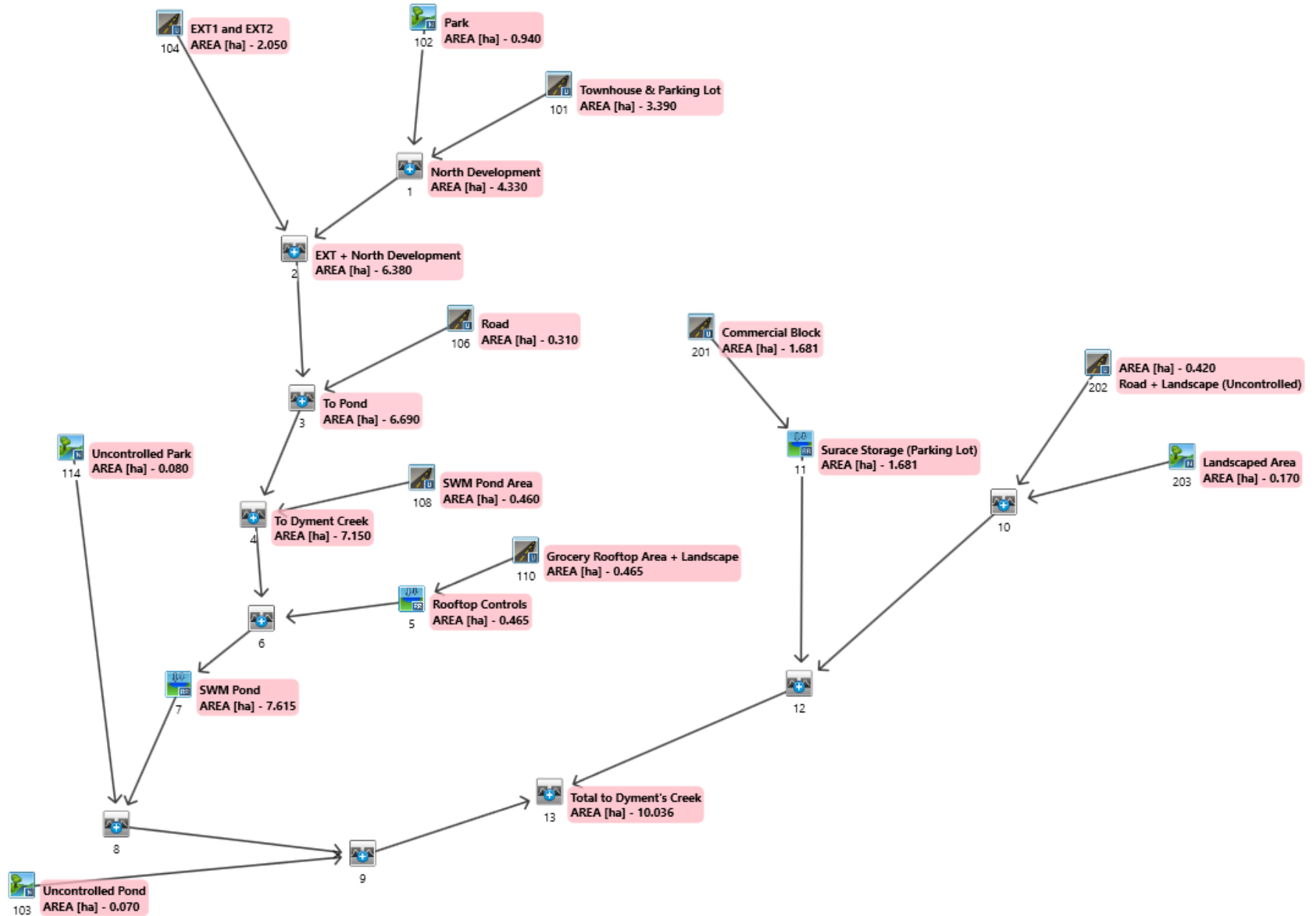
NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

FINISH

=====

=====

VO5 - POSTDEVELOPMENT MODEL SCHEMATIC



4-hour Chicago
2-yr

=====

```
V   V   I   SSSSS U   U   A   L           (v 5.1.2004)
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
  WV   I   SSSSS UUUUU A   A   LLLLL
```

```
  000   TTTTT   TTTTT H   H   Y   Y   M   M   000   TM
O   O   T       T   H   H   Y Y   MM MM   O   O
O   O   T       T   H   H   Y   M   M   O   O
  000   T       T   H   H   Y   M   M   000
```

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

Input filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\V02\voin.dat

Output filename:

C:\Users\bjo\AppData\Local\Civica\XH5\e91bc6c1-1ed6-4e95-932d-66b6211c2905\107525b8-9011-49eb-ab02-67b69b7589c7\scenario

Summary filename:

C:\Users\bjo\AppData\Local\Civica\XH5\e91bc6c1-1ed6-4e95-932d-66b6211c2905\107525b8-9011-49eb-ab02-67b69b7589c7\scenario

DATE: 10/30/2019

TIME: 02:52:52

USER:

COMMENTS: _____

```
*****
** SIMULATION : Run 01           **
*****
```

```
|  READ STORM  |  Filename: C:\Users\bjo\AppData\
|              |  Local\Temp\
```

|
 | Ptotal= 36.95 mm | b6c47c87-ffa1-4ea3-b46e-09b9679b04af\ec889e4b
 | Comments: Barrie_2yr_4hour_Chicago_v2

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	18.78	2.50	4.89	3.67	2.55
0.33	2.47	1.50	83.11	2.67	4.28	3.83	2.39
0.50	2.82	1.67	24.57	2.83	3.82	4.00	2.26
0.67	3.31	1.83	13.01	3.00	3.46	4.17	2.15
0.83	4.05	2.00	9.01	3.17	3.17		
1.00	5.30	2.17	6.97	3.33	2.93		
1.17	7.98	2.33	5.73	3.50	2.72		

 | CALIB
 | NASHYD (0102) | Area (ha)= 0.94 Curve Number (CN)= 33.0
 | ID= 1 DT= 5.0 min | Ia (mm)= 5.00 # of Linear Res.(N)= 3.00

 U.H. Tp(hrs)= 0.11

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

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

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	7.98	2.250	5.73	3.33	2.93
0.167	0.00	1.250	18.78	2.333	5.73	3.42	2.72
0.250	2.47	1.333	18.78	2.417	4.89	3.50	2.72
0.333	2.47	1.417	83.11	2.500	4.89	3.58	2.55
0.417	2.82	1.500	83.11	2.583	4.28	3.67	2.55
0.500	2.82	1.583	24.57	2.667	4.28	3.75	2.39
0.583	3.31	1.667	24.57	2.750	3.82	3.83	2.39
0.667	3.31	1.750	13.01	2.833	3.82	3.92	2.26
0.750	4.05	1.833	13.01	2.917	3.46	4.00	2.26
0.833	4.05	1.917	9.01	3.000	3.46	4.08	2.15
0.917	5.30	2.000	9.01	3.083	3.17	4.17	2.15
1.000	5.30	2.083	6.97	3.167	3.17		
1.083	7.98	2.167	6.97	3.250	2.93		

Unit Hyd Qpeak (cms)= 0.326

PEAK FLOW (cms)= 0.006 (i)

TIME TO PEAK (hrs)= 1.583

RUNOFF VOLUME (mm)= 1.830

TOTAL RAINFALL (mm)= 36.955

RUNOFF COEFFICIENT = 0.050

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

READ STORM	Filename: C:\Users\bjo\AppData\Local\Temp\b6c47c87-ffa1-4ea3-b46e-09b9679b04af\ec889e4b
Ptotal= 36.95 mm	Comments: Barrie_2yr_4hour_Chicago_v2

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	18.78	2.50	4.89	3.67	2.55
0.33	2.47	1.50	83.11	2.67	4.28	3.83	2.39
0.50	2.82	1.67	24.57	2.83	3.82	4.00	2.26
0.67	3.31	1.83	13.01	3.00	3.46	4.17	2.15
0.83	4.05	2.00	9.01	3.17	3.17		
1.00	5.30	2.17	6.97	3.33	2.93		
1.17	7.98	2.33	5.73	3.50	2.72		

CALIB	Area (ha)= 3.39
STANDHYD (0101)	Total Imp(%)= 83.00 Dir. Conn.(%)= 83.00
ID= 1 DT= 5.0 min	

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	2.81	0.58
Dep. Storage (mm)=	2.00	5.00
Average Slope (%)=	1.00	2.00
Length (m)=	150.33	40.00
Mannings n =	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	7.98	2.250	5.73	3.33	2.93
0.167	0.00	1.250	18.78	2.333	5.73	3.42	2.72
0.250	2.47	1.333	18.78	2.417	4.89	3.50	2.72
0.333	2.47	1.417	83.11	2.500	4.89	3.58	2.55
0.417	2.82	1.500	83.11	2.583	4.28	3.67	2.55
0.500	2.82	1.583	24.57	2.667	4.28	3.75	2.39
0.583	3.31	1.667	24.57	2.750	3.82	3.83	2.39
0.667	3.31	1.750	13.01	2.833	3.82	3.92	2.26
0.750	4.05	1.833	13.01	2.917	3.46	4.00	2.26
0.833	4.05	1.917	9.01	3.000	3.46	4.08	2.15
0.917	5.30	2.000	9.01	3.083	3.17	4.17	2.15

1.000	5.30		2.083	6.97		3.167	3.17	
1.083	7.98		2.167	6.97		3.250	2.93	

Max.Eff.Inten.(mm/hr)=	83.11		2.93	
over (min)	5.00		10.00	
Storage Coeff. (min)=	3.51 (ii)		7.54 (ii)	
Unit Hyd. Tpeak (min)=	5.00		10.00	
Unit Hyd. peak (cms)=	0.26		0.13	
				TOTALS
PEAK FLOW (cms)=	0.62		0.00	0.623 (iii)
TIME TO PEAK (hrs)=	1.50		1.58	1.50
RUNOFF VOLUME (mm)=	34.95		1.86	29.33
TOTAL RAINFALL (mm)=	36.95		36.95	36.95
RUNOFF COEFFICIENT =	0.95		0.05	0.79

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 33.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0103)				
1 + 2 = 3				
	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0101):	3.39	0.623	1.50	29.33
+ ID2= 2 (0102):	0.94	0.006	1.58	1.83
=====				
ID = 3 (0103):	4.33	0.628	1.50	23.36

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

READ STORM	Filename: C:\Users\bjo\AppData\
	Local\Temp\
	b6c47c87-ffa1-4ea3-b46e-09b9679b04af\ec889e4b
Ptotal= 36.95 mm	Comments: Barrie_2yr_4hour_Chicago_v2

TIME	RAIN		TIME	RAIN		TIME	RAIN		TIME	RAIN
hrs	mm/hr		hrs	mm/hr		hrs	mm/hr		hrs	mm/hr
0.17	0.00		1.33	18.78		2.50	4.89		3.67	2.55
0.33	2.47		1.50	83.11		2.67	4.28		3.83	2.39
0.50	2.82		1.67	24.57		2.83	3.82		4.00	2.26
0.67	3.31		1.83	13.01		3.00	3.46		4.17	2.15

0.83	4.05	2.00	9.01	3.17	3.17
1.00	5.30	2.17	6.97	3.33	2.93
1.17	7.98	2.33	5.73	3.50	2.72

CALIB	
STANDHYD (0104)	Area (ha)= 2.05
ID= 1 DT= 5.0 min	Total Imp(%)= 55.00 Dir. Conn.(%)= 45.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.13	0.92
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	116.90	40.00
Mannings n	=	0.013	0.250

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

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

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	7.98	2.250	5.73	3.33	2.93
0.167	0.00	1.250	18.78	2.333	5.73	3.42	2.72
0.250	2.47	1.333	18.78	2.417	4.89	3.50	2.72
0.333	2.47	1.417	83.11	2.500	4.89	3.58	2.55
0.417	2.82	1.500	83.11	2.583	4.28	3.67	2.55
0.500	2.82	1.583	24.57	2.667	4.28	3.75	2.39
0.583	3.31	1.667	24.57	2.750	3.82	3.83	2.39
0.667	3.31	1.750	13.01	2.833	3.82	3.92	2.26
0.750	4.05	1.833	13.01	2.917	3.46	4.00	2.26
0.833	4.05	1.917	9.01	3.000	3.46	4.08	2.15
0.917	5.30	2.000	9.01	3.083	3.17	4.17	2.15
1.000	5.30	2.083	6.97	3.167	3.17		
1.083	7.98	2.167	6.97	3.250	2.93		

Max.Eff.Inten.(mm/hr)=	83.11	2.96
over (min)	5.00	35.00
Storage Coeff. (min)=	3.02 (ii)	31.87 (ii)
Unit Hyd. Tpeak (min)=	5.00	35.00
Unit Hyd. peak (cms)=	0.27	0.03

TOTALS

PEAK FLOW (cms)=	0.21	0.00	0.207 (iii)
TIME TO PEAK (hrs)=	1.50	2.08	1.50
RUNOFF VOLUME (mm)=	34.95	2.37	17.03
TOTAL RAINFALL (mm)=	36.95	36.95	36.95
RUNOFF COEFFICIENT =	0.95	0.06	0.46

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 33.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
-----
| ADD HYD ( 0105) |
| 1 + 2 = 3 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0103):    4.33    0.628    1.50    23.36
+ ID2= 2 ( 0104):    2.05    0.207    1.50    17.03
=====
ID = 3 ( 0105):    6.38    0.836    1.50    21.32
-----
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| READ STORM |
|          |
| Ptotal= 36.95 mm |
-----
Filename: C:\Users\bjo\AppData\
Local\Temp\
b6c47c87-ffa1-4ea3-b46e-09b9679b04af\ec889e4b
Comments: Barrie_2yr_4hour_Chicago_v2
-----
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.17	0.00	1.33	18.78	2.50	4.89	3.67	2.55
0.33	2.47	1.50	83.11	2.67	4.28	3.83	2.39
0.50	2.82	1.67	24.57	2.83	3.82	4.00	2.26
0.67	3.31	1.83	13.01	3.00	3.46	4.17	2.15
0.83	4.05	2.00	9.01	3.17	3.17		
1.00	5.30	2.17	6.97	3.33	2.93		
1.17	7.98	2.33	5.73	3.50	2.72		

```
-----
| CALIB |
| STANDHYD ( 0106) |
| ID= 1 DT= 5.0 min |
-----
Area (ha)= 0.31
Total Imp(%)= 67.00 Dir. Conn.(%)= 67.00
-----
```

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.21	0.10
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	1.00	2.00

Length (m)= 45.46 40.00
Mannings n = 0.013 0.250

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

----- TRANSFORMED HYETOGRAPH -----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	7.98	2.250	5.73	3.33	2.93
0.167	0.00	1.250	18.78	2.333	5.73	3.42	2.72
0.250	2.47	1.333	18.78	2.417	4.89	3.50	2.72
0.333	2.47	1.417	83.11	2.500	4.89	3.58	2.55
0.417	2.82	1.500	83.11	2.583	4.28	3.67	2.55
0.500	2.82	1.583	24.57	2.667	4.28	3.75	2.39
0.583	3.31	1.667	24.57	2.750	3.82	3.83	2.39
0.667	3.31	1.750	13.01	2.833	3.82	3.92	2.26
0.750	4.05	1.833	13.01	2.917	3.46	4.00	2.26
0.833	4.05	1.917	9.01	3.000	3.46	4.08	2.15
0.917	5.30	2.000	9.01	3.083	3.17	4.17	2.15
1.000	5.30	2.083	6.97	3.167	3.17		
1.083	7.98	2.167	6.97	3.250	2.93		

Max.Eff.Inten.(mm/hr)= 83.11 1.59
over (min) 5.00 40.00
Storage Coeff. (min)= 1.71 (ii) 38.68 (ii)
Unit Hyd. Tpeak (min)= 5.00 40.00
Unit Hyd. peak (cms)= 0.32 0.03

TOTALS

PEAK FLOW (cms)= 0.05 0.00 0.048 (iii)
TIME TO PEAK (hrs)= 1.50 2.25 1.50
RUNOFF VOLUME (mm)= 34.95 1.86 23.95
TOTAL RAINFALL (mm)= 36.95 36.95 36.95
RUNOFF COEFFICIENT = 0.95 0.05 0.65

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 33.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD (0107) |
1 + 2 = 3
ID1= 1 (0105): AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
6.38 0.836 1.50 21.32

```

+ ID2= 2 ( 0106):      0.31   0.048      1.50   23.95
=====
ID = 3 ( 0107):      6.69   0.884      1.50   21.45

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| READ STORM |      Filename: C:\Users\bjo\AppData\
|            |      Local\Temp\
|            |      b6c47c87-ffa1-4ea3-b46e-09b9679b04af\ec889e4b
| Ptotal= 36.95 mm |      Comments: Barrie_2yr_4hour_Chicago_v2
-----

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	18.78	2.50	4.89	3.67	2.55
0.33	2.47	1.50	83.11	2.67	4.28	3.83	2.39
0.50	2.82	1.67	24.57	2.83	3.82	4.00	2.26
0.67	3.31	1.83	13.01	3.00	3.46	4.17	2.15
0.83	4.05	2.00	9.01	3.17	3.17		
1.00	5.30	2.17	6.97	3.33	2.93		
1.17	7.98	2.33	5.73	3.50	2.72		

```

-----
| CALIB |
| STANDHYD ( 0108) |      Area (ha)= 0.46
| ID= 1 DT= 5.0 min |      Total Imp(%)= 40.00      Dir. Conn.(%)= 40.00
-----

```

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.18	0.28
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	55.38	40.00
Mannings n	=	0.013	0.250

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

```

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

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	7.98	2.250	5.73	3.33	2.93
0.167	0.00	1.250	18.78	2.333	5.73	3.42	2.72
0.250	2.47	1.333	18.78	2.417	4.89	3.50	2.72
0.333	2.47	1.417	83.11	2.500	4.89	3.58	2.55
0.417	2.82	1.500	83.11	2.583	4.28	3.67	2.55
0.500	2.82	1.583	24.57	2.667	4.28	3.75	2.39

0.583	3.31	1.667	24.57	2.750	3.82	3.83	2.39
0.667	3.31	1.750	13.01	2.833	3.82	3.92	2.26
0.750	4.05	1.833	13.01	2.917	3.46	4.00	2.26
0.833	4.05	1.917	9.01	3.000	3.46	4.08	2.15
0.917	5.30	2.000	9.01	3.083	3.17	4.17	2.15
1.000	5.30	2.083	6.97	3.167	3.17		
1.083	7.98	2.167	6.97	3.250	2.93		

Max.Eff.Inten.(mm/hr)= 83.11 1.59
over (min) 5.00 40.00
Storage Coeff. (min)= 1.93 (ii) 38.90 (ii)
Unit Hyd. Tpeak (min)= 5.00 40.00
Unit Hyd. peak (cms)= 0.31 0.03

TOTALS

PEAK FLOW (cms)= 0.04 0.00 0.042 (iii)
TIME TO PEAK (hrs)= 1.50 2.25 1.50
RUNOFF VOLUME (mm)= 35.95 1.86 15.45
TOTAL RAINFALL (mm)= 36.95 36.95 36.95
RUNOFF COEFFICIENT = 0.97 0.05 0.42

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 33.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| ADD HYD ( 0109) |
| 1 + 2 = 3 |
-----
          AREA    QPEAK    TPEAK    R.V.
          (ha)    (cms)    (hrs)    (mm)
ID1= 1 ( 0107):    6.69    0.884    1.50    21.45
+ ID2= 2 ( 0108):    0.46    0.042    1.50    15.45
=====
ID = 3 ( 0109):    7.15    0.926    1.50    21.06

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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-----
| READ STORM |      Filename: C:\Users\bjo\AppData\
|            |      Local\Temp\
|            |      b6c47c87-ffa1-4ea3-b46e-09b9679b04af\ec889e4b
| Ptotal= 36.95 mm |      Comments: Barrie_2yr_4hour_Chicago_v2
-----

```

TIME RAIN | TIME RAIN | ' TIME RAIN | TIME RAIN

hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	18.78	2.50	4.89	3.67	2.55
0.33	2.47	1.50	83.11	2.67	4.28	3.83	2.39
0.50	2.82	1.67	24.57	2.83	3.82	4.00	2.26
0.67	3.31	1.83	13.01	3.00	3.46	4.17	2.15
0.83	4.05	2.00	9.01	3.17	3.17		
1.00	5.30	2.17	6.97	3.33	2.93		
1.17	7.98	2.33	5.73	3.50	2.72		

CALIB	
STANDHYD (0110)	Area (ha)= 0.46
ID= 1 DT= 5.0 min	Total Imp(%)= 80.00 Dir. Conn.(%)= 80.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.37	0.09
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	55.68	40.00
Mannings n	=	0.013	0.250

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

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

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	7.98	2.250	5.73	3.33	2.93
0.167	0.00	1.250	18.78	2.333	5.73	3.42	2.72
0.250	2.47	1.333	18.78	2.417	4.89	3.50	2.72
0.333	2.47	1.417	83.11	2.500	4.89	3.58	2.55
0.417	2.82	1.500	83.11	2.583	4.28	3.67	2.55
0.500	2.82	1.583	24.57	2.667	4.28	3.75	2.39
0.583	3.31	1.667	24.57	2.750	3.82	3.83	2.39
0.667	3.31	1.750	13.01	2.833	3.82	3.92	2.26
0.750	4.05	1.833	13.01	2.917	3.46	4.00	2.26
0.833	4.05	1.917	9.01	3.000	3.46	4.08	2.15
0.917	5.30	2.000	9.01	3.083	3.17	4.17	2.15
1.000	5.30	2.083	6.97	3.167	3.17		
1.083	7.98	2.167	6.97	3.250	2.93		

Max.Eff.Inten.(mm/hr)=	83.11	2.93
over (min)	5.00	10.00
Storage Coeff. (min)=	1.94 (ii)	6.30 (ii)
Unit Hyd. Tpeak (min)=	5.00	10.00
Unit Hyd. peak (cms)=	0.31	0.15

		TOTALS
PEAK FLOW (cms)=	0.09	0.086 (iii)

TIME TO PEAK	(hrs)=	1.50	1.58	1.50
RUNOFF VOLUME	(mm)=	35.95	1.86	29.13
TOTAL RAINFALL	(mm)=	36.95	36.95	36.95
RUNOFF COEFFICIENT	=	0.97	0.05	0.79

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 33.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| RESERVOIR( 0111) |
| IN= 2---> OUT= 1 |
| DT= 1.0 min      |
-----

```

	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0160	0.0170
	0.0160	0.0001	0.0000	0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0110)	0.465	0.086	1.50	29.13
OUTFLOW: ID= 1 (0111)	0.465	0.016	1.25	29.13

PEAK FLOW REDUCTION [Qout/Qin](%)= 18.62
TIME SHIFT OF PEAK FLOW (min)=-15.00
MAXIMUM STORAGE USED (ha.m.)= 0.0035

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-----
| ADD HYD ( 0112) |
| 1 + 2 = 3       |
-----

```

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0109):	7.15	0.926	1.50	21.06
+ ID2= 2 (0111):	0.46	0.016	1.25	29.13
=====				
ID = 3 (0112):	7.61	0.942	1.50	21.55

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| RESERVOIR( 0113) |
| IN= 2---> OUT= 1 |
| DT= 1.0 min      |
-----

```

	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)

0.0000	0.0000	0.2410	0.2699
0.0100	0.0274	0.2810	0.2999
0.0170	0.0677	0.3140	0.3309
0.0240	0.1236	0.5430	0.3630
0.0650	0.1601	1.4010	0.3961
0.0870	0.1859	2.6120	0.4304
0.1630	0.2128	3.3210	0.4480
0.2020	0.2408	0.0000	0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0112)	7.615	0.942	1.50	21.55
OUTFLOW: ID= 1 (0113)	7.615	0.036	3.58	20.81

PEAK FLOW REDUCTION [Qout/Qin](%)= 3.82
 TIME SHIFT OF PEAK FLOW (min)=125.00
 MAXIMUM STORAGE USED (ha.m.)= 0.1343

READ STORM	Filename: C:\Users\bjo\AppData\Local\Temp\
	b6c47c87-ffa1-4ea3-b46e-09b9679b04af\ec889e4b
Ptotal= 36.95 mm	Comments: Barrie_2yr_4hour_Chicago_v2

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	18.78	2.50	4.89	3.67	2.55
0.33	2.47	1.50	83.11	2.67	4.28	3.83	2.39
0.50	2.82	1.67	24.57	2.83	3.82	4.00	2.26
0.67	3.31	1.83	13.01	3.00	3.46	4.17	2.15
0.83	4.05	2.00	9.01	3.17	3.17		
1.00	5.30	2.17	6.97	3.33	2.93		
1.17	7.98	2.33	5.73	3.50	2.72		

CALIB	
NASHYD (0114)	Area (ha)= 0.08 Curve Number (CN)= 33.0
ID= 1 DT= 5.0 min	Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= 0.03

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr

0.083	0.00	1.167	7.98	2.250	5.73	3.33	2.93
0.167	0.00	1.250	18.78	2.333	5.73	3.42	2.72
0.250	2.47	1.333	18.78	2.417	4.89	3.50	2.72
0.333	2.47	1.417	83.11	2.500	4.89	3.58	2.55
0.417	2.82	1.500	83.11	2.583	4.28	3.67	2.55
0.500	2.82	1.583	24.57	2.667	4.28	3.75	2.39
0.583	3.31	1.667	24.57	2.750	3.82	3.83	2.39
0.667	3.31	1.750	13.01	2.833	3.82	3.92	2.26
0.750	4.05	1.833	13.01	2.917	3.46	4.00	2.26
0.833	4.05	1.917	9.01	3.000	3.46	4.08	2.15
0.917	5.30	2.000	9.01	3.083	3.17	4.17	2.15
1.000	5.30	2.083	6.97	3.167	3.17		
1.083	7.98	2.167	6.97	3.250	2.93		

Unit Hyd Qpeak (cms)= 0.102

PEAK FLOW (cms)= 0.000 (i)
TIME TO PEAK (hrs)= 1.500
RUNOFF VOLUME (mm)= 0.628
TOTAL RAINFALL (mm)= 36.955
RUNOFF COEFFICIENT = 0.017

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

ADD HYD (0115)				
1	+	2	=	3
		AREA (ha)	QPEAK (cms)	TPEAK (hrs)
		R.V. (mm)		
ID1= 1 (0113):		7.61	0.036	3.58
+ ID2= 2 (0114):		0.08	0.000	1.50
=====				
ID = 3 (0115):		7.69	0.036	3.57
		20.60		

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

READ STORM		Filename: C:\Users\bjo\AppData\Local\Temp\ b6c47c87-ffa1-4ea3-b46e-09b9679b04af\ec889e4b							
Ptotal= 36.95 mm		Comments: Barrie_2yr_4hour_Chicago_v2							
TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	'	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	
0.17	0.00	1.33	18.78	'	2.50	4.89	3.67	2.55	
0.33	2.47	1.50	83.11	'	2.67	4.28	3.83	2.39	
0.50	2.82	1.67	24.57	'	2.83	3.82	4.00	2.26	

0.67	3.31	1.83	13.01	3.00	3.46	4.17	2.15
0.83	4.05	2.00	9.01	3.17	3.17		
1.00	5.30	2.17	6.97	3.33	2.93		
1.17	7.98	2.33	5.73	3.50	2.72		

CALIB							
NASHYD (0116)	Area (ha)=	0.07	Curve Number (CN)=	33.0			
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	# of Linear Res.(N)=	3.00			
	U.H. Tp(hrs)=	0.20					

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	7.98	2.250	5.73	3.33	2.93
0.167	0.00	1.250	18.78	2.333	5.73	3.42	2.72
0.250	2.47	1.333	18.78	2.417	4.89	3.50	2.72
0.333	2.47	1.417	83.11	2.500	4.89	3.58	2.55
0.417	2.82	1.500	83.11	2.583	4.28	3.67	2.55
0.500	2.82	1.583	24.57	2.667	4.28	3.75	2.39
0.583	3.31	1.667	24.57	2.750	3.82	3.83	2.39
0.667	3.31	1.750	13.01	2.833	3.82	3.92	2.26
0.750	4.05	1.833	13.01	2.917	3.46	4.00	2.26
0.833	4.05	1.917	9.01	3.000	3.46	4.08	2.15
0.917	5.30	2.000	9.01	3.083	3.17	4.17	2.15
1.000	5.30	2.083	6.97	3.167	3.17		
1.083	7.98	2.167	6.97	3.250	2.93		

Unit Hyd Qpeak (cms)= 0.013

PEAK FLOW (cms)= 0.000 (i)
TIME TO PEAK (hrs)= 1.667
RUNOFF VOLUME (mm)= 1.852
TOTAL RAINFALL (mm)= 36.955
RUNOFF COEFFICIENT = 0.050

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

ADD HYD (0117)				
1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0115):	7.69	0.036	3.57	20.60


```

+ ID2= 2 ( 0116):      0.07   0.000      1.67      1.85
=====
ID = 3 ( 0117):      7.76   0.036      3.57      20.43

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NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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| READ STORM |      Filename: C:\Users\bjo\AppData\
|            |      Local\Temp\
|            |      b6c47c87-ffa1-4ea3-b46e-09b9679b04af\ec889e4b
| Ptotal= 36.95 mm |      Comments: Barrie_2yr_4hour_Chicago_v2
-----

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	18.78	2.50	4.89	3.67	2.55
0.33	2.47	1.50	83.11	2.67	4.28	3.83	2.39
0.50	2.82	1.67	24.57	2.83	3.82	4.00	2.26
0.67	3.31	1.83	13.01	3.00	3.46	4.17	2.15
0.83	4.05	2.00	9.01	3.17	3.17		
1.00	5.30	2.17	6.97	3.33	2.93		
1.17	7.98	2.33	5.73	3.50	2.72		

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-----
| CALIB |
| NASHYD ( 0203) |      Area (ha)= 0.17      Curve Number (CN)= 33.0
| ID= 1 DT= 5.0 min |      Ia (mm)= 5.00      # of Linear Res.(N)= 3.00
-----
| U.H. Tp(hrs)= 0.03

```

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

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

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TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	7.98	2.250	5.73	3.33	2.93
0.167	0.00	1.250	18.78	2.333	5.73	3.42	2.72
0.250	2.47	1.333	18.78	2.417	4.89	3.50	2.72
0.333	2.47	1.417	83.11	2.500	4.89	3.58	2.55
0.417	2.82	1.500	83.11	2.583	4.28	3.67	2.55
0.500	2.82	1.583	24.57	2.667	4.28	3.75	2.39
0.583	3.31	1.667	24.57	2.750	3.82	3.83	2.39
0.667	3.31	1.750	13.01	2.833	3.82	3.92	2.26
0.750	4.05	1.833	13.01	2.917	3.46	4.00	2.26
0.833	4.05	1.917	9.01	3.000	3.46	4.08	2.15
0.917	5.30	2.000	9.01	3.083	3.17	4.17	2.15
1.000	5.30	2.083	6.97	3.167	3.17		

1.083 7.98 | 2.167 6.97 | 3.250 2.93 |

Unit Hyd Qpeak (cms)= 0.216

PEAK FLOW (cms)= 0.001 (i)

TIME TO PEAK (hrs)= 1.500

RUNOFF VOLUME (mm)= 0.628

TOTAL RAINFALL (mm)= 36.955

RUNOFF COEFFICIENT = 0.017

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

| READ STORM | Filename: C:\Users\bjo\AppData\
| | Local\Temp\
| | b6c47c87-ffa1-4ea3-b46e-09b9679b04af\ec889e4b
| Ptotal= 36.95 mm | Comments: Barrie_2yr_4hour_Chicago_v2

TIME	RAIN	TIME	RAIN	'	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	'	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	18.78		2.50	4.89	3.67	2.55
0.33	2.47	1.50	83.11		2.67	4.28	3.83	2.39
0.50	2.82	1.67	24.57		2.83	3.82	4.00	2.26
0.67	3.31	1.83	13.01		3.00	3.46	4.17	2.15
0.83	4.05	2.00	9.01		3.17	3.17		
1.00	5.30	2.17	6.97		3.33	2.93		
1.17	7.98	2.33	5.73		3.50	2.72		

| CALIB |
| STANDHYD (0202) | Area (ha)= 0.42
| ID= 1 DT= 5.0 min | Total Imp(%)= 54.00 Dir. Conn.(%)= 54.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.23	0.19
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	52.92	40.00
Mannings n	=	0.013	0.250

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

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

TIME RAIN | TIME RAIN | ' TIME RAIN | TIME RAIN
hrs mm/hr | hrs mm/hr | ' hrs mm/hr | hrs mm/hr

0.083	0.00	1.167	7.98	2.250	5.73	3.33	2.93
0.167	0.00	1.250	18.78	2.333	5.73	3.42	2.72
0.250	2.47	1.333	18.78	2.417	4.89	3.50	2.72
0.333	2.47	1.417	83.11	2.500	4.89	3.58	2.55
0.417	2.82	1.500	83.11	2.583	4.28	3.67	2.55
0.500	2.82	1.583	24.57	2.667	4.28	3.75	2.39
0.583	3.31	1.667	24.57	2.750	3.82	3.83	2.39
0.667	3.31	1.750	13.01	2.833	3.82	3.92	2.26
0.750	4.05	1.833	13.01	2.917	3.46	4.00	2.26
0.833	4.05	1.917	9.01	3.000	3.46	4.08	2.15
0.917	5.30	2.000	9.01	3.083	3.17	4.17	2.15
1.000	5.30	2.083	6.97	3.167	3.17		
1.083	7.98	2.167	6.97	3.250	2.93		

Max.Eff.Inten.(mm/hr)= 83.11 1.59
over (min) 5.00 40.00
Storage Coeff. (min)= 1.88 (ii) 38.85 (ii)
Unit Hyd. Tpeak (min)= 5.00 40.00
Unit Hyd. peak (cms)= 0.32 0.03

TOTALS

PEAK FLOW (cms)= 0.05 0.00 0.052 (iii)
TIME TO PEAK (hrs)= 1.50 2.25 1.50
RUNOFF VOLUME (mm)= 34.95 1.86 19.68
TOTAL RAINFALL (mm)= 36.95 36.95 36.95
RUNOFF COEFFICIENT = 0.95 0.05 0.53

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 33.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| ADD HYD ( 0205) |
| 1 + 2 = 3 |
-----
      AREA      QPEAK      TPEAK      R.V.
      (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0202):  0.42  0.052  1.50  19.68
+ ID2= 2 ( 0203):  0.17  0.001  1.50   0.63
=====
ID = 3 ( 0205):  0.59  0.053  1.50  14.19

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

READ STORM	Filename: C:\Users\bjo\AppData\Local\Temp\
	b6c47c87-ffa1-4ea3-b46e-09b9679b04af\ec889e4b
Ptotal= 36.95 mm	Comments: Barrie_2yr_4hour_Chicago_v2

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.17	0.00	1.33	18.78	2.50	4.89	3.67	2.55
0.33	2.47	1.50	83.11	2.67	4.28	3.83	2.39
0.50	2.82	1.67	24.57	2.83	3.82	4.00	2.26
0.67	3.31	1.83	13.01	3.00	3.46	4.17	2.15
0.83	4.05	2.00	9.01	3.17	3.17		
1.00	5.30	2.17	6.97	3.33	2.93		
1.17	7.98	2.33	5.73	3.50	2.72		

CALIB	
STANDHYD (0201)	Area (ha)= 1.68
ID= 1 DT= 5.0 min	Total Imp(%)= 93.00 Dir. Conn.(%)= 93.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	1.56	0.12
Dep. Storage (mm)=	2.00	5.00
Average Slope (%)=	1.00	2.00
Length (m)=	105.86	40.00
Mannings n =	0.013	0.250

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

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

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	1.167	7.98	2.250	5.73	3.33	2.93
0.167	0.00	1.250	18.78	2.333	5.73	3.42	2.72
0.250	2.47	1.333	18.78	2.417	4.89	3.50	2.72
0.333	2.47	1.417	83.11	2.500	4.89	3.58	2.55
0.417	2.82	1.500	83.11	2.583	4.28	3.67	2.55
0.500	2.82	1.583	24.57	2.667	4.28	3.75	2.39
0.583	3.31	1.667	24.57	2.750	3.82	3.83	2.39
0.667	3.31	1.750	13.01	2.833	3.82	3.92	2.26
0.750	4.05	1.833	13.01	2.917	3.46	4.00	2.26
0.833	4.05	1.917	9.01	3.000	3.46	4.08	2.15
0.917	5.30	2.000	9.01	3.083	3.17	4.17	2.15
1.000	5.30	2.083	6.97	3.167	3.17		
1.083	7.98	2.167	6.97	3.250	2.93		

Max.Eff.Inten.(mm/hr)=	83.11	2.93
------------------------	-------	------

over (min)	5.00	10.00	
Storage Coeff. (min)=	2.85 (ii)	5.55 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.28	0.16	
			TOTALS
PEAK FLOW (cms)=	0.35	0.00	0.353 (iii)
TIME TO PEAK (hrs)=	1.50	1.58	1.50
RUNOFF VOLUME (mm)=	34.95	1.86	32.64
TOTAL RAINFALL (mm)=	36.95	36.95	36.95
RUNOFF COEFFICIENT =	0.95	0.05	0.88

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
 CN* = 33.0 Ia = Dep. Storage (Above)
 (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
 THAN THE STORAGE COEFFICIENT.
 (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| RESERVOIR( 0204) |
| IN= 2---> OUT= 1 |
| DT= 1.0 min      |
-----

```

	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.2000	0.0600
	0.1500	0.0010	0.0000	0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0201)	1.681	0.353	1.50	32.64
OUTFLOW: ID= 1 (0204)	1.681	0.158	1.58	32.64

PEAK FLOW REDUCTION [Qout/Qin](%)= 44.83
 TIME SHIFT OF PEAK FLOW (min)= 5.00
 MAXIMUM STORAGE USED (ha.m.)= 0.0108

```

-----
| ADD HYD ( 0206) |
| 1 + 2 = 3      |
-----

```

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0204):	1.68	0.158	1.58	32.64
+ ID2= 2 (0205):	0.59	0.053	1.50	14.19
=====				
ID = 3 (0206):	2.27	0.209	1.50	27.84

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| ADD HYD (0301) |
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0117):	7.76	0.036	3.57	20.43
+ ID2= 2 (0206):	2.27	0.209	1.50	27.84
=====				
ID = 3 (0301):	10.04	0.225	1.50	22.11

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

4-hour Chicago
5-yr

=====

```
V   V   I   SSSSS   U   U   A   L           (v 5.1.2004)
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
  WW     I   SSSSS   UUUUU   A   A   LLLLL
```

```
  000   TTTTT   TTTTT   H   H   Y   Y   M   M   000   TM
O   O   T       T   H   H   Y Y   MM MM   O   O
O   O   T       T   H   H   Y   M   M   O   O
  000   T       T   H   H   Y   M   M   000
```

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

Input filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\V02\voin.dat

Output filename:

C:\Users\bjo\AppData\Local\Civica\XH5\e91bc6c1-1ed6-4e95-932d-66b6211c2905\0d7a7d9b-5c4c-4449-bf8e-9b375f245d03\scenario

Summary filename:

C:\Users\bjo\AppData\Local\Civica\XH5\e91bc6c1-1ed6-4e95-932d-66b6211c2905\0d7a7d9b-5c4c-4449-bf8e-9b375f245d03\scenario

DATE: 10/30/2019

TIME: 02:52:52

USER:

COMMENTS: _____

```
*****
** SIMULATION : Run 02           **
*****
```

| READ STORM |
|

Filename: C:\Users\bjo\AppData\
Local\Temp\

Ptotal= 50.52 mm	b6c47c87-ffa1-4ea3-b46e-09b9679b04af\863046e4 Comments: Barrie_5yr_4hour_Chicago_v2
------------------	--

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	25.64	2.50	6.96	3.67	3.68
0.33	3.57	1.50	108.92	2.67	6.12	3.83	3.47
0.50	4.07	1.67	33.31	2.83	5.48	4.00	3.28
0.67	4.76	1.83	17.99	3.00	4.97	4.17	3.12
0.83	5.79	2.00	12.60	3.17	4.56		
1.00	7.53	2.17	9.82	3.33	4.22		
1.17	11.20	2.33	8.12	3.50	3.93		

CALIB	
NASHYD (0102)	Area (ha)= 0.94 Curve Number (CN)= 33.0
ID= 1 DT= 5.0 min	Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= 0.11

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

---- TRANSFORMED HYETOGRAPH ----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	11.20	2.250	8.12	3.33	4.22
0.167	0.00	1.250	25.64	2.333	8.12	3.42	3.93
0.250	3.57	1.333	25.64	2.417	6.96	3.50	3.93
0.333	3.57	1.417	108.92	2.500	6.96	3.58	3.68
0.417	4.07	1.500	108.92	2.583	6.12	3.67	3.68
0.500	4.07	1.583	33.31	2.667	6.12	3.75	3.47
0.583	4.76	1.667	33.31	2.750	5.48	3.83	3.47
0.667	4.76	1.750	17.99	2.833	5.48	3.92	3.28
0.750	5.79	1.833	17.99	2.917	4.97	4.00	3.28
0.833	5.79	1.917	12.60	3.000	4.97	4.08	3.12
0.917	7.53	2.000	12.60	3.083	4.56	4.17	3.12
1.000	7.53	2.083	9.82	3.167	4.56		
1.083	11.20	2.167	9.82	3.250	4.22		

Unit Hyd Qpeak (cms)= 0.326

PEAK FLOW (cms)= 0.012 (i)

TIME TO PEAK (hrs)= 1.583

RUNOFF VOLUME (mm)= 3.624

TOTAL RAINFALL (mm)= 50.518

RUNOFF COEFFICIENT = 0.072

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

```

-----
| READ STORM | Filename: C:\Users\bjo\AppData\
|            | Local\Temp\
|            | b6c47c87-ffa1-4ea3-b46e-09b9679b04af\863046e4
| Ptotal= 50.52 mm | Comments: Barrie_5yr_4hour_Chicago_v2
-----

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	25.64	2.50	6.96	3.67	3.68
0.33	3.57	1.50	108.92	2.67	6.12	3.83	3.47
0.50	4.07	1.67	33.31	2.83	5.48	4.00	3.28
0.67	4.76	1.83	17.99	3.00	4.97	4.17	3.12
0.83	5.79	2.00	12.60	3.17	4.56		
1.00	7.53	2.17	9.82	3.33	4.22		
1.17	11.20	2.33	8.12	3.50	3.93		

```

-----
| CALIB |
| STANDHYD ( 0101) | Area (ha)= 3.39
| ID= 1 DT= 5.0 min | Total Imp(%)= 83.00 Dir. Conn.(%)= 83.00
-----

```

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	2.81	0.58
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	150.33	40.00
Mannings n	=	0.013	0.250

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

```

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

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	11.20	2.250	8.12	3.33	4.22
0.167	0.00	1.250	25.64	2.333	8.12	3.42	3.93
0.250	3.57	1.333	25.64	2.417	6.96	3.50	3.93
0.333	3.57	1.417	108.92	2.500	6.96	3.58	3.68
0.417	4.07	1.500	108.92	2.583	6.12	3.67	3.68
0.500	4.07	1.583	33.31	2.667	6.12	3.75	3.47
0.583	4.76	1.667	33.31	2.750	5.48	3.83	3.47
0.667	4.76	1.750	17.99	2.833	5.48	3.92	3.28
0.750	5.79	1.833	17.99	2.917	4.97	4.00	3.28
0.833	5.79	1.917	12.60	3.000	4.97	4.08	3.12
0.917	7.53	2.000	12.60	3.083	4.56	4.17	3.12

1.000	7.53		2.083	9.82		3.167	4.56	
1.083	11.20		2.167	9.82		3.250	4.22	

Max.Eff.Inten.(mm/hr)=	108.92		5.85	
over (min)	5.00		10.00	
Storage Coeff. (min)=	3.15 (ii)		6.77 (ii)	
Unit Hyd. Tpeak (min)=	5.00		10.00	
Unit Hyd. peak (cms)=	0.27		0.14	
				TOTALS
PEAK FLOW (cms)=	0.82		0.01	0.829 (iii)
TIME TO PEAK (hrs)=	1.50		1.58	1.50
RUNOFF VOLUME (mm)=	48.52		3.69	40.90
TOTAL RAINFALL (mm)=	50.52		50.52	50.52
RUNOFF COEFFICIENT =	0.96		0.07	0.81

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 33.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0103)				
1 + 2 = 3				
	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0101):	3.39	0.829	1.50	40.90
+ ID2= 2 (0102):	0.94	0.012	1.58	3.62
=====				
ID = 3 (0103):	4.33	0.841	1.50	32.81

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

READ STORM	Filename: C:\Users\bjo\AppData\
	Local\Temp\
	b6c47c87-ffa1-4ea3-b46e-09b9679b04af\863046e4
Ptotal= 50.52 mm	Comments: Barrie_5yr_4hour_Chicago_v2

TIME	RAIN		TIME	RAIN		TIME	RAIN		TIME	RAIN
hrs	mm/hr		hrs	mm/hr		hrs	mm/hr		hrs	mm/hr
0.17	0.00		1.33	25.64		2.50	6.96		3.67	3.68
0.33	3.57		1.50	108.92		2.67	6.12		3.83	3.47
0.50	4.07		1.67	33.31		2.83	5.48		4.00	3.28
0.67	4.76		1.83	17.99		3.00	4.97		4.17	3.12

0.83	5.79	2.00	12.60	3.17	4.56
1.00	7.53	2.17	9.82	3.33	4.22
1.17	11.20	2.33	8.12	3.50	3.93

CALIB	
STANDHYD (0104)	Area (ha)= 2.05
ID= 1 DT= 5.0 min	Total Imp(%)= 55.00 Dir. Conn.(%)= 45.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.13	0.92
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	116.90	40.00
Mannings n	=	0.013	0.250

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

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

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	11.20	2.250	8.12	3.33	4.22
0.167	0.00	1.250	25.64	2.333	8.12	3.42	3.93
0.250	3.57	1.333	25.64	2.417	6.96	3.50	3.93
0.333	3.57	1.417	108.92	2.500	6.96	3.58	3.68
0.417	4.07	1.500	108.92	2.583	6.12	3.67	3.68
0.500	4.07	1.583	33.31	2.667	6.12	3.75	3.47
0.583	4.76	1.667	33.31	2.750	5.48	3.83	3.47
0.667	4.76	1.750	17.99	2.833	5.48	3.92	3.28
0.750	5.79	1.833	17.99	2.917	4.97	4.00	3.28
0.833	5.79	1.917	12.60	3.000	4.97	4.08	3.12
0.917	7.53	2.000	12.60	3.083	4.56	4.17	3.12
1.000	7.53	2.083	9.82	3.167	4.56		
1.083	11.20	2.167	9.82	3.250	4.22		

Max.Eff.Inten.(mm/hr)=	108.92	6.16
over (min)	5.00	25.00
Storage Coeff. (min)=	2.71 (ii)	24.23 (ii)
Unit Hyd. Tpeak (min)=	5.00	25.00
Unit Hyd. peak (cms)=	0.29	0.05

			TOTALS
PEAK FLOW (cms)=	0.27	0.01	0.276 (iii)
TIME TO PEAK (hrs)=	1.50	1.92	1.50
RUNOFF VOLUME (mm)=	48.52	4.60	24.36
TOTAL RAINFALL (mm)=	50.52	50.52	50.52
RUNOFF COEFFICIENT =	0.96	0.09	0.48

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 33.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
-----
| ADD HYD ( 0105) |
| 1 + 2 = 3 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0103):    4.33    0.841    1.50    32.81
+ ID2= 2 ( 0104):    2.05    0.276    1.50    24.36
=====
ID = 3 ( 0105):    6.38    1.116    1.50    30.09
-----
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| READ STORM |
| Ptotal= 50.52 mm |
-----
Filename: C:\Users\bjo\AppData\
Local\Temp\
b6c47c87-ffa1-4ea3-b46e-09b9679b04af\863046e4
Comments: Barrie_5yr_4hour_Chicago_v2
-----
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.17	0.00	1.33	25.64	2.50	6.96	3.67	3.68
0.33	3.57	1.50	108.92	2.67	6.12	3.83	3.47
0.50	4.07	1.67	33.31	2.83	5.48	4.00	3.28
0.67	4.76	1.83	17.99	3.00	4.97	4.17	3.12
0.83	5.79	2.00	12.60	3.17	4.56		
1.00	7.53	2.17	9.82	3.33	4.22		
1.17	11.20	2.33	8.12	3.50	3.93		

```
-----
| CALIB |
| STANDHYD ( 0106) |
| ID= 1 DT= 5.0 min |
-----
Area (ha)= 0.31
Total Imp(%)= 67.00 Dir. Conn.(%)= 67.00
-----
```

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.21	0.10
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	1.00	2.00

Length (m)= 45.46 40.00
Mannings n = 0.013 0.250

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	11.20	2.250	8.12	3.33	4.22
0.167	0.00	1.250	25.64	2.333	8.12	3.42	3.93
0.250	3.57	1.333	25.64	2.417	6.96	3.50	3.93
0.333	3.57	1.417	108.92	2.500	6.96	3.58	3.68
0.417	4.07	1.500	108.92	2.583	6.12	3.67	3.68
0.500	4.07	1.583	33.31	2.667	6.12	3.75	3.47
0.583	4.76	1.667	33.31	2.750	5.48	3.83	3.47
0.667	4.76	1.750	17.99	2.833	5.48	3.92	3.28
0.750	5.79	1.833	17.99	2.917	4.97	4.00	3.28
0.833	5.79	1.917	12.60	3.000	4.97	4.08	3.12
0.917	7.53	2.000	12.60	3.083	4.56	4.17	3.12
1.000	7.53	2.083	9.82	3.167	4.56		
1.083	11.20	2.167	9.82	3.250	4.22		

Max.Eff.Inten.(mm/hr)= 108.92 3.66
over (min) 5.00 30.00
Storage Coeff. (min)= 1.54 (ii) 28.05 (ii)
Unit Hyd. Tpeak (min)= 5.00 30.00
Unit Hyd. peak (cms)= 0.33 0.04

TOTALS

PEAK FLOW (cms)= 0.06 0.00 0.063 (iii)
TIME TO PEAK (hrs)= 1.50 2.00 1.50
RUNOFF VOLUME (mm)= 48.52 3.69 33.67
TOTAL RAINFALL (mm)= 50.52 50.52 50.52
RUNOFF COEFFICIENT = 0.96 0.07 0.67

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 33.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD (0107) |
1 + 2 = 3
ID1= 1 (0105): AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
6.38 1.116 1.50 30.09

```

+ ID2= 2 ( 0106):      0.31   0.063      1.50   33.67
=====
ID = 3 ( 0107):      6.69   1.179      1.50   30.26

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| READ STORM |      Filename: C:\Users\bjo\AppData\
|            |      Local\Temp\
|            |      b6c47c87-ffa1-4ea3-b46e-09b9679b04af\863046e4
| Ptotal= 50.52 mm |      Comments: Barrie_5yr_4hour_Chicago_v2
-----

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	25.64	2.50	6.96	3.67	3.68
0.33	3.57	1.50	108.92	2.67	6.12	3.83	3.47
0.50	4.07	1.67	33.31	2.83	5.48	4.00	3.28
0.67	4.76	1.83	17.99	3.00	4.97	4.17	3.12
0.83	5.79	2.00	12.60	3.17	4.56		
1.00	7.53	2.17	9.82	3.33	4.22		
1.17	11.20	2.33	8.12	3.50	3.93		

```

-----
| CALIB |
| STANDHYD ( 0108) |      Area (ha)= 0.46
| ID= 1 DT= 5.0 min |      Total Imp(%)= 40.00      Dir. Conn.(%)= 40.00
-----

```

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.18	0.28
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	55.38	40.00
Mannings n	=	0.013	0.250

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

```

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

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	11.20	2.250	8.12	3.33	4.22
0.167	0.00	1.250	25.64	2.333	8.12	3.42	3.93
0.250	3.57	1.333	25.64	2.417	6.96	3.50	3.93
0.333	3.57	1.417	108.92	2.500	6.96	3.58	3.68
0.417	4.07	1.500	108.92	2.583	6.12	3.67	3.68
0.500	4.07	1.583	33.31	2.667	6.12	3.75	3.47

0.583	4.76	1.667	33.31	2.750	5.48	3.83	3.47
0.667	4.76	1.750	17.99	2.833	5.48	3.92	3.28
0.750	5.79	1.833	17.99	2.917	4.97	4.00	3.28
0.833	5.79	1.917	12.60	3.000	4.97	4.08	3.12
0.917	7.53	2.000	12.60	3.083	4.56	4.17	3.12
1.000	7.53	2.083	9.82	3.167	4.56		
1.083	11.20	2.167	9.82	3.250	4.22		

Max.Eff.Inten.(mm/hr)= 108.92 3.66
over (min) 5.00 30.00
Storage Coeff. (min)= 1.73 (ii) 28.25 (ii)
Unit Hyd. Tpeak (min)= 5.00 30.00
Unit Hyd. peak (cms)= 0.32 0.04

TOTALS

PEAK FLOW (cms)= 0.06 0.00 0.056 (iii)
TIME TO PEAK (hrs)= 1.50 2.00 1.50
RUNOFF VOLUME (mm)= 49.52 3.69 21.99
TOTAL RAINFALL (mm)= 50.52 50.52 50.52
RUNOFF COEFFICIENT = 0.98 0.07 0.44

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 33.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| ADD HYD ( 0109) |
| 1 + 2 = 3 |
-----
          AREA    QPEAK    TPEAK    R.V.
          (ha)    (cms)    (hrs)    (mm)
ID1= 1 ( 0107):    6.69    1.179    1.50    30.26
+ ID2= 2 ( 0108):    0.46    0.056    1.50    21.99
=====
ID = 3 ( 0109):    7.15    1.235    1.50    29.72

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| READ STORM |      Filename: C:\Users\bjo\AppData\
|             |      Local\Temp\
|             |      b6c47c87-ffa1-4ea3-b46e-09b9679b04af\863046e4
| Ptotal= 50.52 mm |      Comments: Barrie_5yr_4hour_Chicago_v2
-----

```

TIME RAIN | TIME RAIN | ' TIME RAIN | TIME RAIN

hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	25.64	2.50	6.96	3.67	3.68
0.33	3.57	1.50	108.92	2.67	6.12	3.83	3.47
0.50	4.07	1.67	33.31	2.83	5.48	4.00	3.28
0.67	4.76	1.83	17.99	3.00	4.97	4.17	3.12
0.83	5.79	2.00	12.60	3.17	4.56		
1.00	7.53	2.17	9.82	3.33	4.22		
1.17	11.20	2.33	8.12	3.50	3.93		

CALIB	
STANDHYD (0110)	Area (ha)= 0.46
ID= 1 DT= 5.0 min	Total Imp(%)= 80.00 Dir. Conn.(%)= 80.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.37	0.09
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	55.68	40.00
Mannings n	=	0.013	0.250

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

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

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	11.20	2.250	8.12	3.33	4.22
0.167	0.00	1.250	25.64	2.333	8.12	3.42	3.93
0.250	3.57	1.333	25.64	2.417	6.96	3.50	3.93
0.333	3.57	1.417	108.92	2.500	6.96	3.58	3.68
0.417	4.07	1.500	108.92	2.583	6.12	3.67	3.68
0.500	4.07	1.583	33.31	2.667	6.12	3.75	3.47
0.583	4.76	1.667	33.31	2.750	5.48	3.83	3.47
0.667	4.76	1.750	17.99	2.833	5.48	3.92	3.28
0.750	5.79	1.833	17.99	2.917	4.97	4.00	3.28
0.833	5.79	1.917	12.60	3.000	4.97	4.08	3.12
0.917	7.53	2.000	12.60	3.083	4.56	4.17	3.12
1.000	7.53	2.083	9.82	3.167	4.56		
1.083	11.20	2.167	9.82	3.250	4.22		

Max.Eff.Inten.(mm/hr)=	108.92	5.85
over (min)	5.00	10.00
Storage Coeff. (min)=	1.74 (ii)	5.65 (ii)
Unit Hyd. Tpeak (min)=	5.00	10.00
Unit Hyd. peak (cms)=	0.32	0.15

PEAK FLOW	(cms)=	0.11	0.00	*TOTALS*
				0.113 (iii)

TIME TO PEAK	(hrs)=	1.50	1.58	1.50
RUNOFF VOLUME	(mm)=	49.52	3.69	40.35
TOTAL RAINFALL	(mm)=	50.52	50.52	50.52
RUNOFF COEFFICIENT	=	0.98	0.07	0.80

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 33.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| RESERVOIR( 0111)|
| IN= 2---> OUT= 1 |
| DT= 1.0 min      |
-----

```

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.0160	0.0170
0.0160	0.0001	0.0000	0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0110)	0.465	0.113	1.50	40.35
OUTFLOW: ID= 1 (0111)	0.465	0.016	1.22	40.34

PEAK FLOW REDUCTION [Qout/Qin](%)= 14.13
TIME SHIFT OF PEAK FLOW (min)=-17.00
MAXIMUM STORAGE USED (ha.m.)= 0.0052

```

-----
| ADD HYD ( 0112)|
| 1 + 2 = 3      |
-----

```

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0109):	7.15	1.235	1.50	29.72
+ ID2= 2 (0111):	0.46	0.016	1.22	40.34
=====				
ID = 3 (0112):	7.61	1.251	1.50	30.37

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| RESERVOIR( 0113)|
| IN= 2---> OUT= 1 |
| DT= 1.0 min      |
-----

```

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
------------------	--------------------	------------------	--------------------

0.0000	0.0000	0.2410	0.2699
0.0100	0.0274	0.2810	0.2999
0.0170	0.0677	0.3140	0.3309
0.0240	0.1236	0.5430	0.3630
0.0650	0.1601	1.4010	0.3961
0.0870	0.1859	2.6120	0.4304
0.1630	0.2128	3.3210	0.4480
0.2020	0.2408	0.0000	0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0112)	7.615	1.251	1.50	30.37
OUTFLOW: ID= 1 (0113)	7.615	0.073	3.23	29.44

PEAK FLOW REDUCTION [Qout/Qin](%)= 5.83
 TIME SHIFT OF PEAK FLOW (min)=104.00
 MAXIMUM STORAGE USED (ha.m.)= 0.1694

READ STORM	Filename: C:\Users\bjo\AppData\Local\Temp\
	b6c47c87-ffa1-4ea3-b46e-09b9679b04af\863046e4
Ptotal= 50.52 mm	Comments: Barrie_5yr_4hour_Chicago_v2

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	25.64	2.50	6.96	3.67	3.68
0.33	3.57	1.50	108.92	2.67	6.12	3.83	3.47
0.50	4.07	1.67	33.31	2.83	5.48	4.00	3.28
0.67	4.76	1.83	17.99	3.00	4.97	4.17	3.12
0.83	5.79	2.00	12.60	3.17	4.56		
1.00	7.53	2.17	9.82	3.33	4.22		
1.17	11.20	2.33	8.12	3.50	3.93		

CALIB	
NASHYD (0114)	Area (ha)= 0.08 Curve Number (CN)= 33.0
ID= 1 DT= 5.0 min	Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= 0.03

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr

0.083	0.00	1.167	11.20	2.250	8.12	3.33	4.22
0.167	0.00	1.250	25.64	2.333	8.12	3.42	3.93
0.250	3.57	1.333	25.64	2.417	6.96	3.50	3.93
0.333	3.57	1.417	108.92	2.500	6.96	3.58	3.68
0.417	4.07	1.500	108.92	2.583	6.12	3.67	3.68
0.500	4.07	1.583	33.31	2.667	6.12	3.75	3.47
0.583	4.76	1.667	33.31	2.750	5.48	3.83	3.47
0.667	4.76	1.750	17.99	2.833	5.48	3.92	3.28
0.750	5.79	1.833	17.99	2.917	4.97	4.00	3.28
0.833	5.79	1.917	12.60	3.000	4.97	4.08	3.12
0.917	7.53	2.000	12.60	3.083	4.56	4.17	3.12
1.000	7.53	2.083	9.82	3.167	4.56		
1.083	11.20	2.167	9.82	3.250	4.22		

Unit Hyd Qpeak (cms)= 0.102

PEAK FLOW (cms)= 0.001 (i)
TIME TO PEAK (hrs)= 1.500
RUNOFF VOLUME (mm)= 1.243
TOTAL RAINFALL (mm)= 50.518
RUNOFF COEFFICIENT = 0.025

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

ADD HYD (0115)				
1	+	2	=	3
		AREA (ha)	QPEAK (cms)	TPEAK (hrs)
		R.V. (mm)		
ID1= 1 (0113):		7.61	0.073	3.23
+ ID2= 2 (0114):		0.08	0.001	1.50
=====				
ID = 3 (0115):		7.69	0.073	3.23
		29.14		

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

READ STORM		Filename: C:\Users\bjo\AppData\Local\Temp\ b6c47c87-ffa1-4ea3-b46e-09b9679b04af\863046e4							
Ptotal= 50.52 mm		Comments: Barrie_5yr_4hour_Chicago_v2							
		TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
		0.17	0.00	1.33	25.64	2.50	6.96	3.67	3.68
		0.33	3.57	1.50	108.92	2.67	6.12	3.83	3.47
		0.50	4.07	1.67	33.31	2.83	5.48	4.00	3.28

0.67	4.76	1.83	17.99	3.00	4.97	4.17	3.12
0.83	5.79	2.00	12.60	3.17	4.56		
1.00	7.53	2.17	9.82	3.33	4.22		
1.17	11.20	2.33	8.12	3.50	3.93		

CALIB							
NASHYD (0116)	Area (ha)=	0.07	Curve Number (CN)=	33.0			
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	# of Linear Res.(N)=	3.00			
	U.H. Tp(hrs)=	0.20					

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	11.20	2.250	8.12	3.33	4.22
0.167	0.00	1.250	25.64	2.333	8.12	3.42	3.93
0.250	3.57	1.333	25.64	2.417	6.96	3.50	3.93
0.333	3.57	1.417	108.92	2.500	6.96	3.58	3.68
0.417	4.07	1.500	108.92	2.583	6.12	3.67	3.68
0.500	4.07	1.583	33.31	2.667	6.12	3.75	3.47
0.583	4.76	1.667	33.31	2.750	5.48	3.83	3.47
0.667	4.76	1.750	17.99	2.833	5.48	3.92	3.28
0.750	5.79	1.833	17.99	2.917	4.97	4.00	3.28
0.833	5.79	1.917	12.60	3.000	4.97	4.08	3.12
0.917	7.53	2.000	12.60	3.083	4.56	4.17	3.12
1.000	7.53	2.083	9.82	3.167	4.56		
1.083	11.20	2.167	9.82	3.250	4.22		

Unit Hyd Qpeak (cms)= 0.013

PEAK FLOW (cms)= 0.001 (i)
TIME TO PEAK (hrs)= 1.667
RUNOFF VOLUME (mm)= 3.675
TOTAL RAINFALL (mm)= 50.518
RUNOFF COEFFICIENT = 0.073

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

ADD HYD (0117)				
1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0115):	7.69	0.073	3.23	29.14

```

+ ID2= 2 ( 0116):      0.07   0.001      1.67      3.68
=====
ID = 3 ( 0117):      7.76   0.073      3.23      28.91

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NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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| READ STORM |      Filename: C:\Users\bjo\AppData\
|            |      Local\Temp\
|            |      b6c47c87-ffa1-4ea3-b46e-09b9679b04af\863046e4
| Ptotal= 50.52 mm |      Comments: Barrie_5yr_4hour_Chicago_v2
|            |
-----

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	25.64	2.50	6.96	3.67	3.68
0.33	3.57	1.50	108.92	2.67	6.12	3.83	3.47
0.50	4.07	1.67	33.31	2.83	5.48	4.00	3.28
0.67	4.76	1.83	17.99	3.00	4.97	4.17	3.12
0.83	5.79	2.00	12.60	3.17	4.56		
1.00	7.53	2.17	9.82	3.33	4.22		
1.17	11.20	2.33	8.12	3.50	3.93		

```

-----
| CALIB      |
| NASHYD ( 0203) |      Area (ha)= 0.17      Curve Number (CN)= 33.0
| ID= 1 DT= 5.0 min |      Ia (mm)= 5.00      # of Linear Res.(N)= 3.00
|            |      U.H. Tp(hrs)= 0.03
-----

```

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

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

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TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	11.20	2.250	8.12	3.33	4.22
0.167	0.00	1.250	25.64	2.333	8.12	3.42	3.93
0.250	3.57	1.333	25.64	2.417	6.96	3.50	3.93
0.333	3.57	1.417	108.92	2.500	6.96	3.58	3.68
0.417	4.07	1.500	108.92	2.583	6.12	3.67	3.68
0.500	4.07	1.583	33.31	2.667	6.12	3.75	3.47
0.583	4.76	1.667	33.31	2.750	5.48	3.83	3.47
0.667	4.76	1.750	17.99	2.833	5.48	3.92	3.28
0.750	5.79	1.833	17.99	2.917	4.97	4.00	3.28
0.833	5.79	1.917	12.60	3.000	4.97	4.08	3.12
0.917	7.53	2.000	12.60	3.083	4.56	4.17	3.12
1.000	7.53	2.083	9.82	3.167	4.56		

1.083 11.20 | 2.167 9.82 | 3.250 4.22 |

Unit Hyd Qpeak (cms)= 0.216

PEAK FLOW (cms)= 0.001 (i)

TIME TO PEAK (hrs)= 1.500

RUNOFF VOLUME (mm)= 1.243

TOTAL RAINFALL (mm)= 50.518

RUNOFF COEFFICIENT = 0.025

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

| READ STORM | Filename: C:\Users\bjo\AppData\
| | Local\Temp\
| | b6c47c87-ffa1-4ea3-b46e-09b9679b04af\863046e4
| Ptotal= 50.52 mm | Comments: Barrie_5yr_4hour_Chicago_v2

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	25.64	2.50	6.96	3.67	3.68
0.33	3.57	1.50	108.92	2.67	6.12	3.83	3.47
0.50	4.07	1.67	33.31	2.83	5.48	4.00	3.28
0.67	4.76	1.83	17.99	3.00	4.97	4.17	3.12
0.83	5.79	2.00	12.60	3.17	4.56		
1.00	7.53	2.17	9.82	3.33	4.22		
1.17	11.20	2.33	8.12	3.50	3.93		

| CALIB |
| STANDHYD (0202) | Area (ha)= 0.42
| ID= 1 DT= 5.0 min | Total Imp(%)= 54.00 Dir. Conn.(%)= 54.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.23	0.19
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	52.92	40.00
Mannings n	=	0.013	0.250

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

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

0.083	0.00	1.167	11.20	2.250	8.12	3.33	4.22
0.167	0.00	1.250	25.64	2.333	8.12	3.42	3.93
0.250	3.57	1.333	25.64	2.417	6.96	3.50	3.93
0.333	3.57	1.417	108.92	2.500	6.96	3.58	3.68
0.417	4.07	1.500	108.92	2.583	6.12	3.67	3.68
0.500	4.07	1.583	33.31	2.667	6.12	3.75	3.47
0.583	4.76	1.667	33.31	2.750	5.48	3.83	3.47
0.667	4.76	1.750	17.99	2.833	5.48	3.92	3.28
0.750	5.79	1.833	17.99	2.917	4.97	4.00	3.28
0.833	5.79	1.917	12.60	3.000	4.97	4.08	3.12
0.917	7.53	2.000	12.60	3.083	4.56	4.17	3.12
1.000	7.53	2.083	9.82	3.167	4.56		
1.083	11.20	2.167	9.82	3.250	4.22		

Max.Eff.Inten.(mm/hr)= 108.92 3.66
over (min) 5.00 30.00
Storage Coeff. (min)= 1.69 (ii) 28.20 (ii)
Unit Hyd. Tpeak (min)= 5.00 30.00
Unit Hyd. peak (cms)= 0.32 0.04

TOTALS

PEAK FLOW (cms)= 0.07 0.00 0.069 (iii)
TIME TO PEAK (hrs)= 1.50 2.00 1.50
RUNOFF VOLUME (mm)= 48.52 3.69 27.86
TOTAL RAINFALL (mm)= 50.52 50.52 50.52
RUNOFF COEFFICIENT = 0.96 0.07 0.55

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 33.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| ADD HYD ( 0205) |
| 1 + 2 = 3 |
-----
          AREA    QPEAK    TPEAK    R.V.
          (ha)    (cms)    (hrs)    (mm)
ID1= 1 ( 0202):  0.42  0.069  1.50  27.86
+ ID2= 2 ( 0203):  0.17  0.001  1.50  1.24
=====
ID = 3 ( 0205):  0.59  0.070  1.50  20.19

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

READ STORM	Filename: C:\Users\bjo\AppData\Local\Temp\
	b6c47c87-ffa1-4ea3-b46e-09b9679b04af\863046e4
Ptotal= 50.52 mm	Comments: Barrie_5yr_4hour_Chicago_v2

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.17	0.00	1.33	25.64	2.50	6.96	3.67	3.68
0.33	3.57	1.50	108.92	2.67	6.12	3.83	3.47
0.50	4.07	1.67	33.31	2.83	5.48	4.00	3.28
0.67	4.76	1.83	17.99	3.00	4.97	4.17	3.12
0.83	5.79	2.00	12.60	3.17	4.56		
1.00	7.53	2.17	9.82	3.33	4.22		
1.17	11.20	2.33	8.12	3.50	3.93		

CALIB	
STANDHYD (0201)	Area (ha)= 1.68
ID= 1 DT= 5.0 min	Total Imp(%)= 93.00 Dir. Conn.(%)= 93.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	1.56	0.12
Dep. Storage (mm)=	2.00	5.00
Average Slope (%)=	1.00	2.00
Length (m)=	105.86	40.00
Mannings n =	0.013	0.250

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

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

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	1.167	11.20	2.250	8.12	3.33	4.22
0.167	0.00	1.250	25.64	2.333	8.12	3.42	3.93
0.250	3.57	1.333	25.64	2.417	6.96	3.50	3.93
0.333	3.57	1.417	108.92	2.500	6.96	3.58	3.68
0.417	4.07	1.500	108.92	2.583	6.12	3.67	3.68
0.500	4.07	1.583	33.31	2.667	6.12	3.75	3.47
0.583	4.76	1.667	33.31	2.750	5.48	3.83	3.47
0.667	4.76	1.750	17.99	2.833	5.48	3.92	3.28
0.750	5.79	1.833	17.99	2.917	4.97	4.00	3.28
0.833	5.79	1.917	12.60	3.000	4.97	4.08	3.12
0.917	7.53	2.000	12.60	3.083	4.56	4.17	3.12
1.000	7.53	2.083	9.82	3.167	4.56		
1.083	11.20	2.167	9.82	3.250	4.22		

Max.Eff.Inten.(mm/hr)=	108.92	5.85
------------------------	--------	------

over (min)	5.00	5.00	
Storage Coeff. (min)=	2.55 (ii)	4.98 (ii)	
Unit Hyd. Tpeak (min)=	5.00	5.00	
Unit Hyd. peak (cms)=	0.29	0.22	
			TOTALS
PEAK FLOW (cms)=	0.47	0.00	0.468 (iii)
TIME TO PEAK (hrs)=	1.50	1.50	1.50
RUNOFF VOLUME (mm)=	48.52	3.69	45.38
TOTAL RAINFALL (mm)=	50.52	50.52	50.52
RUNOFF COEFFICIENT =	0.96	0.07	0.90

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
 CN* = 33.0 Ia = Dep. Storage (Above)
 (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
 THAN THE STORAGE COEFFICIENT.
 (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| RESERVOIR( 0204) |
| IN= 2---> OUT= 1 |
| DT= 1.0 min      |
-----

```

	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.2000	0.0600
	0.1500	0.0010	0.0000	0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0201)	1.681	0.468	1.50	45.38
OUTFLOW: ID= 1 (0204)	1.681	0.165	1.63	45.38

PEAK FLOW REDUCTION [Qout/Qin](%)= 35.22
 TIME SHIFT OF PEAK FLOW (min)= 8.00
 MAXIMUM STORAGE USED (ha.m.)= 0.0184

```

-----
| ADD HYD ( 0206) |
| 1 + 2 = 3      |
-----

```

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0204):	1.68	0.165	1.63	45.38
+ ID2= 2 (0205):	0.59	0.070	1.50	20.19
=====				
ID = 3 (0206):	2.27	0.230	1.50	38.83

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| ADD HYD ( 0301) |
| 1 + 2 = 3 |
-----
      AREA      QPEAK      TPEAK      R.V.
      (ha)      (cms)      (hrs)      (mm)
      ID1= 1 ( 0117):      7.76      0.073      3.23      28.91
+ ID2= 2 ( 0206):      2.27      0.230      1.50      38.83
=====
      ID = 3 ( 0301):      10.04      0.250      1.50      31.16

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

4-hour Chicago
10yr

=====

```
V   V   I   SSSSS U   U   A   L           (v 5.1.2004)
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
  WV   I   SSSSS UUUUU A   A   LLLLL
```

```
  000   TTTTT   TTTTT H   H   Y   Y   M   M   000   TM
O   O   T       T   H   H   Y Y   MM MM   O   O
O   O   T       T   H   H   Y   M   M   O   O
  000   T       T   H   H   Y   M   M   000
```

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

Input filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\V02\voin.dat

Output filename:

C:\Users\bjo\AppData\Local\Civica\XH5\e91bc6c1-1ed6-4e95-932d-66b6211c2905\062b6e82-feff-47c6-a23c-47036dfc846d\scenario

Summary filename:

C:\Users\bjo\AppData\Local\Civica\XH5\e91bc6c1-1ed6-4e95-932d-66b6211c2905\062b6e82-feff-47c6-a23c-47036dfc846d\scenario

DATE: 10/30/2019

TIME: 02:52:52

USER:

COMMENTS: _____

```
*****
** SIMULATION : Run 03           **
*****
```

| READ STORM |
|

Filename: C:\Users\bjo\AppData\
Local\Temp\

b6c47c87-ffa1-4ea3-b46e-09b9679b04af\742c3208
 Ptotal= 59.69 mm | Comments: Barrie_10yr_4hour_Chicago_v2

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.17	0.00	1.33	30.27	2.50	8.35	3.67	4.45
0.33	4.32	1.50	126.55	2.67	7.35	3.83	4.19
0.50	4.91	1.67	39.22	2.83	6.59	4.00	3.97
0.67	5.73	1.83	21.35	3.00	5.99	4.17	3.77
0.83	6.96	2.00	15.01	3.17	5.50		
1.00	9.03	2.17	11.74	3.33	5.09		
1.17	13.36	2.33	9.72	3.50	4.74		

CALIB
 NASHYD (0102) | Area (ha)= 0.94 Curve Number (CN)= 33.0
 ID= 1 DT= 5.0 min | Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
 U.H. Tp(hrs)= 0.11

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	1.167	13.36	2.250	9.72	3.33	5.09
0.167	0.00	1.250	30.27	2.333	9.72	3.42	4.74
0.250	4.32	1.333	30.27	2.417	8.35	3.50	4.74
0.333	4.32	1.417	126.55	2.500	8.35	3.58	4.45
0.417	4.91	1.500	126.55	2.583	7.35	3.67	4.45
0.500	4.91	1.583	39.22	2.667	7.35	3.75	4.19
0.583	5.73	1.667	39.22	2.750	6.59	3.83	4.19
0.667	5.73	1.750	21.35	2.833	6.59	3.92	3.97
0.750	6.96	1.833	21.35	2.917	5.99	4.00	3.97
0.833	6.96	1.917	15.01	3.000	5.99	4.08	3.77
0.917	9.03	2.000	15.01	3.083	5.50	4.17	3.77
1.000	9.03	2.083	11.74	3.167	5.50		
1.083	13.36	2.167	11.74	3.250	5.09		

Unit Hyd Qpeak (cms)= 0.326

PEAK FLOW (cms)= 0.016 (i)

TIME TO PEAK (hrs)= 1.583

RUNOFF VOLUME (mm)= 5.148

TOTAL RAINFALL (mm)= 59.693

RUNOFF COEFFICIENT = 0.086

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


```

-----
| READ STORM | Filename: C:\Users\bjo\AppData\
|             | Local\Temp\
|             | b6c47c87-ffa1-4ea3-b46e-09b9679b04af\742c3208
| Ptotal= 59.69 mm | Comments: Barrie_10yr_4hour_Chicago_v2
-----

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	30.27	2.50	8.35	3.67	4.45
0.33	4.32	1.50	126.55	2.67	7.35	3.83	4.19
0.50	4.91	1.67	39.22	2.83	6.59	4.00	3.97
0.67	5.73	1.83	21.35	3.00	5.99	4.17	3.77
0.83	6.96	2.00	15.01	3.17	5.50		
1.00	9.03	2.17	11.74	3.33	5.09		
1.17	13.36	2.33	9.72	3.50	4.74		

```

-----
| CALIB |
| STANDHYD ( 0101) | Area (ha)= 3.39
| ID= 1 DT= 5.0 min | Total Imp(%)= 83.00 Dir. Conn.(%)= 83.00
-----

```

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	2.81	0.58
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	150.33	40.00
Mannings n	=	0.013	0.250

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

```

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

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	13.36	2.250	9.72	3.33	5.09
0.167	0.00	1.250	30.27	2.333	9.72	3.42	4.74
0.250	4.32	1.333	30.27	2.417	8.35	3.50	4.74
0.333	4.32	1.417	126.55	2.500	8.35	3.58	4.45
0.417	4.91	1.500	126.55	2.583	7.35	3.67	4.45
0.500	4.91	1.583	39.22	2.667	7.35	3.75	4.19
0.583	5.73	1.667	39.22	2.750	6.59	3.83	4.19
0.667	5.73	1.750	21.35	2.833	6.59	3.92	3.97
0.750	6.96	1.833	21.35	2.917	5.99	4.00	3.97
0.833	6.96	1.917	15.01	3.000	5.99	4.08	3.77
0.917	9.03	2.000	15.01	3.083	5.50	4.17	3.77

1.000	9.03		2.083	11.74		3.167	5.50	
1.083	13.36		2.167	11.74		3.250	5.09	

Max.Eff.Inten.(mm/hr)=	126.55	8.34	
over (min)	5.00	10.00	
Storage Coeff. (min)=	2.97 (ii)	6.38 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.28	0.15	
			TOTALS
PEAK FLOW (cms)=	0.96	0.01	0.971 (iii)
TIME TO PEAK (hrs)=	1.50	1.58	1.50
RUNOFF VOLUME (mm)=	57.69	5.24	48.78
TOTAL RAINFALL (mm)=	59.69	59.69	59.69
RUNOFF COEFFICIENT =	0.97	0.09	0.82

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 33.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0103)				
1 + 2 = 3				
	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0101):	3.39	0.971	1.50	48.78
+ ID2= 2 (0102):	0.94	0.016	1.58	5.15
=====				
ID = 3 (0103):	4.33	0.987	1.50	39.30

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

READ STORM	Filename: C:\Users\bjo\AppData\
	Local\Temp\
	b6c47c87-ffa1-4ea3-b46e-09b9679b04af\742c3208
Ptotal= 59.69 mm	Comments: Barrie_10yr_4hour_Chicago_v2

TIME	RAIN		TIME	RAIN		TIME	RAIN		TIME	RAIN
hrs	mm/hr		hrs	mm/hr		hrs	mm/hr		hrs	mm/hr
0.17	0.00		1.33	30.27		2.50	8.35		3.67	4.45
0.33	4.32		1.50	126.55		2.67	7.35		3.83	4.19
0.50	4.91		1.67	39.22		2.83	6.59		4.00	3.97
0.67	5.73		1.83	21.35		3.00	5.99		4.17	3.77

0.83	6.96	2.00	15.01	3.17	5.50
1.00	9.03	2.17	11.74	3.33	5.09
1.17	13.36	2.33	9.72	3.50	4.74

CALIB	
STANDHYD (0104)	Area (ha)= 2.05
ID= 1 DT= 5.0 min	Total Imp(%)= 55.00 Dir. Conn.(%)= 45.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.13	0.92
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	116.90	40.00
Mannings n	=	0.013	0.250

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

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

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	13.36	2.250	9.72	3.33	5.09
0.167	0.00	1.250	30.27	2.333	9.72	3.42	4.74
0.250	4.32	1.333	30.27	2.417	8.35	3.50	4.74
0.333	4.32	1.417	126.55	2.500	8.35	3.58	4.45
0.417	4.91	1.500	126.55	2.583	7.35	3.67	4.45
0.500	4.91	1.583	39.22	2.667	7.35	3.75	4.19
0.583	5.73	1.667	39.22	2.750	6.59	3.83	4.19
0.667	5.73	1.750	21.35	2.833	6.59	3.92	3.97
0.750	6.96	1.833	21.35	2.917	5.99	4.00	3.97
0.833	6.96	1.917	15.01	3.000	5.99	4.08	3.77
0.917	9.03	2.000	15.01	3.083	5.50	4.17	3.77
1.000	9.03	2.083	11.74	3.167	5.50		
1.083	13.36	2.167	11.74	3.250	5.09		

Max.Eff.Inten.(mm/hr)=	126.55	9.77
over (min)	5.00	25.00
Storage Coeff. (min)=	2.55 (ii)	20.45 (ii)
Unit Hyd. Tpeak (min)=	5.00	25.00
Unit Hyd. peak (cms)=	0.29	0.05

TOTALS

PEAK FLOW (cms)=	0.32	0.01	0.323 (iii)
TIME TO PEAK (hrs)=	1.50	1.83	1.50
RUNOFF VOLUME (mm)=	57.69	6.47	29.52
TOTAL RAINFALL (mm)=	59.69	59.69	59.69
RUNOFF COEFFICIENT =	0.97	0.11	0.49

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 33.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
-----
| ADD HYD ( 0105) |
| 1 + 2 = 3 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0103):    4.33    0.987    1.50    39.30
+ ID2= 2 ( 0104):    2.05    0.323    1.50    29.52
=====
ID = 3 ( 0105):    6.38    1.310    1.50    36.16
-----
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| READ STORM |
|          |
| Ptotal= 59.69 mm |
-----
Filename: C:\Users\bjo\AppData\
Local\Temp\
b6c47c87-ffa1-4ea3-b46e-09b9679b04af\742c3208
Comments: Barrie_10yr_4hour_Chicago_v2
-----
```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	30.27	2.50	8.35	3.67	4.45
0.33	4.32	1.50	126.55	2.67	7.35	3.83	4.19
0.50	4.91	1.67	39.22	2.83	6.59	4.00	3.97
0.67	5.73	1.83	21.35	3.00	5.99	4.17	3.77
0.83	6.96	2.00	15.01	3.17	5.50		
1.00	9.03	2.17	11.74	3.33	5.09		
1.17	13.36	2.33	9.72	3.50	4.74		

```
-----
| CALIB |
| STANDHYD ( 0106) |
| ID= 1 DT= 5.0 min |
-----
Area (ha)= 0.31
Total Imp(%)= 67.00 Dir. Conn.(%)= 67.00
-----
```

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.21	0.10
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	1.00	2.00

Length (m)= 45.46 40.00
Mannings n = 0.013 0.250

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

----- TRANSFORMED HYETOGRAPH -----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	13.36	2.250	9.72	3.33	5.09
0.167	0.00	1.250	30.27	2.333	9.72	3.42	4.74
0.250	4.32	1.333	30.27	2.417	8.35	3.50	4.74
0.333	4.32	1.417	126.55	2.500	8.35	3.58	4.45
0.417	4.91	1.500	126.55	2.583	7.35	3.67	4.45
0.500	4.91	1.583	39.22	2.667	7.35	3.75	4.19
0.583	5.73	1.667	39.22	2.750	6.59	3.83	4.19
0.667	5.73	1.750	21.35	2.833	6.59	3.92	3.97
0.750	6.96	1.833	21.35	2.917	5.99	4.00	3.97
0.833	6.96	1.917	15.01	3.000	5.99	4.08	3.77
0.917	9.03	2.000	15.01	3.083	5.50	4.17	3.77
1.000	9.03	2.083	11.74	3.167	5.50		
1.083	13.36	2.167	11.74	3.250	5.09		

Max.Eff.Inten.(mm/hr)= 126.55 8.34
over (min) 5.00 10.00
Storage Coeff. (min)= 1.45 (ii) 6.29 (ii)
Unit Hyd. Tpeak (min)= 5.00 10.00
Unit Hyd. peak (cms)= 0.33 0.15

TOTALS

PEAK FLOW (cms)= 0.07 0.00 0.074 (iii)
TIME TO PEAK (hrs)= 1.50 1.58 1.50
RUNOFF VOLUME (mm)= 57.69 5.24 40.37
TOTAL RAINFALL (mm)= 59.69 59.69 59.69
RUNOFF COEFFICIENT = 0.97 0.09 0.68

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 33.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD (0107) |
1 + 2 = 3
ID1= 1 (0105): AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
6.38 1.310 1.50 36.16

```

+ ID2= 2 ( 0106):      0.31   0.074      1.50   40.37
=====
ID = 3 ( 0107):      6.69   1.384      1.50   36.36

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| READ STORM |      Filename: C:\Users\bjo\AppData\
|            |      Local\Temp\
|            |      b6c47c87-ffa1-4ea3-b46e-09b9679b04af\742c3208
| Ptotal= 59.69 mm |      Comments: Barrie_10yr_4hour_Chicago_v2
-----

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	30.27	2.50	8.35	3.67	4.45
0.33	4.32	1.50	126.55	2.67	7.35	3.83	4.19
0.50	4.91	1.67	39.22	2.83	6.59	4.00	3.97
0.67	5.73	1.83	21.35	3.00	5.99	4.17	3.77
0.83	6.96	2.00	15.01	3.17	5.50		
1.00	9.03	2.17	11.74	3.33	5.09		
1.17	13.36	2.33	9.72	3.50	4.74		

```

-----
| CALIB      |
| STANDHYD ( 0108) |      Area (ha)= 0.46
| ID= 1 DT= 5.0 min |      Total Imp(%)= 40.00   Dir. Conn.(%)= 40.00
-----

```

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.18	0.28
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	55.38	40.00
Mannings n	=	0.013	0.250

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

```

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

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	13.36	2.250	9.72	3.33	5.09
0.167	0.00	1.250	30.27	2.333	9.72	3.42	4.74
0.250	4.32	1.333	30.27	2.417	8.35	3.50	4.74
0.333	4.32	1.417	126.55	2.500	8.35	3.58	4.45
0.417	4.91	1.500	126.55	2.583	7.35	3.67	4.45
0.500	4.91	1.583	39.22	2.667	7.35	3.75	4.19

0.583	5.73	1.667	39.22	2.750	6.59	3.83	4.19
0.667	5.73	1.750	21.35	2.833	6.59	3.92	3.97
0.750	6.96	1.833	21.35	2.917	5.99	4.00	3.97
0.833	6.96	1.917	15.01	3.000	5.99	4.08	3.77
0.917	9.03	2.000	15.01	3.083	5.50	4.17	3.77
1.000	9.03	2.083	11.74	3.167	5.50		
1.083	13.36	2.167	11.74	3.250	5.09		

Max.Eff.Inten.(mm/hr)= 126.55 5.64
over (min) 5.00 25.00
Storage Coeff. (min)= 1.63 (ii) 23.92 (ii)
Unit Hyd. Tpeak (min)= 5.00 25.00
Unit Hyd. peak (cms)= 0.32 0.05

TOTALS

PEAK FLOW (cms)= 0.06 0.00 0.065 (iii)
TIME TO PEAK (hrs)= 1.50 1.92 1.50
RUNOFF VOLUME (mm)= 58.69 5.24 26.59
TOTAL RAINFALL (mm)= 59.69 59.69 59.69
RUNOFF COEFFICIENT = 0.98 0.09 0.45

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 33.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| ADD HYD ( 0109) |
| 1 + 2 = 3 |
-----
          AREA    QPEAK    TPEAK    R.V.
          (ha)    (cms)    (hrs)    (mm)
ID1= 1 ( 0107):    6.69    1.384    1.50    36.36
+ ID2= 2 ( 0108):    0.46    0.065    1.50    26.59
=====
ID = 3 ( 0109):    7.15    1.450    1.50    35.73

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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-----
| READ STORM |      Filename: C:\Users\bjo\AppData\
|             |      Local\Temp\
|             |      b6c47c87-ffa1-4ea3-b46e-09b9679b04af\742c3208
| Ptotal= 59.69 mm |      Comments: Barrie_10yr_4hour_Chicago_v2
-----

```

TIME RAIN | TIME RAIN | ' TIME RAIN | TIME RAIN

hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	30.27	2.50	8.35	3.67	4.45
0.33	4.32	1.50	126.55	2.67	7.35	3.83	4.19
0.50	4.91	1.67	39.22	2.83	6.59	4.00	3.97
0.67	5.73	1.83	21.35	3.00	5.99	4.17	3.77
0.83	6.96	2.00	15.01	3.17	5.50		
1.00	9.03	2.17	11.74	3.33	5.09		
1.17	13.36	2.33	9.72	3.50	4.74		

CALIB	
STANDHYD (0110)	Area (ha)= 0.46
ID= 1 DT= 5.0 min	Total Imp(%)= 80.00 Dir. Conn.(%)= 80.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.37	0.09
Dep. Storage (mm)=	1.00	5.00
Average Slope (%)=	1.00	2.00
Length (m)=	55.68	40.00
Mannings n =	0.013	0.250

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

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

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	13.36	2.250	9.72	3.33	5.09
0.167	0.00	1.250	30.27	2.333	9.72	3.42	4.74
0.250	4.32	1.333	30.27	2.417	8.35	3.50	4.74
0.333	4.32	1.417	126.55	2.500	8.35	3.58	4.45
0.417	4.91	1.500	126.55	2.583	7.35	3.67	4.45
0.500	4.91	1.583	39.22	2.667	7.35	3.75	4.19
0.583	5.73	1.667	39.22	2.750	6.59	3.83	4.19
0.667	5.73	1.750	21.35	2.833	6.59	3.92	3.97
0.750	6.96	1.833	21.35	2.917	5.99	4.00	3.97
0.833	6.96	1.917	15.01	3.000	5.99	4.08	3.77
0.917	9.03	2.000	15.01	3.083	5.50	4.17	3.77
1.000	9.03	2.083	11.74	3.167	5.50		
1.083	13.36	2.167	11.74	3.250	5.09		

Max.Eff.Inten.(mm/hr)=	126.55	8.34
over (min)	5.00	10.00
Storage Coeff. (min)=	1.64 (ii)	5.33 (ii)
Unit Hyd. Tpeak (min)=	5.00	10.00
Unit Hyd. peak (cms)=	0.32	0.16

PEAK FLOW (cms)=	0.13	0.00	*TOTALS* 0.132 (iii)
------------------	------	------	-------------------------

TIME TO PEAK	(hrs)=	1.50	1.58	1.50
RUNOFF VOLUME	(mm)=	58.69	5.24	48.00
TOTAL RAINFALL	(mm)=	59.69	59.69	59.69
RUNOFF COEFFICIENT	=	0.98	0.09	0.80

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 33.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| RESERVOIR( 0111) |
| IN= 2---> OUT= 1 |
| DT= 1.0 min      |
-----

```

	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0160	0.0170
	0.0160	0.0001	0.0000	0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0110)	0.465	0.132	1.50	48.00
OUTFLOW: ID= 1 (0111)	0.465	0.016	1.20	47.99

PEAK FLOW REDUCTION [Qout/Qin](%)= 12.13
TIME SHIFT OF PEAK FLOW (min)=-18.00
MAXIMUM STORAGE USED (ha.m.)= 0.0064

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-----
| ADD HYD ( 0112) |
| 1 + 2 = 3       |
-----

```

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0109):	7.15	1.450	1.50	35.73
+ ID2= 2 (0111):	0.46	0.016	1.20	47.99
=====				
ID = 3 (0112):	7.61	1.466	1.50	36.48

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| RESERVOIR( 0113) |
| IN= 2---> OUT= 1 |
| DT= 1.0 min      |
-----

```

	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)

0.0000	0.0000	0.2410	0.2699
0.0100	0.0274	0.2810	0.2999
0.0170	0.0677	0.3140	0.3309
0.0240	0.1236	0.5430	0.3630
0.0650	0.1601	1.4010	0.3961
0.0870	0.1859	2.6120	0.4304
0.1630	0.2128	3.3210	0.4480
0.2020	0.2408	0.0000	0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0112)	7.615	1.466	1.50	36.48
OUTFLOW: ID= 1 (0113)	7.615	0.106	2.77	35.44

PEAK FLOW REDUCTION [Qout/Qin](%)= 7.20
 TIME SHIFT OF PEAK FLOW (min)= 76.00
 MAXIMUM STORAGE USED (ha.m.)= 0.1925

READ STORM	Filename: C:\Users\bjo\AppData\Local\Temp\
	b6c47c87-ffa1-4ea3-b46e-09b9679b04af\742c3208
Ptotal= 59.69 mm	Comments: Barrie_10yr_4hour_Chicago_v2

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	30.27	2.50	8.35	3.67	4.45
0.33	4.32	1.50	126.55	2.67	7.35	3.83	4.19
0.50	4.91	1.67	39.22	2.83	6.59	4.00	3.97
0.67	5.73	1.83	21.35	3.00	5.99	4.17	3.77
0.83	6.96	2.00	15.01	3.17	5.50		
1.00	9.03	2.17	11.74	3.33	5.09		
1.17	13.36	2.33	9.72	3.50	4.74		

CALIB	
NASHYD (0114)	Area (ha)= 0.08 Curve Number (CN)= 33.0
ID= 1 DT= 5.0 min	Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= 0.03

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr

0.083	0.00	1.167	13.36	2.250	9.72	3.33	5.09
0.167	0.00	1.250	30.27	2.333	9.72	3.42	4.74
0.250	4.32	1.333	30.27	2.417	8.35	3.50	4.74
0.333	4.32	1.417	126.55	2.500	8.35	3.58	4.45
0.417	4.91	1.500	126.55	2.583	7.35	3.67	4.45
0.500	4.91	1.583	39.22	2.667	7.35	3.75	4.19
0.583	5.73	1.667	39.22	2.750	6.59	3.83	4.19
0.667	5.73	1.750	21.35	2.833	6.59	3.92	3.97
0.750	6.96	1.833	21.35	2.917	5.99	4.00	3.97
0.833	6.96	1.917	15.01	3.000	5.99	4.08	3.77
0.917	9.03	2.000	15.01	3.083	5.50	4.17	3.77
1.000	9.03	2.083	11.74	3.167	5.50		
1.083	13.36	2.167	11.74	3.250	5.09		

Unit Hyd Qpeak (cms)= 0.102

PEAK FLOW (cms)= 0.001 (i)
TIME TO PEAK (hrs)= 1.500
RUNOFF VOLUME (mm)= 1.765
TOTAL RAINFALL (mm)= 59.693
RUNOFF COEFFICIENT = 0.030

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

ADD HYD (0115)				
1	+	2	=	3
		AREA (ha)	QPEAK (cms)	TPEAK (hrs)
		R.V. (mm)		
ID1= 1 (0113):		7.61	0.106	2.77
+ ID2= 2 (0114):		0.08	0.001	1.50
=====				
ID = 3 (0115):		7.69	0.106	2.77
		35.09		

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

READ STORM		Filename: C:\Users\bjo\AppData\Local\Temp\
		b6c47c87-ffa1-4ea3-b46e-09b9679b04af\742c3208
Ptotal= 59.69 mm		Comments: Barrie_10yr_4hour_Chicago_v2

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.17	0.00	1.33	30.27	2.50	8.35	3.67	4.45
0.33	4.32	1.50	126.55	2.67	7.35	3.83	4.19
0.50	4.91	1.67	39.22	2.83	6.59	4.00	3.97

0.67	5.73	1.83	21.35	3.00	5.99	4.17	3.77
0.83	6.96	2.00	15.01	3.17	5.50		
1.00	9.03	2.17	11.74	3.33	5.09		
1.17	13.36	2.33	9.72	3.50	4.74		

CALIB							
NASHYD (0116)	Area (ha)=	0.07	Curve Number (CN)=	33.0			
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	# of Linear Res.(N)=	3.00			
	U.H. Tp(hrs)=	0.20					

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

----- TRANSFORMED HYETOGRAPH -----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	13.36	2.250	9.72	3.33	5.09
0.167	0.00	1.250	30.27	2.333	9.72	3.42	4.74
0.250	4.32	1.333	30.27	2.417	8.35	3.50	4.74
0.333	4.32	1.417	126.55	2.500	8.35	3.58	4.45
0.417	4.91	1.500	126.55	2.583	7.35	3.67	4.45
0.500	4.91	1.583	39.22	2.667	7.35	3.75	4.19
0.583	5.73	1.667	39.22	2.750	6.59	3.83	4.19
0.667	5.73	1.750	21.35	2.833	6.59	3.92	3.97
0.750	6.96	1.833	21.35	2.917	5.99	4.00	3.97
0.833	6.96	1.917	15.01	3.000	5.99	4.08	3.77
0.917	9.03	2.000	15.01	3.083	5.50	4.17	3.77
1.000	9.03	2.083	11.74	3.167	5.50		
1.083	13.36	2.167	11.74	3.250	5.09		

Unit Hyd Qpeak (cms)= 0.013

PEAK FLOW (cms)= 0.001 (i)
 TIME TO PEAK (hrs)= 1.667
 RUNOFF VOLUME (mm)= 5.226
 TOTAL RAINFALL (mm)= 59.693
 RUNOFF COEFFICIENT = 0.088

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

ADD HYD (0117)				
1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0115):	7.69	0.106	2.77	35.09

```

+ ID2= 2 ( 0116):      0.07   0.001    1.67    5.23
=====
ID = 3 ( 0117):      7.76   0.106    2.77   34.82

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NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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| READ STORM |      Filename: C:\Users\bjo\AppData\
|            |      Local\Temp\
|            |      b6c47c87-ffa1-4ea3-b46e-09b9679b04af\742c3208
| Ptotal= 59.69 mm |      Comments: Barrie_10yr_4hour_Chicago_v2
-----

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	30.27	2.50	8.35	3.67	4.45
0.33	4.32	1.50	126.55	2.67	7.35	3.83	4.19
0.50	4.91	1.67	39.22	2.83	6.59	4.00	3.97
0.67	5.73	1.83	21.35	3.00	5.99	4.17	3.77
0.83	6.96	2.00	15.01	3.17	5.50		
1.00	9.03	2.17	11.74	3.33	5.09		
1.17	13.36	2.33	9.72	3.50	4.74		

```

-----
| CALIB      |
| NASHYD ( 0203) |      Area (ha)= 0.17   Curve Number (CN)= 33.0
| ID= 1 DT= 5.0 min |      Ia (mm)= 5.00   # of Linear Res.(N)= 3.00
-----
|            |      U.H. Tp(hrs)= 0.03

```

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

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

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	13.36	2.250	9.72	3.33	5.09
0.167	0.00	1.250	30.27	2.333	9.72	3.42	4.74
0.250	4.32	1.333	30.27	2.417	8.35	3.50	4.74
0.333	4.32	1.417	126.55	2.500	8.35	3.58	4.45
0.417	4.91	1.500	126.55	2.583	7.35	3.67	4.45
0.500	4.91	1.583	39.22	2.667	7.35	3.75	4.19
0.583	5.73	1.667	39.22	2.750	6.59	3.83	4.19
0.667	5.73	1.750	21.35	2.833	6.59	3.92	3.97
0.750	6.96	1.833	21.35	2.917	5.99	4.00	3.97
0.833	6.96	1.917	15.01	3.000	5.99	4.08	3.77
0.917	9.03	2.000	15.01	3.083	5.50	4.17	3.77
1.000	9.03	2.083	11.74	3.167	5.50		

1.083 13.36 | 2.167 11.74 | 3.250 5.09 |

Unit Hyd Qpeak (cms)= 0.216

PEAK FLOW (cms)= 0.002 (i)

TIME TO PEAK (hrs)= 1.500

RUNOFF VOLUME (mm)= 1.765

TOTAL RAINFALL (mm)= 59.693

RUNOFF COEFFICIENT = 0.030

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

| READ STORM | Filename: C:\Users\bjo\AppData\
| | Local\Temp\
| | b6c47c87-ffa1-4ea3-b46e-09b9679b04af\742c3208
| Ptotal= 59.69 mm | Comments: Barrie_10yr_4hour_Chicago_v2

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	30.27	2.50	8.35	3.67	4.45
0.33	4.32	1.50	126.55	2.67	7.35	3.83	4.19
0.50	4.91	1.67	39.22	2.83	6.59	4.00	3.97
0.67	5.73	1.83	21.35	3.00	5.99	4.17	3.77
0.83	6.96	2.00	15.01	3.17	5.50		
1.00	9.03	2.17	11.74	3.33	5.09		
1.17	13.36	2.33	9.72	3.50	4.74		

| CALIB |
| STANDHYD (0202) | Area (ha)= 0.42
| ID= 1 DT= 5.0 min | Total Imp(%)= 54.00 Dir. Conn.(%)= 54.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.23	0.19
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	52.92	40.00
Mannings n	=	0.013	0.250

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

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

0.083	0.00	1.167	13.36	2.250	9.72	3.33	5.09
0.167	0.00	1.250	30.27	2.333	9.72	3.42	4.74
0.250	4.32	1.333	30.27	2.417	8.35	3.50	4.74
0.333	4.32	1.417	126.55	2.500	8.35	3.58	4.45
0.417	4.91	1.500	126.55	2.583	7.35	3.67	4.45
0.500	4.91	1.583	39.22	2.667	7.35	3.75	4.19
0.583	5.73	1.667	39.22	2.750	6.59	3.83	4.19
0.667	5.73	1.750	21.35	2.833	6.59	3.92	3.97
0.750	6.96	1.833	21.35	2.917	5.99	4.00	3.97
0.833	6.96	1.917	15.01	3.000	5.99	4.08	3.77
0.917	9.03	2.000	15.01	3.083	5.50	4.17	3.77
1.000	9.03	2.083	11.74	3.167	5.50		
1.083	13.36	2.167	11.74	3.250	5.09		

Max.Eff.Inten.(mm/hr)= 126.55 5.64
over (min) 5.00 25.00
Storage Coeff. (min)= 1.59 (ii) 23.88 (ii)
Unit Hyd. Tpeak (min)= 5.00 25.00
Unit Hyd. peak (cms)= 0.33 0.05

TOTALS

PEAK FLOW (cms)= 0.08 0.00 0.080 (iii)
TIME TO PEAK (hrs)= 1.50 1.92 1.50
RUNOFF VOLUME (mm)= 57.69 5.24 33.54
TOTAL RAINFALL (mm)= 59.69 59.69 59.69
RUNOFF COEFFICIENT = 0.97 0.09 0.56

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 33.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| ADD HYD ( 0205) |
| 1 + 2 = 3 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0202):    0.42    0.080    1.50    33.54
+ ID2= 2 ( 0203):    0.17    0.002    1.50     1.77
=====
ID = 3 ( 0205):    0.59    0.082    1.50    24.38

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

READ STORM	Filename: C:\Users\bjo\AppData\Local\Temp\
	b6c47c87-ffa1-4ea3-b46e-09b9679b04af\742c3208
Ptotal= 59.69 mm	Comments: Barrie_10yr_4hour_Chicago_v2

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	30.27	2.50	8.35	3.67	4.45
0.33	4.32	1.50	126.55	2.67	7.35	3.83	4.19
0.50	4.91	1.67	39.22	2.83	6.59	4.00	3.97
0.67	5.73	1.83	21.35	3.00	5.99	4.17	3.77
0.83	6.96	2.00	15.01	3.17	5.50		
1.00	9.03	2.17	11.74	3.33	5.09		
1.17	13.36	2.33	9.72	3.50	4.74		

CALIB	
STANDHYD (0201)	Area (ha)= 1.68
ID= 1 DT= 5.0 min	Total Imp(%)= 93.00 Dir. Conn.(%)= 93.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	1.56	0.12
Dep. Storage (mm)=	2.00	5.00
Average Slope (%)=	1.00	2.00
Length (m)=	105.86	40.00
Mannings n =	0.013	0.250

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

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

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	13.36	2.250	9.72	3.33	5.09
0.167	0.00	1.250	30.27	2.333	9.72	3.42	4.74
0.250	4.32	1.333	30.27	2.417	8.35	3.50	4.74
0.333	4.32	1.417	126.55	2.500	8.35	3.58	4.45
0.417	4.91	1.500	126.55	2.583	7.35	3.67	4.45
0.500	4.91	1.583	39.22	2.667	7.35	3.75	4.19
0.583	5.73	1.667	39.22	2.750	6.59	3.83	4.19
0.667	5.73	1.750	21.35	2.833	6.59	3.92	3.97
0.750	6.96	1.833	21.35	2.917	5.99	4.00	3.97
0.833	6.96	1.917	15.01	3.000	5.99	4.08	3.77
0.917	9.03	2.000	15.01	3.083	5.50	4.17	3.77
1.000	9.03	2.083	11.74	3.167	5.50		
1.083	13.36	2.167	11.74	3.250	5.09		

Max.Eff.Inten.(mm/hr)=	126.55	8.34
------------------------	--------	------

over (min)	5.00	5.00	
Storage Coeff. (min)=	2.41 (ii)	4.69 (ii)	
Unit Hyd. Tpeak (min)=	5.00	5.00	
Unit Hyd. peak (cms)=	0.30	0.22	
			TOTALS
PEAK FLOW (cms)=	0.54	0.00	0.546 (iii)
TIME TO PEAK (hrs)=	1.50	1.50	1.50
RUNOFF VOLUME (mm)=	57.69	5.24	54.02
TOTAL RAINFALL (mm)=	59.69	59.69	59.69
RUNOFF COEFFICIENT =	0.97	0.09	0.90

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
 CN* = 33.0 Ia = Dep. Storage (Above)
 (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
 THAN THE STORAGE COEFFICIENT.
 (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| RESERVOIR( 0204) |
| IN= 2---> OUT= 1 |
| DT= 1.0 min      |
-----

```

	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.2000	0.0600
	0.1500	0.0010	0.0000	0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0201)	1.681	0.546	1.50	54.02
OUTFLOW: ID= 1 (0204)	1.681	0.170	1.68	54.02

PEAK FLOW REDUCTION [Qout/Qin](%)= 31.07
 TIME SHIFT OF PEAK FLOW (min)= 11.00
 MAXIMUM STORAGE USED (ha.m.)= 0.0241

```

-----
| ADD HYD ( 0206) |
| 1 + 2 = 3      |
-----

```

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0204):	1.68	0.170	1.68	54.02
+ ID2= 2 (0205):	0.59	0.082	1.50	24.38
=====				
ID = 3 (0206):	2.27	0.245	1.50	46.32

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| ADD HYD (0301) |
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0117):	7.76	0.106	2.77	34.82
+ ID2= 2 (0206):	2.27	0.245	1.50	46.32
=====				
ID = 3 (0301):	10.04	0.268	1.50	37.42

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

4-hour Chicago
25-yr

=====

```
V   V   I   SSSSS U   U   A   L           (v 5.1.2004)
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
  WW     I   SSSSS UUUUU A   A   LLLLL
```

```
  000  TTTTT  TTTTT  H   H  Y   Y  M   M  000  TM
O   O   T      T   H   H   Y Y   MM MM  O   O
O   O   T      T   H   H   Y   M   M  O   O
  000   T      T   H   H   Y   M   M  000
```

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

Input filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\V02\voin.dat

Output filename:

C:\Users\bjo\AppData\Local\Civica\XH5\e91bc6c1-1ed6-4e95-932d-66b6211c2905\d784a3d6-f869-4bbc-84e1-211373277f45\scenario

Summary filename:

C:\Users\bjo\AppData\Local\Civica\XH5\e91bc6c1-1ed6-4e95-932d-66b6211c2905\d784a3d6-f869-4bbc-84e1-211373277f45\scenario

DATE: 10/30/2019

TIME: 02:52:54

USER:

COMMENTS: _____

```
*****
** SIMULATION : Run 04          **
*****
```

READ STORM	Filename: C:\Users\bjo\AppData\Local\Temp\
------------	--

b6c47c87-ffa1-4ea3-b46e-09b9679b04af\b95ed81c
 Ptotal= 71.24 mm | Comments: Barrie_25yr_4hour_Chicago_v2

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.17	0.00	1.33	36.37	2.50	10.09	3.67	5.38
0.33	5.22	1.50	148.15	2.67	8.89	3.83	5.08
0.50	5.94	1.67	47.06	2.83	7.96	4.00	4.80
0.67	6.93	1.83	25.72	3.00	7.24	4.17	4.57
0.83	8.42	2.00	18.11	3.17	6.65		
1.00	10.91	2.17	14.17	3.33	6.15		
1.17	16.13	2.33	11.74	3.50	5.74		

CALIB
 NASHYD (0102) | Area (ha)= 0.94 Curve Number (CN)= 33.0
 ID= 1 DT= 5.0 min | Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
 U.H. Tp(hrs)= 0.11

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	1.167	16.13	2.250	11.74	3.33	6.15
0.167	0.00	1.250	36.37	2.333	11.74	3.42	5.74
0.250	5.22	1.333	36.37	2.417	10.09	3.50	5.74
0.333	5.22	1.417	148.15	2.500	10.09	3.58	5.38
0.417	5.94	1.500	148.15	2.583	8.89	3.67	5.38
0.500	5.94	1.583	47.06	2.667	8.89	3.75	5.08
0.583	6.93	1.667	47.06	2.750	7.96	3.83	5.08
0.667	6.93	1.750	25.72	2.833	7.96	3.92	4.80
0.750	8.42	1.833	25.72	2.917	7.24	4.00	4.80
0.833	8.42	1.917	18.11	3.000	7.24	4.08	4.57
0.917	10.91	2.000	18.11	3.083	6.65	4.17	4.57
1.000	10.91	2.083	14.17	3.167	6.65		
1.083	16.13	2.167	14.17	3.250	6.15		

Unit Hyd Qpeak (cms)= 0.326

PEAK FLOW (cms)= 0.023 (i)

TIME TO PEAK (hrs)= 1.500

RUNOFF VOLUME (mm)= 7.400

TOTAL RAINFALL (mm)= 71.237

RUNOFF COEFFICIENT = 0.104

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

```

-----
| READ STORM |      Filename: C:\Users\bjo\AppData\
|            |      Local\Temp\
|            |      b6c47c87-ffa1-4ea3-b46e-09b9679b04af\b95ed81c
| Ptotal= 71.24 mm |      Comments: Barrie_25yr_4hour_Chicago_v2
-----

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	36.37	2.50	10.09	3.67	5.38
0.33	5.22	1.50	148.15	2.67	8.89	3.83	5.08
0.50	5.94	1.67	47.06	2.83	7.96	4.00	4.80
0.67	6.93	1.83	25.72	3.00	7.24	4.17	4.57
0.83	8.42	2.00	18.11	3.17	6.65		
1.00	10.91	2.17	14.17	3.33	6.15		
1.17	16.13	2.33	11.74	3.50	5.74		

```

-----
| CALIB      |
| STANDHYD ( 0101) |      Area      (ha)=      3.39
| ID= 1 DT= 5.0 min |      Total Imp(%)= 83.00   Dir. Conn.(%)= 83.00
-----

```

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	2.81	0.58
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	150.33	40.00
Mannings n	=	0.013	0.250

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

```

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

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	16.13	2.250	11.74	3.33	6.15
0.167	0.00	1.250	36.37	2.333	11.74	3.42	5.74
0.250	5.22	1.333	36.37	2.417	10.09	3.50	5.74
0.333	5.22	1.417	148.15	2.500	10.09	3.58	5.38
0.417	5.94	1.500	148.15	2.583	8.89	3.67	5.38
0.500	5.94	1.583	47.06	2.667	8.89	3.75	5.08
0.583	6.93	1.667	47.06	2.750	7.96	3.83	5.08
0.667	6.93	1.750	25.72	2.833	7.96	3.92	4.80
0.750	8.42	1.833	25.72	2.917	7.24	4.00	4.80
0.833	8.42	1.917	18.11	3.000	7.24	4.08	4.57
0.917	10.91	2.000	18.11	3.083	6.65	4.17	4.57

1.000	10.91		2.083	14.17		3.167	6.65	
1.083	16.13		2.167	14.17		3.250	6.15	

Max.Eff.Inten.(mm/hr)=	148.15		11.97	
over (min)	5.00		10.00	
Storage Coeff. (min)=	2.79 (ii)		5.99 (ii)	
Unit Hyd. Tpeak (min)=	5.00		10.00	
Unit Hyd. peak (cms)=	0.28		0.15	
				TOTALS
PEAK FLOW (cms)=	1.13		0.02	1.146 (iii)
TIME TO PEAK (hrs)=	1.50		1.58	1.50
RUNOFF VOLUME (mm)=	69.24		7.54	58.75
TOTAL RAINFALL (mm)=	71.24		71.24	71.24
RUNOFF COEFFICIENT =	0.97		0.11	0.82

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 33.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0103)				
1 + 2 = 3				
	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0101):	3.39	1.146	1.50	58.75
+ ID2= 2 (0102):	0.94	0.023	1.50	7.40
=====				
ID = 3 (0103):	4.33	1.169	1.50	47.60

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

READ STORM	Filename: C:\Users\bjo\AppData\
	Local\Temp\
	b6c47c87-ffa1-4ea3-b46e-09b9679b04af\b95ed81c
Ptotal= 71.24 mm	Comments: Barrie_25yr_4hour_Chicago_v2

TIME	RAIN		TIME	RAIN		TIME	RAIN		TIME	RAIN
hrs	mm/hr		hrs	mm/hr		hrs	mm/hr		hrs	mm/hr
0.17	0.00		1.33	36.37		2.50	10.09		3.67	5.38
0.33	5.22		1.50	148.15		2.67	8.89		3.83	5.08
0.50	5.94		1.67	47.06		2.83	7.96		4.00	4.80
0.67	6.93		1.83	25.72		3.00	7.24		4.17	4.57

0.83	8.42	2.00	18.11	3.17	6.65
1.00	10.91	2.17	14.17	3.33	6.15
1.17	16.13	2.33	11.74	3.50	5.74

CALIB	
STANDHYD (0104)	Area (ha)= 2.05
ID= 1 DT= 5.0 min	Total Imp(%)= 55.00 Dir. Conn.(%)= 45.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.13	0.92
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	116.90	40.00
Mannings n	=	0.013	0.250

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

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

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	16.13	2.250	11.74	3.33	6.15
0.167	0.00	1.250	36.37	2.333	11.74	3.42	5.74
0.250	5.22	1.333	36.37	2.417	10.09	3.50	5.74
0.333	5.22	1.417	148.15	2.500	10.09	3.58	5.38
0.417	5.94	1.500	148.15	2.583	8.89	3.67	5.38
0.500	5.94	1.583	47.06	2.667	8.89	3.75	5.08
0.583	6.93	1.667	47.06	2.750	7.96	3.83	5.08
0.667	6.93	1.750	25.72	2.833	7.96	3.92	4.80
0.750	8.42	1.833	25.72	2.917	7.24	4.00	4.80
0.833	8.42	1.917	18.11	3.000	7.24	4.08	4.57
0.917	10.91	2.000	18.11	3.083	6.65	4.17	4.57
1.000	10.91	2.083	14.17	3.167	6.65		
1.083	16.13	2.167	14.17	3.250	6.15		

Max.Eff.Inten.(mm/hr)=	148.15	15.20
over (min)	5.00	20.00
Storage Coeff. (min)=	2.40 (ii)	17.39 (ii)
Unit Hyd. Tpeak (min)=	5.00	20.00
Unit Hyd. peak (cms)=	0.30	0.06

			TOTALS
PEAK FLOW (cms)=	0.38	0.02	0.383 (iii)
TIME TO PEAK (hrs)=	1.50	1.75	1.50
RUNOFF VOLUME (mm)=	69.24	9.22	36.22
TOTAL RAINFALL (mm)=	71.24	71.24	71.24
RUNOFF COEFFICIENT =	0.97	0.13	0.51

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 33.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
-----
| ADD HYD ( 0105) |
| 1 + 2 = 3 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0103):    4.33    1.169    1.50    47.60
+ ID2= 2 ( 0104):    2.05    0.383    1.50    36.22
=====
ID = 3 ( 0105):    6.38    1.552    1.50    43.94
-----
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| READ STORM |
|           |
| Ptotal= 71.24 mm |
-----
Filename: C:\Users\bjo\AppData\
Local\Temp\
b6c47c87-ffa1-4ea3-b46e-09b9679b04af\b95ed81c
Comments: Barrie_25yr_4hour_Chicago_v2
-----
```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	36.37	2.50	10.09	3.67	5.38
0.33	5.22	1.50	148.15	2.67	8.89	3.83	5.08
0.50	5.94	1.67	47.06	2.83	7.96	4.00	4.80
0.67	6.93	1.83	25.72	3.00	7.24	4.17	4.57
0.83	8.42	2.00	18.11	3.17	6.65		
1.00	10.91	2.17	14.17	3.33	6.15		
1.17	16.13	2.33	11.74	3.50	5.74		

```
-----
| CALIB |
| STANDHYD ( 0106) |
| ID= 1 DT= 5.0 min |
-----
Area (ha)= 0.31
Total Imp(%)= 67.00 Dir. Conn.(%)= 67.00
-----
```

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.21	0.10
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	1.00	2.00

Length (m)= 45.46 40.00
Mannings n = 0.013 0.250

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

----- TRANSFORMED HYETOGRAPH -----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	16.13	2.250	11.74	3.33	6.15
0.167	0.00	1.250	36.37	2.333	11.74	3.42	5.74
0.250	5.22	1.333	36.37	2.417	10.09	3.50	5.74
0.333	5.22	1.417	148.15	2.500	10.09	3.58	5.38
0.417	5.94	1.500	148.15	2.583	8.89	3.67	5.38
0.500	5.94	1.583	47.06	2.667	8.89	3.75	5.08
0.583	6.93	1.667	47.06	2.750	7.96	3.83	5.08
0.667	6.93	1.750	25.72	2.833	7.96	3.92	4.80
0.750	8.42	1.833	25.72	2.917	7.24	4.00	4.80
0.833	8.42	1.917	18.11	3.000	7.24	4.08	4.57
0.917	10.91	2.000	18.11	3.083	6.65	4.17	4.57
1.000	10.91	2.083	14.17	3.167	6.65		
1.083	16.13	2.167	14.17	3.250	6.15		

Max.Eff.Inten.(mm/hr)= 148.15 11.97
over (min) 5.00 10.00
Storage Coeff. (min)= 1.36 (ii) 5.90 (ii)
Unit Hyd. Tpeak (min)= 5.00 10.00
Unit Hyd. peak (cms)= 0.33 0.15

TOTALS

PEAK FLOW (cms)= 0.09 0.00 0.088 (iii)
TIME TO PEAK (hrs)= 1.50 1.58 1.50
RUNOFF VOLUME (mm)= 69.24 7.54 48.86
TOTAL RAINFALL (mm)= 71.24 71.24 71.24
RUNOFF COEFFICIENT = 0.97 0.11 0.69

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 33.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD (0107) |
1 + 2 = 3
ID1= 1 (0105): AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
6.38 1.552 1.50 43.94

```

+ ID2= 2 ( 0106):      0.31   0.088      1.50   48.86
=====
ID = 3 ( 0107):      6.69   1.639      1.50   44.17

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| READ STORM |      Filename: C:\Users\bjo\AppData\
|            |      Local\Temp\
|            |      b6c47c87-ffa1-4ea3-b46e-09b9679b04af\b95ed81c
| Ptotal= 71.24 mm |      Comments: Barrie_25yr_4hour_Chicago_v2
-----

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	36.37	2.50	10.09	3.67	5.38
0.33	5.22	1.50	148.15	2.67	8.89	3.83	5.08
0.50	5.94	1.67	47.06	2.83	7.96	4.00	4.80
0.67	6.93	1.83	25.72	3.00	7.24	4.17	4.57
0.83	8.42	2.00	18.11	3.17	6.65		
1.00	10.91	2.17	14.17	3.33	6.15		
1.17	16.13	2.33	11.74	3.50	5.74		

```

-----
| CALIB      |
| STANDHYD ( 0108) |      Area (ha)= 0.46
| ID= 1 DT= 5.0 min |      Total Imp(%)= 40.00   Dir. Conn.(%)= 40.00
-----

```

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.18	0.28
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	55.38	40.00
Mannings n	=	0.013	0.250

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

```

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

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	16.13	2.250	11.74	3.33	6.15
0.167	0.00	1.250	36.37	2.333	11.74	3.42	5.74
0.250	5.22	1.333	36.37	2.417	10.09	3.50	5.74
0.333	5.22	1.417	148.15	2.500	10.09	3.58	5.38
0.417	5.94	1.500	148.15	2.583	8.89	3.67	5.38
0.500	5.94	1.583	47.06	2.667	8.89	3.75	5.08

0.583	6.93	1.667	47.06	2.750	7.96	3.83	5.08
0.667	6.93	1.750	25.72	2.833	7.96	3.92	4.80
0.750	8.42	1.833	25.72	2.917	7.24	4.00	4.80
0.833	8.42	1.917	18.11	3.000	7.24	4.08	4.57
0.917	10.91	2.000	18.11	3.083	6.65	4.17	4.57
1.000	10.91	2.083	14.17	3.167	6.65		
1.083	16.13	2.167	14.17	3.250	6.15		

Max.Eff.Inten.(mm/hr)= 148.15 9.15
over (min) 5.00 20.00
Storage Coeff. (min)= 1.53 (ii) 19.90 (ii)
Unit Hyd. Tpeak (min)= 5.00 20.00
Unit Hyd. peak (cms)= 0.33 0.06

TOTALS

PEAK FLOW (cms)= 0.08 0.00 0.077 (iii)
TIME TO PEAK (hrs)= 1.50 1.75 1.50
RUNOFF VOLUME (mm)= 70.24 7.54 32.59
TOTAL RAINFALL (mm)= 71.24 71.24 71.24
RUNOFF COEFFICIENT = 0.99 0.11 0.46

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 33.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| ADD HYD ( 0109) |
| 1 + 2 = 3 |
-----
          AREA    QPEAK    TPEAK    R.V.
          (ha)    (cms)    (hrs)    (mm)
ID1= 1 ( 0107):    6.69    1.639    1.50    44.17
+ ID2= 2 ( 0108):    0.46    0.077    1.50    32.59
=====
ID = 3 ( 0109):    7.15    1.716    1.50    43.43

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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-----
| READ STORM |      Filename: C:\Users\bjo\AppData\
|            |      Local\Temp\
|            |      b6c47c87-ffa1-4ea3-b46e-09b9679b04af\b95ed81c
| Ptotal= 71.24 mm |      Comments: Barrie_25yr_4hour_Chicago_v2
-----

```

TIME RAIN | TIME RAIN | ' TIME RAIN | TIME RAIN

hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	36.37	2.50	10.09	3.67	5.38
0.33	5.22	1.50	148.15	2.67	8.89	3.83	5.08
0.50	5.94	1.67	47.06	2.83	7.96	4.00	4.80
0.67	6.93	1.83	25.72	3.00	7.24	4.17	4.57
0.83	8.42	2.00	18.11	3.17	6.65		
1.00	10.91	2.17	14.17	3.33	6.15		
1.17	16.13	2.33	11.74	3.50	5.74		

CALIB	
STANDHYD (0110)	Area (ha)= 0.46
ID= 1 DT= 5.0 min	Total Imp(%)= 80.00 Dir. Conn.(%)= 80.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.37	0.09
Dep. Storage (mm)=	1.00	5.00
Average Slope (%)=	1.00	2.00
Length (m)=	55.68	40.00
Mannings n =	0.013	0.250

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

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

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	16.13	2.250	11.74	3.33	6.15
0.167	0.00	1.250	36.37	2.333	11.74	3.42	5.74
0.250	5.22	1.333	36.37	2.417	10.09	3.50	5.74
0.333	5.22	1.417	148.15	2.500	10.09	3.58	5.38
0.417	5.94	1.500	148.15	2.583	8.89	3.67	5.38
0.500	5.94	1.583	47.06	2.667	8.89	3.75	5.08
0.583	6.93	1.667	47.06	2.750	7.96	3.83	5.08
0.667	6.93	1.750	25.72	2.833	7.96	3.92	4.80
0.750	8.42	1.833	25.72	2.917	7.24	4.00	4.80
0.833	8.42	1.917	18.11	3.000	7.24	4.08	4.57
0.917	10.91	2.000	18.11	3.083	6.65	4.17	4.57
1.000	10.91	2.083	14.17	3.167	6.65		
1.083	16.13	2.167	14.17	3.250	6.15		

Max.Eff.Inten.(mm/hr)=	148.15	11.97
over (min)	5.00	10.00
Storage Coeff. (min)=	1.54 (ii)	5.00 (ii)
Unit Hyd. Tpeak (min)=	5.00	10.00
Unit Hyd. peak (cms)=	0.33	0.16

PEAK FLOW (cms)=	0.15	0.00	*TOTALS* 0.155 (iii)
------------------	------	------	-------------------------

TIME TO PEAK	(hrs)=	1.50	1.58	1.50
RUNOFF VOLUME	(mm)=	70.24	7.54	57.69
TOTAL RAINFALL	(mm)=	71.24	71.24	71.24
RUNOFF COEFFICIENT	=	0.99	0.11	0.81

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 33.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| RESERVOIR( 0111) |
| IN= 2---> OUT= 1 |
| DT= 1.0 min      |
-----

```

	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0160	0.0170
	0.0160	0.0001	0.0000	0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0110)	0.465	0.155	1.50	57.69
OUTFLOW: ID= 1 (0111)	0.465	0.016	1.10	57.68

PEAK FLOW REDUCTION [Qout/Qin](%)= 10.32
TIME SHIFT OF PEAK FLOW (min)=-24.00
MAXIMUM STORAGE USED (ha.m.)= 0.0079

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-----
| ADD HYD ( 0112) |
| 1 + 2 = 3       |
-----

```

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0109):	7.15	1.716	1.50	43.43
+ ID2= 2 (0111):	0.46	0.016	1.10	57.68
=====				
ID = 3 (0112):	7.61	1.732	1.50	44.30

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| RESERVOIR( 0113) |
| IN= 2---> OUT= 1 |
| DT= 1.0 min      |
-----

```

	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)

0.0000	0.0000	0.2410	0.2699
0.0100	0.0274	0.2810	0.2999
0.0170	0.0677	0.3140	0.3309
0.0240	0.1236	0.5430	0.3630
0.0650	0.1601	1.4010	0.3961
0.0870	0.1859	2.6120	0.4304
0.1630	0.2128	3.3210	0.4480
0.2020	0.2408	0.0000	0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0112)	7.615	1.732	1.50	44.30
OUTFLOW: ID= 1 (0113)	7.615	0.167	2.38	43.21

PEAK FLOW REDUCTION [Qout/Qin](%)= 9.64
 TIME SHIFT OF PEAK FLOW (min)= 53.00
 MAXIMUM STORAGE USED (ha.m.)= 0.2157

READ STORM	Filename: C:\Users\bjo\AppData\Local\Temp\
	b6c47c87-ffa1-4ea3-b46e-09b9679b04af\b95ed81c
Ptotal= 71.24 mm	Comments: Barrie_25yr_4hour_Chicago_v2

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	36.37	2.50	10.09	3.67	5.38
0.33	5.22	1.50	148.15	2.67	8.89	3.83	5.08
0.50	5.94	1.67	47.06	2.83	7.96	4.00	4.80
0.67	6.93	1.83	25.72	3.00	7.24	4.17	4.57
0.83	8.42	2.00	18.11	3.17	6.65		
1.00	10.91	2.17	14.17	3.33	6.15		
1.17	16.13	2.33	11.74	3.50	5.74		

CALIB	
NASHYD (0114)	Area (ha)= 0.08 Curve Number (CN)= 33.0
ID= 1 DT= 5.0 min	Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= 0.03

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr

0.083	0.00	1.167	16.13	2.250	11.74	3.33	6.15
0.167	0.00	1.250	36.37	2.333	11.74	3.42	5.74
0.250	5.22	1.333	36.37	2.417	10.09	3.50	5.74
0.333	5.22	1.417	148.15	2.500	10.09	3.58	5.38
0.417	5.94	1.500	148.15	2.583	8.89	3.67	5.38
0.500	5.94	1.583	47.06	2.667	8.89	3.75	5.08
0.583	6.93	1.667	47.06	2.750	7.96	3.83	5.08
0.667	6.93	1.750	25.72	2.833	7.96	3.92	4.80
0.750	8.42	1.833	25.72	2.917	7.24	4.00	4.80
0.833	8.42	1.917	18.11	3.000	7.24	4.08	4.57
0.917	10.91	2.000	18.11	3.083	6.65	4.17	4.57
1.000	10.91	2.083	14.17	3.167	6.65		
1.083	16.13	2.167	14.17	3.250	6.15		

Unit Hyd Qpeak (cms)= 0.102

PEAK FLOW (cms)= 0.001 (i)
TIME TO PEAK (hrs)= 1.500
RUNOFF VOLUME (mm)= 2.537
TOTAL RAINFALL (mm)= 71.237
RUNOFF COEFFICIENT = 0.036

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

ADD HYD (0115)				
1	+	2	=	3
		AREA (ha)	QPEAK (cms)	TPEAK (hrs)
		R.V. (mm)		
ID1= 1 (0113):		7.61	0.167	2.38
+ ID2= 2 (0114):		0.08	0.001	1.50
=====				
ID = 3 (0115):		7.69	0.167	2.37
		42.79		

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

READ STORM		Filename: C:\Users\bjo\AppData\Local\Temp\b6c47c87-ffa1-4ea3-b46e-09b9679b04af\b95ed81c							
Ptotal= 71.24 mm		Comments: Barrie_25yr_4hour_Chicago_v2							
TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	'	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	
0.17	0.00	1.33	36.37	'	2.50	10.09	3.67	5.38	
0.33	5.22	1.50	148.15	'	2.67	8.89	3.83	5.08	
0.50	5.94	1.67	47.06	'	2.83	7.96	4.00	4.80	

0.67	6.93	1.83	25.72	3.00	7.24	4.17	4.57
0.83	8.42	2.00	18.11	3.17	6.65		
1.00	10.91	2.17	14.17	3.33	6.15		
1.17	16.13	2.33	11.74	3.50	5.74		

CALIB							
NASHYD (0116)	Area (ha)=	0.07	Curve Number (CN)=	33.0			
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	# of Linear Res.(N)=	3.00			
	U.H. Tp(hrs)=	0.20					

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	16.13	2.250	11.74	3.33	6.15
0.167	0.00	1.250	36.37	2.333	11.74	3.42	5.74
0.250	5.22	1.333	36.37	2.417	10.09	3.50	5.74
0.333	5.22	1.417	148.15	2.500	10.09	3.58	5.38
0.417	5.94	1.500	148.15	2.583	8.89	3.67	5.38
0.500	5.94	1.583	47.06	2.667	8.89	3.75	5.08
0.583	6.93	1.667	47.06	2.750	7.96	3.83	5.08
0.667	6.93	1.750	25.72	2.833	7.96	3.92	4.80
0.750	8.42	1.833	25.72	2.917	7.24	4.00	4.80
0.833	8.42	1.917	18.11	3.000	7.24	4.08	4.57
0.917	10.91	2.000	18.11	3.083	6.65	4.17	4.57
1.000	10.91	2.083	14.17	3.167	6.65		
1.083	16.13	2.167	14.17	3.250	6.15		

Unit Hyd Qpeak (cms)= 0.013

PEAK FLOW (cms)= 0.001 (i)
 TIME TO PEAK (hrs)= 1.667
 RUNOFF VOLUME (mm)= 7.514
 TOTAL RAINFALL (mm)= 71.237
 RUNOFF COEFFICIENT = 0.105

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

ADD HYD (0117)				
1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0115):	7.69	0.167	2.37	42.79


```

+ ID2= 2 ( 0116):      0.07   0.001      1.67      7.51
=====
ID = 3 ( 0117):      7.76   0.168      2.37      42.47

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NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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-----
| READ STORM |      Filename: C:\Users\bjo\AppData\
|            |      Local\Temp\
|            |      b6c47c87-ffa1-4ea3-b46e-09b9679b04af\b95ed81c
| Ptotal= 71.24 mm |      Comments: Barrie_25yr_4hour_Chicago_v2
-----

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	36.37	2.50	10.09	3.67	5.38
0.33	5.22	1.50	148.15	2.67	8.89	3.83	5.08
0.50	5.94	1.67	47.06	2.83	7.96	4.00	4.80
0.67	6.93	1.83	25.72	3.00	7.24	4.17	4.57
0.83	8.42	2.00	18.11	3.17	6.65		
1.00	10.91	2.17	14.17	3.33	6.15		
1.17	16.13	2.33	11.74	3.50	5.74		

```

-----
| CALIB |
| NASHYD ( 0203) |      Area (ha)= 0.17      Curve Number (CN)= 33.0
| ID= 1 DT= 5.0 min |      Ia (mm)= 5.00      # of Linear Res.(N)= 3.00
-----
| U.H. Tp(hrs)= 0.03

```

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

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

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	16.13	2.250	11.74	3.33	6.15
0.167	0.00	1.250	36.37	2.333	11.74	3.42	5.74
0.250	5.22	1.333	36.37	2.417	10.09	3.50	5.74
0.333	5.22	1.417	148.15	2.500	10.09	3.58	5.38
0.417	5.94	1.500	148.15	2.583	8.89	3.67	5.38
0.500	5.94	1.583	47.06	2.667	8.89	3.75	5.08
0.583	6.93	1.667	47.06	2.750	7.96	3.83	5.08
0.667	6.93	1.750	25.72	2.833	7.96	3.92	4.80
0.750	8.42	1.833	25.72	2.917	7.24	4.00	4.80
0.833	8.42	1.917	18.11	3.000	7.24	4.08	4.57
0.917	10.91	2.000	18.11	3.083	6.65	4.17	4.57
1.000	10.91	2.083	14.17	3.167	6.65		

1.083 16.13 | 2.167 14.17 | 3.250 6.15 |

Unit Hyd Qpeak (cms)= 0.216

PEAK FLOW (cms)= 0.002 (i)

TIME TO PEAK (hrs)= 1.500

RUNOFF VOLUME (mm)= 2.537

TOTAL RAINFALL (mm)= 71.237

RUNOFF COEFFICIENT = 0.036

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

| READ STORM | Filename: C:\Users\bjo\AppData\
| | Local\Temp\
| | b6c47c87-ffa1-4ea3-b46e-09b9679b04af\b95ed81c
| Ptotal= 71.24 mm | Comments: Barrie_25yr_4hour_Chicago_v2

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	36.37	2.50	10.09	3.67	5.38
0.33	5.22	1.50	148.15	2.67	8.89	3.83	5.08
0.50	5.94	1.67	47.06	2.83	7.96	4.00	4.80
0.67	6.93	1.83	25.72	3.00	7.24	4.17	4.57
0.83	8.42	2.00	18.11	3.17	6.65		
1.00	10.91	2.17	14.17	3.33	6.15		
1.17	16.13	2.33	11.74	3.50	5.74		

| CALIB |
| STANDHYD (0202) | Area (ha)= 0.42
| ID= 1 DT= 5.0 min | Total Imp(%)= 54.00 Dir. Conn.(%)= 54.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.23	0.19
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	52.92	40.00
Mannings n	=	0.013	0.250

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

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

0.083	0.00	1.167	16.13	2.250	11.74	3.33	6.15
0.167	0.00	1.250	36.37	2.333	11.74	3.42	5.74
0.250	5.22	1.333	36.37	2.417	10.09	3.50	5.74
0.333	5.22	1.417	148.15	2.500	10.09	3.58	5.38
0.417	5.94	1.500	148.15	2.583	8.89	3.67	5.38
0.500	5.94	1.583	47.06	2.667	8.89	3.75	5.08
0.583	6.93	1.667	47.06	2.750	7.96	3.83	5.08
0.667	6.93	1.750	25.72	2.833	7.96	3.92	4.80
0.750	8.42	1.833	25.72	2.917	7.24	4.00	4.80
0.833	8.42	1.917	18.11	3.000	7.24	4.08	4.57
0.917	10.91	2.000	18.11	3.083	6.65	4.17	4.57
1.000	10.91	2.083	14.17	3.167	6.65		
1.083	16.13	2.167	14.17	3.250	6.15		

Max.Eff.Inten.(mm/hr)= 148.15 9.15
over (min) 5.00 20.00
Storage Coeff. (min)= 1.49 (ii) 19.86 (ii)
Unit Hyd. Tpeak (min)= 5.00 20.00
Unit Hyd. peak (cms)= 0.33 0.06

TOTALS

PEAK FLOW (cms)= 0.09 0.00 0.094 (iii)
TIME TO PEAK (hrs)= 1.50 1.75 1.50
RUNOFF VOLUME (mm)= 69.24 7.54 40.83
TOTAL RAINFALL (mm)= 71.24 71.24 71.24
RUNOFF COEFFICIENT = 0.97 0.11 0.57

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 33.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| ADD HYD ( 0205) |
| 1 + 2 = 3 |
-----
      AREA      QPEAK      TPEAK      R.V.
      (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0202):  0.42  0.094  1.50  40.83
+ ID2= 2 ( 0203):  0.17  0.002  1.50   2.54
=====
ID = 3 ( 0205):  0.59  0.097  1.50  29.79

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

READ STORM	Filename: C:\Users\bjo\AppData\Local\Temp\
	b6c47c87-ffa1-4ea3-b46e-09b9679b04af\b95ed81c
Ptotal= 71.24 mm	Comments: Barrie_25yr_4hour_Chicago_v2

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.17	0.00	1.33	36.37	2.50	10.09	3.67	5.38
0.33	5.22	1.50	148.15	2.67	8.89	3.83	5.08
0.50	5.94	1.67	47.06	2.83	7.96	4.00	4.80
0.67	6.93	1.83	25.72	3.00	7.24	4.17	4.57
0.83	8.42	2.00	18.11	3.17	6.65		
1.00	10.91	2.17	14.17	3.33	6.15		
1.17	16.13	2.33	11.74	3.50	5.74		

CALIB	
STANDHYD (0201)	Area (ha)= 1.68
ID= 1 DT= 5.0 min	Total Imp(%)= 93.00 Dir. Conn.(%)= 93.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	1.56	0.12
Dep. Storage (mm)=	2.00	5.00
Average Slope (%)=	1.00	2.00
Length (m)=	105.86	40.00
Mannings n =	0.013	0.250

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

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

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	1.167	16.13	2.250	11.74	3.33	6.15
0.167	0.00	1.250	36.37	2.333	11.74	3.42	5.74
0.250	5.22	1.333	36.37	2.417	10.09	3.50	5.74
0.333	5.22	1.417	148.15	2.500	10.09	3.58	5.38
0.417	5.94	1.500	148.15	2.583	8.89	3.67	5.38
0.500	5.94	1.583	47.06	2.667	8.89	3.75	5.08
0.583	6.93	1.667	47.06	2.750	7.96	3.83	5.08
0.667	6.93	1.750	25.72	2.833	7.96	3.92	4.80
0.750	8.42	1.833	25.72	2.917	7.24	4.00	4.80
0.833	8.42	1.917	18.11	3.000	7.24	4.08	4.57
0.917	10.91	2.000	18.11	3.083	6.65	4.17	4.57
1.000	10.91	2.083	14.17	3.167	6.65		
1.083	16.13	2.167	14.17	3.250	6.15		

Max.Eff.Inten.(mm/hr)=	148.15	11.97
------------------------	--------	-------

over (min)	5.00	5.00	
Storage Coeff. (min)=	2.26 (ii)	4.40 (ii)	
Unit Hyd. Tpeak (min)=	5.00	5.00	
Unit Hyd. peak (cms)=	0.30	0.23	
			TOTALS
PEAK FLOW (cms)=	0.64	0.00	0.642 (iii)
TIME TO PEAK (hrs)=	1.50	1.50	1.50
RUNOFF VOLUME (mm)=	69.24	7.54	64.92
TOTAL RAINFALL (mm)=	71.24	71.24	71.24
RUNOFF COEFFICIENT =	0.97	0.11	0.91

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
 CN* = 33.0 Ia = Dep. Storage (Above)
 (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
 THAN THE STORAGE COEFFICIENT.
 (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| RESERVOIR( 0204) |
| IN= 2---> OUT= 1 |
| DT= 1.0 min      |
-----

```

	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.2000	0.0600
	0.1500	0.0010	0.0000	0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0201)	1.681	0.642	1.50	64.92
OUTFLOW: ID= 1 (0204)	1.681	0.176	1.70	64.92

PEAK FLOW REDUCTION [Qout/Qin](%)= 27.43
 TIME SHIFT OF PEAK FLOW (min)= 12.00
 MAXIMUM STORAGE USED (ha.m.)= 0.0317

```

-----
| ADD HYD ( 0206) |
| 1 + 2 = 3      |
-----

```

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0204):	1.68	0.176	1.70	64.92
+ ID2= 2 (0205):	0.59	0.097	1.50	29.79
=====				
ID = 3 (0206):	2.27	0.264	1.50	55.79

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| ADD HYD (0301) |
1 + 2 = 3

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0117):	7.76	0.168	2.37	42.47
+ ID2= 2 (0206):	2.27	0.264	1.50	55.79
=====				
ID = 3 (0301):	10.04	0.343	2.07	45.48

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

FINISH

=====

=====

4-hour Chicago
50-yr

=====

```
V   V   I   SSSSS U   U   A   L           (v 5.1.2004)
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
  WV   I   SSSSS UUUUU A   A   LLLLL
```

```
  000  TTTTT  TTTTT  H   H  Y   Y  M   M  000  TM
O   O   T      T   H   H   Y Y   MM MM  O   O
O   O   T      T   H   H   Y   M   M  O   O
  000   T      T   H   H   Y   M   M  000
```

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

Input filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\V02\voin.dat

Output filename:

C:\Users\bjo\AppData\Local\Civica\XH5\e91bc6c1-1ed6-4e95-932d-66b6211c2905\c2aee759-27fe-4aa8-bb45-f9afb3ab47a0\scenario

Summary filename:

C:\Users\bjo\AppData\Local\Civica\XH5\e91bc6c1-1ed6-4e95-932d-66b6211c2905\c2aee759-27fe-4aa8-bb45-f9afb3ab47a0\scenario

DATE: 10/30/2019

TIME: 02:52:53

USER:

COMMENTS: _____

```
*****
** SIMULATION : Run 05           **
*****
```

| READ STORM |

Filename: C:\Users\bjo\AppData\Local\Temp\

b6c47c87-ffa1-4ea3-b46e-09b9679b04af\0563787d
 Ptotal= 79.45 mm | Comments: Barrie_50yr_4hour_Chicago_v2

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.17	0.00	1.33	40.22	2.50	11.37	3.67	6.11
0.33	5.93	1.50	164.22	2.67	10.03	3.83	5.77
0.50	6.74	1.67	51.92	2.83	9.00	4.00	5.46
0.67	7.85	1.83	28.58	3.00	8.19	4.17	5.19
0.83	9.50	2.00	20.23	3.17	7.53		
1.00	12.27	2.17	15.88	3.33	6.98		
1.17	18.04	2.33	13.20	3.50	6.51		

CALIB
 NASHYD (0102) | Area (ha)= 0.94 Curve Number (CN)= 33.0
 ID= 1 DT= 5.0 min | Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
 U.H. Tp(hrs)= 0.11

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	1.167	18.04	2.250	13.20	3.33	6.98
0.167	0.00	1.250	40.22	2.333	13.20	3.42	6.51
0.250	5.93	1.333	40.22	2.417	11.37	3.50	6.51
0.333	5.93	1.417	164.22	2.500	11.37	3.58	6.11
0.417	6.74	1.500	164.22	2.583	10.03	3.67	6.11
0.500	6.74	1.583	51.92	2.667	10.03	3.75	5.77
0.583	7.85	1.667	51.92	2.750	9.00	3.83	5.77
0.667	7.85	1.750	28.58	2.833	9.00	3.92	5.46
0.750	9.50	1.833	28.58	2.917	8.19	4.00	5.46
0.833	9.50	1.917	20.23	3.000	8.19	4.08	5.19
0.917	12.27	2.000	20.23	3.083	7.53	4.17	5.19
1.000	12.27	2.083	15.88	3.167	7.53		
1.083	18.04	2.167	15.88	3.250	6.98		

Unit Hyd Qpeak (cms)= 0.326

PEAK FLOW (cms)= 0.029 (i)

TIME TO PEAK (hrs)= 1.500

RUNOFF VOLUME (mm)= 9.220

TOTAL RAINFALL (mm)= 79.453

RUNOFF COEFFICIENT = 0.116

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


```

-----
| READ STORM | Filename: C:\Users\bjo\AppData\
|             | Local\Temp\
|             | b6c47c87-ffa1-4ea3-b46e-09b9679b04af\0563787d
| Ptotal= 79.45 mm | Comments: Barrie_50yr_4hour_Chicago_v2
-----

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	40.22	2.50	11.37	3.67	6.11
0.33	5.93	1.50	164.22	2.67	10.03	3.83	5.77
0.50	6.74	1.67	51.92	2.83	9.00	4.00	5.46
0.67	7.85	1.83	28.58	3.00	8.19	4.17	5.19
0.83	9.50	2.00	20.23	3.17	7.53		
1.00	12.27	2.17	15.88	3.33	6.98		
1.17	18.04	2.33	13.20	3.50	6.51		

```

-----
| CALIB |
| STANDHYD ( 0101) | Area (ha)= 3.39
| ID= 1 DT= 5.0 min | Total Imp(%)= 83.00 Dir. Conn.(%)= 83.00
-----

```

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	2.81	0.58
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	150.33	40.00
Mannings n	=	0.013	0.250

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

```

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

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	18.04	2.250	13.20	3.33	6.98
0.167	0.00	1.250	40.22	2.333	13.20	3.42	6.51
0.250	5.93	1.333	40.22	2.417	11.37	3.50	6.51
0.333	5.93	1.417	164.22	2.500	11.37	3.58	6.11
0.417	6.74	1.500	164.22	2.583	10.03	3.67	6.11
0.500	6.74	1.583	51.92	2.667	10.03	3.75	5.77
0.583	7.85	1.667	51.92	2.750	9.00	3.83	5.77
0.667	7.85	1.750	28.58	2.833	9.00	3.92	5.46
0.750	9.50	1.833	28.58	2.917	8.19	4.00	5.46
0.833	9.50	1.917	20.23	3.000	8.19	4.08	5.19
0.917	12.27	2.000	20.23	3.083	7.53	4.17	5.19

1.000	12.27		2.083	15.88		3.167	7.53	
1.083	18.04		2.167	15.88		3.250	6.98	

Max.Eff.Inten.(mm/hr)=	164.22		14.98	
over (min)	5.00		10.00	
Storage Coeff. (min)=	2.68 (ii)		5.74 (ii)	
Unit Hyd. Tpeak (min)=	5.00		10.00	
Unit Hyd. peak (cms)=	0.29		0.15	
				TOTALS
PEAK FLOW (cms)=	1.26		0.02	1.276 (iii)
TIME TO PEAK (hrs)=	1.50		1.58	1.50
RUNOFF VOLUME (mm)=	77.45		9.39	65.88
TOTAL RAINFALL (mm)=	79.45		79.45	79.45
RUNOFF COEFFICIENT =	0.97		0.12	0.83

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 33.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0103)				
1 + 2 = 3				
	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0101):	3.39	1.276	1.50	65.88
+ ID2= 2 (0102):	0.94	0.029	1.50	9.22
=====				
ID = 3 (0103):	4.33	1.305	1.50	53.58

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

READ STORM	Filename: C:\Users\bjo\AppData\
	Local\Temp\
	b6c47c87-ffa1-4ea3-b46e-09b9679b04af\0563787d
Ptotal= 79.45 mm	Comments: Barrie_50yr_4hour_Chicago_v2

TIME	RAIN		TIME	RAIN		TIME	RAIN		TIME	RAIN
hrs	mm/hr		hrs	mm/hr		hrs	mm/hr		hrs	mm/hr
0.17	0.00		1.33	40.22		2.50	11.37		3.67	6.11
0.33	5.93		1.50	164.22		2.67	10.03		3.83	5.77
0.50	6.74		1.67	51.92		2.83	9.00		4.00	5.46
0.67	7.85		1.83	28.58		3.00	8.19		4.17	5.19

0.83	9.50	2.00	20.23	3.17	7.53
1.00	12.27	2.17	15.88	3.33	6.98
1.17	18.04	2.33	13.20	3.50	6.51

CALIB	
STANDHYD (0104)	Area (ha)= 2.05
ID= 1 DT= 5.0 min	Total Imp(%)= 55.00 Dir. Conn.(%)= 45.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	1.13	0.92
Dep. Storage (mm)=	2.00	5.00
Average Slope (%)=	1.00	2.00
Length (m)=	116.90	40.00
Mannings n =	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	18.04	2.250	13.20	3.33	6.98
0.167	0.00	1.250	40.22	2.333	13.20	3.42	6.51
0.250	5.93	1.333	40.22	2.417	11.37	3.50	6.51
0.333	5.93	1.417	164.22	2.500	11.37	3.58	6.11
0.417	6.74	1.500	164.22	2.583	10.03	3.67	6.11
0.500	6.74	1.583	51.92	2.667	10.03	3.75	5.77
0.583	7.85	1.667	51.92	2.750	9.00	3.83	5.77
0.667	7.85	1.750	28.58	2.833	9.00	3.92	5.46
0.750	9.50	1.833	28.58	2.917	8.19	4.00	5.46
0.833	9.50	1.917	20.23	3.000	8.19	4.08	5.19
0.917	12.27	2.000	20.23	3.083	7.53	4.17	5.19
1.000	12.27	2.083	15.88	3.167	7.53		
1.083	18.04	2.167	15.88	3.250	6.98		

Max.Eff.Inten.(mm/hr)=	164.22	18.83
over (min)	5.00	20.00
Storage Coeff. (min)=	2.30 (ii)	16.06 (ii)
Unit Hyd. Tpeak (min)=	5.00	20.00
Unit Hyd. peak (cms)=	0.30	0.06

PEAK FLOW (cms)=	0.42	0.03	*TOTALS*
TIME TO PEAK (hrs)=	1.50	1.75	0.426 (iii)
RUNOFF VOLUME (mm)=	77.45	11.42	1.50
TOTAL RAINFALL (mm)=	79.45	79.45	41.13
RUNOFF COEFFICIENT =	0.97	0.14	79.45
			0.52

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 33.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
-----
| ADD HYD ( 0105) |
| 1 + 2 = 3 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0103):    4.33    1.305    1.50    53.58
+ ID2= 2 ( 0104):    2.05    0.426    1.50    41.13
=====
ID = 3 ( 0105):    6.38    1.732    1.50    49.58
-----
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| READ STORM |
|          |
| Ptotal= 79.45 mm |
-----
Filename: C:\Users\bjo\AppData\
Local\Temp\
b6c47c87-ffa1-4ea3-b46e-09b9679b04af\0563787d
Comments: Barrie_50yr_4hour_Chicago_v2
-----
```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	40.22	2.50	11.37	3.67	6.11
0.33	5.93	1.50	164.22	2.67	10.03	3.83	5.77
0.50	6.74	1.67	51.92	2.83	9.00	4.00	5.46
0.67	7.85	1.83	28.58	3.00	8.19	4.17	5.19
0.83	9.50	2.00	20.23	3.17	7.53		
1.00	12.27	2.17	15.88	3.33	6.98		
1.17	18.04	2.33	13.20	3.50	6.51		

```
-----
| CALIB |
| STANDHYD ( 0106) |
| ID= 1 DT= 5.0 min |
-----
Area (ha)= 0.31
Total Imp(%)= 67.00 Dir. Conn.(%)= 67.00
-----
```

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.21	0.10
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	1.00	2.00

Length (m)= 45.46 40.00
Mannings n = 0.013 0.250

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

----- TRANSFORMED HYETOGRAPH -----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	18.04	2.250	13.20	3.33	6.98
0.167	0.00	1.250	40.22	2.333	13.20	3.42	6.51
0.250	5.93	1.333	40.22	2.417	11.37	3.50	6.51
0.333	5.93	1.417	164.22	2.500	11.37	3.58	6.11
0.417	6.74	1.500	164.22	2.583	10.03	3.67	6.11
0.500	6.74	1.583	51.92	2.667	10.03	3.75	5.77
0.583	7.85	1.667	51.92	2.750	9.00	3.83	5.77
0.667	7.85	1.750	28.58	2.833	9.00	3.92	5.46
0.750	9.50	1.833	28.58	2.917	8.19	4.00	5.46
0.833	9.50	1.917	20.23	3.000	8.19	4.08	5.19
0.917	12.27	2.000	20.23	3.083	7.53	4.17	5.19
1.000	12.27	2.083	15.88	3.167	7.53		
1.083	18.04	2.167	15.88	3.250	6.98		

Max.Eff.Inten.(mm/hr)= 164.22 14.98
over (min) 5.00 10.00
Storage Coeff. (min)= 1.31 (ii) 5.67 (ii)
Unit Hyd. Tpeak (min)= 5.00 10.00
Unit Hyd. peak (cms)= 0.33 0.15

TOTALS

PEAK FLOW (cms)= 0.09 0.00 0.097 (iii)
TIME TO PEAK (hrs)= 1.50 1.58 1.50
RUNOFF VOLUME (mm)= 77.45 9.39 54.99
TOTAL RAINFALL (mm)= 79.45 79.45 79.45
RUNOFF COEFFICIENT = 0.97 0.12 0.69

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 33.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD (0107) |
1 + 2 = 3
ID1= 1 (0105): AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
6.38 1.732 1.50 49.58

```

+ ID2= 2 ( 0106):      0.31   0.097      1.50   54.99
=====
ID = 3 ( 0107):      6.69   1.829      1.50   49.83

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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-----
| READ STORM |      Filename: C:\Users\bjo\AppData\
|            |      Local\Temp\
|            |      b6c47c87-ffa1-4ea3-b46e-09b9679b04af\0563787d
| Ptotal= 79.45 mm |      Comments: Barrie_50yr_4hour_Chicago_v2
-----

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	40.22	2.50	11.37	3.67	6.11
0.33	5.93	1.50	164.22	2.67	10.03	3.83	5.77
0.50	6.74	1.67	51.92	2.83	9.00	4.00	5.46
0.67	7.85	1.83	28.58	3.00	8.19	4.17	5.19
0.83	9.50	2.00	20.23	3.17	7.53		
1.00	12.27	2.17	15.88	3.33	6.98		
1.17	18.04	2.33	13.20	3.50	6.51		

```

-----
| CALIB      |
| STANDHYD ( 0108) |      Area (ha)= 0.46
| ID= 1 DT= 5.0 min |      Total Imp(%)= 40.00   Dir. Conn.(%)= 40.00
-----

```

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.18	0.28
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	55.38	40.00
Mannings n	=	0.013	0.250

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

```

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

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	18.04	2.250	13.20	3.33	6.98
0.167	0.00	1.250	40.22	2.333	13.20	3.42	6.51
0.250	5.93	1.333	40.22	2.417	11.37	3.50	6.51
0.333	5.93	1.417	164.22	2.500	11.37	3.58	6.11
0.417	6.74	1.500	164.22	2.583	10.03	3.67	6.11
0.500	6.74	1.583	51.92	2.667	10.03	3.75	5.77

0.583	7.85	1.667	51.92	2.750	9.00	3.83	5.77
0.667	7.85	1.750	28.58	2.833	9.00	3.92	5.46
0.750	9.50	1.833	28.58	2.917	8.19	4.00	5.46
0.833	9.50	1.917	20.23	3.000	8.19	4.08	5.19
0.917	12.27	2.000	20.23	3.083	7.53	4.17	5.19
1.000	12.27	2.083	15.88	3.167	7.53		
1.083	18.04	2.167	15.88	3.250	6.98		

Max.Eff.Inten.(mm/hr)= 164.22 11.37
over (min) 5.00 20.00
Storage Coeff. (min)= 1.47 (ii) 18.31 (ii)
Unit Hyd. Tpeak (min)= 5.00 20.00
Unit Hyd. peak (cms)= 0.33 0.06

TOTALS

PEAK FLOW (cms)= 0.08 0.01 0.086 (iii)
TIME TO PEAK (hrs)= 1.50 1.75 1.50
RUNOFF VOLUME (mm)= 78.45 9.39 36.99
TOTAL RAINFALL (mm)= 79.45 79.45 79.45
RUNOFF COEFFICIENT = 0.99 0.12 0.47

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 33.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0109)				
1 + 2 = 3				
	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0107):	6.69	1.829	1.50	49.83
+ ID2= 2 (0108):	0.46	0.086	1.50	36.99
=====				
ID = 3 (0109):	7.15	1.915	1.50	49.01

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

READ STORM	Filename: C:\Users\bjo\AppData\
	Local\Temp\
	b6c47c87-ffa1-4ea3-b46e-09b9679b04af\0563787d
Ptotal= 79.45 mm	Comments: Barrie_50yr_4hour_Chicago_v2

TIME RAIN | TIME RAIN | ' TIME RAIN | TIME RAIN

hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	40.22	2.50	11.37	3.67	6.11
0.33	5.93	1.50	164.22	2.67	10.03	3.83	5.77
0.50	6.74	1.67	51.92	2.83	9.00	4.00	5.46
0.67	7.85	1.83	28.58	3.00	8.19	4.17	5.19
0.83	9.50	2.00	20.23	3.17	7.53		
1.00	12.27	2.17	15.88	3.33	6.98		
1.17	18.04	2.33	13.20	3.50	6.51		

CALIB	
STANDHYD (0110)	Area (ha)= 0.46
ID= 1 DT= 5.0 min	Total Imp(%)= 80.00 Dir. Conn.(%)= 80.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.37	0.09
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	55.68	40.00
Mannings n	=	0.013	0.250

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

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

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	18.04	2.250	13.20	3.33	6.98
0.167	0.00	1.250	40.22	2.333	13.20	3.42	6.51
0.250	5.93	1.333	40.22	2.417	11.37	3.50	6.51
0.333	5.93	1.417	164.22	2.500	11.37	3.58	6.11
0.417	6.74	1.500	164.22	2.583	10.03	3.67	6.11
0.500	6.74	1.583	51.92	2.667	10.03	3.75	5.77
0.583	7.85	1.667	51.92	2.750	9.00	3.83	5.77
0.667	7.85	1.750	28.58	2.833	9.00	3.92	5.46
0.750	9.50	1.833	28.58	2.917	8.19	4.00	5.46
0.833	9.50	1.917	20.23	3.000	8.19	4.08	5.19
0.917	12.27	2.000	20.23	3.083	7.53	4.17	5.19
1.000	12.27	2.083	15.88	3.167	7.53		
1.083	18.04	2.167	15.88	3.250	6.98		

Max.Eff.Inten.(mm/hr)=	164.22	14.98
over (min)	5.00	5.00
Storage Coeff. (min)=	1.47 (ii)	4.80 (ii)
Unit Hyd. Tpeak (min)=	5.00	5.00
Unit Hyd. peak (cms)=	0.33	0.22

PEAK FLOW	(cms)=	0.17	0.00	*TOTALS*
				0.173 (iii)

TIME TO PEAK	(hrs)=	1.50	1.50	1.50
RUNOFF VOLUME	(mm)=	78.45	9.39	64.64
TOTAL RAINFALL	(mm)=	79.45	79.45	79.45
RUNOFF COEFFICIENT	=	0.99	0.12	0.81

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 33.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| RESERVOIR( 0111) |
| IN= 2---> OUT= 1 |
| DT= 1.0 min      |
-----

```

	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0160	0.0170
	0.0160	0.0001	0.0000	0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0110)	0.465	0.173	1.50	64.64
OUTFLOW: ID= 1 (0111)	0.465	0.016	1.07	64.63

PEAK FLOW REDUCTION [Qout/Qin](%)= 9.23
TIME SHIFT OF PEAK FLOW (min)=-26.00
MAXIMUM STORAGE USED (ha.m.)= 0.0091

```

-----
| ADD HYD ( 0112) |
| 1 + 2 = 3       |
-----

```

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0109):	7.15	1.915	1.50	49.01
+ ID2= 2 (0111):	0.46	0.016	1.07	64.63
=====				
ID = 3 (0112):	7.61	1.931	1.50	49.96

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| RESERVOIR( 0113) |
| IN= 2---> OUT= 1 |
| DT= 1.0 min      |
-----

```

	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)

0.0000	0.0000	0.2410	0.2699
0.0100	0.0274	0.2810	0.2999
0.0170	0.0677	0.3140	0.3309
0.0240	0.1236	0.5430	0.3630
0.0650	0.1601	1.4010	0.3961
0.0870	0.1859	2.6120	0.4304
0.1630	0.2128	3.3210	0.4480
0.2020	0.2408	0.0000	0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0112)	7.615	1.931	1.50	49.96
OUTFLOW: ID= 1 (0113)	7.615	0.195	2.35	48.83

PEAK FLOW REDUCTION [Qout/Qin](%)= 10.10
 TIME SHIFT OF PEAK FLOW (min)= 51.00
 MAXIMUM STORAGE USED (ha.m.)= 0.2358

READ STORM	Filename: C:\Users\bjo\AppData\Local\Temp\
	b6c47c87-ffa1-4ea3-b46e-09b9679b04af\0563787d
Ptotal= 79.45 mm	Comments: Barrie_50yr_4hour_Chicago_v2

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	40.22	2.50	11.37	3.67	6.11
0.33	5.93	1.50	164.22	2.67	10.03	3.83	5.77
0.50	6.74	1.67	51.92	2.83	9.00	4.00	5.46
0.67	7.85	1.83	28.58	3.00	8.19	4.17	5.19
0.83	9.50	2.00	20.23	3.17	7.53		
1.00	12.27	2.17	15.88	3.33	6.98		
1.17	18.04	2.33	13.20	3.50	6.51		

CALIB	
NASHYD (0114)	Area (ha)= 0.08 Curve Number (CN)= 33.0
ID= 1 DT= 5.0 min	Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= 0.03

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr

0.083	0.00	1.167	18.04	2.250	13.20	3.33	6.98
0.167	0.00	1.250	40.22	2.333	13.20	3.42	6.51
0.250	5.93	1.333	40.22	2.417	11.37	3.50	6.51
0.333	5.93	1.417	164.22	2.500	11.37	3.58	6.11
0.417	6.74	1.500	164.22	2.583	10.03	3.67	6.11
0.500	6.74	1.583	51.92	2.667	10.03	3.75	5.77
0.583	7.85	1.667	51.92	2.750	9.00	3.83	5.77
0.667	7.85	1.750	28.58	2.833	9.00	3.92	5.46
0.750	9.50	1.833	28.58	2.917	8.19	4.00	5.46
0.833	9.50	1.917	20.23	3.000	8.19	4.08	5.19
0.917	12.27	2.000	20.23	3.083	7.53	4.17	5.19
1.000	12.27	2.083	15.88	3.167	7.53		
1.083	18.04	2.167	15.88	3.250	6.98		

Unit Hyd Qpeak (cms)= 0.102

PEAK FLOW (cms)= 0.001 (i)
TIME TO PEAK (hrs)= 1.500
RUNOFF VOLUME (mm)= 3.161
TOTAL RAINFALL (mm)= 79.453
RUNOFF COEFFICIENT = 0.040

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

ADD HYD (0115)				
1	+	2	=	3
		AREA (ha)	QPEAK (cms)	TPEAK (hrs)
		R.V. (mm)		
ID1= 1 (0113):		7.61	0.195	2.35
+ ID2= 2 (0114):		0.08	0.001	1.50
=====				
ID = 3 (0115):		7.69	0.195	2.35
		48.35		

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

READ STORM		Filename: C:\Users\bjo\AppData\Local\Temp\
		b6c47c87-ffa1-4ea3-b46e-09b9679b04af\0563787d
Ptotal= 79.45 mm		Comments: Barrie_50yr_4hour_Chicago_v2

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.17	0.00	1.33	40.22	2.50	11.37	3.67	6.11
0.33	5.93	1.50	164.22	2.67	10.03	3.83	5.77
0.50	6.74	1.67	51.92	2.83	9.00	4.00	5.46

0.67	7.85	1.83	28.58	3.00	8.19	4.17	5.19
0.83	9.50	2.00	20.23	3.17	7.53		
1.00	12.27	2.17	15.88	3.33	6.98		
1.17	18.04	2.33	13.20	3.50	6.51		

CALIB							
NASHYD (0116)	Area (ha)=	0.07	Curve Number (CN)=	33.0			
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	# of Linear Res.(N)=	3.00			
	U.H. Tp(hrs)=	0.20					

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

----- TRANSFORMED HYETOGRAPH -----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	18.04	2.250	13.20	3.33	6.98
0.167	0.00	1.250	40.22	2.333	13.20	3.42	6.51
0.250	5.93	1.333	40.22	2.417	11.37	3.50	6.51
0.333	5.93	1.417	164.22	2.500	11.37	3.58	6.11
0.417	6.74	1.500	164.22	2.583	10.03	3.67	6.11
0.500	6.74	1.583	51.92	2.667	10.03	3.75	5.77
0.583	7.85	1.667	51.92	2.750	9.00	3.83	5.77
0.667	7.85	1.750	28.58	2.833	9.00	3.92	5.46
0.750	9.50	1.833	28.58	2.917	8.19	4.00	5.46
0.833	9.50	1.917	20.23	3.000	8.19	4.08	5.19
0.917	12.27	2.000	20.23	3.083	7.53	4.17	5.19
1.000	12.27	2.083	15.88	3.167	7.53		
1.083	18.04	2.167	15.88	3.250	6.98		

Unit Hyd Qpeak (cms)= 0.013

PEAK FLOW (cms)= 0.002 (i)
TIME TO PEAK (hrs)= 1.667
RUNOFF VOLUME (mm)= 9.367
TOTAL RAINFALL (mm)= 79.453
RUNOFF COEFFICIENT = 0.118

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

ADD HYD (0117)				
1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0115):	7.69	0.195	2.35	48.35

```

+ ID2= 2 ( 0116):      0.07   0.002      1.67      9.37
=====
ID = 3 ( 0117):      7.76   0.196      2.33     48.00

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NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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| READ STORM |      Filename: C:\Users\bjo\AppData\
|            |      Local\Temp\
|            |      b6c47c87-ffa1-4ea3-b46e-09b9679b04af\0563787d
| Ptotal= 79.45 mm |      Comments: Barrie_50yr_4hour_Chicago_v2
-----

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	40.22	2.50	11.37	3.67	6.11
0.33	5.93	1.50	164.22	2.67	10.03	3.83	5.77
0.50	6.74	1.67	51.92	2.83	9.00	4.00	5.46
0.67	7.85	1.83	28.58	3.00	8.19	4.17	5.19
0.83	9.50	2.00	20.23	3.17	7.53		
1.00	12.27	2.17	15.88	3.33	6.98		
1.17	18.04	2.33	13.20	3.50	6.51		

```

-----
| CALIB |
| NASHYD ( 0203) |      Area (ha)= 0.17      Curve Number (CN)= 33.0
| ID= 1 DT= 5.0 min |      Ia (mm)= 5.00      # of Linear Res.(N)= 3.00
-----
| U.H. Tp(hrs)= 0.03

```

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

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

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	18.04	2.250	13.20	3.33	6.98
0.167	0.00	1.250	40.22	2.333	13.20	3.42	6.51
0.250	5.93	1.333	40.22	2.417	11.37	3.50	6.51
0.333	5.93	1.417	164.22	2.500	11.37	3.58	6.11
0.417	6.74	1.500	164.22	2.583	10.03	3.67	6.11
0.500	6.74	1.583	51.92	2.667	10.03	3.75	5.77
0.583	7.85	1.667	51.92	2.750	9.00	3.83	5.77
0.667	7.85	1.750	28.58	2.833	9.00	3.92	5.46
0.750	9.50	1.833	28.58	2.917	8.19	4.00	5.46
0.833	9.50	1.917	20.23	3.000	8.19	4.08	5.19
0.917	12.27	2.000	20.23	3.083	7.53	4.17	5.19
1.000	12.27	2.083	15.88	3.167	7.53		

1.083 18.04 | 2.167 15.88 | 3.250 6.98 |

Unit Hyd Qpeak (cms)= 0.216

PEAK FLOW (cms)= 0.003 (i)

TIME TO PEAK (hrs)= 1.500

RUNOFF VOLUME (mm)= 3.161

TOTAL RAINFALL (mm)= 79.453

RUNOFF COEFFICIENT = 0.040

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

| READ STORM | Filename: C:\Users\bjo\AppData\
| | Local\Temp\
| | b6c47c87-ffa1-4ea3-b46e-09b9679b04af\0563787d
| Ptotal= 79.45 mm | Comments: Barrie_50yr_4hour_Chicago_v2

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	40.22	2.50	11.37	3.67	6.11
0.33	5.93	1.50	164.22	2.67	10.03	3.83	5.77
0.50	6.74	1.67	51.92	2.83	9.00	4.00	5.46
0.67	7.85	1.83	28.58	3.00	8.19	4.17	5.19
0.83	9.50	2.00	20.23	3.17	7.53		
1.00	12.27	2.17	15.88	3.33	6.98		
1.17	18.04	2.33	13.20	3.50	6.51		

| CALIB |
| STANDHYD (0202) | Area (ha)= 0.42
| ID= 1 DT= 5.0 min | Total Imp(%)= 54.00 Dir. Conn.(%)= 54.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.23	0.19
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	52.92	40.00
Mannings n	=	0.013	0.250

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

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

TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN
hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr

0.083	0.00	1.167	18.04	2.250	13.20	3.33	6.98
0.167	0.00	1.250	40.22	2.333	13.20	3.42	6.51
0.250	5.93	1.333	40.22	2.417	11.37	3.50	6.51
0.333	5.93	1.417	164.22	2.500	11.37	3.58	6.11
0.417	6.74	1.500	164.22	2.583	10.03	3.67	6.11
0.500	6.74	1.583	51.92	2.667	10.03	3.75	5.77
0.583	7.85	1.667	51.92	2.750	9.00	3.83	5.77
0.667	7.85	1.750	28.58	2.833	9.00	3.92	5.46
0.750	9.50	1.833	28.58	2.917	8.19	4.00	5.46
0.833	9.50	1.917	20.23	3.000	8.19	4.08	5.19
0.917	12.27	2.000	20.23	3.083	7.53	4.17	5.19
1.000	12.27	2.083	15.88	3.167	7.53		
1.083	18.04	2.167	15.88	3.250	6.98		

Max.Eff.Inten.(mm/hr)= 164.22 11.37
over (min) 5.00 20.00
Storage Coeff. (min)= 1.43 (ii) 18.27 (ii)
Unit Hyd. Tpeak (min)= 5.00 20.00
Unit Hyd. peak (cms)= 0.33 0.06

TOTALS

PEAK FLOW (cms)= 0.10 0.00 0.105 (iii)
TIME TO PEAK (hrs)= 1.50 1.75 1.50
RUNOFF VOLUME (mm)= 77.45 9.39 46.12
TOTAL RAINFALL (mm)= 79.45 79.45 79.45
RUNOFF COEFFICIENT = 0.97 0.12 0.58

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 33.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| ADD HYD ( 0205) |
| 1 + 2 = 3 |
-----
      AREA      QPEAK      TPEAK      R.V.
      (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0202):  0.42  0.105  1.50  46.12
+ ID2= 2 ( 0203):  0.17  0.003  1.50  3.16
=====
ID = 3 ( 0205):  0.59  0.108  1.50  33.74

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

READ STORM	Filename: C:\Users\bjo\AppData\Local\Temp\
	b6c47c87-ffa1-4ea3-b46e-09b9679b04af\0563787d
Ptotal= 79.45 mm	Comments: Barrie_50yr_4hour_Chicago_v2

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	40.22	2.50	11.37	3.67	6.11
0.33	5.93	1.50	164.22	2.67	10.03	3.83	5.77
0.50	6.74	1.67	51.92	2.83	9.00	4.00	5.46
0.67	7.85	1.83	28.58	3.00	8.19	4.17	5.19
0.83	9.50	2.00	20.23	3.17	7.53		
1.00	12.27	2.17	15.88	3.33	6.98		
1.17	18.04	2.33	13.20	3.50	6.51		

CALIB	
STANDHYD (0201)	Area (ha)= 1.68
ID= 1 DT= 5.0 min	Total Imp(%)= 93.00 Dir. Conn.(%)= 93.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	1.56	0.12
Dep. Storage (mm)=	2.00	5.00
Average Slope (%)=	1.00	2.00
Length (m)=	105.86	40.00
Mannings n =	0.013	0.250

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

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

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	18.04	2.250	13.20	3.33	6.98
0.167	0.00	1.250	40.22	2.333	13.20	3.42	6.51
0.250	5.93	1.333	40.22	2.417	11.37	3.50	6.51
0.333	5.93	1.417	164.22	2.500	11.37	3.58	6.11
0.417	6.74	1.500	164.22	2.583	10.03	3.67	6.11
0.500	6.74	1.583	51.92	2.667	10.03	3.75	5.77
0.583	7.85	1.667	51.92	2.750	9.00	3.83	5.77
0.667	7.85	1.750	28.58	2.833	9.00	3.92	5.46
0.750	9.50	1.833	28.58	2.917	8.19	4.00	5.46
0.833	9.50	1.917	20.23	3.000	8.19	4.08	5.19
0.917	12.27	2.000	20.23	3.083	7.53	4.17	5.19
1.000	12.27	2.083	15.88	3.167	7.53		
1.083	18.04	2.167	15.88	3.250	6.98		

Max.Eff.Inten.(mm/hr)=	164.22	14.98
------------------------	--------	-------

over (min)	5.00	5.00	
Storage Coeff. (min)=	2.17 (ii)	4.22 (ii)	
Unit Hyd. Tpeak (min)=	5.00	5.00	
Unit Hyd. peak (cms)=	0.31	0.24	
			TOTALS
PEAK FLOW (cms)=	0.71	0.01	0.713 (iii)
TIME TO PEAK (hrs)=	1.50	1.50	1.50
RUNOFF VOLUME (mm)=	77.45	9.39	72.69
TOTAL RAINFALL (mm)=	79.45	79.45	79.45
RUNOFF COEFFICIENT =	0.97	0.12	0.91

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
 CN* = 33.0 Ia = Dep. Storage (Above)
 (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
 THAN THE STORAGE COEFFICIENT.
 (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| RESERVOIR( 0204) |
| IN= 2---> OUT= 1 |
| DT= 1.0 min      |
-----

```

	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.2000	0.0600
	0.1500	0.0010	0.0000	0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0201)	1.681	0.713	1.50	72.69
OUTFLOW: ID= 1 (0204)	1.681	0.181	1.72	72.69

PEAK FLOW REDUCTION [Qout/Qin](%)= 25.38
 TIME SHIFT OF PEAK FLOW (min)= 13.00
 MAXIMUM STORAGE USED (ha.m.)= 0.0375

```

-----
| ADD HYD ( 0206) |
| 1 + 2 = 3      |
-----

```

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0204):	1.68	0.181	1.72	72.69
+ ID2= 2 (0205):	0.59	0.108	1.50	33.74
=====				
ID = 3 (0206):	2.27	0.278	1.50	62.57

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| ADD HYD ( 0301) |
| 1 + 2 = 3 |
-----
      AREA      QPEAK      TPEAK      R.V.
      (ha)      (cms)      (hrs)      (mm)
      ID1= 1 ( 0117):      7.76      0.196      2.33      48.00
+ ID2= 2 ( 0206):      2.27      0.278      1.50      62.57
=====
      ID = 3 ( 0301):      10.04      0.382      2.00      51.30

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

4-hour Chicago
100-yr

=====

```
V   V   I   SSSSS U   U   A   L           (v 5.1.2004)
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
  WV   I   SSSSS UUUUU A   A   LLLLL
```

```
  000   TTTTT   TTTTT H   H   Y   Y   M   M   000   TM
O   O   T       T   H   H   Y Y   MM MM   O   O
O   O   T       T   H   H   Y   M   M   O   O
  000   T       T   H   H   Y   M   M   000
```

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

Input filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\V02\voin.dat

Output filename:

C:\Users\bjo\AppData\Local\Civica\XH5\e91bc6c1-1ed6-4e95-932d-66b6211c2905\9f3041e7-7da1-49f4-8e8d-5fcce352703c\scenario

Summary filename:

C:\Users\bjo\AppData\Local\Civica\XH5\e91bc6c1-1ed6-4e95-932d-66b6211c2905\9f3041e7-7da1-49f4-8e8d-5fcce352703c\scenario

DATE: 10/30/2019

TIME: 02:52:53

USER:

COMMENTS: _____

```
*****
** SIMULATION : Run 06           **
*****
```

Filename: C:\Users\bjo\AppData\Local\Temp\

	b6c47c87-ffa1-4ea3-b46e-09b9679b04af\55aad7a0
Ptotal= 87.58 mm	Comments: Barrie_100yr_4hour_Chicago_v2

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	45.22	2.50	12.44	3.67	6.60
0.33	6.41	1.50	180.15	2.67	10.94	3.83	6.22
0.50	7.29	1.67	58.54	2.83	9.80	4.00	5.89
0.67	8.52	1.83	31.96	3.00	8.90	4.17	5.59
0.83	10.36	2.00	22.45	3.17	8.16		
1.00	13.45	2.17	17.52	3.33	7.56		
1.17	19.96	2.33	14.50	3.50	7.04		

CALIB	
NASHYD (0102)	Area (ha)= 0.94 Curve Number (CN)= 33.0
ID= 1 DT= 5.0 min	Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
-----	U.H. Tp(hrs)= 0.11

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

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

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	19.96	2.250	14.50	3.33	7.56
0.167	0.00	1.250	45.22	2.333	14.50	3.42	7.04
0.250	6.41	1.333	45.22	2.417	12.44	3.50	7.04
0.333	6.41	1.417	180.15	2.500	12.44	3.58	6.60
0.417	7.29	1.500	180.15	2.583	10.94	3.67	6.60
0.500	7.29	1.583	58.54	2.667	10.94	3.75	6.22
0.583	8.52	1.667	58.54	2.750	9.80	3.83	6.22
0.667	8.52	1.750	31.96	2.833	9.80	3.92	5.89
0.750	10.36	1.833	31.96	2.917	8.90	4.00	5.89
0.833	10.36	1.917	22.45	3.000	8.90	4.08	5.59
0.917	13.45	2.000	22.45	3.083	8.16	4.17	5.59
1.000	13.45	2.083	17.52	3.167	8.16		
1.083	19.96	2.167	17.52	3.250	7.56		

Unit Hyd Qpeak (cms)= 0.326

PEAK FLOW (cms)= 0.036 (i)

TIME TO PEAK (hrs)= 1.500

RUNOFF VOLUME (mm)= 11.188

TOTAL RAINFALL (mm)= 87.578

RUNOFF COEFFICIENT = 0.128

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

```

-----
| READ STORM | Filename: C:\Users\bjo\AppData\
|            | Local\Temp\
|            | b6c47c87-ffa1-4ea3-b46e-09b9679b04af\55aad7a0
| Ptotal= 87.58 mm | Comments: Barrie_100yr_4hour_Chicago_v2
-----

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	45.22	2.50	12.44	3.67	6.60
0.33	6.41	1.50	180.15	2.67	10.94	3.83	6.22
0.50	7.29	1.67	58.54	2.83	9.80	4.00	5.89
0.67	8.52	1.83	31.96	3.00	8.90	4.17	5.59
0.83	10.36	2.00	22.45	3.17	8.16		
1.00	13.45	2.17	17.52	3.33	7.56		
1.17	19.96	2.33	14.50	3.50	7.04		

```

-----
| CALIB |
| STANDHYD ( 0101) | Area (ha)= 3.39
| ID= 1 DT= 5.0 min | Total Imp(%)= 83.00 Dir. Conn.(%)= 83.00
-----

```

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	2.81	0.58
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	150.33	40.00
Mannings n	=	0.013	0.250

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

```

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

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	19.96	2.250	14.50	3.33	7.56
0.167	0.00	1.250	45.22	2.333	14.50	3.42	7.04
0.250	6.41	1.333	45.22	2.417	12.44	3.50	7.04
0.333	6.41	1.417	180.15	2.500	12.44	3.58	6.60
0.417	7.29	1.500	180.15	2.583	10.94	3.67	6.60
0.500	7.29	1.583	58.54	2.667	10.94	3.75	6.22
0.583	8.52	1.667	58.54	2.750	9.80	3.83	6.22
0.667	8.52	1.750	31.96	2.833	9.80	3.92	5.89
0.750	10.36	1.833	31.96	2.917	8.90	4.00	5.89
0.833	10.36	1.917	22.45	3.000	8.90	4.08	5.59
0.917	13.45	2.000	22.45	3.083	8.16	4.17	5.59

1.000	13.45		2.083	17.52		3.167	8.16	
1.083	19.96		2.167	17.52		3.250	7.56	

Max.Eff.Inten.(mm/hr)=	180.15		18.28	
over (min)	5.00		10.00	
Storage Coeff. (min)=	2.58 (ii)		5.54 (ii)	
Unit Hyd. Tpeak (min)=	5.00		10.00	
Unit Hyd. peak (cms)=	0.29		0.16	
				TOTALS
PEAK FLOW (cms)=	1.39		0.02	1.405 (iii)
TIME TO PEAK (hrs)=	1.50		1.58	1.50
RUNOFF VOLUME (mm)=	85.58		11.40	72.97
TOTAL RAINFALL (mm)=	87.58		87.58	87.58
RUNOFF COEFFICIENT =	0.98		0.13	0.83

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 33.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0103)				
1 + 2 = 3				
	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0101):	3.39	1.405	1.50	72.97
+ ID2= 2 (0102):	0.94	0.036	1.50	11.19
=====				
ID = 3 (0103):	4.33	1.441	1.50	59.56

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

READ STORM	Filename: C:\Users\bjo\AppData\Local\Temp\
	b6c47c87-ffa1-4ea3-b46e-09b9679b04af\55aad7a0
Ptotal= 87.58 mm	Comments: Barrie_100yr_4hour_Chicago_v2

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	45.22	2.50	12.44	3.67	6.60
0.33	6.41	1.50	180.15	2.67	10.94	3.83	6.22
0.50	7.29	1.67	58.54	2.83	9.80	4.00	5.89
0.67	8.52	1.83	31.96	3.00	8.90	4.17	5.59

0.83	10.36	2.00	22.45	3.17	8.16
1.00	13.45	2.17	17.52	3.33	7.56
1.17	19.96	2.33	14.50	3.50	7.04

CALIB	
STANDHYD (0104)	Area (ha)= 2.05
ID= 1 DT= 5.0 min	Total Imp(%)= 55.00 Dir. Conn.(%)= 45.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.13	0.92
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	116.90	40.00
Mannings n	=	0.013	0.250

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

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

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	19.96	2.250	14.50	3.33	7.56
0.167	0.00	1.250	45.22	2.333	14.50	3.42	7.04
0.250	6.41	1.333	45.22	2.417	12.44	3.50	7.04
0.333	6.41	1.417	180.15	2.500	12.44	3.58	6.60
0.417	7.29	1.500	180.15	2.583	10.94	3.67	6.60
0.500	7.29	1.583	58.54	2.667	10.94	3.75	6.22
0.583	8.52	1.667	58.54	2.750	9.80	3.83	6.22
0.667	8.52	1.750	31.96	2.833	9.80	3.92	5.89
0.750	10.36	1.833	31.96	2.917	8.90	4.00	5.89
0.833	10.36	1.917	22.45	3.000	8.90	4.08	5.59
0.917	13.45	2.000	22.45	3.083	8.16	4.17	5.59
1.000	13.45	2.083	17.52	3.167	8.16		
1.083	19.96	2.167	17.52	3.250	7.56		

Max.Eff.Inten.(mm/hr)=	180.15	22.92
over (min)	5.00	15.00
Storage Coeff. (min)=	2.22 (ii)	14.94 (ii)
Unit Hyd. Tpeak (min)=	5.00	15.00
Unit Hyd. peak (cms)=	0.30	0.08

PEAK FLOW	(cms)=	0.46	0.04	0.475 (iii)
TIME TO PEAK	(hrs)=	1.50	1.67	1.50
RUNOFF VOLUME	(mm)=	85.58	13.79	46.09
TOTAL RAINFALL	(mm)=	87.58	87.58	87.58
RUNOFF COEFFICIENT	=	0.98	0.16	0.53

TOTALS

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 33.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
-----
| ADD HYD ( 0105) |
| 1 + 2 = 3 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0103):    4.33    1.441    1.50    59.56
+ ID2= 2 ( 0104):    2.05    0.475    1.50    46.09
=====
ID = 3 ( 0105):    6.38    1.917    1.50    55.23
-----
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| READ STORM |
| Ptotal= 87.58 mm |
-----
Filename: C:\Users\bjo\AppData\
Local\Temp\
b6c47c87-ffa1-4ea3-b46e-09b9679b04af\55aad7a0
Comments: Barrie_100yr_4hour_Chicago_v2
-----
```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	45.22	2.50	12.44	3.67	6.60
0.33	6.41	1.50	180.15	2.67	10.94	3.83	6.22
0.50	7.29	1.67	58.54	2.83	9.80	4.00	5.89
0.67	8.52	1.83	31.96	3.00	8.90	4.17	5.59
0.83	10.36	2.00	22.45	3.17	8.16		
1.00	13.45	2.17	17.52	3.33	7.56		
1.17	19.96	2.33	14.50	3.50	7.04		

```
-----
| CALIB |
| STANDHYD ( 0106) |
| ID= 1 DT= 5.0 min |
-----
Area (ha)= 0.31
Total Imp(%)= 67.00 Dir. Conn.(%)= 67.00
-----
```

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.21	0.10
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	1.00	2.00

Length (m)= 45.46 40.00
Mannings n = 0.013 0.250

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	19.96	2.250	14.50	3.33	7.56
0.167	0.00	1.250	45.22	2.333	14.50	3.42	7.04
0.250	6.41	1.333	45.22	2.417	12.44	3.50	7.04
0.333	6.41	1.417	180.15	2.500	12.44	3.58	6.60
0.417	7.29	1.500	180.15	2.583	10.94	3.67	6.60
0.500	7.29	1.583	58.54	2.667	10.94	3.75	6.22
0.583	8.52	1.667	58.54	2.750	9.80	3.83	6.22
0.667	8.52	1.750	31.96	2.833	9.80	3.92	5.89
0.750	10.36	1.833	31.96	2.917	8.90	4.00	5.89
0.833	10.36	1.917	22.45	3.000	8.90	4.08	5.59
0.917	13.45	2.000	22.45	3.083	8.16	4.17	5.59
1.000	13.45	2.083	17.52	3.167	8.16		
1.083	19.96	2.167	17.52	3.250	7.56		

Max.Eff.Inten.(mm/hr)= 180.15 18.28
over (min) 5.00 10.00
Storage Coeff. (min)= 1.26 (ii) 5.46 (ii)
Unit Hyd. Tpeak (min)= 5.00 10.00
Unit Hyd. peak (cms)= 0.33 0.16

TOTALS

PEAK FLOW (cms)= 0.10 0.00 0.107 (iii)
TIME TO PEAK (hrs)= 1.50 1.58 1.50
RUNOFF VOLUME (mm)= 85.58 11.40 61.09
TOTAL RAINFALL (mm)= 87.58 87.58 87.58
RUNOFF COEFFICIENT = 0.98 0.13 0.70

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 33.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD (0107) |
1 + 2 = 3
ID1= 1 (0105): AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
6.38 1.917 1.50 55.23

```

+ ID2= 2 ( 0106):      0.31   0.107      1.50   61.09
=====
ID = 3 ( 0107):      6.69   2.024      1.50   55.50

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| READ STORM |      Filename: C:\Users\bjo\AppData\
|            |      Local\Temp\
|            |      b6c47c87-ffa1-4ea3-b46e-09b9679b04af\55aad7a0
| Ptotal= 87.58 mm |      Comments: Barrie_100yr_4hour_Chicago_v2
-----

```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	'	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.17	0.00	1.33	45.22		2.50	12.44	3.67	6.60
0.33	6.41	1.50	180.15		2.67	10.94	3.83	6.22
0.50	7.29	1.67	58.54		2.83	9.80	4.00	5.89
0.67	8.52	1.83	31.96		3.00	8.90	4.17	5.59
0.83	10.36	2.00	22.45		3.17	8.16		
1.00	13.45	2.17	17.52		3.33	7.56		
1.17	19.96	2.33	14.50		3.50	7.04		

```

-----
| CALIB      |
| STANDHYD ( 0108) |      Area (ha)= 0.46
| ID= 1 DT= 5.0 min |      Total Imp(%)= 40.00   Dir. Conn.(%)= 40.00
-----

```

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.18	0.28
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	55.38	40.00
Mannings n	=	0.013	0.250

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

```

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

```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	'	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	1.167	19.96		2.250	14.50	3.33	7.56
0.167	0.00	1.250	45.22		2.333	14.50	3.42	7.04
0.250	6.41	1.333	45.22		2.417	12.44	3.50	7.04
0.333	6.41	1.417	180.15		2.500	12.44	3.58	6.60
0.417	7.29	1.500	180.15		2.583	10.94	3.67	6.60
0.500	7.29	1.583	58.54		2.667	10.94	3.75	6.22

0.583	8.52	1.667	58.54	2.750	9.80	3.83	6.22
0.667	8.52	1.750	31.96	2.833	9.80	3.92	5.89
0.750	10.36	1.833	31.96	2.917	8.90	4.00	5.89
0.833	10.36	1.917	22.45	3.000	8.90	4.08	5.59
0.917	13.45	2.000	22.45	3.083	8.16	4.17	5.59
1.000	13.45	2.083	17.52	3.167	8.16		
1.083	19.96	2.167	17.52	3.250	7.56		

Max.Eff.Inten.(mm/hr)= 180.15 15.25
over (min) 5.00 20.00
Storage Coeff. (min)= 1.42 (ii) 16.39 (ii)
Unit Hyd. Tpeak (min)= 5.00 20.00
Unit Hyd. peak (cms)= 0.33 0.06

TOTALS

PEAK FLOW (cms)= 0.09 0.01 0.094 (iii)
TIME TO PEAK (hrs)= 1.50 1.75 1.50
RUNOFF VOLUME (mm)= 86.58 11.40 41.45
TOTAL RAINFALL (mm)= 87.58 87.58 87.58
RUNOFF COEFFICIENT = 0.99 0.13 0.47

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 33.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| ADD HYD ( 0109) |
| 1 + 2 = 3 |
-----
          AREA    QPEAK    TPEAK    R.V.
          (ha)    (cms)    (hrs)    (mm)
ID1= 1 ( 0107):    6.69    2.024    1.50    55.50
+ ID2= 2 ( 0108):    0.46    0.094    1.50    41.45
=====
ID = 3 ( 0109):    7.15    2.118    1.50    54.60

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| READ STORM |      Filename: C:\Users\bjo\AppData\
|            |      Local\Temp\
|            |      b6c47c87-ffa1-4ea3-b46e-09b9679b04af\55aad7a0
| Ptotal= 87.58 mm |      Comments: Barrie_100yr_4hour_Chicago_v2
-----

```

TIME RAIN | TIME RAIN | ' TIME RAIN | TIME RAIN

hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	45.22	2.50	12.44	3.67	6.60
0.33	6.41	1.50	180.15	2.67	10.94	3.83	6.22
0.50	7.29	1.67	58.54	2.83	9.80	4.00	5.89
0.67	8.52	1.83	31.96	3.00	8.90	4.17	5.59
0.83	10.36	2.00	22.45	3.17	8.16		
1.00	13.45	2.17	17.52	3.33	7.56		
1.17	19.96	2.33	14.50	3.50	7.04		

CALIB	
STANDHYD (0110)	Area (ha)= 0.46
ID= 1 DT= 5.0 min	Total Imp(%)= 80.00 Dir. Conn.(%)= 80.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.37	0.09
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	55.68	40.00
Mannings n	=	0.013	0.250

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

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

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	19.96	2.250	14.50	3.33	7.56
0.167	0.00	1.250	45.22	2.333	14.50	3.42	7.04
0.250	6.41	1.333	45.22	2.417	12.44	3.50	7.04
0.333	6.41	1.417	180.15	2.500	12.44	3.58	6.60
0.417	7.29	1.500	180.15	2.583	10.94	3.67	6.60
0.500	7.29	1.583	58.54	2.667	10.94	3.75	6.22
0.583	8.52	1.667	58.54	2.750	9.80	3.83	6.22
0.667	8.52	1.750	31.96	2.833	9.80	3.92	5.89
0.750	10.36	1.833	31.96	2.917	8.90	4.00	5.89
0.833	10.36	1.917	22.45	3.000	8.90	4.08	5.59
0.917	13.45	2.000	22.45	3.083	8.16	4.17	5.59
1.000	13.45	2.083	17.52	3.167	8.16		
1.083	19.96	2.167	17.52	3.250	7.56		

Max.Eff.Inten.(mm/hr)=	180.15	18.28
over (min)	5.00	5.00
Storage Coeff. (min)=	1.42 (ii)	4.62 (ii)
Unit Hyd. Tpeak (min)=	5.00	5.00
Unit Hyd. peak (cms)=	0.33	0.22

PEAK FLOW	(cms)=	0.19	0.00	*TOTALS*
				0.191 (iii)

TIME TO PEAK	(hrs)=	1.50	1.50	1.50
RUNOFF VOLUME	(mm)=	86.58	11.40	71.54
TOTAL RAINFALL	(mm)=	87.58	87.58	87.58
RUNOFF COEFFICIENT	=	0.99	0.13	0.82

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 33.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| RESERVOIR( 0111)|
| IN= 2---> OUT= 1 |
| DT= 1.0 min      |
-----

```

	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0160	0.0170
	0.0160	0.0001	0.0000	0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0110)	0.465	0.191	1.50	71.54
OUTFLOW: ID= 1 (0111)	0.465	0.016	1.05	71.53

PEAK FLOW REDUCTION [Qout/Qin](%)= 8.39
TIME SHIFT OF PEAK FLOW (min)=-27.00
MAXIMUM STORAGE USED (ha.m.)= 0.0104

```

-----
| ADD HYD ( 0112)|
| 1 + 2 = 3      |
-----

```

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0109):	7.15	2.118	1.50	54.60
+ ID2= 2 (0111):	0.46	0.016	1.05	71.53
=====				
ID = 3 (0112):	7.61	2.134	1.50	55.63

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| RESERVOIR( 0113)|
| IN= 2---> OUT= 1 |
| DT= 1.0 min      |
-----

```

	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)

0.0000	0.0000	0.2410	0.2699
0.0100	0.0274	0.2810	0.2999
0.0170	0.0677	0.3140	0.3309
0.0240	0.1236	0.5430	0.3630
0.0650	0.1601	1.4010	0.3961
0.0870	0.1859	2.6120	0.4304
0.1630	0.2128	3.3210	0.4480
0.2020	0.2408	0.0000	0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0112)	7.615	2.134	1.50	55.63
OUTFLOW: ID= 1 (0113)	7.615	0.226	2.25	54.45

PEAK FLOW REDUCTION [Qout/Qin](%)= 10.59
 TIME SHIFT OF PEAK FLOW (min)= 45.00
 MAXIMUM STORAGE USED (ha.m.)= 0.2587

READ STORM	Filename: C:\Users\bjo\AppData\Local\Temp\
	b6c47c87-ffa1-4ea3-b46e-09b9679b04af\55aad7a0
Ptotal= 87.58 mm	Comments: Barrie_100yr_4hour_Chicago_v2

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	45.22	2.50	12.44	3.67	6.60
0.33	6.41	1.50	180.15	2.67	10.94	3.83	6.22
0.50	7.29	1.67	58.54	2.83	9.80	4.00	5.89
0.67	8.52	1.83	31.96	3.00	8.90	4.17	5.59
0.83	10.36	2.00	22.45	3.17	8.16		
1.00	13.45	2.17	17.52	3.33	7.56		
1.17	19.96	2.33	14.50	3.50	7.04		

CALIB	
NASHYD (0114)	Area (ha)= 0.08 Curve Number (CN)= 33.0
ID= 1 DT= 5.0 min	Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= 0.03

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr

0.083	0.00	1.167	19.96	2.250	14.50	3.33	7.56
0.167	0.00	1.250	45.22	2.333	14.50	3.42	7.04
0.250	6.41	1.333	45.22	2.417	12.44	3.50	7.04
0.333	6.41	1.417	180.15	2.500	12.44	3.58	6.60
0.417	7.29	1.500	180.15	2.583	10.94	3.67	6.60
0.500	7.29	1.583	58.54	2.667	10.94	3.75	6.22
0.583	8.52	1.667	58.54	2.750	9.80	3.83	6.22
0.667	8.52	1.750	31.96	2.833	9.80	3.92	5.89
0.750	10.36	1.833	31.96	2.917	8.90	4.00	5.89
0.833	10.36	1.917	22.45	3.000	8.90	4.08	5.59
0.917	13.45	2.000	22.45	3.083	8.16	4.17	5.59
1.000	13.45	2.083	17.52	3.167	8.16		
1.083	19.96	2.167	17.52	3.250	7.56		

Unit Hyd Qpeak (cms)= 0.102

PEAK FLOW (cms)= 0.002 (i)
TIME TO PEAK (hrs)= 1.500
RUNOFF VOLUME (mm)= 3.836
TOTAL RAINFALL (mm)= 87.578
RUNOFF COEFFICIENT = 0.044

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

ADD HYD (0115)				
1 + 2 = 3				
	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0113):	7.61	0.226	2.25	54.45
+ ID2= 2 (0114):	0.08	0.002	1.50	3.84
=====				
ID = 3 (0115):	7.69	0.226	2.25	53.93

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

READ STORM		Filename: C:\Users\bjo\AppData\Local\Temp\
		b6c47c87-ffa1-4ea3-b46e-09b9679b04af\55aad7a0
Ptotal= 87.58 mm		Comments: Barrie_100yr_4hour_Chicago_v2

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	45.22	2.50	12.44	3.67	6.60
0.33	6.41	1.50	180.15	2.67	10.94	3.83	6.22
0.50	7.29	1.67	58.54	2.83	9.80	4.00	5.89

0.67	8.52	1.83	31.96	3.00	8.90	4.17	5.59
0.83	10.36	2.00	22.45	3.17	8.16		
1.00	13.45	2.17	17.52	3.33	7.56		
1.17	19.96	2.33	14.50	3.50	7.04		

CALIB							
NASHYD (0116)	Area (ha)=	0.07	Curve Number (CN)=	33.0			
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	# of Linear Res.(N)=	3.00			
	U.H. Tp(hrs)=	0.20					

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

----- TRANSFORMED HYETOGRAPH -----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	19.96	2.250	14.50	3.33	7.56
0.167	0.00	1.250	45.22	2.333	14.50	3.42	7.04
0.250	6.41	1.333	45.22	2.417	12.44	3.50	7.04
0.333	6.41	1.417	180.15	2.500	12.44	3.58	6.60
0.417	7.29	1.500	180.15	2.583	10.94	3.67	6.60
0.500	7.29	1.583	58.54	2.667	10.94	3.75	6.22
0.583	8.52	1.667	58.54	2.750	9.80	3.83	6.22
0.667	8.52	1.750	31.96	2.833	9.80	3.92	5.89
0.750	10.36	1.833	31.96	2.917	8.90	4.00	5.89
0.833	10.36	1.917	22.45	3.000	8.90	4.08	5.59
0.917	13.45	2.000	22.45	3.083	8.16	4.17	5.59
1.000	13.45	2.083	17.52	3.167	8.16		
1.083	19.96	2.167	17.52	3.250	7.56		

Unit Hyd Qpeak (cms)= 0.013

PEAK FLOW (cms)= 0.002 (i)
TIME TO PEAK (hrs)= 1.667
RUNOFF VOLUME (mm)= 11.367
TOTAL RAINFALL (mm)= 87.578
RUNOFF COEFFICIENT = 0.130

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

ADD HYD (0117)				
1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0115):	7.69	0.226	2.25	53.93


```

+ ID2= 2 ( 0116):      0.07   0.002      1.67    11.37
=====
ID = 3 ( 0117):      7.76   0.227      2.23    53.54

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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-----
| READ STORM |      Filename: C:\Users\bjo\AppData\
|            |      Local\Temp\
|            |      b6c47c87-ffa1-4ea3-b46e-09b9679b04af\55aad7a0
| Ptotal= 87.58 mm |      Comments: Barrie_100yr_4hour_Chicago_v2
|            |
-----

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	45.22	2.50	12.44	3.67	6.60
0.33	6.41	1.50	180.15	2.67	10.94	3.83	6.22
0.50	7.29	1.67	58.54	2.83	9.80	4.00	5.89
0.67	8.52	1.83	31.96	3.00	8.90	4.17	5.59
0.83	10.36	2.00	22.45	3.17	8.16		
1.00	13.45	2.17	17.52	3.33	7.56		
1.17	19.96	2.33	14.50	3.50	7.04		

```

-----
| CALIB |
| NASHYD ( 0203) |      Area (ha)= 0.17      Curve Number (CN)= 33.0
| ID= 1 DT= 5.0 min |      Ia (mm)= 5.00      # of Linear Res.(N)= 3.00
|            |      U.H. Tp(hrs)= 0.03
-----

```

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

```

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

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	19.96	2.250	14.50	3.33	7.56
0.167	0.00	1.250	45.22	2.333	14.50	3.42	7.04
0.250	6.41	1.333	45.22	2.417	12.44	3.50	7.04
0.333	6.41	1.417	180.15	2.500	12.44	3.58	6.60
0.417	7.29	1.500	180.15	2.583	10.94	3.67	6.60
0.500	7.29	1.583	58.54	2.667	10.94	3.75	6.22
0.583	8.52	1.667	58.54	2.750	9.80	3.83	6.22
0.667	8.52	1.750	31.96	2.833	9.80	3.92	5.89
0.750	10.36	1.833	31.96	2.917	8.90	4.00	5.89
0.833	10.36	1.917	22.45	3.000	8.90	4.08	5.59
0.917	13.45	2.000	22.45	3.083	8.16	4.17	5.59
1.000	13.45	2.083	17.52	3.167	8.16		

1.083 19.96 | 2.167 17.52 | 3.250 7.56 |

Unit Hyd Qpeak (cms)= 0.216

PEAK FLOW (cms)= 0.004 (i)

TIME TO PEAK (hrs)= 1.500

RUNOFF VOLUME (mm)= 3.836

TOTAL RAINFALL (mm)= 87.578

RUNOFF COEFFICIENT = 0.044

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

| READ STORM | Filename: C:\Users\bjo\AppData\
| | Local\Temp\
| | b6c47c87-ffa1-4ea3-b46e-09b9679b04af\55aad7a0
| Ptotal= 87.58 mm | Comments: Barrie_100yr_4hour_Chicago_v2

TIME	RAIN	TIME	RAIN	'	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	'	hrs	mm/hr	hrs	mm/hr
0.17	0.00	1.33	45.22		2.50	12.44	3.67	6.60
0.33	6.41	1.50	180.15		2.67	10.94	3.83	6.22
0.50	7.29	1.67	58.54		2.83	9.80	4.00	5.89
0.67	8.52	1.83	31.96		3.00	8.90	4.17	5.59
0.83	10.36	2.00	22.45		3.17	8.16		
1.00	13.45	2.17	17.52		3.33	7.56		
1.17	19.96	2.33	14.50		3.50	7.04		

| CALIB |
| STANDHYD (0202) | Area (ha)= 0.42
| ID= 1 DT= 5.0 min | Total Imp(%)= 54.00 Dir. Conn.(%)= 54.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.23	0.19
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	52.92	40.00
Mannings n	=	0.013	0.250

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

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

0.083	0.00	1.167	19.96	2.250	14.50	3.33	7.56
0.167	0.00	1.250	45.22	2.333	14.50	3.42	7.04
0.250	6.41	1.333	45.22	2.417	12.44	3.50	7.04
0.333	6.41	1.417	180.15	2.500	12.44	3.58	6.60
0.417	7.29	1.500	180.15	2.583	10.94	3.67	6.60
0.500	7.29	1.583	58.54	2.667	10.94	3.75	6.22
0.583	8.52	1.667	58.54	2.750	9.80	3.83	6.22
0.667	8.52	1.750	31.96	2.833	9.80	3.92	5.89
0.750	10.36	1.833	31.96	2.917	8.90	4.00	5.89
0.833	10.36	1.917	22.45	3.000	8.90	4.08	5.59
0.917	13.45	2.000	22.45	3.083	8.16	4.17	5.59
1.000	13.45	2.083	17.52	3.167	8.16		
1.083	19.96	2.167	17.52	3.250	7.56		

Max.Eff.Inten.(mm/hr)= 180.15 15.25
over (min) 5.00 20.00
Storage Coeff. (min)= 1.38 (ii) 16.35 (ii)
Unit Hyd. Tpeak (min)= 5.00 20.00
Unit Hyd. peak (cms)= 0.33 0.06

TOTALS

PEAK FLOW (cms)= 0.11 0.00 0.115 (iii)
TIME TO PEAK (hrs)= 1.50 1.75 1.50
RUNOFF VOLUME (mm)= 85.58 11.40 51.43
TOTAL RAINFALL (mm)= 87.58 87.58 87.58
RUNOFF COEFFICIENT = 0.98 0.13 0.59

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 33.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| ADD HYD ( 0205) |
| 1 + 2 = 3 |
-----
      AREA      QPEAK      TPEAK      R.V.
      (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0202):  0.42  0.115  1.50  51.43
+ ID2= 2 ( 0203):  0.17  0.004  1.50  3.84
=====
ID = 3 ( 0205):  0.59  0.119  1.50  37.72

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

READ STORM	Filename: C:\Users\bjo\AppData\Local\Temp\
	b6c47c87-ffa1-4ea3-b46e-09b9679b04af\55aad7a0
Ptotal= 87.58 mm	Comments: Barrie_100yr_4hour_Chicago_v2

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.17	0.00	1.33	45.22	2.50	12.44	3.67	6.60
0.33	6.41	1.50	180.15	2.67	10.94	3.83	6.22
0.50	7.29	1.67	58.54	2.83	9.80	4.00	5.89
0.67	8.52	1.83	31.96	3.00	8.90	4.17	5.59
0.83	10.36	2.00	22.45	3.17	8.16		
1.00	13.45	2.17	17.52	3.33	7.56		
1.17	19.96	2.33	14.50	3.50	7.04		

CALIB	
STANDHYD (0201)	Area (ha)= 1.68
ID= 1 DT= 5.0 min	Total Imp(%)= 93.00 Dir. Conn.(%)= 93.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	1.56	0.12
Dep. Storage (mm)=	2.00	5.00
Average Slope (%)=	1.00	2.00
Length (m)=	105.86	40.00
Mannings n =	0.013	0.250

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

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

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	1.167	19.96	2.250	14.50	3.33	7.56
0.167	0.00	1.250	45.22	2.333	14.50	3.42	7.04
0.250	6.41	1.333	45.22	2.417	12.44	3.50	7.04
0.333	6.41	1.417	180.15	2.500	12.44	3.58	6.60
0.417	7.29	1.500	180.15	2.583	10.94	3.67	6.60
0.500	7.29	1.583	58.54	2.667	10.94	3.75	6.22
0.583	8.52	1.667	58.54	2.750	9.80	3.83	6.22
0.667	8.52	1.750	31.96	2.833	9.80	3.92	5.89
0.750	10.36	1.833	31.96	2.917	8.90	4.00	5.89
0.833	10.36	1.917	22.45	3.000	8.90	4.08	5.59
0.917	13.45	2.000	22.45	3.083	8.16	4.17	5.59
1.000	13.45	2.083	17.52	3.167	8.16		
1.083	19.96	2.167	17.52	3.250	7.56		

Max.Eff.Inten.(mm/hr)=	180.15	18.28
------------------------	--------	-------

over (min)	5.00	5.00	
Storage Coeff. (min)=	2.09 (ii)	4.07 (ii)	
Unit Hyd. Tpeak (min)=	5.00	5.00	
Unit Hyd. peak (cms)=	0.31	0.24	
			TOTALS
PEAK FLOW (cms)=	0.78	0.01	0.784 (iii)
TIME TO PEAK (hrs)=	1.50	1.50	1.50
RUNOFF VOLUME (mm)=	85.58	11.40	80.39
TOTAL RAINFALL (mm)=	87.58	87.58	87.58
RUNOFF COEFFICIENT =	0.98	0.13	0.92

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
 CN* = 33.0 Ia = Dep. Storage (Above)
 (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
 THAN THE STORAGE COEFFICIENT.
 (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| RESERVOIR( 0204) |
| IN= 2---> OUT= 1 |
| DT= 1.0 min      |
-----

```

	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.2000	0.0600
	0.1500	0.0010	0.0000	0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0201)	1.681	0.784	1.50	80.39
OUTFLOW: ID= 1 (0204)	1.681	0.187	1.72	80.38

PEAK FLOW REDUCTION [Qout/Qin](%)= 23.80
 TIME SHIFT OF PEAK FLOW (min)= 13.00
 MAXIMUM STORAGE USED (ha.m.)= 0.0441

```

-----
| ADD HYD ( 0206) |
| 1 + 2 = 3      |
-----

```

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0204):	1.68	0.187	1.72	80.38
+ ID2= 2 (0205):	0.59	0.119	1.50	37.72
=====				
ID = 3 (0206):	2.27	0.293	1.50	69.30

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| ADD HYD (0301) |
| 1 + 2 = 3 |

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0117):	7.76	0.227	2.23	53.54
+ ID2= 2 (0206):	2.27	0.293	1.50	69.30
=====				
ID = 3 (0301):	10.04	0.423	2.00	57.11

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

4-hour
25mm

=====

```
V   V   I   SSSSS U   U   A   L           (v 5.1.2004)
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
  WV   I   SSSSS UUUUU A   A   LLLLL
```

```
  000   TTTTT   TTTTT H   H   Y   Y   M   M   000   TM
O   O   T       T   H   H   Y Y   MM MM   O   O
O   O   T       T   H   H   Y   M   M   O   O
  000   T       T   H   H   Y   M   M   000
```

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

Input filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\V02\voin.dat

Output filename:

C:\Users\bjo\AppData\Local\Civica\XH5\e91bc6c1-1ed6-4e95-932d-66b6211c2905\ca76e0e0-b3d8-46e4-ac32-e83ec5e2a9ef\scenario

Summary filename:

C:\Users\bjo\AppData\Local\Civica\XH5\e91bc6c1-1ed6-4e95-932d-66b6211c2905\ca76e0e0-b3d8-46e4-ac32-e83ec5e2a9ef\scenario

DATE: 11/07/2019

TIME: 11:58:13

USER:

COMMENTS: _____

```
*****
** SIMULATION : Run 07           **
*****
```

| READ STORM |
| |

Filename: C:\Users\bjo\AppData\
Local\Temp\

e2ee2593-a619-4ea9-84ef-23fcef4ac511\0493f3fb
 Ptotal= 25.00 mm Comments: 25mm4hour

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.17	2.40	1.17	33.60	2.17	3.45	3.17	1.65
0.33	1.95	1.33	38.10	2.33	3.00	3.33	1.80
0.50	2.40	1.50	13.80	2.50	2.70	3.50	1.50
0.67	2.85	1.67	7.35	2.67	2.25	3.67	1.50
0.83	4.65	1.83	5.55	2.83	2.25	3.83	0.75
1.00	9.60	2.00	4.35	3.00	1.95	4.00	0.60

CALIB
 NASHYD (0102) Area (ha)= 0.94 Curve Number (CN)= 33.0
 ID= 1 DT= 5.0 min Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
 U.H. Tp(hrs)= 0.11

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	2.40	1.083	33.60	2.083	3.45	3.08	1.65
0.167	2.40	1.167	33.60	2.167	3.45	3.17	1.65
0.250	1.95	1.250	38.10	2.250	3.00	3.25	1.80
0.333	1.95	1.333	38.10	2.333	3.00	3.33	1.80
0.417	2.40	1.417	13.80	2.417	2.70	3.42	1.50
0.500	2.40	1.500	13.80	2.500	2.70	3.50	1.50
0.583	2.85	1.583	7.35	2.583	2.25	3.58	1.50
0.667	2.85	1.667	7.35	2.667	2.25	3.67	1.50
0.750	4.65	1.750	5.55	2.750	2.25	3.75	0.75
0.833	4.65	1.833	5.55	2.833	2.25	3.83	0.75
0.917	9.60	1.917	4.35	2.917	1.95	3.92	0.60
1.000	9.60	2.000	4.35	3.000	1.95	4.00	0.60

Unit Hyd Qpeak (cms)= 0.326

PEAK FLOW (cms)= 0.002 (i)
 TIME TO PEAK (hrs)= 1.333
 RUNOFF VOLUME (mm)= 0.733
 TOTAL RAINFALL (mm)= 25.000
 RUNOFF COEFFICIENT = 0.029

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

READ STORM	Filename: C:\Users\bjo\AppData\Local\Temp\
Ptotal= 25.00 mm	e2ee2593-a619-4ea9-84ef-23fcef4ac511\0493f3fb
	Comments: 25mm4hour

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.17	2.40	1.17	33.60	2.17	3.45	3.17	1.65
0.33	1.95	1.33	38.10	2.33	3.00	3.33	1.80
0.50	2.40	1.50	13.80	2.50	2.70	3.50	1.50
0.67	2.85	1.67	7.35	2.67	2.25	3.67	1.50
0.83	4.65	1.83	5.55	2.83	2.25	3.83	0.75
1.00	9.60	2.00	4.35	3.00	1.95	4.00	0.60

CALIB	Area (ha)= 3.39
STANDHYD (0101)	Total Imp(%)= 83.00 Dir. Conn.(%)= 83.00
ID= 1 DT= 5.0 min	

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	2.81	0.58
Dep. Storage (mm)=	2.00	5.00
Average Slope (%)=	1.00	2.00
Length (m)=	150.33	40.00
Mannings n =	0.013	0.250

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

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

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.40	1.083	33.60	2.083	3.45	3.08	1.65
0.167	2.40	1.167	33.60	2.167	3.45	3.17	1.65
0.250	1.95	1.250	38.10	2.250	3.00	3.25	1.80
0.333	1.95	1.333	38.10	2.333	3.00	3.33	1.80
0.417	2.40	1.417	13.80	2.417	2.70	3.42	1.50
0.500	2.40	1.500	13.80	2.500	2.70	3.50	1.50
0.583	2.85	1.583	7.35	2.583	2.25	3.58	1.50
0.667	2.85	1.667	7.35	2.667	2.25	3.67	1.50
0.750	4.65	1.750	5.55	2.750	2.25	3.75	0.75
0.833	4.65	1.833	5.55	2.833	2.25	3.83	0.75
0.917	9.60	1.917	4.35	2.917	1.95	3.92	0.60
1.000	9.60	2.000	4.35	3.000	1.95	4.00	0.60

Max.Eff.Inten.(mm/hr)=	38.10	0.50
------------------------	-------	------

over (min)	5.00	65.00	
Storage Coeff. (min)=	4.80 (ii)	63.62 (ii)	
Unit Hyd. Tpeak (min)=	5.00	65.00	
Unit Hyd. peak (cms)=	0.22	0.02	
			TOTALS
PEAK FLOW (cms)=	0.29	0.00	0.290 (iii)
TIME TO PEAK (hrs)=	1.33	2.50	1.33
RUNOFF VOLUME (mm)=	23.00	0.75	19.21
TOTAL RAINFALL (mm)=	25.00	25.00	25.00
RUNOFF COEFFICIENT =	0.92	0.03	0.77

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 33.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0001)				
1 + 2 = 3				

ID1= 1 (0101):	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
	3.39	0.290	1.33	19.21
+ ID2= 2 (0102):	0.94	0.002	1.33	0.73
=====				
ID = 3 (0001):	4.33	0.293	1.33	15.20

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

READ STORM	Filename: C:\Users\bjo\AppData\
	Local\Temp\
	e2ee2593-a619-4ea9-84ef-23fcef4ac511\0493f3fb
Ptotal= 25.00 mm	Comments: 25mm4hour

TIME	RAIN	TIME	RAIN	'	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	'	hrs	mm/hr	hrs	mm/hr
0.17	2.40	1.17	33.60		2.17	3.45	3.17	1.65
0.33	1.95	1.33	38.10		2.33	3.00	3.33	1.80
0.50	2.40	1.50	13.80		2.50	2.70	3.50	1.50
0.67	2.85	1.67	7.35		2.67	2.25	3.67	1.50
0.83	4.65	1.83	5.55		2.83	2.25	3.83	0.75
1.00	9.60	2.00	4.35		3.00	1.95	4.00	0.60

```

-----
| CALIB |
| STANDHYD ( 0104) | Area (ha)= 2.05
| ID= 1 DT= 5.0 min | Total Imp(%)= 55.00 Dir. Conn.(%)= 45.00
-----

```

```

                IMPERVIOUS      PERVIOUS (i)
Surface Area    (ha)=          1.13          0.92
Dep. Storage    (mm)=          2.00          5.00
Average Slope    (%)=          1.00          2.00
Length          (m)=        116.90         40.00
Mannings n      =           0.013         0.250

```

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

```

                ----- TRANSFORMED HYETOGRAPH -----
TIME    RAIN | TIME    RAIN | ' TIME    RAIN | TIME    RAIN
  hrs   mm/hr |   hrs   mm/hr | '   hrs   mm/hr |   hrs   mm/hr
0.083   2.40 | 1.083  33.60 | 2.083   3.45 | 3.08   1.65
0.167   2.40 | 1.167  33.60 | 2.167   3.45 | 3.17   1.65
0.250   1.95 | 1.250  38.10 | 2.250   3.00 | 3.25   1.80
0.333   1.95 | 1.333  38.10 | 2.333   3.00 | 3.33   1.80
0.417   2.40 | 1.417  13.80 | 2.417   2.70 | 3.42   1.50
0.500   2.40 | 1.500  13.80 | 2.500   2.70 | 3.50   1.50
0.583   2.85 | 1.583   7.35 | 2.583   2.25 | 3.58   1.50
0.667   2.85 | 1.667   7.35 | 2.667   2.25 | 3.67   1.50
0.750   4.65 | 1.750   5.55 | 2.750   2.25 | 3.75   0.75
0.833   4.65 | 1.833   5.55 | 2.833   2.25 | 3.83   0.75
0.917   9.60 | 1.917   4.35 | 2.917   1.95 | 3.92   0.60
1.000   9.60 | 2.000   4.35 | 3.000   1.95 | 4.00   0.60

```

```

Max.Eff.Inten.(mm/hr)=      38.10          0.90
over (min)              5.00          55.00
Storage Coeff. (min)=      4.13 (ii)      50.54 (ii)
Unit Hyd. Tpeak (min)=      5.00          55.00
Unit Hyd. peak (cms)=      0.24          0.02

```

```

                *TOTALS*
PEAK FLOW      (cms)=      0.10          0.00          0.096 (iii)
TIME TO PEAK   (hrs)=      1.33          2.33          1.33
RUNOFF VOLUME   (mm)=      23.00          0.99          10.88
TOTAL RAINFALL  (mm)=      25.00          25.00          25.00
RUNOFF COEFFICIENT =      0.92          0.04          0.44

```

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 33.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.

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

```
-----
| ADD HYD ( 0002) |
| 1 + 2 = 3 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
      ID1= 1 ( 0001):  4.33    0.293    1.33    15.20
+ ID2= 2 ( 0104):  2.05    0.096    1.33    10.88
=====
      ID = 3 ( 0002):  6.38    0.389    1.33    13.81
-----
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| READ STORM |      Filename: C:\Users\bjo\AppData\
|            |      Local\Temp\
|            |      e2ee2593-a619-4ea9-84ef-23fcef4ac511\0493f3fb
| Ptotal= 25.00 mm |      Comments: 25mm4hour
-----
```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	2.40	1.17	33.60	2.17	3.45	3.17	1.65
0.33	1.95	1.33	38.10	2.33	3.00	3.33	1.80
0.50	2.40	1.50	13.80	2.50	2.70	3.50	1.50
0.67	2.85	1.67	7.35	2.67	2.25	3.67	1.50
0.83	4.65	1.83	5.55	2.83	2.25	3.83	0.75
1.00	9.60	2.00	4.35	3.00	1.95	4.00	0.60

```
-----
| CALIB |
| STANDHYD ( 0106) |      Area (ha)= 0.31
| ID= 1 DT= 5.0 min |      Total Imp(%)= 67.00 Dir. Conn.(%)= 67.00
-----
```

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.21	0.10
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	45.46	40.00
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	2.40	1.083	33.60	2.083	3.45	3.08	1.65
0.167	2.40	1.167	33.60	2.167	3.45	3.17	1.65
0.250	1.95	1.250	38.10	2.250	3.00	3.25	1.80
0.333	1.95	1.333	38.10	2.333	3.00	3.33	1.80
0.417	2.40	1.417	13.80	2.417	2.70	3.42	1.50
0.500	2.40	1.500	13.80	2.500	2.70	3.50	1.50
0.583	2.85	1.583	7.35	2.583	2.25	3.58	1.50
0.667	2.85	1.667	7.35	2.667	2.25	3.67	1.50
0.750	4.65	1.750	5.55	2.750	2.25	3.75	0.75
0.833	4.65	1.833	5.55	2.833	2.25	3.83	0.75
0.917	9.60	1.917	4.35	2.917	1.95	3.92	0.60
1.000	9.60	2.000	4.35	3.000	1.95	4.00	0.60

Max.Eff.Inten.(mm/hr)= 38.10 0.50
over (min) 5.00 65.00
Storage Coeff. (min)= 2.34 (ii) 61.17 (ii)
Unit Hyd. Tpeak (min)= 5.00 65.00
Unit Hyd. peak (cms)= 0.30 0.02

TOTALS

PEAK FLOW (cms)= 0.02 0.00 0.022 (iii)
TIME TO PEAK (hrs)= 1.33 2.50 1.33
RUNOFF VOLUME (mm)= 23.00 0.75 15.58
TOTAL RAINFALL (mm)= 25.00 25.00 25.00
RUNOFF COEFFICIENT = 0.92 0.03 0.62

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 33.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0003)	AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0106):	0.31	0.022	1.33	15.58
+ ID2= 2 (0002):	6.38	0.389	1.33	13.81
=====				
ID = 3 (0003):	6.69	0.411	1.33	13.89

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

READ STORM	Filename: C:\Users\bjo\AppData\Local\Temp\
Ptotal= 25.00 mm	e2ee2593-a619-4ea9-84ef-23fcef4ac511\0493f3fb
	Comments: 25mm4hour

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	2.40	1.17	33.60	2.17	3.45	3.17	1.65
0.33	1.95	1.33	38.10	2.33	3.00	3.33	1.80
0.50	2.40	1.50	13.80	2.50	2.70	3.50	1.50
0.67	2.85	1.67	7.35	2.67	2.25	3.67	1.50
0.83	4.65	1.83	5.55	2.83	2.25	3.83	0.75
1.00	9.60	2.00	4.35	3.00	1.95	4.00	0.60

CALIB	Area (ha)= 0.46
STANDHYD (0108)	Total Imp(%)= 40.00 Dir. Conn.(%)= 40.00
ID= 1 DT= 5.0 min	

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.18	0.28
Dep. Storage (mm)=	1.00	5.00
Average Slope (%)=	1.00	2.00
Length (m)=	55.38	40.00
Mannings n =	0.013	0.250

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

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

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	2.40	1.083	33.60	2.083	3.45	3.08	1.65
0.167	2.40	1.167	33.60	2.167	3.45	3.17	1.65
0.250	1.95	1.250	38.10	2.250	3.00	3.25	1.80
0.333	1.95	1.333	38.10	2.333	3.00	3.33	1.80
0.417	2.40	1.417	13.80	2.417	2.70	3.42	1.50
0.500	2.40	1.500	13.80	2.500	2.70	3.50	1.50
0.583	2.85	1.583	7.35	2.583	2.25	3.58	1.50
0.667	2.85	1.667	7.35	2.667	2.25	3.67	1.50
0.750	4.65	1.750	5.55	2.750	2.25	3.75	0.75
0.833	4.65	1.833	5.55	2.833	2.25	3.83	0.75
0.917	9.60	1.917	4.35	2.917	1.95	3.92	0.60
1.000	9.60	2.000	4.35	3.000	1.95	4.00	0.60

Max.Eff.Inten.(mm/hr)=	38.10	0.50
over (min)	5.00	65.00

Storage Coeff. (min)=	2.64 (ii)	61.46 (ii)	
Unit Hyd. Tpeak (min)=	5.00	65.00	
Unit Hyd. peak (cms)=	0.29	0.02	
			TOTALS
PEAK FLOW (cms)=	0.02	0.00	0.019 (iii)
TIME TO PEAK (hrs)=	1.33	2.50	1.33
RUNOFF VOLUME (mm)=	24.00	0.75	9.96
TOTAL RAINFALL (mm)=	25.00	25.00	25.00
RUNOFF COEFFICIENT =	0.96	0.03	0.40

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 33.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0004)				
1 + 2 = 3				
	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0108):	0.46	0.019	1.33	9.96
+ ID2= 2 (0003):	6.69	0.411	1.33	13.89
=====				
ID = 3 (0004):	7.15	0.430	1.33	13.64

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

READ STORM	Filename: C:\Users\bjo\AppData\Local\Temp\
	e2ee2593-a619-4ea9-84ef-23fcef4ac511\0493f3fb
Ptotal= 25.00 mm	Comments: 25mm4hour

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	2.40	1.17	33.60	2.17	3.45	3.17	1.65
0.33	1.95	1.33	38.10	2.33	3.00	3.33	1.80
0.50	2.40	1.50	13.80	2.50	2.70	3.50	1.50
0.67	2.85	1.67	7.35	2.67	2.25	3.67	1.50
0.83	4.65	1.83	5.55	2.83	2.25	3.83	0.75
1.00	9.60	2.00	4.35	3.00	1.95	4.00	0.60

```

-----
| CALIB |
| STANDHYD ( 0110) | Area (ha)= 0.46
| ID= 1 DT= 5.0 min | Total Imp(%)= 80.00 Dir. Conn.(%)= 80.00
-----

```

```

                IMPERVIOUS    PERVIOUS (i)
Surface Area    (ha)=        0.37        0.09
Dep. Storage    (mm)=        1.00        5.00
Average Slope    (%)=        1.00        2.00
Length          (m)=       55.68       40.00
Mannings n      =         0.013       0.250

```

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

---- TRANSFORMED HYETOGRAPH ----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	2.40	1.083	33.60	2.083	3.45	3.08	1.65
0.167	2.40	1.167	33.60	2.167	3.45	3.17	1.65
0.250	1.95	1.250	38.10	2.250	3.00	3.25	1.80
0.333	1.95	1.333	38.10	2.333	3.00	3.33	1.80
0.417	2.40	1.417	13.80	2.417	2.70	3.42	1.50
0.500	2.40	1.500	13.80	2.500	2.70	3.50	1.50
0.583	2.85	1.583	7.35	2.583	2.25	3.58	1.50
0.667	2.85	1.667	7.35	2.667	2.25	3.67	1.50
0.750	4.65	1.750	5.55	2.750	2.25	3.75	0.75
0.833	4.65	1.833	5.55	2.833	2.25	3.83	0.75
0.917	9.60	1.917	4.35	2.917	1.95	3.92	0.60
1.000	9.60	2.000	4.35	3.000	1.95	4.00	0.60

```

Max.Eff.Inten.(mm/hr)= 38.10      0.50
over (min)           5.00      65.00
Storage Coeff. (min)= 2.64 (ii)  61.47 (ii)
Unit Hyd. Tpeak (min)= 5.00      65.00
Unit Hyd. peak (cms)= 0.29      0.02

```

TOTALS

```

PEAK FLOW      (cms)= 0.04      0.00      0.039 (iii)
TIME TO PEAK   (hrs)= 1.33      2.50      1.33
RUNOFF VOLUME  (mm)= 24.00      0.75      19.31
TOTAL RAINFALL (mm)= 25.00      25.00      25.00
RUNOFF COEFFICIENT = 0.96      0.03      0.77

```

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 33.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.


```

-----
| RESERVOIR( 0005) |
| IN= 2---> OUT= 1 |
| DT= 1.0 min      |
-----

```

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.0160	0.0170
0.0160	0.0001	0.0000	0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0110)	0.465	0.039	1.33	19.31
OUTFLOW: ID= 1 (0005)	0.465	0.016	1.05	19.30

PEAK FLOW REDUCTION [Qout/Qin](%)= 40.76
 TIME SHIFT OF PEAK FLOW (min)=-17.00
 MAXIMUM STORAGE USED (ha.m.)= 0.0021

```

-----
| ADD HYD ( 0006) |
| 1 + 2 = 3       |
-----

```

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0004):	7.15	0.430	1.33	13.64
+ ID2= 2 (0005):	0.46	0.016	1.05	19.30
=====				
ID = 3 (0006):	7.61	0.446	1.33	13.98

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| RESERVOIR( 0007) |
| IN= 2---> OUT= 1 |
| DT= 1.0 min      |
-----

```

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.2410	0.2699
0.0100	0.0274	0.2810	0.2999
0.0170	0.0677	0.3140	0.3309
0.0240	0.1236	0.5780	0.3630
0.0650	0.1601	1.5860	0.3961
0.0870	0.1859	3.0110	0.4304
0.1630	0.2128	3.8450	0.4480
0.2020	0.2408	6.7550	0.5029

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0006)	7.615	0.446	1.33	13.98

OUTFLOW: ID= 1 (0007) 7.615 0.020 3.68 13.64

PEAK FLOW REDUCTION [Qout/Qin](%)= 4.37
TIME SHIFT OF PEAK FLOW (min)=141.00
MAXIMUM STORAGE USED (ha.m.)= 0.0878

| READ STORM | Filename: C:\Users\bjo\AppData\
| | Local\Temp\
| | e2ee2593-a619-4ea9-84ef-23fcef4ac511\0493f3fb
| Ptotal= 25.00 mm | Comments: 25mm4hour

TIME	RAIN	TIME	RAIN	'	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	'	hrs	mm/hr	hrs	mm/hr
0.17	2.40	1.17	33.60		2.17	3.45	3.17	1.65
0.33	1.95	1.33	38.10		2.33	3.00	3.33	1.80
0.50	2.40	1.50	13.80		2.50	2.70	3.50	1.50
0.67	2.85	1.67	7.35		2.67	2.25	3.67	1.50
0.83	4.65	1.83	5.55		2.83	2.25	3.83	0.75
1.00	9.60	2.00	4.35		3.00	1.95	4.00	0.60

| CALIB |
| NASHYD (0114) | Area (ha)= 0.08 Curve Number (CN)= 33.0
| ID= 1 DT= 5.0 min | Ia (mm)= 5.00 # of Linear Res.(N)= 3.00

| | U.H. Tp(hrs)= 0.03

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

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

TIME	RAIN	TIME	RAIN	'	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	'	hrs	mm/hr	hrs	mm/hr
0.083	2.40	1.083	33.60		2.083	3.45	3.08	1.65
0.167	2.40	1.167	33.60		2.167	3.45	3.17	1.65
0.250	1.95	1.250	38.10		2.250	3.00	3.25	1.80
0.333	1.95	1.333	38.10		2.333	3.00	3.33	1.80
0.417	2.40	1.417	13.80		2.417	2.70	3.42	1.50
0.500	2.40	1.500	13.80		2.500	2.70	3.50	1.50
0.583	2.85	1.583	7.35		2.583	2.25	3.58	1.50
0.667	2.85	1.667	7.35		2.667	2.25	3.67	1.50
0.750	4.65	1.750	5.55		2.750	2.25	3.75	0.75
0.833	4.65	1.833	5.55		2.833	2.25	3.83	0.75
0.917	9.60	1.917	4.35		2.917	1.95	3.92	0.60
1.000	9.60	2.000	4.35		3.000	1.95	4.00	0.60

Unit Hyd Qpeak (cms)= 0.102

PEAK FLOW (cms)= 0.000 (i)

TIME TO PEAK (hrs)= 1.333

RUNOFF VOLUME (mm)= 0.213

TOTAL RAINFALL (mm)= 25.000

RUNOFF COEFFICIENT = 0.009

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

```
-----
| ADD HYD ( 0008) |
| 1 + 2 = 3 |
-----
                AREA      QPEAK      TPEAK      R.V.
                (ha)      (cms)      (hrs)      (mm)
      ID1= 1 ( 0114):    0.08    0.000      1.33      0.21
+ ID2= 2 ( 0007):    7.61    0.020      3.68     13.64
=====
      ID = 3 ( 0008):    7.69    0.020      3.68     13.50
-----
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| READ STORM |
|           |
|           |
| Ptotal= 25.00 mm |
-----
Filename: C:\Users\bjo\AppData\
          Local\Temp\
          e2ee2593-a619-4ea9-84ef-23fcef4ac511\0493f3fb
Comments: 25mm4hour
```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	2.40	1.17	33.60	2.17	3.45	3.17	1.65
0.33	1.95	1.33	38.10	2.33	3.00	3.33	1.80
0.50	2.40	1.50	13.80	2.50	2.70	3.50	1.50
0.67	2.85	1.67	7.35	2.67	2.25	3.67	1.50
0.83	4.65	1.83	5.55	2.83	2.25	3.83	0.75
1.00	9.60	2.00	4.35	3.00	1.95	4.00	0.60

```
-----
| CALIB |
| NASHYD ( 0103) |
| ID= 1 DT= 5.0 min |
-----
Area (ha)= 0.07      Curve Number (CN)= 33.0
Ia (mm)= 5.00      # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.20
```

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

----- TRANSFORMED HYETOGRAPH -----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	2.40	1.083	33.60	2.083	3.45	3.08	1.65
0.167	2.40	1.167	33.60	2.167	3.45	3.17	1.65
0.250	1.95	1.250	38.10	2.250	3.00	3.25	1.80
0.333	1.95	1.333	38.10	2.333	3.00	3.33	1.80
0.417	2.40	1.417	13.80	2.417	2.70	3.42	1.50
0.500	2.40	1.500	13.80	2.500	2.70	3.50	1.50
0.583	2.85	1.583	7.35	2.583	2.25	3.58	1.50
0.667	2.85	1.667	7.35	2.667	2.25	3.67	1.50
0.750	4.65	1.750	5.55	2.750	2.25	3.75	0.75
0.833	4.65	1.833	5.55	2.833	2.25	3.83	0.75
0.917	9.60	1.917	4.35	2.917	1.95	3.92	0.60
1.000	9.60	2.000	4.35	3.000	1.95	4.00	0.60

Unit Hyd Qpeak (cms)= 0.013

PEAK FLOW (cms)= 0.000 (i)

TIME TO PEAK (hrs)= 1.500

RUNOFF VOLUME (mm)= 0.735

TOTAL RAINFALL (mm)= 25.000

RUNOFF COEFFICIENT = 0.029

(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 (0103):	0.07	0.000	1.50	0.73
+ ID2= 2 (0008):	7.69	0.020	3.68	13.50
=====				
ID = 3 (0009):	7.76	0.020	3.67	13.38

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

READ STORM		Filename: C:\Users\bjo\AppData\
		Local\Temp\
		e2ee2593-a619-4ea9-84ef-23fcef4ac511\0493f3fb
Ptotal= 25.00 mm		Comments: 25mm4hour

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr

0.17	2.40	1.17	33.60	2.17	3.45	3.17	1.65
0.33	1.95	1.33	38.10	2.33	3.00	3.33	1.80
0.50	2.40	1.50	13.80	2.50	2.70	3.50	1.50
0.67	2.85	1.67	7.35	2.67	2.25	3.67	1.50
0.83	4.65	1.83	5.55	2.83	2.25	3.83	0.75
1.00	9.60	2.00	4.35	3.00	1.95	4.00	0.60

CALIB							
NASHYD (0203)	Area (ha)=	0.17	Curve Number (CN)=	33.0			
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	# of Linear Res.(N)=	3.00			
	U.H. Tp(hrs)=	0.03					

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	2.40	1.083	33.60	2.083	3.45	3.08	1.65
0.167	2.40	1.167	33.60	2.167	3.45	3.17	1.65
0.250	1.95	1.250	38.10	2.250	3.00	3.25	1.80
0.333	1.95	1.333	38.10	2.333	3.00	3.33	1.80
0.417	2.40	1.417	13.80	2.417	2.70	3.42	1.50
0.500	2.40	1.500	13.80	2.500	2.70	3.50	1.50
0.583	2.85	1.583	7.35	2.583	2.25	3.58	1.50
0.667	2.85	1.667	7.35	2.667	2.25	3.67	1.50
0.750	4.65	1.750	5.55	2.750	2.25	3.75	0.75
0.833	4.65	1.833	5.55	2.833	2.25	3.83	0.75
0.917	9.60	1.917	4.35	2.917	1.95	3.92	0.60
1.000	9.60	2.000	4.35	3.000	1.95	4.00	0.60

Unit Hyd Qpeak (cms)= 0.216

PEAK FLOW (cms)= 0.000 (i)
 TIME TO PEAK (hrs)= 1.333
 RUNOFF VOLUME (mm)= 0.246
 TOTAL RAINFALL (mm)= 25.000
 RUNOFF COEFFICIENT = 0.010

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

READ STORM	Filename: C:\Users\bjo\AppData\Local\Temp\
	e2ee2593-a619-4ea9-84ef-23fcef4ac511\0493f3fb

| Ptotal= 25.00 mm | Comments: 25mm4hour

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	2.40	1.17	33.60	2.17	3.45	3.17	1.65
0.33	1.95	1.33	38.10	2.33	3.00	3.33	1.80
0.50	2.40	1.50	13.80	2.50	2.70	3.50	1.50
0.67	2.85	1.67	7.35	2.67	2.25	3.67	1.50
0.83	4.65	1.83	5.55	2.83	2.25	3.83	0.75
1.00	9.60	2.00	4.35	3.00	1.95	4.00	0.60

CALIB	
STANDHYD (0202)	Area (ha)= 0.42
ID= 1 DT= 5.0 min	Total Imp(%)= 54.00 Dir. Conn.(%)= 54.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.23	0.19
Dep. Storage (mm)=	2.00	5.00
Average Slope (%)=	1.00	2.00
Length (m)=	52.92	40.00
Mannings n =	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	2.40	1.083	33.60	2.083	3.45	3.08	1.65
0.167	2.40	1.167	33.60	2.167	3.45	3.17	1.65
0.250	1.95	1.250	38.10	2.250	3.00	3.25	1.80
0.333	1.95	1.333	38.10	2.333	3.00	3.33	1.80
0.417	2.40	1.417	13.80	2.417	2.70	3.42	1.50
0.500	2.40	1.500	13.80	2.500	2.70	3.50	1.50
0.583	2.85	1.583	7.35	2.583	2.25	3.58	1.50
0.667	2.85	1.667	7.35	2.667	2.25	3.67	1.50
0.750	4.65	1.750	5.55	2.750	2.25	3.75	0.75
0.833	4.65	1.833	5.55	2.833	2.25	3.83	0.75
0.917	9.60	1.917	4.35	2.917	1.95	3.92	0.60
1.000	9.60	2.000	4.35	3.000	1.95	4.00	0.60

Max.Eff.Inten.(mm/hr)=	38.10	0.50
over (min)	5.00	65.00
Storage Coeff. (min)=	2.57 (ii)	61.39 (ii)
Unit Hyd. Tpeak (min)=	5.00	65.00
Unit Hyd. peak (cms)=	0.29	0.02

TOTALS

PEAK FLOW	(cms)=	0.02	0.00	0.024 (iii)
TIME TO PEAK	(hrs)=	1.33	2.50	1.33
RUNOFF VOLUME	(mm)=	23.00	0.75	12.67
TOTAL RAINFALL	(mm)=	25.00	25.00	25.00
RUNOFF COEFFICIENT	=	0.92	0.03	0.51

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 33.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0010)					
1 + 2 = 3					

		AREA	QPEAK	TPEAK	R.V.
		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0202):		0.42	0.024	1.33	12.67
+ ID2= 2 (0203):		0.17	0.000	1.33	0.25
=====					
ID = 3 (0010):		0.59	0.024	1.33	9.09

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

READ STORM	Filename: C:\Users\bjo\AppData\
	Local\Temp\
	e2ee2593-a619-4ea9-84ef-23fcef4ac511\0493f3fb
Ptotal= 25.00 mm	Comments: 25mm4hour

TIME	RAIN	TIME	RAIN	'	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	'	hrs	mm/hr	hrs	mm/hr
0.17	2.40	1.17	33.60		2.17	3.45	3.17	1.65
0.33	1.95	1.33	38.10		2.33	3.00	3.33	1.80
0.50	2.40	1.50	13.80		2.50	2.70	3.50	1.50
0.67	2.85	1.67	7.35		2.67	2.25	3.67	1.50
0.83	4.65	1.83	5.55		2.83	2.25	3.83	0.75
1.00	9.60	2.00	4.35		3.00	1.95	4.00	0.60

CALIB	
STANDHYD (0201)	Area (ha)= 1.68
ID= 1 DT= 5.0 min	Total Imp(%)= 93.00 Dir. Conn.(%)= 93.00

```

-----
                        IMPERVIOUS      PERVIOUS (i)
Surface Area      (ha)=      1.56      0.12
Dep. Storage      (mm)=      2.00      5.00
Average Slope     (%)=      1.00      2.00
Length            (m)=     105.86     40.00
Mannings n        =        0.013     0.250

```

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

```

----- TRANSFORMED HYETOGRAPH -----
      TIME      RAIN |  TIME      RAIN |  TIME      RAIN |  TIME      RAIN
      hrs      mm/hr |  hrs      mm/hr |  hrs      mm/hr |  hrs      mm/hr
0.083      2.40 | 1.083     33.60 | 2.083      3.45 | 3.08      1.65
0.167      2.40 | 1.167     33.60 | 2.167      3.45 | 3.17      1.65
0.250      1.95 | 1.250     38.10 | 2.250      3.00 | 3.25      1.80
0.333      1.95 | 1.333     38.10 | 2.333      3.00 | 3.33      1.80
0.417      2.40 | 1.417     13.80 | 2.417      2.70 | 3.42      1.50
0.500      2.40 | 1.500     13.80 | 2.500      2.70 | 3.50      1.50
0.583      2.85 | 1.583      7.35 | 2.583      2.25 | 3.58      1.50
0.667      2.85 | 1.667      7.35 | 2.667      2.25 | 3.67      1.50
0.750      4.65 | 1.750      5.55 | 2.750      2.25 | 3.75      0.75
0.833      4.65 | 1.833      5.55 | 2.833      2.25 | 3.83      0.75
0.917      9.60 | 1.917      4.35 | 2.917      1.95 | 3.92      0.60
1.000      9.60 | 2.000      4.35 | 3.000      1.95 | 4.00      0.60

```

```

Max.Eff.Inten.(mm/hr)=      38.10      1.12
over (min)            5.00      10.00
Storage Coeff. (min)=      3.89 (ii)      7.58 (ii)
Unit Hyd. Tpeak (min)=      5.00      10.00
Unit Hyd. peak (cms)=      0.25      0.13

```

```

                                     *TOTALS*
PEAK FLOW      (cms)=      0.16      0.00      0.164 (iii)
TIME TO PEAK   (hrs)=      1.33      1.42      1.33
RUNOFF VOLUME  (mm)=      23.00      0.75      21.44
TOTAL RAINFALL (mm)=      25.00      25.00      25.00
RUNOFF COEFFICIENT =      0.92      0.03      0.86

```

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 33.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| RESERVOIR( 0011)|

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IN= 2---> OUT= 1				
DT= 1.0 min				

	OUTFLOW	STORAGE	OUTFLOW	STORAGE
	(cms)	(ha.m.)	(cms)	(ha.m.)
	0.0000	0.0000	0.2000	0.0600
	0.1500	0.0010	0.0000	0.0000
	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (0201)	1.681	0.164	1.33	21.44
OUTFLOW: ID= 1 (0011)	1.681	0.150	1.35	21.44
	PEAK FLOW REDUCTION [Qout/Qin](%)=	91.90		
	TIME SHIFT OF PEAK FLOW (min)=	1.00		
	MAXIMUM STORAGE USED (ha.m.)=	0.0014		

ADD HYD (0012)				
1 + 2 = 3				

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0010):	0.59	0.024	1.33	9.09
+ ID2= 2 (0011):	1.68	0.150	1.35	21.44
=====				
ID = 3 (0012):	2.27	0.174	1.33	18.23

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0013)				
1 + 2 = 3				

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0012):	2.27	0.174	1.33	18.23
+ ID2= 2 (0009):	7.76	0.020	3.67	13.38
=====				
ID = 3 (0013):	10.04	0.188	1.33	14.48

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

A4 – Areas & Imperviousness Calculation



KSGS Engineering Corp

Project Name Previn Court
Project No. 19011
Subject Drainage Areas and Imperviousness

Area Tributary to SWM Facility

Description	Area	Imperviousness	Impervious Area	Model Representation
External Area (Existing Residential)	2.05	55%	1.13	StandHYD
Open Space/Park	0.94			NasHYD
Residential Development	3.39	83%	2.81	StandHYD
SWM Pond	0.46	40%	0.18	StandHYD
Future Sproule Road	0.31	67%	0.21	StandHYD
Commercial Rooftop/Landscape	0.47	80%	0.38	StandHYD

Area Tributary to Ferndale

Description	Area	Imperviousness		Model Representation
Commercial Development	1.68	93%	1.56	StandHYD

Uncontrolled

Description	Area	Imperviousness		Model Representation
<i>To Ferndale</i>				
Future Sproule Road	0.42	54%	0.23	StandHYD
Residential Development La	0.17			NasHYD
<i>To Dymont's Creek</i>				
Open Space/Park	0.08			NasHYD
Pond Block	0.07			NasHYD

A5 – Quality Volume Calculation



KSGS Engineering Corp

PROJECT NAME: Previn Court Development
PROJECT NO.: 19011
DESCRIPTION: Storage Requirement Calculations

Project Parameters:		Units
Drainage Area	7.6	ha
Protection Level	1	(1, 2, or 3)
Imperviousness	62	%
SWMP Type	Wet Pond	(Infiltration, Wetlands, Hybrid, Wet P)

Table 3.2 - MOE SWM Planning and Design Manual, March 2003

Storage Requirements		Level 1 - 80% TSS Removal		
Imperviousness	Wet Pond	Hybrid	Wetlands	Infiltration
35	140	110	80	
55	190	150	105	
70	225	175	120	
85	250	195	140	

Total Storage Requirement 206 m³/ha
 Permanent Pool Storage Requirement 166 m³/ha
 (Total Storage Requirement less 40 m³/ha)

PERMANENT POOL VOLUME m³

Extended Detention Volume is Greater of:

1) 40m³/ha x Drainage Area 304 m³

2) Design storm over Drainage Area (Hydrology modeling)

a) Criteria 25 mm 4 hr

b) Runoff Volume = 13.98 mm (From Model)

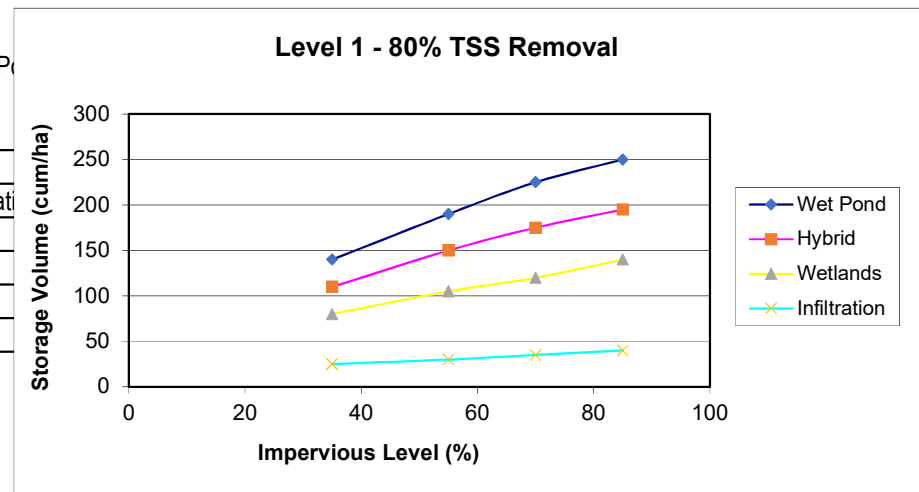
= 139.8 m³/ha

Volume = Runoff Volume x Drainage Area

= 1,062 m³/ha

EXTENDED DETENTION VOLUME m³

User Entry/Selection



Brief Stormceptor Sizing Report - Previn Court Commercial Area

Project Information & Location			
Project Name	Previn Court	Project Number	19011
City	Barrie	State/ Province	Ontario
Country	Canada	Date	10/22/2019
Designer Information		EOR Information (optional)	
Name	Brian Jo	Name	
Company	KSGS Engineering Corp	Company	
Phone #	437-990-7126	Phone #	
Email	brian.jo@ksgsengineering.com	Email	

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	Previn Court Commercial Area
Target TSS Removal (%)	80
TSS Removal (%) Provided	80
Recommended Stormceptor Model	STC 5000

The recommended Stormceptor Model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizing Summary	
Stormceptor Model	% TSS Removal Provided
STC 300	53
STC 750	66
STC 1000	68
STC 1500	68
STC 2000	73
STC 3000	75
STC 4000	79
STC 5000	80
STC 6000	82
STC 9000	86
STC 10000	86
STC 14000	89
StormceptorMAX	Custom

Sizing Details			
Drainage Area		Water Quality Objective	
Total Area (ha)	1.68	TSS Removal (%)	80.0
Imperviousness %	93.00	Runoff Volume Capture (%)	
Rainfall		Oil Spill Capture Volume (L)	
Station Name	BARRIE WPCC	Peak Conveyed Flow Rate (L/s)	150.00
State/Province	Ontario	Water Quality Flow Rate (L/s)	
Station ID #	0557	Up Stream Storage	
Years of Records	36	Storage (ha-m)	Discharge (cms)
Latitude	44°23'N	0.000	0.000
Longitude	79°41'W	Up Stream Flow Diversion	
		Max. Flow to Stormceptor (cms)	

Particle Size Distribution (PSD) The selected PSD defines TSS removal		
Fine Distribution		
Particle Diameter (microns)	Distribution %	Specific Gravity
20.0	20.0	1.30
60.0	20.0	1.80
150.0	20.0	2.20
400.0	20.0	2.65
2000.0	20.0	2.65

Notes
- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules. - Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed. - For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

For Stormceptor Specifications and Drawings Please Visit:
<http://www.imbriumsystems.com/technical-specifications>

A6 – Peak Runoff, Controlled Flow Rates and Pond Storage Volumes



KSGS Engineering Corp

Project Name Previn Court
Project No. 19011
Subject Peak Runoff Rate, Storage Volume and Controlled Flow Rates

4-hour Chicago

Return Period	Peak Runoff Rate	Controlled Flow Rates	Storage Volume
	m ³ /s	m ³ /s	m ²
2-year	0.942	0.036	1343
5-year	1.251	0.073	1694
10-year	1.466	0.106	1925
25-year	1.732	0.167	2157
50-year	1.931	0.195	2358
100-year	2.134	0.226	2587

6-hour SCS

Return Period	Peak Runoff Rate	Controlled Flow Rates	Storage Volume
	m ³ /s	m ³ /s	m ²
2-year	0.782	0.05	1465
5-year	1.115	0.105	1922
10-year	1.342	0.173	2197
25-year	1.643	0.23	2613
50-year	1.868	0.272	2932
100-year	2.094	0.309	3259

12-hour SCS

Return Period	Peak Runoff Rate	Controlled Flow Rates	Storage Volume
	m ³ /s	m ³ /s	m ²
2-year	0.733	0.049	1459
5-year	1.024	0.101	1909
10-year	1.224	0.169	2168
25-year	1.89	0.222	2556
50-year	1.684	0.262	2857
100-year	1.88	0.298	3159

24-hour SCS

Return Period	Peak Runoff Rate	Controlled Flow Rates	Storage Volume
	m ³ /s	m ³ /s	m ²
2-year	0.727	0.054	1503
5-year	1.023	0.12	1977
10-year	1.224	0.182	2262
25-year	1.493	0.239	2686
50-year	1.695	0.282	3013
100-year	1.897	0.339	3340



KSGS Engineering Corp

Project Name: Previn Court Development
Project No. 19011
Subject SWM Pond Stage-Volume

SWM Pond Parameters

PP Elevation 237.8 m
ED Elevation 238.4 m
Depth Increment 0.05 m

Pond Requirements

PP. Vol. Req'd 1,264
PP. Vol. Provided 1432
ED. Vol. Req'd 1062
ED. Vol. Provided 1236

Description	Elevation (m)	Depth (m)	Surface Area (m ²)	Incr. Area (m ²)
Bottom of Forebay	236.3		113.8	
Bottom of Main Cell	236.8	0	457.8	292.70
	236.85	0.05	750.5	49.36
	237.3	0.5	1194.7	55.72
PP	237.8	1	1751.9	51.71
	238.3	1.5	2269	40.35
ED	238.4	1.6	2349.7	56.70
	238.8	2	2803.3	50.18
	239.3	2.5	3305.1	63.71
	239.65	2.85	3751.1	63.71

37%

Surface/Volume from CAD Output

Elevation (m)	Surface Area (m ²)	Cum. Vol. (m ³)
236.3	113.8	
236.8	457.8	227
237.3	1194.7	712
237.3	1194.7	712
237.8	1751.9	1447
238.3	2269	2464
238.8	2803.3	3728
239.3	3305.1	5249
239.65	3751.1	6498

Elevation (m)	Depth (m)	Area (m ²)	Incr. Vol. (m ³)	Cum. Vol. (m ³)	Active Storage Vol. (m ³)	Ext. Det. Vol. (m ³)	Active Vol. Above ED (m ³)
236.3		113.8			0	0	0
236.8	0	458	227	227	0	0	0
236.85	0.05	751	30	258	0	0	0
236.9	0.1	800	39	296	0	0	0
236.95	0.15	849	41	338	0	0	0
237	0.2	899	44	381	0	0	0
237.05	0.25	948	46	427	0	0	0
237.1	0.3	997	49	476	0	0	0
237.15	0.35	1047	51	527	0	0	0
237.2	0.4	1096	54	581	0	0	0
237.25	0.45	1145	56	637	0	0	0
237.3	0.5	1195	59	695	0	0	0
237.35	0.55	1250	61	756	0	0	0
237.4	0.6	1306	64	820	0	0	0
237.45	0.65	1362	67	887	0	0	0
237.5	0.7	1418	69	957	0	0	0
237.55	0.75	1473	72	1029	0	0	0
237.6	0.8	1529	75	1104	0	0	0
237.65	0.85	1585	78	1182	0	0	0
237.7	0.9	1640	81	1262	0	0	0
237.75	0.95	1696	83	1346	0	0	0
237.8	1	1752	86	1432	0	0	0
237.85	1.05	1804	89	1521	89	89	0
237.9	1.1	1855	91	1612	180	180	0
237.95	1.15	1907	94	1706	274	274	0
238	1.2	1959	97	1803	371	371	0
238.05	1.25	2010	99	1902	470	470	0
238.1	1.3	2062	102	2004	572	572	0
238.15	1.35	2114	104	2108	677	677	0
238.2	1.4	2166	107	2215	783	783	0
238.25	1.45	2217	110	2325	893	893	0
238.3	1.5	2269	112	2437	1005	1005	0
238.35	1.55	2309	114	2552	1120	1120	0
238.4	1.6	2350	116	2668	1236	1236	0
238.45	1.65	2406	119	2787	1355	0	119
238.5	1.7	2463	122	2909	1477	0	241
238.55	1.75	2520	125	3033	1601	0	365
238.6	1.8	2577	127	3161	1729	0	493
238.65	1.85	2633	130	3291	1859	0	623
238.7	1.9	2690	133	3424	1992	0	756
238.75	1.95	2747	136	3560	2128	0	892
238.8	2	2803	139	3699	2267	0	1031
238.85	2.05	2853	141	3840	2408	0	1172
238.9	2.1	2904	144	3984	2552	0	1316
238.95	2.15	2954	146	4130	2699	0	1462
239	2.2	3004	149	4279	2847	0	1611
239.05	2.25	3054	151	4431	2999	0	1763
239.1	2.3	3104	154	4585	3153	0	1917
239.15	2.35	3155	156	4741	3309	0	2073
239.2	2.4	3205	159	4900	3468	0	2232
239.25	2.45	3255	161	5062	3630	0	2394
239.3	2.5	3305	164	5226	3794	0	2558
239.35	2.55	3369	167	5393	3961	0	2725
239.4	2.6	3433	170	5563	4131	0	2895
239.45	2.65	3496	173	5736	4304	0	3068
239.5	2.7	3560	176	5912	4480	0	3244
239.55	2.75	3624	180	6092	4660	0	3424
239.6	2.8	3687	183	6275	4843	0	3607
239.65	2.85	3751	186	6461	5029	0	3793

A7 – Pond Outlet, Forebay and Sediment Calculations



KSGS Engineering Corp

Project Name: Pevin Court Development
Project No. 19011
Subject: SWM Pond Outlet Design

Extended Detention Orifice	
Orifice Diam. (mm) =	125
Area (m2) =	0.012
C _d =	0.6
Invert Elev. (m) =	237.8

	Orifice 1	Orifice 2	Weir Wall	
Width (mm) =	350	400	Length (m) =	1.8
Height (mm) =	150	250	Coeff. C _d =	0.6
Area (m2) =	0.053	0.1	Crest Height (m) =	0.3
C _d =	0.6	0.6	Crest EL (m) =	239.2
Invert Elev. (m) =	238.4	238.65		

$$Q = 2/3 \cdot C_d \cdot (2g)^{0.5} L H^{1.5}$$

Emergency Spillway as Weir:	
Length (m) =	10
Coeff. C _d =	0.6
Crest Height (m) =	0.1
Crest EL (m) =	239.2

26

Water Elev. (m)	Depth (m)	Ext. Det. Orifice		Quantity Control Orifice 1		Quantity Control Orifice 2		Weir Wall		Spillway		Total Discharge, Q	Total Storage	Elevation (m)
		Head (m)	Discharge, Q (l/s)	Head (m)	Discharge, Q (l/s)	Head (m)	Discharge, Q (l/s)	Head (m)	Discharge, Q (l/s)	Head (m)	Discharge, Q (l/s)	(l/s)	(m ³)	
237.85	0.05	0.03	2	0.00	0	0.00	0	0	0	0	0	2	89	237.85
237.9	0.1	0.05	6	0.00	0	0.00	0	0	0	0	0	6	180	237.90
237.95	0.15	0.09	10	0.00	0	0.00	0	0	0	0	0	10	274	237.95
238	0.2	0.14	12	0.00	0	0.00	0	0	0	0	0	12	371	238.00
238.05	0.25	0.19	14	0.00	0	0.00	0	0	0	0	0	14	470	238.05
238.1	0.3	0.24	16	0.00	0	0.00	0	0	0	0	0	16	572	238.10
238.15	0.35	0.29	17	0.00	0	0.00	0	0	0	0	0	17	677	238.15
238.2	0.4	0.34	19	0.00	0	0.00	0	0	0	0	0	19	783	238.20
238.25	0.45	0.39	20	0.00	0	0.00	0	0	0	0	0	20	893	238.25
238.3	0.5	0.44	22	0.00	0	0.00	0	0	0	0	0	22	1005	238.30
238.35	0.55	0.49	23	0.00	0	0.00	0	0	0	0	0	23	1120	238.35
238.4	0.6	0.54	24	0.00	0	0.00	0	0	0	0	0	24	1236	238.40
238.45	0.65	0.59	25	0.03	22	0.00	0	0	0	0	0	47	1355	238.45
238.5	0.7	0.64	26	0.05	31	0.00	0	0	0	0	0	57	1477	238.50
238.55	0.75	0.69	27	0.08	38	0.00	0	0	0	0	0	65	1601	238.55
238.6	0.8	0.74	28	0.13	49	0.00	0	0	0	0	0	77	1729	238.60
238.65	0.85	0.79	29	0.18	58	0.00	0	0	0	0	0	87	1859	238.65
238.7	0.9	0.84	30	0.23	66	0.03	42	0	0	0	0	138	1992	238.70
238.75	0.95	0.89	31	0.28	73	0.05	59	0	0	0	0	163	2128	238.75
238.8	1	0.94	32	0.33	80	0.08	73	0	0	0	0	184	2267	238.80
238.85	1.05	0.99	32	0.38	85	0.10	84	0	0	0	0	202	2408	238.85
238.9	1.1	1.04	33	0.43	91	0.13	94	0	0	0	0	218	2552	238.90
238.95	1.15	1.09	34	0.48	96	0.18	111	0	0	0	0	241	2699	238.95
239	1.2	1.14	35	0.53	101	0.23	126	0	0	0	0	262	2847	239.00
239.05	1.25	1.19	36	0.58	106	0.28	139	0	0	0	0	281	2999	239.05
239.1	1.3	1.24	36	0.63	110	0.33	152	0	0	0	0	298	3153	239.10
239.15	1.35	1.29	37	0.68	115	0.38	163	0	0	0	0	314	3309	239.15
239.2	1.4	1.34	38	0.73	119	0.43	173	0	0	0	0	330	3468	239.20
239.25	1.45	1.39	38	0.78	123	0.48	183	0.05	36	0.05	198	578	3630	239.25
239.3	1.5	1.44	39	0.83	127	0.53	193	0.1	101	0.1	560	1020	3794	239.30
239.35	1.55	1.49	40	0.88	131	0.58	202	0.15	185	0.15	1029	1586	3961	239.35
239.4	1.6	1.54	40	0.93	134	0.63	210	0.2	285	0.2	1585	2255	4131	239.40
239.45	1.65	1.59	41	0.98	138	0.68	218	0.25	399	0.25	2215	3011	4304	239.45
239.5	1.7	1.64	42	1.03	141	0.73	226	0.3	524	0.3	2911	3845	4480	239.50
239.55	1.75	1.69	42	1.08	145	0.78	234	0.35	660	0.35	3669	4750	4660	239.55
239.6	1.8	1.74	43	1.13	148	0.83	241	0.4	807	0.4	4482	5721	4843	239.6
239.65	1.85	1.79	44	1.18	151	0.88	249	0.45	963	0.45	5348	6755	5029	239.65



KSGS Engineering Corp

Project Name: Previn Court Development
Project No. 19011
Subject Quality Drawdown Calculation

Orifice Invert (m) = 237.8

Extended Detention Requirements

Volume Req. (m3) = 1062.48
 Detention Time (hr) = 24.5
 Depth (m) = 0.6
 EL (m) = 238.4
 Max. Qrel (m3/s) = 0.024
 Vol. Available (m3) = 1236

Water Elev. (m)	125mm Orifice		
	Orifice Head (m)	X-Sect Area (m ²)	Orifice Flow (m ³ /s)
237.85	0.03	0.0045839	0.002
237.9	0.05	0.0105246	0.006
237.95	0.09	0.01227185	0.010
238	0.14	0.01227185	0.012
238.05	0.19	0.01227185	0.014
238.1	0.24	0.01227185	0.016
238.15	0.29	0.01227185	0.017
238.2	0.34	0.01227185	0.019
238.25	0.39	0.01227185	0.020
238.3	0.44	0.01227185	0.022
238.35	0.49	0.01227185	0.023
238.4	0.54	0.01227185	0.024

Orifice Geometry		
Height (m)	Angle (rad)	Area (m ²)
0.05	1.37	0.005
0.1	2.21	0.011
0.125	3.14	0.012
0.125	3.14	0.012
0.125	3.14	0.012
0.125	3.14	0.012
0.125	3.14	0.012
0.125	3.14	0.012
0.125	3.14	0.012
0.125	3.14	0.012
0.125	3.14	0.012
0.125	3.14	0.012

Avg. Gov. Discharge (m ³ /s)	Volume (m ³)	Incr. Dewatr. Time (hours)	Cumul. Dewatr. Time (hours)
0.001	86	25	
0.004	89	6.0	24.5
0.008	91	3.2	18.5
0.011	94	2.4	15.3
0.013	97	2.0	12.9
0.015	99	1.8	10.9
0.017	102	1.7	9.0
0.018	104	1.6	7.3
0.020	107	1.5	5.7
0.021	110	1.5	4.2
0.022	112	1.4	2.8
0.023	114	1.4	1.4



KSGS Engineering Corp

Project Name: Previn Court Development
Project No.: 19011
Description: Pond Forebay Settlement and Dispersion Length

Sediment Forebay Length

Inlet flowrate (Q)=	0.45	m ³ /sec	Flow Diverted to Pond (25 mm)
Quality Release Rate (Q _p)=	0.024	m ³ /sec	25mm Extended Detention Release Rate
Settlement particle size =	0.15	mm	
Settling Velocity (V _s)=	0.00033	m/s	
	0	0.50	m/s
Forebay length/Width (r)=	1.0		
Permanent Pool Depth (d)=	1.0	m	

$$\text{Settlement Length} = (r Q_p) / V_s^{0.5}$$

Settlement Length = 9 m Equation 4.5¹

$$\text{Dispersion Length} = 8Q / (d V_f)$$

Dispersion Length = 7 m Equation 4.6¹

Therefore the Sediment Forebay Length must be > 9 m

¹ Stormwater Management Planning and Design Manual, Ministry of the Environment, March 2003



KSGS Engineering Corp

Project Name: Previn Court Development
Project No.: 19011
Description: Sediment Cleanout Calculations

Drainage Area	7.6	ha
Imperviousness	62%	
SWMP Type	Wet Pond	
Protection Level	1	
TSS Removal Efficiency	80%	
Reduction in Efficiency to Initiate Cleanout	5%	
Starting Storage Req.	166	m ³ /ha
Starting Storage Provided.	188	m ³ /ha
Permanent Pool Volume	1432	m ³

Table 6.3: Annual Sediment Loading

(MOE SWM Planning and Design Manual, March 2003)

Imperviousness	Annual Loading (kg/ha)	Wet Density (kg/m ³)	Loading (m ³ /ha)
35%	770	1230	0.63
55%	2300	1230	1.87
70%	3495	1230	2.84
85%	4680	1230	3.8

Annual Loading/ha	2.33	m ³ /ha/yr
Annual Loading	17.7	m ³ /yr

Year	Starting Storage Volume (m ³ /ha)	Sediment Rem. Efficiency (%)	Amt. of Sediment Removed (m ³)	Starting PP Vol. (m ³)	End of Year PP Vol. (m ³)	End of Year Storage Vol. (m ³ /ha)	Cumul. Sediment Removed (m ³)
1	188	83.0%	15	1432	1417	186	15
2	186	82.7%	15	1417	1403	185	29
3	185	82.5%	15	1403	1388	183	44
4	183	82.2%	15	1388	1373	181	59
5	181	81.9%	15	1373	1359	179	73
6	179	81.7%	14	1359	1344	177	88
7	177	81.4%	14	1344	1330	175	102
8	175	81.2%	14	1330	1315	173	116
9	173	80.9%	14	1315	1301	171	131
10	171	80.7%	14	1301	1287	169	145
60	84	69.1%	12	637	625	82	807
61	82	68.9%	12	625	613	81	819
62	81	68.7%	12	613	601	79	831
63	79	68.5%	12	601	588	77	843
64	77	68.3%	12	588	576	76	856
65	76	68.1%	12	576	564	74	868
66	74	67.8%	12	564	552	73	880
67	73	67.6%	12	552	540	71	892

Cleanout as recommended by MOE Guidelines:

- Maintenance required when performance efficiency falls 5% below ORIGINAL target efficiency

Original Efficiency 80%

Starting Efficiency 83%

Cleanout as per MOE 75%

Recommended Cleanout: 10 Years

Volume to be Removed: 145 m³

A8 – Peak Runoff and On-site Storage for Commercial Areas



KSGS Engineering Corp

Project Name Previn Court
Project No. 19011
Subject Peak Runoff and On-site Storage for Commerical Area

4-hour Chicago

Return Period	Peak Runoff Rate	Controlled Flow Rates	Storage Volume
	m ³ /s	m ³ /s	m ²
2-year	0.353	0.158	108
5-year	0.468	0.165	184
10-year	0.546	0.17	241
25-year	0.642	0.176	317
50-year	0.713	0.181	375
100-year	0.784	0.187	441

6-hour SCS

Return Period	Peak Runoff Rate	Controlled Flow Rates	Storage Volume
	m ³ /s	m ³ /s	m ²
2-year	0.286	0.158	105
5-year	0.405	0.167	213
10-year	0.483	0.174	299
25-year	0.583	0.184	413
50-year	0.658	0.191	499
100-year	0.732	0.199	585

12-hour SCS

Return Period	Peak Runoff Rate	Controlled Flow Rates	Storage Volume
	m ³ /s	m ³ /s	m ²
2-year	0.267	0.156	88
5-year	0.37	0.163	179
10-year	0.438	0.169	244
25-year	0.525	0.176	340
50-year	0.59	0.182	413
100-year	0.654	0.188	486

24-hour SCS

Return Period	Peak Runoff Rate	Controlled Flow Rates	Storage Volume
	m ³ /s	m ³ /s	m ²
2-year	0.264	0.156	85
5-year	0.366	0.164	176
10-year	0.434	0.17	242
25-year	0.522	0.178	339
50-year	0.586	0.184	413
100-year	0.651	0.19	487

A9 – Uncontrolled Peak Flows to Ferndale Drive North



KSGS Engineering Corp

Project Name Previn Court
Project No. 19011
Subject Uncontrolled Flows to Ferndale Drive North

4-hour Chicago

Return Period	Peak Runoff Rate	To Ferndale
	m ³ /s	m ³ /s
2-year	0.053	0.209
5-year	0.07	0.230
10-year	0.082	0.245
25-year	0.097	0.264
50-year	0.108	0.278
100-year	0.119	0.293

6-hour SCS

Return Period	Peak Runoff Rate	To Ferndale
	m ³ /s	m ³ /s
2-year	0.043	0.2
5-year	0.061	0.226
10-year	0.074	0.245
25-year	0.09	0.27
50-year	0.104	0.29
100-year	0.117	0.309

12-hour SCS

Return Period	Peak Runoff Rate	To Ferndale
	m ³ /s	m ³ /s
2-year	0.04	0.196
5-year	0.056	0.218
10-year	0.067	0.234
25-year	0.082	0.256
50-year	0.094	0.273
100-year	0.105	0.290

24-hour SCS

Return Period	Peak Runoff Rate	To Ferndale
	m ³ /s	m ³ /s
2-year	0.04	0.195
5-year	0.056	0.218
10-year	0.068	0.234
25-year	0.082	0.256
50-year	0.095	0.274
100-year	0.107	0.292

APPENDIX B

B1 – Table 1.2 from LID Guidance Document

Table 1.2 Infiltration LID requirements for paved area runoff for major and non-major development		
Note: This table outlines requirements for paved area runoff only. Runoff from vegetated areas and rooftop are always permitted to be infiltrated, while runoff from pollution hot spot is never permitted.		
Land Use	Vulnerable Area	Requirement
Low Density Residential	<i>Wellhead Protection Area A and B</i>	Infiltration based practices are not permitted
	<i>Issues Contributing Area</i>	Infiltration based practices are permitted
	<i>Wellhead Protection Area C and D</i>	
	<i>Intake Protection Zone-1 and Zone-2</i>	
	<i>Lake Simcoe Protection Plan Significant Groundwater Recharge Areas</i>	
	<i>Highly Vulnerable Aquifers</i>	
	<i>Not Vulnerable</i>	
Commercial & Institutional	<i>Wellhead Protection Area A and B</i>	Infiltration based practices are not permitted
	<i>Issues Contributing Area</i>	Infiltration based practices are permitted with conditions
	<i>Wellhead Protection Area C and D</i>	
	<i>Intake Protection Zone-1 and Zone-2</i>	Infiltration based practices are permitted
	<i>Lake Simcoe Protection Plan Significant Groundwater Recharge Areas</i>	Infiltration based practices are not permitted
	<i>Highly Vulnerable Aquifers</i>	
	<i>Not Vulnerable</i>	Infiltration based practices are permitted
Industrial	<i>Wellhead Protection Area A and B</i>	Infiltration based practices are not permitted
	<i>Issues Contributing Area</i>	
	<i>Wellhead Protection Area C and D</i>	
	<i>Intake Protection Zone-1 and Zone-2</i>	
	<i>Lake Simcoe Protection Plan Significant Groundwater Recharge Areas</i>	
	<i>Highly Vulnerable Aquifers</i>	
	<i>Not Vulnerable</i>	
Mixed Use and High Density Residential	<i>Wellhead Protection Area A and B</i>	Infiltration based practices are not permitted
	<i>Issues Contributing Area</i>	Infiltration based practices are permitted with conditions
	<i>Wellhead Protection Area C and D</i>	
	<i>Intake Protection Zone-1 and Zone-2</i>	Infiltration based practices are permitted
	<i>Lake Simcoe Protection Plan Significant Groundwater Recharge Areas</i>	Infiltration based practices are permitted with conditions
	<i>Highly Vulnerable Aquifers</i>	
	<i>Not Vulnerable</i>	Infiltration based practices are permitted
Open Spaces and Environmental Protection Areas	<i>Wellhead Protection Area A and B</i>	Infiltration based practices are permitted with conditions
	<i>Issues Contributing Area</i>	
	<i>Wellhead Protection Area C and D</i>	
	<i>Intake Protection Zone-1 and Zone-2</i>	
	<i>Lake Simcoe Protection Plan Significant Groundwater Recharge Areas</i>	
	<i>Highly Vulnerable Aquifers</i>	
	<i>Not Vulnerable</i>	Infiltration based practices are permitted

B2 – Barrie FSR Review Comments (March 25, 2019)

MEMORANDUM

TO: C. McLaren
Senior Planner

FROM: L. Klein
Senior Development Services Technologist

DATE: March 25, 2019

RE: **Proposed Official Plan Amendment, Zoning Bylaw amendment & Draft Plan of Subdivision (dated November 15, 2018) submitted by the Innovated Planning Solutions on behalf 301099 Ontario Ltd. (Previn Court Homes) Located South of Edgehill Drive and West of Ferndale Drive North. (180 & 190 Ferndale Drive North and 59 & 61 Sproule Drive)**

File: D12-441

Further to your request for comments regarding the above noted application, please be advised that the Engineering Department has completed a preliminary review of this proposal and recommends that the following comments be included in the draft plan conditions.

SPECIAL CONDITIONS

1. Development of the subject lands must be in accordance with the Edgehill Secondary Plan and Functional Servicing Report.
2. Registration of this plan will not be considered until all infrastructure necessary to support the development of this plan is secured with the City of Barrie. Further, occupancy will not be granted until all necessary infrastructure is constructed and operating to municipal standard.
3. According to the City of Barrie's official plan, a 34 m right of way (ROW) is required for Ferndale Drive North. In this regard, the owner will be responsible to dedicate to the City of Barrie, a 4 m ROW widening across the full frontage of Ferndale Drive North.
4. Block 6 (Sproule Drive) shall have a ROW width of 23 m in according to the City of Barrie's Official Plan.
5. The ROW width of Block 6 (Sproule Drive) at its approach to Ferndale Drive North shall be increased to accommodate the additional lane assignments as recommended by the Traffic Impact Study.
6. The proposed Sproule Drive ROW (Block 6) shall be aligned with the existing Sproule Drive ROW to the west of the subject development and with the existing City of Barrie Operation Centre access on the east side of Ferndale Drive, having a minimum horizontal curve radius that meets the Transportation Association of Canada (TAC) guidelines (assuming a normal 2% cross-fall and a minimum design speed of 60 km/hr).
7. The draft plan shall be revised to show the existing City of Barrie Operations Centre access.
8. Blocks 1 and 2 shall be developed under site plan control.
9. The size of Block 3 (Stormwater Management) shall be confirmed through revisions to the Functional Servicing Report (FSR).
10. The FSR (dated November 2018) prepared by Pearson Engineering Ltd. shall be revised to address the following:

- a) Section 4.2 (Internal Water Distribution System) – The owner will be required to provide a Water Supply and Distribution Analysis / Model ensuring adequate domestic and fire flow, and pressure for this development. The boundary conditions provided for this analysis must utilize results from a current fire flow test. This analysis shall also include calculations to determine the required fire flows in accordance with the Fire Underwriters Survey. The results will be checked against the City's system model. Please contact Sheyda Dorraj (Ext. 4499) regarding minimum required fire flows.
- b) Fig-2 (Watermain Layout):
 - i) Identify the existing watermain stubs that were provided to the property as part of the City's Ferndale Drive North Reconstruction project; and
 - ii) Separate fire and domestic services are required for the Commercial Block.
- c) Fig-3 (Sanitary Layout):
 - i) Identify the existing sanitary stubs that were provided to the property as part of the City's Ferndale Drive North Reconstruction project. Are sanitary sewers still required on Sproule Drive?; and
 - ii) Provide proposed surface elevations and inverts to confirm property can be serviced.
- d) Section 6 (Stormwater Management) shall be updated to address the following:
 - i) Include a section that deals with the Floodline Analysis for Dyment's Creek;
 - ii) The pre-development drainage pattern identified is incorrect. Approximately half the site drains to Dyment's Creek and half drains to Ferndale Drive. This will affect your allowable discharge from the pond and corresponding storage volumes;
 - iii) It appears that the impervious value of the subject development lands have increased by approximately 20% compared to the previous development application; however, the SWM Block has decreased in size (from 0.65 Ha to 0.6 Ha). The increase in imperviousness suggests that the pond would need to increase in size accordingly;
 - iv) The SWM Block for the previous development application did not include a sediment drying area as it was permitted to be located directly adjacent to the SWM Block on the Park Block (draining back to the pond). As the Park Block is now located on the opposite side of Sproule Drive, the SWM Block will need to be increased in size to accommodate the sediment drying area;
 - v) The report shall confirm that the uncontrolled area draining to Ferndale Drive North can be accommodated by the existing storm sewer within Ferndale Drive North without surcharging;
 - vi) Fig-4 identifies a 3 m access road for the stormwater management facility whereas the minimum standard is 5 m;
 - vii) The report shall include full size pond drawings demonstrating compliance with Section 4.7 of the City's Storm Drainage & Stormwater Management Policies & Design Guidelines;
 - viii) Section 6 of the report shall clearly identify that all parameters set out in Section 4.7 of the City's Storm Drainage & Stormwater Management Policies & Design Guidelines have been addressed / incorporated into the pond design;
 - ix) Include sizing calculations for the pond forebay;
 - x) The Low Impact Development, Water Balance and Phosphorous sections of the report shall be supported by conceptual plans and a supporting hydrogeological report confirming that the proposed measures can be implemented; and

- xi) In reference to the supplementary Traffic Impact Study, Traffic Services has advised that there are no concerns with the study; however noted that the westerly access for the Commercial Block will be restricted to one-way traffic for vehicles existing the Commercial Block.
- 11. If it is determined that this SWM Block is not sufficient in size to facilitate the quantity / quality design standards of the day, development shall not proceed until storm drainage for this land can be accommodated. Any future increase in size of these Blocks will result in the loss of developable lands and not the adjacent environmentally protected (EP) lands.
- 12. A Design Charrette shall be arranged with the Lake Simcoe Regional Conservation Authority (LSRCA) to confirm acceptance of the low impact development proposal.
- 13. The owner will be responsible for obtaining the necessary approvals from any other applicable agencies with respect to its concerns.
- 14. The owner shall discharge any, and all, applicable City of Barrie Act or local improvement charges associated with the subject property.
- 15. Refer to the attached memorandum dated January 28, 2019 for comments from our Risk Management Official.
- 16. I understand that comments from Environmental Services have been requested separately and will be provided under separate cover.

STANDARD CONDITIONS

- 17. The owner shall be responsible for the provision of all works and services including the connection to existing municipal services in accordance with current City development standards and policies and to the satisfaction of the municipality.
- 18. The owner shall conform to all approved master engineering studies including environmental investigation, hydrogeological and hydrological studies, noise studies, traffic impact studies (all synchro analysis sheets to be included), etc., to determine the conditions under which development should be permitted and should be fully responsible for the provision of all works and services required to support the proposed land use in accordance with current City of Barrie Development Standards and Policies to the satisfaction of the Engineering Department.
- 19. The owner shall provide a FSR, completed by an experienced Civil Engineer, to assess all servicing, transportation, and environmental concerns associated with the proposed development to the satisfaction of the Engineering Department.
- 20. The owner shall provide a noise study, completed by an experienced Acoustical Engineer, and shall undertake any measures required to satisfy the Ministry of the Environment, Conservation and Parks and the City of Barrie.
- 21. The owner shall be responsible for the development of appropriate storm, sanitary and water conveyance systems including outlet works and / or other related facilities, to the satisfaction of the Engineering Department. In that regard, the proposed servicing shall include for the provision of the servicing to all external areas. A special provision must be implemented when out letting storm drainage into any environmentally sensitive areas.
- 22. The owner will be responsible for complying with, and satisfying, all applicable policies and requirements of approval from the Ministry of the Environment, Conservation and Parks, Ministry of Natural Resources, LSRCA, and the City of Barrie, all in accordance with current City development standards and policies.

23. The owner will retain the services of an experienced professional Hydrogeological Engineer to complete a hydrogeological study, all to the satisfaction of the Engineering Department. Without limiting the generality of the foregoing, the study will include a survey of all water supply systems within 300 m of the subject property, and / or the zone of influence, and report of the possible impact the development of the plan will have on the existing water supply systems. Should the Engineering Department apprehend or determine that the existing water supply systems will be altered or eliminated based on the study and any other available supporting data, the owner will be responsible for providing the interim and permanent restoration of the water supply systems, to the satisfaction of the City of Barrie. This report should be conclusive with provisions and recommendations on servicing within the noted recharge area.
24. The owner acknowledges and agrees that the proposed development must be serviced from the municipal water distribution system.
25. The water distribution system for the subject land shall be of sufficient size to provide the maximum day usage plus maintain minimum fire flows, all to the satisfaction of the Engineering Department.
26. The owner is advised that draft approval does not in itself constitute a commitment by the City of Barrie or the Ministry of Environment, Conservation and Parks to provide servicing access to the City's wastewater Treatment Plan or Water Supply Plant. The subject plan may proceed to registration provided there is sufficient plant capacity and capability to serve the development. Plant capacity will be allocated for new development on a priority basis at the time of payment of development charges.
27. Before any site alteration within the subject property, the owner and / or his agents will apply for a Site Alteration Permit as described within By-law 2014-100. Prior to the commencement of any works within the site, all requirements, obligations and control measures, as described within By-law 2014-100, will be in place and undertaken to the satisfaction of the City of Barrie and to the appropriate conservation authority in those areas which are under their jurisdictions. Further, it will be the owner's responsibility through its professional consultant, to maintain the said works for the duration of the subject development.
28. The owner shall provide the City of Barrie with the registered plan of subdivision and all other associated plans referred to in Horizontal Control Surveys UTM (Zone 17) NAD83. They are to be supplied in both hard copy and digital format.
29. In order to mitigate the harmful effects of concentrated stormwater runoff into ravine areas, the owner shall employ various means and methods to decrease the anticipated flow. Such methods may include redirection of the stormwater roof leaders to road, soak away pits, and rear yard infiltration galleries.
30. As a requirement of development, the owner will be responsible for entering a Subdivider's Agreement with the City of Barrie.

Prepared by:


L. A. Klein, Civil Engineering Technologist
Senior Development Services Technologist

LAK/eds



ENGINEERING DEPARTMENT

FILE: W09-SO
"180 and 190 Ferndale Drive North"

MEMORANDUM

TO: Larry Klein, Senior Development Services Technologist

FROM: Katie Thompson, Risk Management Official

DATE: January 28, 2019

SUBJECT: D09-OPA71, D14-1663 & D12-441
Official Plan Amendment, Zoning by-law amendment and draft plan of subdivision applications-301099 Ontario Limited (Previn Court Homes) 180 & 190 Ferndale Drive North and 59 & 61 Sproule Drive

The subject property is located within Source Protection Vulnerable areas known as: Wellhead Protection Area B, an Issue Contributing Area for Sodium and Chloride, and partial Highly Vulnerable Aquifer. This means that groundwater beneath this property is flowing towards municipal wells and could eventually be drawn up by these wells. The following comments are provided to address Significant Drinking Water Threats.

1) Storage of Dense Non-Aqueous Phase Liquids:

- a) The property is located in Wellhead Protection Area B and C. This means groundwater beneath this property is flowing towards municipal wells and could eventually be drawn up by these wells. In these areas the handling and storage of dense non-aqueous phase liquids (DNAPLs) is considered to be a significant threat. DNAPLs are chemicals that are heavy and sink in water (e.g. trichloroethylene). **Source Protection policies prohibit the future handling and storage of DNAPLs in any quantity (excluding incidental volumes for personal/domestic use) on this property.** This can include (but is not limited to) industrial and commercial applications such as the repair and maintenance of automobiles or equipment; dry cleaning; cleaning/degreasing using solvents; the manufacture of electronics, plastics, pesticides, and pharmaceuticals; wood preservation; asphalt operations, and any handling or storage of solvents, varnishes, adhesives, paint removers, furniture strippers, driveway sealants, brake cleaner, electrical contract cleaner, and paint. Any industrial, commercial or institutional activities that may use or store chemical products on-site will need to ensure that these products are free of DNAPLs. If you need help to determine if a specific product would result in a drinking water threat, contact the City's Risk Management Office.

- 2) Issues Contributing Area: The property is located within an Issues Contributing Area that has been outlined because of increasing chloride and sodium concentrations in several municipal wells. As sodium and chloride are the main constituents of road salt, activities relating to the handling, storage and application of road salt as well as the storage of snow are of concern on this property.

Salt Storage:

- a) If road salt is stored in quantities equal to or greater than 5 tonnes, the property is required to have a Risk Management Plan. Please contact the Risk Management Official if 5 tonnes or more of road salt will be stored on site as part of ongoing operations. For more information on Risk Management Plans please consult www.barrie.ca/SourceWaterProtection.

Design Guidelines for Road Salt Reduction:

- b) Site grading and paved area design should be such that it minimizes the need for winter maintenance chemicals to be used:
- I. The design should reduce ponding.
 - II. Downspouts should be directed to pervious surfaces and/or away from pedestrian pathways, vehicle thoroughfares and parking areas to reduce melt water refreezing and creating hazardous conditions. Please outline the proposed downspout locations for the new building on the site plan map.
 - III. Parking lots should be graded away from building entrances and in such a way that major drainage pathways do not cross heavily used areas of the parking lot.
3. c) Snow storage design should be such that it minimizes the need for winter maintenance chemicals to be used:
- I. The selection of the snow storage location should be optimized to reduce melt water refreezing and creating hazardous conditions. Please outline the proposed snow storage location(s) on the site plan map.
 - II. Snow pile location shall be outlined on the lot drainage plan.
 - III. Snow pile storage areas should be clearly delineated and marked with signage to inform winter contractors and the public of the snow pile storage location. Location of signage shall be marked on the lot drainage plan.
 - IV. Meltwater runoff from snow piles should be directed away from high traffic areas and into catch basins. Catch basins or other stormwater collection design features should be laid out directly downgradient from snow storage areas such that the distance meltwater travels before being removed from the lot's surface is minimized. Meltwater collected by catch basins downstream from snow storage piles should be routed through an oil grit separator to reduce meltwater contaminant loads, as snow storage piles typically contain high concentrations of oil, sediment and other contaminants.
 - V. Snow pile storage areas should be located in areas receiving large amounts of solar radiation to promote melting and should be located so that they are easily accessible for plows and other mechanical snow and ice removal machinery.
 - VI. Snow storage piles should be located along downgradient edges of the parking lot and positioned as far away from major pedestrian destinations as possible to prevent meltwater runoff into high traffic areas.

- VII. Sidewalk and walkway design should be such that it minimizes the need for winter maintenance chemicals to be used: Sidewalk and walkway design should consider plow routes as to not impair snow removal

3) Low Impact Development

- I. The City of Barrie has developed an Infiltration Low Impact Development Screening Process. This process is intended to provide guidance for development and redevelopment projects on the suitability of directing runoff from paved surfaces to infiltration LID practices based on the source water protection vulnerable area the project is located within. **Runoff from vegetated areas and rooftops are always permitted to be conveyed or treated using infiltration practices.** For more information please review the document at the following link:

<https://www.barrie.ca/Living/Environment/Conservation/Documents/2017-05-02%20LID%20Guidance-Final.pdf>

4. Highly Vulnerable Aquifer

a) The property is located in an area overlaying a Highly Vulnerable Aquifer. Highly vulnerable aquifers are very susceptible to contamination because of their location near the ground's surface. The shallow soils/rocks and or thin, sandy soils above the aquifer are limited in their capacity to naturally filter out or be an effective barrier to contaminants. In areas of high aquifer vulnerability, bulk fuels and chemicals have been identified as moderate drinking water threats. To help reduce the risk for these types of aquifer, preventative measures need to be implemented for proposed developments associated with bulk fuel and chemicals. It is recommended that a spills management plan, and secondary containment be in place prior to construction. The Risk Management Office will provide a template to develop a Spills Management Plan should any bulk fuels be proposed for the site.

KT

B3 – Figure 3 from LID Guidance Document

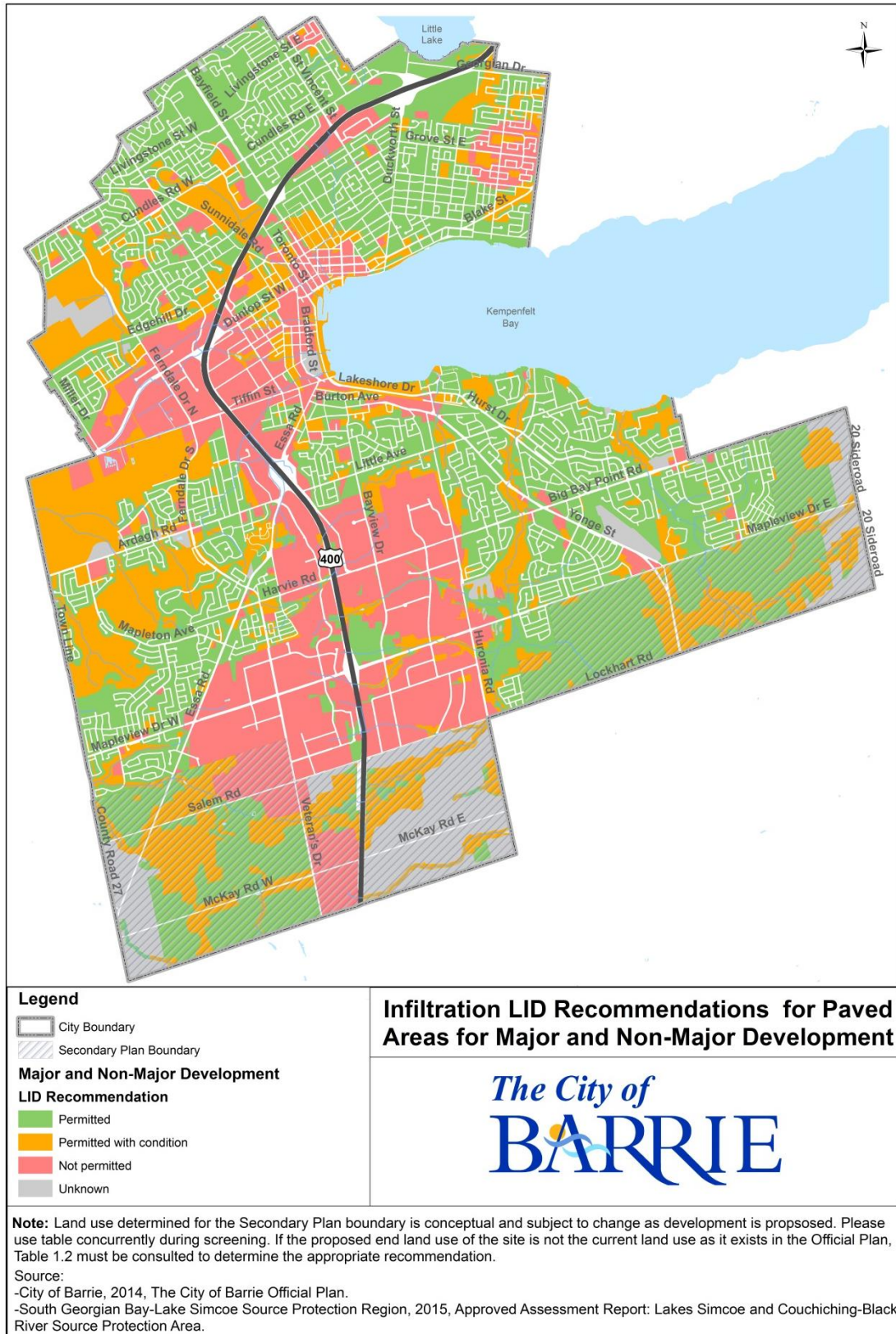


Figure 3. Screening map showing infiltration LID recommendations for paved area runoff for major and non-major development

B4 – Azimuth Consulting Inc. Water Table Summary



Environmental Assessments & Approvals

October 2nd 2019

AEC 08-098

Previn Court Homes
C/O Urban Ecosystems Ltd.
7050 Weston Road Suite 705
Woodbridge, Ontario
L4L 8G7

Attention: Daniel Schembri

Re: **Previn Court Homes - Water Level Monitoring**

Dear Sir/Madam:

Azimuth Environmental Consulting, Inc. was retained to conduct a scoped test pit and monitoring program within Lot 23, Concession 7 in the City of Barrie (the "Site"). The Site is currently vacant forest and shrub land, and is located on the south west side of Ferndale Drive, approximately 140 m south of the Ferndale Drive and Edgehill Drive intersection (Figure 2). The purpose of this technical memorandum is to summarize the test pit program and shallow ground water data collected to date.

Test Pit Program

A field program was conducted by Azimuth staff on April 25th 2019 during which the weather was 18°C and sunny. Test pits were advanced at six (6) locations, spread evenly across the Site. The test pits were advanced using an excavator rented and operated by Eisses Brothers Excavating. The test pit location coordinates are shown in the below Table 1.

Test pits were typically about 2 m wide and 4 m long, and were advanced between 1.6 to 2.9 m below ground surface (mbgs). In general, the subsurface material was composed of topsoil overlying medium to coarse sand with varying amounts of gravel. The material was primarily loose, and was dark brown, brown, red brown, or grey in colour. Ground water seeps were noted in the side walls or the bottom of all test pits advanced. Test pit logs for the field program are appended.



Plastic standpipes were installed in each test pit prior to back filling to enable ground water measurement. Each standpipe was 2 inches in diameter and contained a 5 foot section of perforated pipe at the bottom to allow for ground water flow.

Table 1: Summary of Test Pit Locations

Test Pit ID	Ground Elevation*(masl)	Approximate Base of Excavation (masl)	Approximate Coordinates	
			Easting	Northing
TP-1	251.50	249.06	601652.41	4914863.47
TP-2	242.16	239.66	601492.39	4914781.35
TP-3	238.51	236.28	601676.56	4914732.98
TP-4	238.69	237.07	601557.81	4914681.05
TP-5	240.49	238.41	601602.15	4914765.26
TP-6	237.91	234.97	601665.76	4914605.42

*Based on survey completed by Dino Astri Surveying Inc. in 2019

Ground Water Measurement

Manual measurements were also collected in all six standpipes on April 30th, May 30th, June 26th, and August 2nd 2019. The below Table 2 shows the manual measurements collected.

Table 2: Manual Ground Water Monitoring Summary

Location ID	Manual Water Levels (masl)			
	30-Apr-19	30-May-19	26-Jun-19	02-Aug-19
SP-1	239.40	239.43	239.37	239.21
SP-2	240.55	240.53	240.42	240.21
SP-3	238.33	238.35	238.30	238.02
SP-4	238.23	238.17	238.13	237.95
SP-5	239.36	239.31	239.22	239.04
SP-6	236.67	236.66	236.60	236.39

Notes

Blue highlight indicates the high manual measurement for that location

Typically, the spring high conditions are measured within the months of March, April, May, or June. Based on Azimuth's experience with similar monitoring programs in the Barrie area in 2019, the spring high period occurred late April to early May. In Table 3, the blue highlighted areas represent the highest manual measurement recorded for each location. The high measurement was collected at four locations in April, and at two locations in May. Due to the small variation between April and May (0.02m and 0.03m) for the locations that observed the high in May, the April measurements can be considered the peak ground water conditions for the Site. These conditions are shown on



Figure 3 with extrapolated contours. The inferred shallow ground water flow direction is south east

Data loggers set to record automatic water level measurements every hour were installed within three standpipes (SP-2, SP-3, & SP-6) to collect data between April 30th and August 2nd 2019. Hydrographs for each standpipe are appended. The hydrographs confirm that the April 30th 2019 manual measurement represents peak ground water conditions at the Site (+/- 0.10m) and should be used in detailed design.

Should you have any questions or wish to discuss the report in greater detail, please do not hesitate to contact the undersigned.

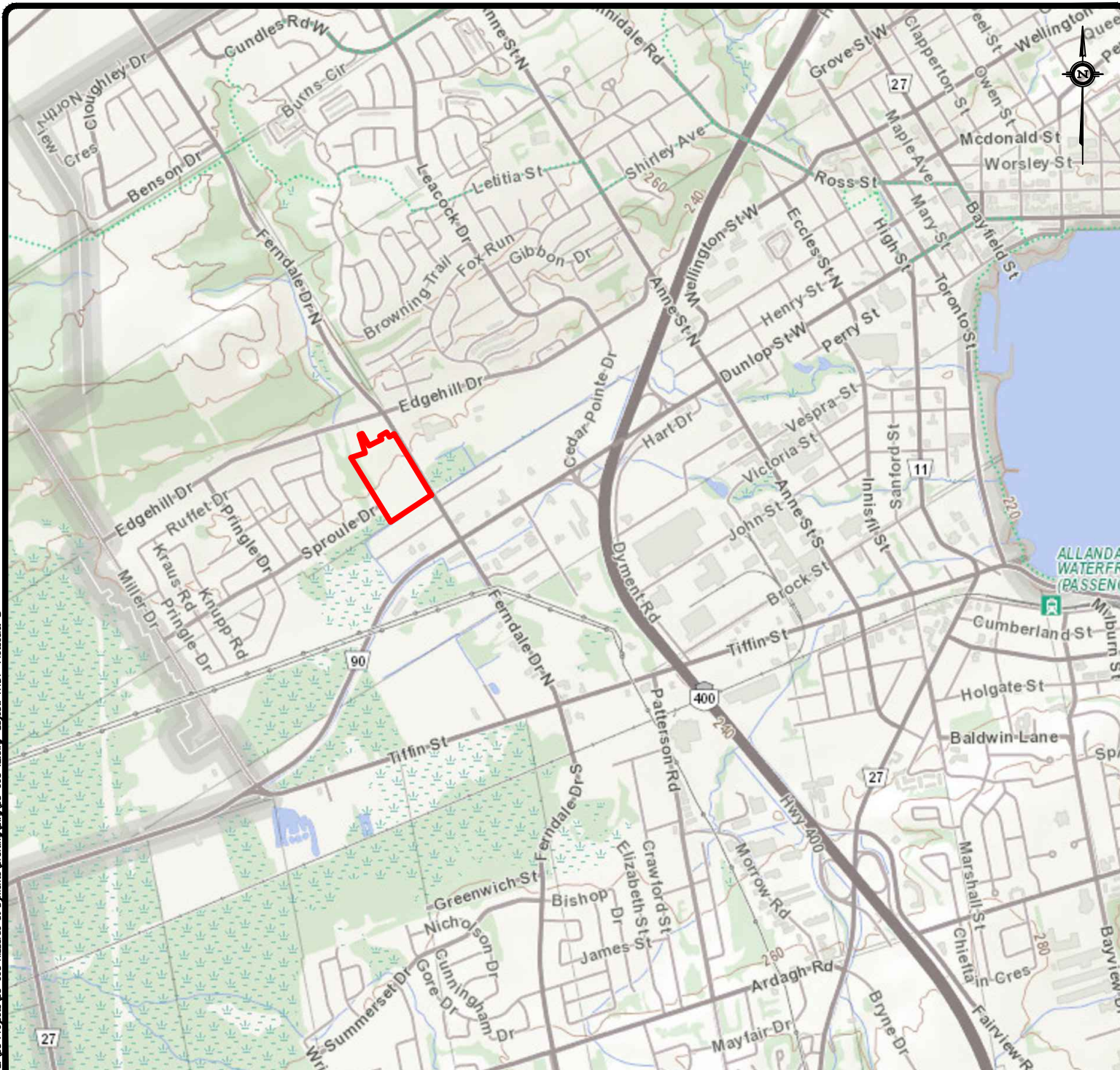
Yours truly,
AZIMUTH ENVIRONMENTAL CONSULTING, INC.

Jennifer Millington, M.A.Sc., P.Geo.
Hydrogeologist



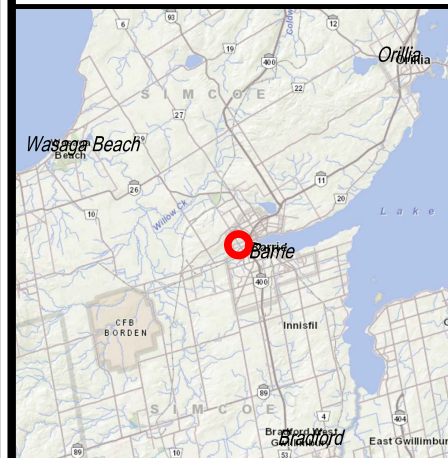
APPENDIX A

Figures



LEGEND:

— Approx. Study Area



REG MAP



Regional Site Location

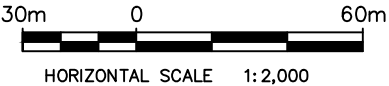
Rizzardo at Dyments Creek
 Ferndale Drive, Barrie

DATE ISSUED: September 2019	Figure No.
CREATED BY: JLM	
PROJECT NO.: 08-098	
REFERENCE: MNR	1



LEGEND:

— Approx. Study Area



Site Layout

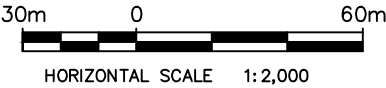
Previn Court Homes at Dyments Creek
Ferndale Drive, Barrie

DATE ISSUED:	September 2019	Figure No. 2
CREATED BY:	JLM	
PROJECT NO.:	08-098	
REFERENCE:	Simcoe County Mapping	



LEGEND:

- Approx. Study Area
- ✚ Stand Pipe Locations
- 239.58 Ground Water Elevation
- 0.5m Ground Water Contours
- - - Inferred 0.5m Ground Water Contours



High Ground Water Conditions
(April 30th, 2019)

Previn Court Homes at Dyments Creek
Ferndale Drive, Barrie

DATE ISSUED:	September 2019	Figure No. 3
CREATED BY:	JLM	
PROJECT NO.:	08-098	
REFERENCE:	Simcoe County Mapping	



APPENDIX B

Test Pit Logs

TEST PIT LOG

Project Name/ Project Client	Previn Court	Project Address	Ferndale Street North Barrie	Date	April 25th 2019
Test Pit Number	TP-1	Contractor	Eisses Brothers Excavating	Elevation	251.50
Equipment	Excavator	Test Pit Size	2.0 x 4.0 (L x W)	Datum	Ground Surface
Temperature	18°C	Weather	Sunny	Sample Type	-

Depth		Soil description	Samples		Headspace Combustible Vapour Concentration (ppm)	Remarks / Chemical Analysis
From (m)	To (m)		No.	Depth (mbgs)		
0.0	0.61	<u>Topsoil</u> Dark brown topsoil, sandy, roots and organics, loose, moist	NA			-
0.61	2.44	<u>Sand</u> Red brown medium to coarse sand, trace gravel, slight layering, loose, moist to saturated. Turning grey at 1.8m	NA			-
-						
Test Pit Terminated at 2.44 mbgs. Significant ponding at the bottom of test pit upon completion.						
Comments			Water Conditions in Test Pit			
Standpipe installed to a depth of 2.45 mbgs. Water level at 1.92 mbgs upon completion			☒ Wet upon completion ☐ Dry upon completion			

JOB No.	08-098
TEST PIT No.	TP-1
FIELD STAFF	JM

TEST PIT LOG

Project Name/ Project Client	Previn Court	Project Address	Ferndale Street North Barrie	Date	April 25th 2019
Test Pit Number	TP-2	Contractor	Eisses Brothers Excavating	Elevation	242.16
Equipment	Excavator	Test Pit Size	2.0 x 4.0 (L x W)	Datum	Ground Surface
Temperature	18°C	Weather	Sunny	Sample Type	-

Depth		Soil description	Samples		Headspace Combustible Vapour Concentration (ppm)	Remarks / Chemical Analysis
From (m)	To (m)		No.	Depth (mbgs)		
0.0	0.30	<u>Topsoil</u> Dark brown topsoil, sandy, roots and organics, loose, moist	NA			-
0.30	2.50	<u>Sand</u> Red brown medium sand, trace gravel, loose, moist to saturated. Turning grey at 0.9 m	NA			-
-						
Test Pit Terminated at 2.50 mbgs. Significant cave in at 0.9mbgs with ground water seeps. Excavator went as far down as possible before installing standpipe.						
Comments			Water Conditions in Test Pit			
Standpipe installed to a depth of 2.50 mbgs. Water level at 1.69 mbgs upon completion			☒ Wet upon completion ☐ Dry upon completion			

JOB No.	08-098
TEST PIT No.	TP-2
FIELD STAFF	JM

TEST PIT LOG

Project Name/ Project Client	Previn Court	Project Address	Ferndale Street North Barrie	Date	April 25th 2019
Test Pit Number	TP-3	Contractor	Eisses Brothers Excavating	Elevation	238.51
Equipment	Excavator	Test Pit Size	2.0 x 4.0 (L x W)	Datum	Ground Surface
Temperature	18°C	Weather	Sunny	Sample Type	-

Depth		Soil description	Samples		Headspace Combustible Vapour Concentration (ppm)	Remarks / Chemical Analysis
From (m)	To (m)		No.	Depth (mbgs)		
0.0	0.20	<u>Topsoil</u> Dark brown topsoil, sandy, roots and organics, loose, moist	NA			-
0.20	2.23	<u>Sand</u> Brown medium to coarse sand, loose, moist to saturated, significant ground water seeps at 0.5m	NA			-
-						
Test Pit Terminated at 2.23 mbgs. Significant seepage within the test pit starting around 0.5m						
Comments			Water Conditions in Test Pit			
Standpipe installed to a depth of 2.23 mbgs. Water level at 0.30 mbgs upon completion			☒ Wet upon completion ☐ Dry upon completion			

JOB No.	08-098
TEST PIT No.	TP-3
FIELD STAFF	JM

TEST PIT LOG

Project Name/ Project Client	Previn Court	Project Address	Ferndale Street North Barrie	Date	April 25th 2019
Test Pit Number	TP-4	Contractor	Eisses Brothers Excavating	Elevation	238.69
Equipment	Excavator	Test Pit Size	2.0 x 4.0 (L x W)	Datum	Ground Surface
Temperature	18°C	Weather	Sunny	Sample Type	-

Depth		Soil description	Samples		Headspace Combustible Vapour Concentration (ppm)	Remarks / Chemical Analysis
From (m)	To (m)		No.	Depth (mbgs)		
0.0	0.20	<u>Topsoil</u> Dark brown topsoil, sandy, roots and organics, loose, moist	NA			-
0.20	1.62	<u>Sand</u> Brown coarse sand, loose, homogeneous, moist to saturated at 0.90m.	NA			-
-						
Test Pit Terminated at 1.62 mbgs. Significant cave in and ground water seeps starting at 0.90 m. Ground water seeps were very silty.						
Comments			Water Conditions in Test Pit			
Standpipe installed to a depth of 1.62 mbgs. Water level at 0.93 mbgs upon completion			☒ Wet upon completion ☐ Dry upon completion			

JOB No.	08-098
TEST PIT No.	TP-4
FIELD STAFF	JM

TEST PIT LOG

Project Name/ Project Client	Previn Court	Project Address	Ferndale Street North Barrie	Date	April 25th 2019
Test Pit Number	TP-5	Contractor	Eisses Brothers Excavating	Elevation	240.49
Equipment	Excavator	Test Pit Size	2.0 x 4.0 (L x W)	Datum	Ground Surface
Temperature	18°C	Weather	Sunny	Sample Type	-

Depth		Soil description	Samples		Headspace Combustible Vapour Concentration (ppm)	Remarks / Chemical Analysis
From (m)	To (m)		No.	Depth (mbgs)		
0.0	0.10	<u>Topsoil</u> Dark brown topsoil, sandy, roots and organics, loose, moist	NA			-
0.10	2.08	<u>Sand</u> Brown medium sand, becoming coarse at 1.55m, loose, moist to saturated at 1.55m. Turning grey at 1.55m	NA			-
-						
Test Pit Terminated at 2.08 mbgs. Ground water seeps starting at 1.55 m upon completion.						
Comments			Water Conditions in Test Pit			
Standpipe installed to a depth of 2.08 mbgs. Water level at 1.21 mbgs upon completion			☒ Wet upon completion ☐ Dry upon completion			

JOB No.	08-098
TEST PIT No.	TP-5
FIELD STAFF	JM

TEST PIT LOG

Project Name/ Project Client	Previn Court	Project Address	Ferndale Street North Barrie	Date	April 25th 2019
Test Pit Number	TP-6	Contractor	Eisses Brothers Excavating	Elevation	237.91
Equipment	Excavator	Test Pit Size	2.0 x 4.0 (L x W)	Datum	Ground Surface
Temperature	18°C	Weather	Sunny	Sample Type	-

Depth		Soil description	Samples		Headspace Combustible Vapour Concentration (ppm)	Remarks / Chemical Analysis
From (m)	To (m)		No.	Depth (mbgs)		
0.0	0.76	<u>Fill</u> Grey sand and gravel, loose, moist	NA			-
0.76	2.30	<u>Fill</u> Black coarse sand and granular asphalt, loose, moist	NA			-
2.30	2.94	<u>Sand</u> Brown medium sand, loose, homogeneous, moist to saturated	NA			-
Test Pit Terminated at 2.94 mbgs. Ground water seeps in the bottom of the test pit.						
Comments			Water Conditions in Test Pit			
Standpipe installed to a depth of 2.94 mbgs. Water level at 1.31 mbgs upon completion			☒ Wet upon completion ☐ Dry upon completion			

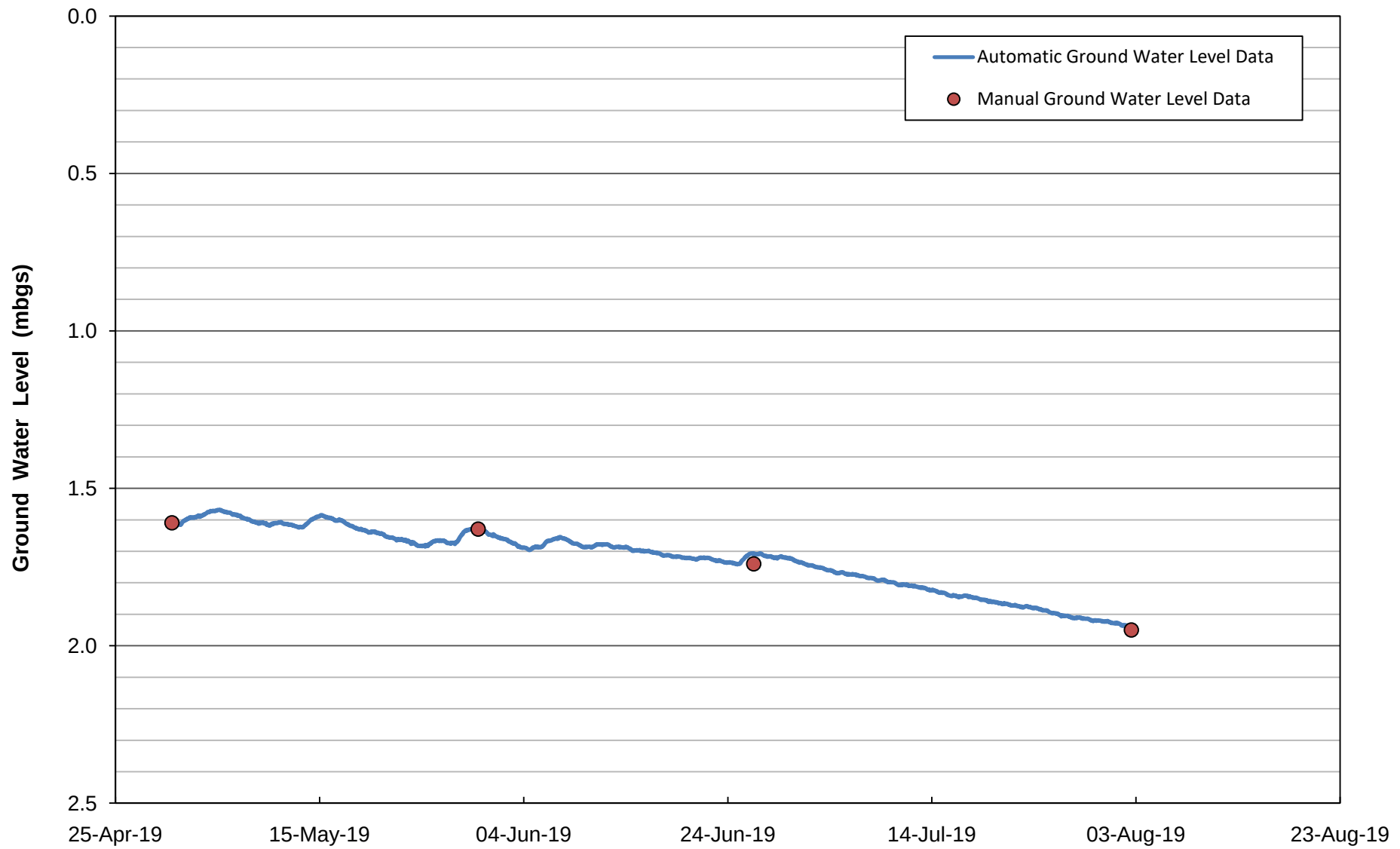
JOB No.	08-098
TEST PIT No.	TP-6
FIELD STAFF	JM



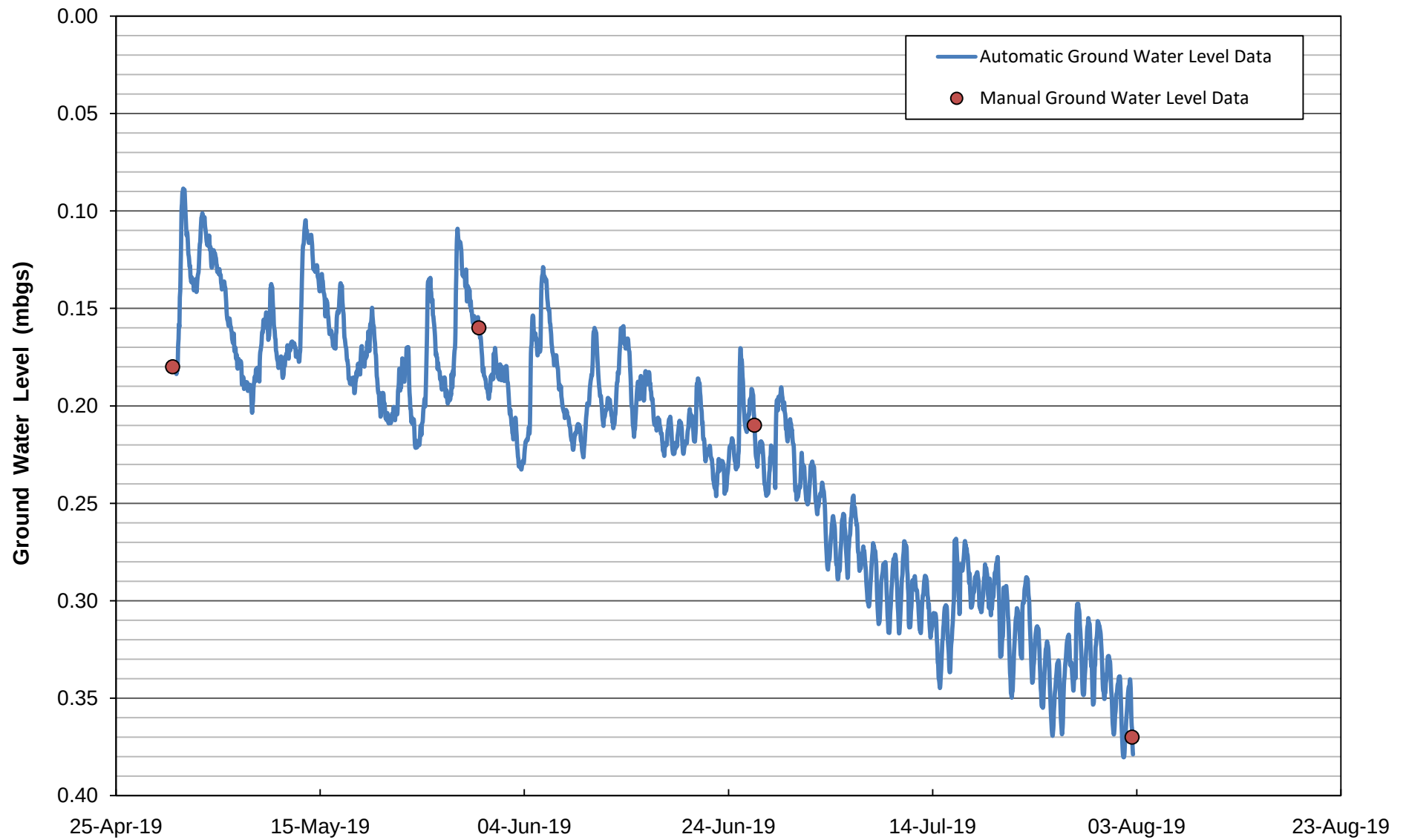
APPENDIX C

Hydrographs

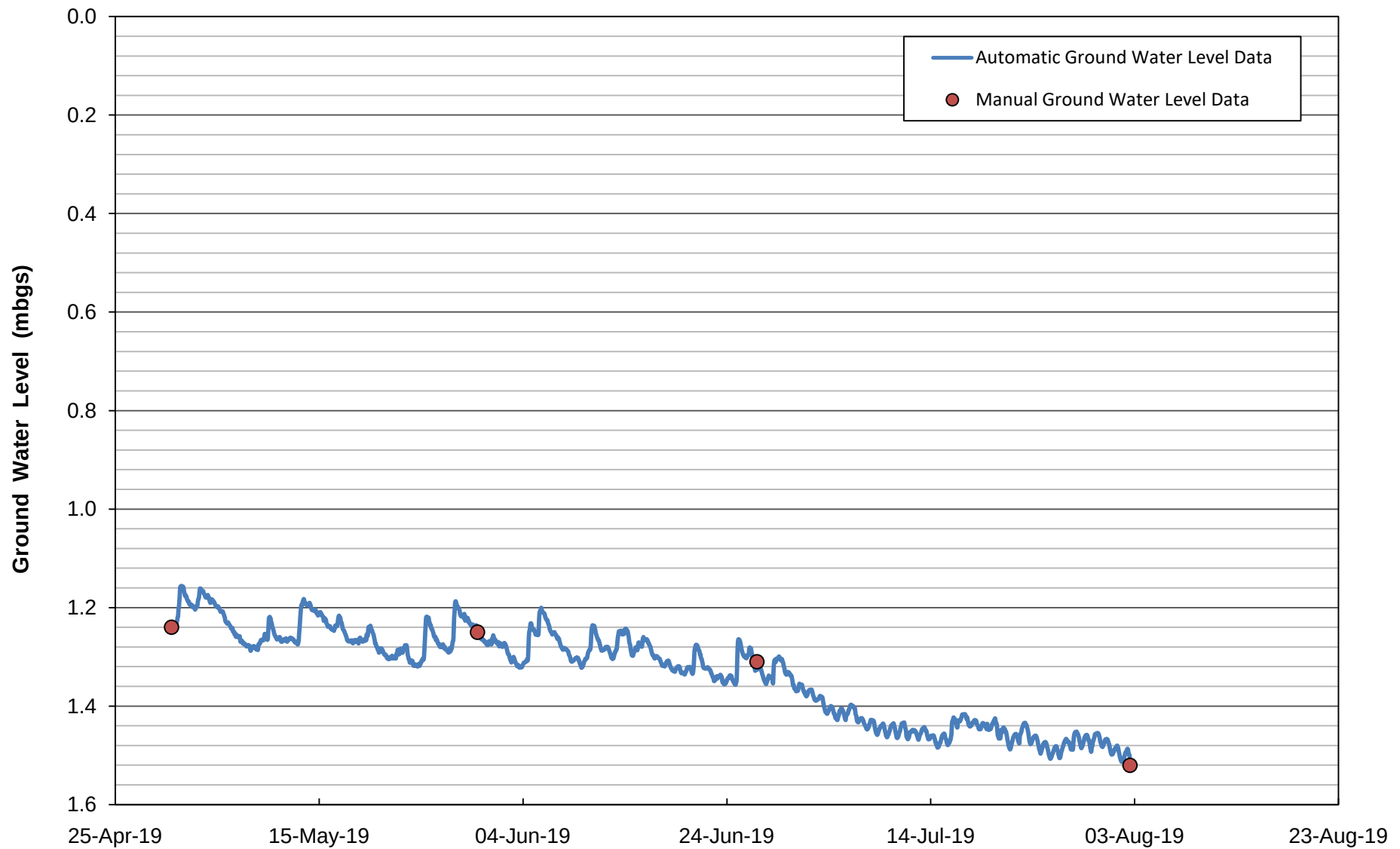
SP-2: Ground Water Hydrograph



SP-3: Ground Water Hydrograph



SP-6: Ground Water Hydrograph



B5 – Runoff Volume/Infiltration Calculations



KSGS Engineering Corp

Project Name: Previn Court Homes Development
Project No. 19011
Subject: Infiltration Gallery Sizing Calculations - Building 'A' and Building 'B'

Runoff/Infiltration Requirements

Roof Area Draining to Infiltration Gallery	2180	m ²
Volume Req. for 30mm Runoff	65.4	m ³

Infiltration Gallery Preliminary Sizing

Area	330	m ²
Void Ratio	0.4	
Depth	0.5	m
Volume Provided	66	m ³



KSGS Engineering Corp

Project Name: Previn Court Homes Development

Project No. 19011

Subject: Infiltration Gallery Sizing Calculations - Building 'C'

Runoff/Infiltration Requirements

Roof Area Draining to Infiltration Gallery	1090	m ²
Volume Req. for 30mm Runoff	32.7	m ³

Infiltration Gallery Preliminary Sizing

Area	85	m ²
Void Ratio	0.4	
Depth	1	m
Volume Provided	34	m ³



KSGS Engineering Corp

Project Name: Previn Court Homes Development

Project No. 19011

Subject: Infiltration Gallery Sizing Calculations - Building 'D' & 'E' & Landscape

Runoff/Infiltration Requirements

Roof Area Draining to Infiltration Gallery	3651	m ²
Volume Req. for 30mm Runoff	110	m ³

Infiltration Gallery Preliminary Sizing

Area	280	m ²
Void Ratio	0.4	
Depth	1	m
Volume Provided	112	m ³



KSGS Engineering Corp

Project Name: Previn Court Homes Development
Project No. 19011
Subject: Bioretention Sizing Calculations - Park

Runoff/Infiltration Requirements		
Park Area Draining to Infiltration Gallery	9400	m ²
Volume Req. for 30mm Runoff	282	m ³

Maximum Storage Depth Calculation		
Infiltration Rate	86	mm/hr
Safety Factor	2.5	
Design Rate	34.4	mm/hr
Time to Drain, t	24	hr
Void Ratio, Vr	0.4	
Max Size of Reservoir (d _s)	2064	mm

>>includes Pipe Dia + Storage Reservoir

Bioretention Cell Specifications			
Layer	Depth (mm)	Void Ratio	Storage (mm)
Freeboard	150	N/A	0
Ponding	300	1	300
Mulch	75	0.7	52.5
Filter Media	600	0.3	180
Choker Layer	100	0.4	40
Storage Layer + Pipe Dia.	1000	0.4	400
SUM =	2225	N/A	972.5

Filter Media Depths

Requirement	Min. Media Depth
Tree & Large Shrubs	1 m
Smaller Shurbs & perennials	0.6 m
Mown Turf Grass	0.3 m

Footprint Req.	705	m ²
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KSGS Engineering Corp

Project Name: Previn Court Homes Development
Project No. 19011
Subject: Bioretention Sizing Calculations - Commercial to Pond

Runoff/Infiltration Requirements		
Area Draining to Infiltration Gallery	4655	m ²
Volume Req. for 25mm Runoff	116	m ³

Maximum Storage Depth Calculation		
Infiltration Rate	86	mm/hr
Safety Factor	2.5	
Design Rate	34.4	mm/hr
Time to Drain, t	24	hr
Void Ratio, Vr	0.4	
Max Size of Reservoir (d _s)	2064	mm

>>includes Pipe Dia + Storage Reservoir

Bioretention Cell Specifications			
Layer	Depth (mm)	Void Ratio	Storage (mm)
Freeboard	150	N/A	0
Ponding	300	1	300
Mulch	75	0.7	52.5
Filter Media	600	0.3	180
Choker Layer	100	0.4	40
Storage Layer + Pipe Dia.	1000	0.4	400
SUM =	2225	N/A	972.5

Filter Media Depths

Requirement	Min. Media Depth
Tree & Large Shrubs	1 m
Smaller Shurbs & perennials	0.6 m
Mown Turf Grass	0.3 m

Footprint Req.	291	m ²
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KSGS Engineering Corp

Project Name: Previn Court Homes Development

Project No. 19011

Subject: Bioretention (Filtration Only) Sizing Calculations - Commercial (north)

Runoff/Infiltration Requirements		
Area Draining to Infiltration Gallery	1220	m ²
Volume Req. for 25mm Runoff	31	m ³

Bioretention Cell Specifications			
Layer	Depth (mm)	Void Ratio	Storage (mm)
Freeboard	150	N/A	0
Ponding	300	1	300
Mulch	75	0.7	52.5
Filter Media	600	0.3	180
Choker Layer	100	0.4	40
Storage Layer + Pipe Dia	1000	0.4	400
SUM =	2225	N/A	972.5

Footprint Req.	76.25	m ²
----------------	-------	----------------

Filter Media Depths

Requireme Min. Media Depth

Tree & Lar 1 m

Smaller Sh 0.6 m

Mown Turf 0.3 m

Filter Media to be replaced with Imbrium's Sorbtive Media, or equivalent



KSGS Engineering Corp

Project Name: Previn Court Homes Development

Project No. 19011

Subject: Bioretention (Filtration Only) Sizing Calculations - Commercial (south)

Runoff/Infiltration Requirements		
Area Draining to Infiltration Gallery	1290	m ²
Volume Req. for 25mm Runoff	32	m ³

Maximum Storage Depth Calculation		
Infiltration Rate	86	mm/hr
Safety Factor	2.5	
Design Rate	34.4	mm/hr
Time to Drain, t	24	hr
Void Ratio, Vr	0.4	
Max Size of Reservoir (d _s)	2064	mm

>>includes Pipe Dia + Storage Reservoir

Bioretention Cell Specifications			
Layer	Depth (mm)	Void Ratio	Storage (mm)
Freeboard	150	N/A	0
Ponding	300	1	300
Mulch	75	0.7	52.5
Filter Media	600	0.3	180
Choker Layer	100	0.4	40
Storage Layer + Pipe Dia.	1000	0.4	400
SUM =	2225	N/A	972.5

Filter Media Depths

Requireme Min. Media Depth

Tree & Lar 1 m

Smaller Sh 0.6 m

Mown Turf 0.3 m

Filter Media to be replaced with Imbrium's Sorbtive Media, or equivalent

Footprint Req.	81	m ²
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B6 – Water Balance Calculations

KSGS Engineering Corp

Project Name Previn Court
Project No. 19011
Subject Water Balance

7.85

Pre-Development

Catchment Designation	Site		
	Grass Area	Wood Area	Total
Area (m2)	52,598	25,905	78,503
Pervious Area (m2)	52,598	25,905	78,503
Impervious Area (m2)	0	0	0
Infiltration Factors¹			
Topography Infiltration Factor	0.1	0.1	
Soil Infiltration Factor	0.4	0.4	
Land Cover Infiltration Factor	0.1	0.2	
MOE Infiltration Factor	0.6	0.7	
Run-Off Coefficient	0.4	0.3	
Runoff from Impervious Surfaces*	0.9	0.9	
Inputs (per unit area)			
Precipitation (mm/yr)	932.90	932.90	932.90
Run-on (mm/yr)	0	0	0
Other Inputs (mm/yr)	0	0	0
Total Inputs (mm/yr)	933	932.90	932.90
Outputs (per unit area)			
Precipitation Surplus (mm/yr)	333	333	333
Net Surplus (mm/yr)	333	333	333
Evapotranspiration (mm/yr)	600	600	600
Infiltration (mm/yr)	200	233	211
Runoff Pervious Areas	133	100	122
Runoff Impervious Areas	0	0	0
Total Runoff (mm/yr)	133	100	122
Total Outputs (mm/yr)	933	933	933
Inputs (Volume)			
Precipitation (m3/yr)	49069	24167	73235
Run-On (m3/yr)	0	0	0
Other Inputs (m3/yr)	0	0	0
Total Inputs (m3/yr)	49069	24167	73235
Outputs (Volume)			
Precipitation Surplus (m3/yr)	17504	8621	26125
Net Surplus (m3/yr)	17504	8621	26125
Evapotranspiration (m3/yr)	31564	15546	47110
Infiltration	10503	6035	16537
Runoff Pervious Areas	7002	2586	9588
Runoff Impervious Areas	0	0	0
Total Runoff (m3/yr)	7002	2586	9588
Total Outputs (m3/yr)	49069	24167	73235
Difference (Inputs - Outputs)	0	0	0

Post-Development

Catchment Designation	Site		
	Pervious	Impervious	Total
Area (m2)	26,573	51,930	78,503
Pervious Area (m2)	26,573		26,573
Impervious Area (m2)	0	51,930	51,930
Infiltration Factors			
Topography Infiltration Factor	0.1	0.1	
Soil Infiltration Factor	0.4	0.4	
Land Cover Infiltration Factor	0.1	0.1	
MOE Infiltration Factor	0.6	0.6	
Run-Off Coefficient	0.4	0.4	
Runoff from Impervious Surfaces	0.9	0.9	
Inputs (per unit area)			
Precipitation (mm/yr)	932.90	932.90	932.90
Run-on (mm/yr)	0	0	0
Other Inputs (mm/yr)	0	0	0
Total Inputs (mm/yr)	932.90	932.90	932.90
Outputs (per unit area)			
Precipitation Surplus (mm/yr)	333	840	668
Net Surplus (mm/yr)	333	840	668
Evapotranspiration (mm/yr)	600	93	265
Infiltration (mm/yr)	200	0	68
Runoff Pervious Areas	133	0	45
Runoff Impervious Areas	0	840	555
Total Runoff (mm/yr)	133	840	600
Total Outputs (mm/yr)	933	933	933
Inputs (Volume)			
Precipitation (m3/yr)	24790	48445	73235
Run-On (m3/yr)	0	0	0
Other Inputs (m3/yr)	0	0	0
Total Inputs (m3/yr)	24790	48445	73235
Outputs (Volume)			
Precipitation Surplus (m3/yr)	8843	43601	52444
Net Surplus (m3/yr)	8843	43601	52444
Evapotranspiration (m3/yr)	15947	4845	20791
Infiltration	5306	0	5306
Runoff Pervious Areas	3537	0	3537
Runoff Impervious Areas	0	43601	43601
Total Runoff (m3/yr)	3537	43601	47138
Total Outputs (m3/yr)	24790	48445	73235
Difference (Inputs - Outputs)	0	0	0

Water Budget Summary

Measurement	Pre-Development	Post-Development	Overall Change (Pre- to Post-) (m3/yr)	Percentage Change (Pre- to Post-)
Inputs				
Precipitation (m3/yr)	73235	73235	0	0%
Run-On (m3/yr)	0	0	0	0%
Other Inputs (m3/yr)	0	0	0	0%
Total Inputs (m3/yr)	73235	73235	0	0%
Outputs				
Precipitation Surplus (m3/yr)	26125	52444	26319	101%
Net Surplus (m3/yr)	26125	52444	26319	101%
Evapotranspiration (m3/yr)	47110	20791	-26319	-56%
Infiltration (m3/yr)	16537	5306	-11231	-68%
Runoff Pervious Areas	9588	3537	-6051	-63%
Runoff Impervious Areas	0	43601	43601	0%
Total Runoff (m3/yr)	9588	47138	37550	392%
Total Outputs (m3/yr)	73235	73235	0	0%

Infiltration Deficit from Development

	Infiltration (mm/yr)	Deficit (mm/yr)
Pre-Development	211	
Post-Development	68	143

Infiltration Requirements

Infiltration Deficit 143 mm/yr
Total Precipitation 932.90 mm/yr
% Deficit 15%
>> 2mm daily rainfall depth makes up 20% of total annual average rainfall depth

Infiltration Volume 157 m³

¹From Table 3.1 of MOE's Stormwater Management Planning and Design Manual (2003)

*Evaporation from impervious area assumed to be: 10% of precipitation

APPENDIX C

C1 – Table 2 from Hutchinson Report

Table 2. Land-Use Specific Phosphorus Export Coefficients (kg/ha/yr) for Lake Simcoe Subwatersheds

Subwatershed	Phosphorus Export (kg/ha/yr)											
	Cropland	Hay-Pasture	Sod Farm/Golf Course	High Intensity Development		Low Intensity Development	Quarry	Unpaved Road	Forest	Transition	Wetland	Open Water
				Commercial /Industrial	Residential							
Monitored Subwatersheds												
Beaver River	0.22	0.04	0.01	1.82	1.32	0.19	0.06	0.83	0.02	0.04	0.02	0.26
Black River	0.23	0.08	0.02	1.82	1.32	0.17	0.15	0.83	0.05	0.06	0.04	0.26
East Holland River	0.36	0.12	0.24	1.82	1.32	0.13	0.08	0.83	0.10	0.16	0.10	0.26
Hawkestone Creek	0.19	0.10	0.06	1.82	1.32	0.09	0.10	0.83	0.03	0.04	0.03	0.26
Lovers Creek	0.16	0.07	0.17	1.82	1.32	0.07	0.06	0.83	0.06	0.06	0.05	0.26
Pefferlaw/Uxbridge Brook	0.11	0.06	0.02	1.82	1.32	0.13	0.04	0.83	0.03	0.04	0.04	0.26
Whites Creek	0.23	0.10	0.42	1.82	1.32	0.15	0.08	0.83	0.10	0.11	0.09	0.26
Unmonitored Subwatersheds												
Barrie Creeks	0.19	0.07	0.12	1.82	1.32	0.13	0.08	0.83	0.05	0.06	0.05	0.26
GeorginaCreeks	0.36	0.12	0.24	1.82	1.32	0.13	0.08	0.83	0.10	0.16	0.10	0.26
Hewitts Creek	0.19	0.07	0.12	1.82	1.32	0.13	0.08	0.83	0.05	0.06	0.05	0.26
Innisfil Creeks	0.19	0.07	0.12	1.82	1.32	0.13	0.08	0.83	0.05	0.06	0.05	0.26
Maskinonge River	0.19	0.07	0.12	1.82	1.32	0.13	0.08	0.83	0.05	0.06	0.05	0.26
Oro Creeks North	0.36	0.12	0.24	1.82	1.32	0.13	0.08	0.83	0.10	0.16	0.10	0.26
Oro Creeks South	0.19	0.07	0.12	1.82	1.32	0.13	0.08	0.83	0.05	0.06	0.05	0.26
Ramara Creeks	0.19	0.07	0.12	1.82	1.32	0.13	0.08	0.83	0.05	0.06	0.05	0.26
Talbot/Upper Talbot River	0.19	0.07	0.12	1.82	1.32	0.13	0.08	0.83	0.05	0.06	0.05	0.26
West Holland River	0.36	0.12	0.24	1.82	1.32	0.13	0.08	0.83	0.10	0.16	0.10	0.26

Module 2 – Estimates post-development phosphorus loads that are representative of the proposed changes in land use for the study site using the same data sources used in Module 1, but accounting for the change in land use that will occur with development.

Module 3 – Estimates efficiencies attributed to classes of BMPs that can be used to reduce stormwater phosphorus loads in the post-development scenario. These efficiencies are based on data that is sourced from relevant, regional studies. The Tool provides standardized phosphorus reduction efficiencies (with rationale) for specific BMPs, but also allows the user to enter their own efficiencies provided that the rationale is also documented and is acceptable to the MOE. The Tool also allows the user to use custom BMPs or to enter the net efficiency achieved using a Treatment Train approach, which would also require documentation in a rationale that is acceptable to the MOE. The BMP selection criteria and efficiencies are shown below as reproduced from Figure 5 and Table 3 of the report, as follows:

C2 – Phosphorus Loading Calculations



KSGS Engineering Corp

Project Name Previn Court
Project No. 19011
Subject: Post-Development Phosphorus Loading with BMP

Subwatershed: Barrie Creeks

Post-Development with BMP

Treated Areas	Area (ha)	P Coefficient	Treatment Options	Intermediate Loading	P Loading
High Intensity Development - Townhouse Rooftops/Landscape	0.69	1.32	Perforated Pipe & Infiltration; Pond	0.12	0.04
Park (Low Intensity Development)	0.94	0.13	Perforated Pipe & Infiltration; Pond	0.02	0.01
High Intensity Development - Commercial Rooftops/Landscape Area (TO POND)	0.47	1.82	Perforated Pipe & Infiltration; Pond	0.11	0.04
High Intensity Development - Commercial Rooftop/Landscape (to Ferndale)	0.25	1.82	Vegetated Filter Strip & Sorbtive Media	0.16	0.04
High Intensity Development - Residential Parking Lot/Remaining Areas	2.53	1.32	Pond		1.23
Road (to SWM Pond)	0.24	1.82	Pond		0.16
High Intensity Development - Commercial	1.43	1.82	Media Filter (Jellyfish)		1.44
SWM Pond	0.46	0.26		0.04	0.01
Untreated Areas					
Road (uncontrolled)	0.28	1.82			0.51
Park (uncontrolled)	0.08	0.13			0.01
Pond (uncontrolled)	0.07	0.26			0.02
Residential (uncontrolled)	0.17	1.32			0.22

Total Area	7.6		Total P Load =	3.74
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Offset Cost \$326,883

APPENDIX D

Existing and Proposed HECRAS Output

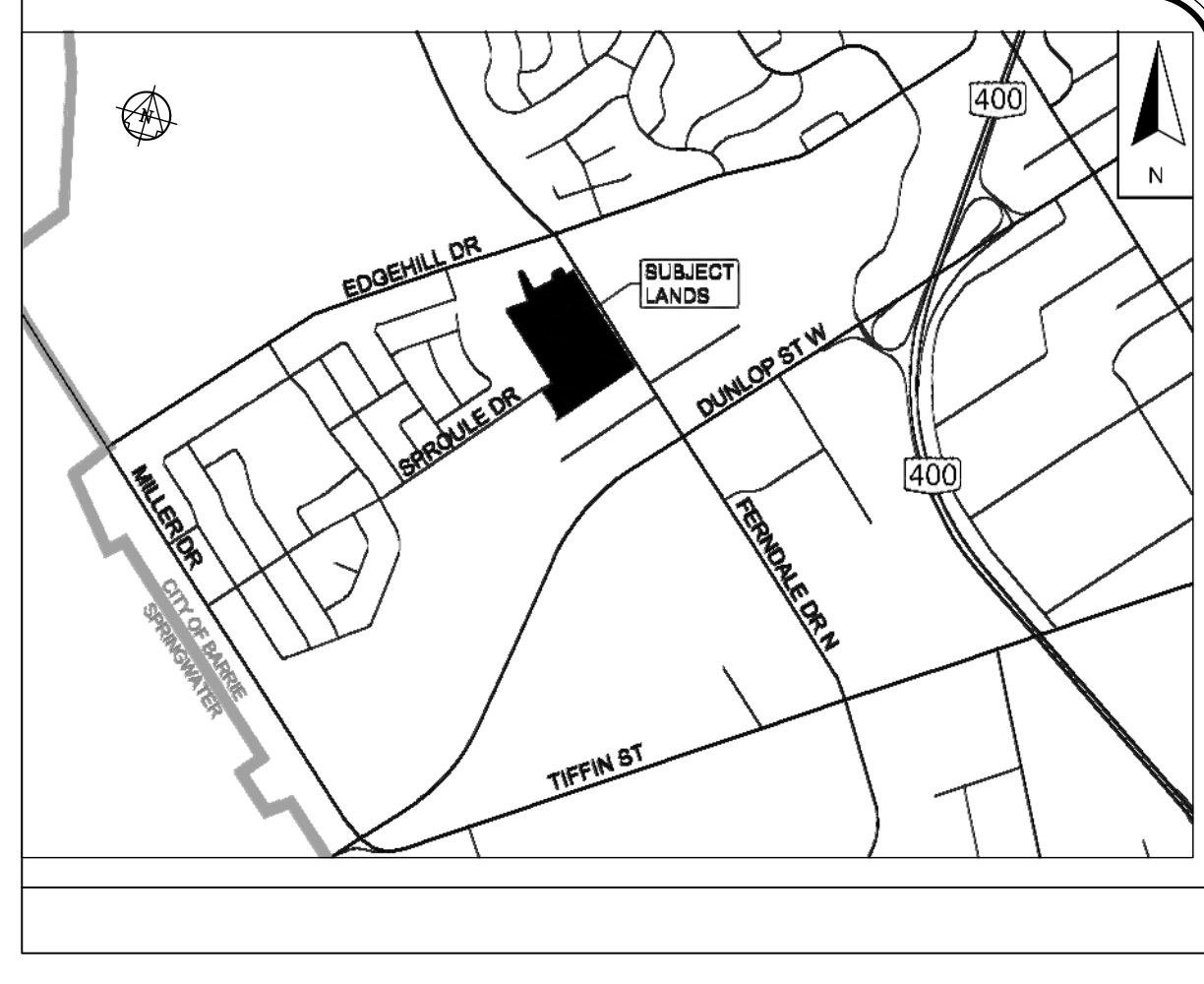
Existing

Reach	River Sta	Profile	Volume (1000 m3)	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
96	516.67	FutD-ExS2SCS	161.06	1.74	253.99	254.51	254.51	254.69	0.010856	1.93	1.06	3.49	0.93
96	516.67	FutD-ExS5SCS	231.62	2.71	253.99	254.65	254.65	254.86	0.009682	2.18	1.57	4.24	0.92
96	516.67	FutD-ExS25SCS	273.05	4.19	253.99	254.81	254.81	255.07	0.008829	2.45	2.33	5.14	0.92
96	516.67	FutD-ExS100SCS	311.42	7.43	253.99	255.08	255.08	255.4	0.007893	2.86	3.91	6.65	0.92
96	516.67	FutD-Hazel	367.43	16.34	253.99	255.55	255.55	255.99	0.00741	3.59	7.69	9.21	0.95
96	513.33	FutD-ExS2SCS	160.92	1.74	250.31	250.85	250.85	251.02	0.012017	1.83	1.02	3.53	0.96
96	513.33	FutD-ExS5SCS	231.43	2.71	250.31	250.98	250.98	251.18	0.010207	2.05	1.52	4.31	0.93
96	513.33	FutD-ExS25SCS	272.76	4.19	250.31	251.12	251.12	251.38	0.009419	2.34	2.19	4.95	0.93
96	513.33	FutD-ExS100SCS	310.94	7.43	250.31	251.38	251.38	251.71	0.008374	2.76	3.6	6.07	0.93
96	513.33	FutD-Hazel	366.47	16.34	250.31	251.89	251.89	252.34	0.006971	3.4	7.48	9.42	0.91
96	510	FutD-ExS2SCS	160.79	1.74	246.64	247.06	247.06	247.24	0.013478	1.87	0.94	2.85	0.99
96	510	FutD-ExS5SCS	231.23	2.71	246.64	247.19	247.19	247.42	0.011755	2.14	1.33	3.21	0.98
96	510	FutD-ExS25SCS	272.48	4.19	246.64	247.35	247.35	247.65	0.010393	2.43	1.89	3.66	0.96
96	510	FutD-ExS100SCS	310.33	7.43	246.64	247.75	247.75	247.97	0.004973	2.31	5.18	13.8	0.72
96	510	FutD-Hazel	365.21	16.34	246.64	248.08	248.08	248.37	0.005492	2.92	10.63	18.46	0.79
96	505	FutD-ExS2SCS	160.75	1.74	245.98	246.29	246.29	246.42	0.014575	1.57	1.11	4.47	1
96	505	FutD-ExS5SCS	231.18	2.71	245.98	246.38	246.38	246.54	0.013094	1.8	1.53	5	1
96	505	FutD-ExS25SCS	272.41	4.19	245.98	246.49	246.49	246.7	0.011495	2.05	2.13	5.7	0.98
96	505	FutD-ExS100SCS	310.19	7.43	245.98	246.7	246.7	246.98	0.009143	2.37	3.56	7.75	0.93
96	505	FutD-Hazel	364.92	16.34	245.98	247.11	247.11	247.48	0.007326	2.92	7.42	11.34	0.91
96	500	FutD-ExS2SCS	160.7	2.04	245.31	245.64	245.51	245.68	0.003082	0.88	2.31	9.18	0.49
96	500	FutD-ExS5SCS	231.09	3.61	245.31	245.8	245.61	245.86	0.002609	1.06	3.42	10.26	0.48
96	500	FutD-ExS25SCS	272.28	5.99	245.31	245.99	245.73	246.07	0.00233	1.25	4.79	11.6	0.48
96	500	FutD-ExS100SCS	309.99	9.12	245.31	246.22	245.87	246.32	0.002121	1.44	6.34	13.11	0.48
96	500	FutD-Hazel	364.51	20.34	245.31	246.86	246.26	247.04	0.001772	1.88	10.83	17.48	0.48
96	495		Culvert										
96	490	FutD-ExS2SCS	160.65	2.04	245.14	245.48	245.48	245.59	0.015434	1.57	1.47	10.43	1.04
96	490	FutD-ExS5SCS	231.03	3.61	245.14	245.58	245.58	245.74	0.01417	1.92	2.13	12.24	1.05
96	490	FutD-ExS25SCS	272.19	5.99	245.14	245.71	245.71	245.94	0.012588	2.26	3	14.63	1.05
96	490	FutD-ExS100SCS	309.88	9.12	245.14	245.86	245.86	246.16	0.011727	2.61	3.95	17.13	1.06
96	490	FutD-Hazel	364.32	20.34	245.14	246.29	246.29	246.81	0.00984	3.4	6.76	59.05	1.06
96	486.66	FutD-ExS2SCS	160.29	2.04	242.41	242.56	242.56	242.6	0.015684	0.92	2.47	29.31	0.91
96	486.66	FutD-ExS5SCS	230.47	3.61	242.41	242.6	242.6	242.66	0.015809	1.15	3.68	32.14	0.97
96	486.66	FutD-ExS25SCS	271.34	5.99	242.41	242.65	242.65	242.73	0.014754	1.36	5.43	37.47	0.98
96	486.66	FutD-ExS100SCS	308.58	9.12	242.41	242.71	242.71	242.81	0.011481	1.46	8.48	48.02	0.91
96	486.66	FutD-Hazel	360.92	20.34	242.41	242.86	242.86	243	0.010403	1.86	16.22	64.88	0.93
96	485	FutD-ExS2SCS	159.64	2.04	240.8	240.98	240.95	241	0.007073	0.63	3.28	80.14	0.62
96	485	FutD-ExS5SCS	229.66	3.61	240.8	241.02	240.99	241.05	0.007381	0.79	4.76	87.8	0.66
96	485	FutD-ExS25SCS	270.34	5.99	240.8	241.06	241.03	241.11	0.008187	1	6.52	95.27	0.73
96	485	FutD-ExS100SCS	307.41	9.12	240.8	241.08	241.08	241.18	0.013684	1.37	7.3	101.99	0.96
96	485	FutD-Hazel	359.47	20.34	240.8	241.09	241.09	241.12	0.007543	1.04	27.15	103.36	0.72
96	483.33	FutD-ExS2SCS	158.2	2.04	238.58	238.65	238.65	238.68	0.064165	0.98	2.79	45.64	1.58
96	483.33	FutD-ExS5SCS	227.88	3.61	238.58	238.67	238.67	238.72	0.05717	1.32	4.05	45.78	1.62
96	483.33	FutD-ExS25SCS	268.14	5.99	238.58	238.71	238.71	238.78	0.044234	1.58	5.87	45.98	1.54
96	483.33	FutD-ExS100SCS	304.63	9.12	238.58	238.85	238.85	238.89	0.008954	1.22	12.1	46.94	0.79
96	483.33	FutD-Hazel	353.06	20.34	238.58	239.49		239.5	0.000491	0.68	61.55	90.51	0.23
96	482	FutD-ExS2SCS	157.68	2.04	237.65	238.31	238.07	238.31	0.00048	0.37	5.58	46.06	0.2
96	482	FutD-ExS5SCS	227.19	3.61	237.65	238.44	238.13	238.45	0.000537	0.48	7.59	47.96	0.22
96	482	FutD-ExS25SCS	267.2	5.99	237.65	238.6	238.2	238.62	0.000552	0.59	10.21	50.42	0.23
96	482	FutD-ExS100SCS	303.29	9.12	237.65	238.79	238.28	238.82	0.000546	0.69	13.18	53.21	0.24
96	482	FutD-Hazel	349.53	20.34	237.65	239.49	238.51	239.49	0.000042	0.29	80.31	57.39	0.07
96	481.5		Culvert										
96	481	FutD-ExS2SCS	157.63	2.04	237.4	237.81	237.8	237.86	0.017599	1	2.03	42.36	0.97
96	481	FutD-ExS5SCS	227.12	3.61	237.4	237.87	237.85	237.93	0.011917	1.12	3.21	43.3	0.87
96	481	FutD-ExS25SCS	267.1	5.99	237.4	237.94	237.91	238.03	0.009768	1.3	4.62	44.41	0.83
96	481	FutD-ExS100SCS	303.16	9.12	237.4	238.03	237.99	238.14	0.008561	1.47	6.19	45.65	0.82
96	481	FutD-Hazel	349.3	20.34	237.4	238.2	238.19	238.44	0.010708	2.17	9.37	48.16	0.98
96	480	FutD-ExS2SCS	157.54	2.04	236.99	237.59	237.59	237.65	0.007524	1.61	4.13	27.99	0.73
96	480	FutD-ExS5SCS	226.98	3.61	236.99	237.66	237.66	237.74	0.009337	1.96	6.22	30.51	0.83
96	480	FutD-ExS25SCS	266.91	5.99	236.99	237.73	237.73	237.83	0.01169	2.38	8.53	32.98	0.95
96	480	FutD-ExS100SCS	302.92	9.12	236.99	237.8	237.8	237.93	0.015093	2.88	10.75	35.62	1.09
96	480	FutD-Hazel	348.92	20.34	236.99	237.99	237.99	238.16	0.01714	3.61	18.47	41.02	1.21
96	479	FutD-ExS2SCS	157.28	2.04	236.69	237.1	236.91	237.11	0.001	0.48	8.4	42.78	0.28
96	479	FutD-ExS5SCS	226.58	3.61	236.69	237.22	236.98	237.23	0.000847	0.55	13.63	43.33	0.27
96	479	FutD-ExS25SCS	266.34	5.99	236.69	237.36	237.06	237.37	0.000809	0.65	19.56	43.83	0.27
96	479	FutD-ExS100SCS	302.19	9.12	236.69	237.49	237.13	237.5	0.000849	0.76	25.41	44.31	0.29
96	479	FutD-Hazel	347.7	20.34	236.69	237.87	237.29	237.89	0.000872	1.03	42.38	45.69	0.32
96	478	FutD-ExS2SCS	157.16	2.04	236.28	236.85	236.85	237.03	0.013182	1.87	1.11	3.42	0.99
96	478	FutD-ExS5SCS	226.36	3.61	236.28	237.05	237.05	237.17	0.006456	1.74	4.23	21.62	0.74
96	478	FutD-ExS25SCS	266.01	5.99	236.28	237.16	237.16	237.31	0.006838	2.03	7	25.92	0.79
96	478	FutD-ExS100SCS	301.74	9.12	236.28	237.3	237.27	237.45	0.006128	2.18	10.89	30.45	0.77
96	478	FutD-Hazel	346.84	20.34	236.28	237.75	237.53	237.85	0.003257	2.13	26.97	39.21	0.61

Proposed

Reach	River Sta	Profile	Volume (1000 m3)	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
96	516.67	FutD-ExS2SCS	161.37	1.74	253.99	254.51	254.51	254.69	0.010856	1.93	1.06	3.49	0.93
96	516.67	FutD-ExS5SCS	232.09	2.71	253.99	254.65	254.65	254.86	0.009682	2.18	1.57	4.24	0.92
96	516.67	FutD-ExS25SCS	273.76	4.19	253.99	254.81	254.81	255.07	0.008829	2.45	2.33	5.14	0.92
96	516.67	FutD-ExS100SCS	312.38	7.43	253.99	255.08	255.08	255.4	0.007893	2.86	3.91	6.65	0.92
96	516.67	FutD-Hazel	368.15	16.34	253.99	255.55	255.55	255.99	0.00741	3.59	7.69	9.21	0.95
96	513.33	FutD-ExS2SCS	161.24	1.74	250.31	250.85	250.85	251.02	0.012017	1.83	1.02	3.53	0.96
96	513.33	FutD-ExS5SCS	231.9	2.71	250.31	250.98	250.98	251.18	0.010207	2.05	1.52	4.31	0.93
96	513.33	FutD-ExS25SCS	273.47	4.19	250.31	251.12	251.12	251.38	0.009419	2.34	2.19	4.95	0.93
96	513.33	FutD-ExS100SCS	311.9	7.43	250.31	251.38	251.38	251.71	0.008374	2.76	3.6	6.07	0.93
96	513.33	FutD-Hazel	367.19	16.34	250.31	251.89	251.89	252.34	0.006971	3.4	7.48	9.42	0.91
96	510	FutD-ExS2SCS	161.1	1.74	246.64	247.06	247.06	247.24	0.013478	1.87	0.94	2.85	0.99
96	510	FutD-ExS5SCS	231.7	2.71	246.64	247.19	247.19	247.42	0.011755	2.14	1.33	3.21	0.98
96	510	FutD-ExS25SCS	273.19	4.19	246.64	247.35	247.35	247.65	0.010393	2.43	1.89	3.66	0.96
96	510	FutD-ExS100SCS	311.29	7.43	246.64	247.75	247.75	247.97	0.004973	2.31	5.18	13.8	0.72
96	510	FutD-Hazel	365.93	16.34	246.64	248.08	248.08	248.37	0.005492	2.92	10.63	18.46	0.79
96	505	FutD-ExS2SCS	161.07	1.74	245.98	246.29	246.29	246.42	0.014575	1.57	1.11	4.47	1
96	505	FutD-ExS5SCS	231.65	2.71	245.98	246.38	246.38	246.54	0.013094	1.8	1.53	5	1
96	505	FutD-ExS25SCS	273.12	4.19	245.98	246.49	246.49	246.7	0.011495	2.05	2.13	5.7	0.98
96	505	FutD-ExS100SCS	311.15	7.43	245.98	246.7	246.7	246.98	0.009143	2.37	3.56	7.75	0.93
96	505	FutD-Hazel	365.64	16.34	245.98	247.11	247.11	247.48	0.007326	2.92	7.42	11.34	0.91
96	500	FutD-ExS2SCS	161.01	2.04	245.31	245.64	245.51	245.68	0.003082	0.88	2.31	9.18	0.49
96	500	FutD-ExS5SCS	231.56	3.61	245.31	245.8	245.61	245.86	0.002609	1.06	3.42	10.26	0.48
96	500	FutD-ExS25SCS	272.99	5.99	245.31	245.99	245.73	246.07	0.00233	1.25	4.79	11.6	0.48
96	500	FutD-ExS100SCS	310.95	9.12	245.31	246.22	245.87	246.32	0.002121	1.44	6.34	13.11	0.48
96	500	FutD-Hazel	365.23	20.34	245.31	246.86	246.26	247.04	0.001772	1.88	10.83	17.48	0.48
96	495	Culvert											
96	490	FutD-ExS2SCS	160.96	2.04	245.14	245.48	245.48	245.59	0.015434	1.57	1.47	10.43	1.04
96	490	FutD-ExS5SCS	231.5	3.61	245.14	245.58	245.58	245.74	0.01417	1.92	2.13	12.24	1.05
96	490	FutD-ExS25SCS	272.9	5.99	245.14	245.71	245.71	245.94	0.012588	2.26	3	14.63	1.05
96	490	FutD-ExS100SCS	310.84	9.12	245.14	245.86	245.86	246.16	0.011727	2.61	3.95	17.13	1.06
96	490	FutD-Hazel	365.04	20.34	245.14	246.29	246.29	246.81	0.00984	3.4	6.76	59.05	1.06
96	486.66	FutD-ExS2SCS	160.6	2.04	242.41	242.56	242.56	242.6	0.015684	0.92	2.47	29.31	0.91
96	486.66	FutD-ExS5SCS	230.94	3.61	242.41	242.6	242.6	242.66	0.015809	1.15	3.68	32.14	0.97
96	486.66	FutD-ExS25SCS	272.05	5.99	242.41	242.65	242.65	242.73	0.014754	1.36	5.43	37.47	0.98
96	486.66	FutD-ExS100SCS	309.53	9.12	242.41	242.71	242.71	242.81	0.011481	1.46	8.48	48.02	0.91
96	486.66	FutD-Hazel	361.64	20.34	242.41	242.86	242.86	243	0.010403	1.86	16.22	64.88	0.93
96	485	FutD-ExS2SCS	160.02	2.04	240.8	240.95	240.95	240.99	0.019006	0.85	2.41	76.23	0.96
96	485	FutD-ExS5SCS	230.23	3.61	240.8	240.99	240.99	241.04	0.017448	1.04	3.54	80.96	0.98
96	485	FutD-ExS25SCS	271.14	5.99	240.8	241.03	241.03	241.11	0.015297	1.21	5.25	89.29	0.97
96	485	FutD-ExS100SCS	308.37	9.12	240.8	241.08	241.08	241.18	0.013696	1.38	7.31	102.01	0.96
96	485	FutD-Hazel	360.19	20.34	240.8	241.09	241.09	241.12	0.007559	1.04	27.15	103.36	0.72
96	483.33	FutD-ExS2SCS	158.33	2.04	238.54	238.75	238.75	238.81	0.012089	1.2	2.89	55.03	0.89
96	483.33	FutD-ExS5SCS	228.08	3.61	238.54	238.81	238.81	238.88	0.011615	1.42	4.81	63.35	0.91
96	483.33	FutD-ExS25SCS	268.4	5.99	238.54	238.88	238.88	238.97	0.011676	1.67	7.29	70.61	0.95
96	483.33	FutD-ExS100SCS	304.88	9.12	238.54	238.95	238.95	238.97	0.003036	0.98	21.98	82.03	0.5
96	483.33	FutD-Hazel	353.25	20.34	238.54	239.49	238.95	239.5	0.00043	0.66	68.86	89.49	0.22
96	482	FutD-ExS2SCS	157.68	2.04	237.65	238.31	238.07	238.31	0.00048	0.37	5.58	46.06	0.2
96	482	FutD-ExS5SCS	227.19	3.61	237.65	238.44	238.13	238.45	0.000537	0.48	7.59	47.96	0.22
96	482	FutD-ExS25SCS	267.2	5.99	237.65	238.6	238.2	238.62	0.000552	0.59	10.21	50.42	
96	482	FutD-ExS100SCS	303.29	9.12	237.65	238.79	238.28	238.82	0.000546	0.69	13.18	53.21	0.24
96	482	FutD-Hazel	349.53	20.34	237.65	239.49	238.51	239.49	0.000042	0.29	80.31	57.39	0.07
96	481.5	Culvert											
96	481	FutD-ExS2SCS	157.63	2.04	237.4	237.81	237.8	237.86	0.017599	1	2.03	42.36	0.97
96	481	FutD-ExS5SCS	227.12	3.61	237.4	237.87	237.85	237.93	0.011917	1.12	3.21	43.3	0.87
96	481	FutD-ExS25SCS	267.1	5.99	237.4	237.94	237.91	238.03	0.009768	1.3	4.62	44.41	0.83
96	481	FutD-ExS100SCS	303.16	9.12	237.4	238.03	237.99	238.14	0.008561	1.47	6.19	45.65	0.82
96	481	FutD-Hazel	349.3	20.34	237.4	238.2	238.19	238.44	0.010708	2.17	9.37	48.16	0.98
96	480	FutD-ExS2SCS	157.54	2.04	236.99	237.59	237.59	237.65	0.007524	1.61	4.13	27.99	0.73
96	480	FutD-ExS5SCS	226.98	3.61	236.99	237.66	237.66	237.74	0.009337	1.96	6.22	30.51	0.83
96	480	FutD-ExS25SCS	266.91	5.99	236.99	237.73	237.73	237.83	0.01169	2.38	8.53	32.98	0.95
96	480	FutD-ExS100SCS	302.92	9.12	236.99	237.8	237.8	237.93	0.015093	2.88	10.75	35.62	1.09
96	480	FutD-Hazel	348.92	20.34	236.99	237.99	237.99	238.16	0.01714	3.61	18.47	41.02	1.21
96	479	FutD-ExS2SCS	157.28	2.04	236.69	237.1	236.91	237.11	0.001	0.48	8.4	42.78	0.28
96	479	FutD-ExS5SCS	226.58	3.61	236.69	237.22	236.98	237.23	0.000847	0.55	13.63	43.33	0.27
96	479	FutD-ExS25SCS	266.34	5.99	236.69	237.36	237.06	237.37	0.000809	0.65	19.56	43.83	0.27
96	479	FutD-ExS100SCS	302.19	9.12	236.69	237.49	237.13	237.5	0.000849	0.76	25.41	44.31	0.29
96	479	FutD-Hazel	347.7	20.34	236.69	237.87	237.29	237.89	0.000872	1.03	42.38	45.69	0.32
96	478	FutD-ExS2SCS	157.16	2.04	236.28	236.85	236.85	237.03	0.013182	1.87	1.11	3.42	0.99
96	478	FutD-ExS5SCS	226.36	3.61	236.28	237.05	237.05	237.17	0.006456	1.74	4.23	21.62	0.74
96	478	FutD-ExS25SCS	266.01	5.99	236.28	237.16	237.16	237.31	0.006838	2.03	7	25.92	0.79
96	478	FutD-ExS100SCS	301.74	9.12	236.28	237.3	237.27	237.45	0.006128	2.18	10.89	30.45	0.77
96	478	FutD-Hazel	346.84	20.34	236.28	237.75	237.53	237.85	0.003257	2.13	26.97	39.21	0.61

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LEGEND



No.	By	Date	Revision	Checked

APPROVED AS TO FORM IN RELIANCE UPON THE PROFESSIONAL SKILL AND ABILITY OF URBAN ECOSYSTEMS LIMITED AS TO DESIGN AND SPECIFICATION.

REGISTERED PROFESSIONAL ENGINEER
ROSARIO SACCOC
NOV 1, 2019
PROVINCE OF ONTARIO

Director of Development Engineering

Date

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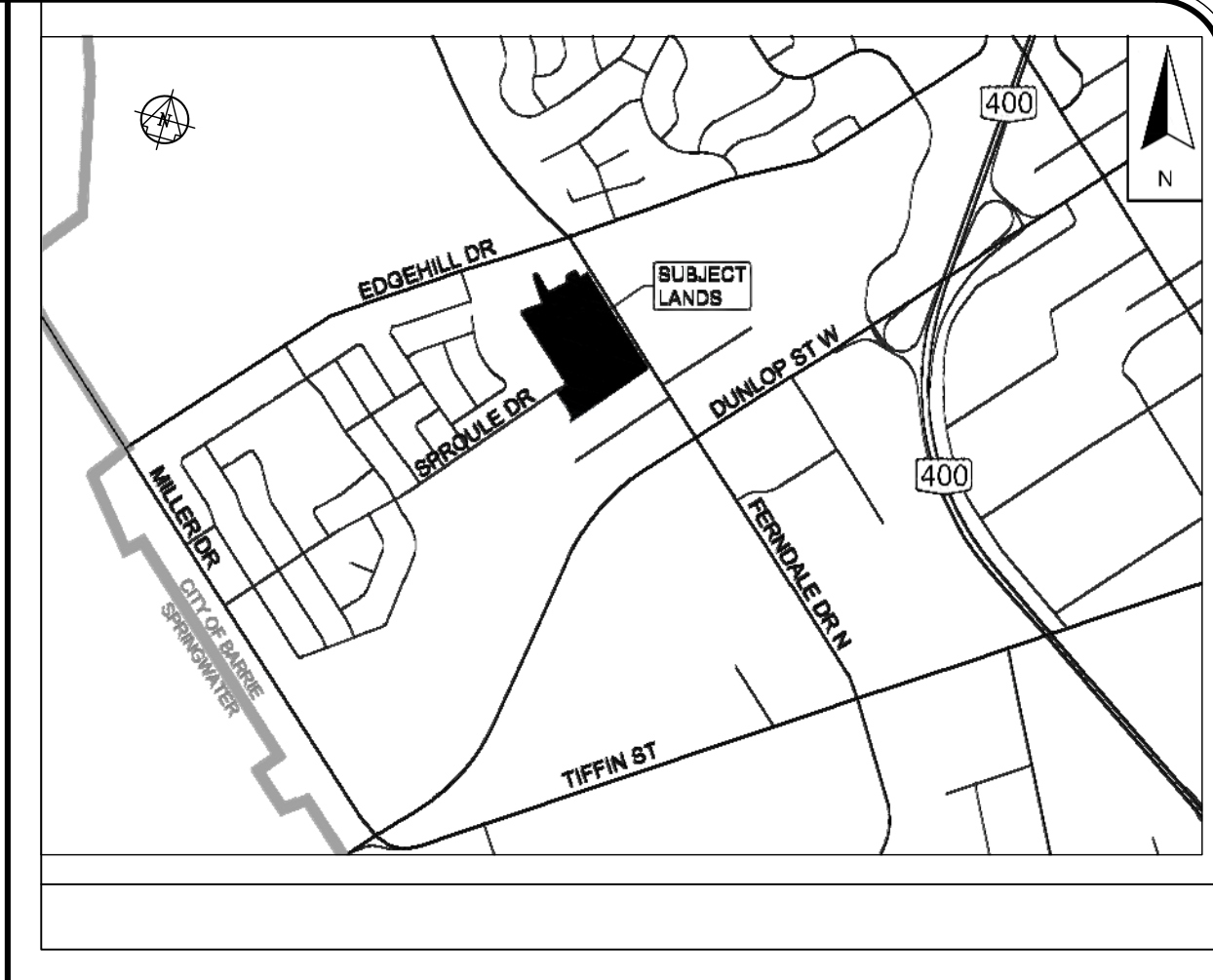
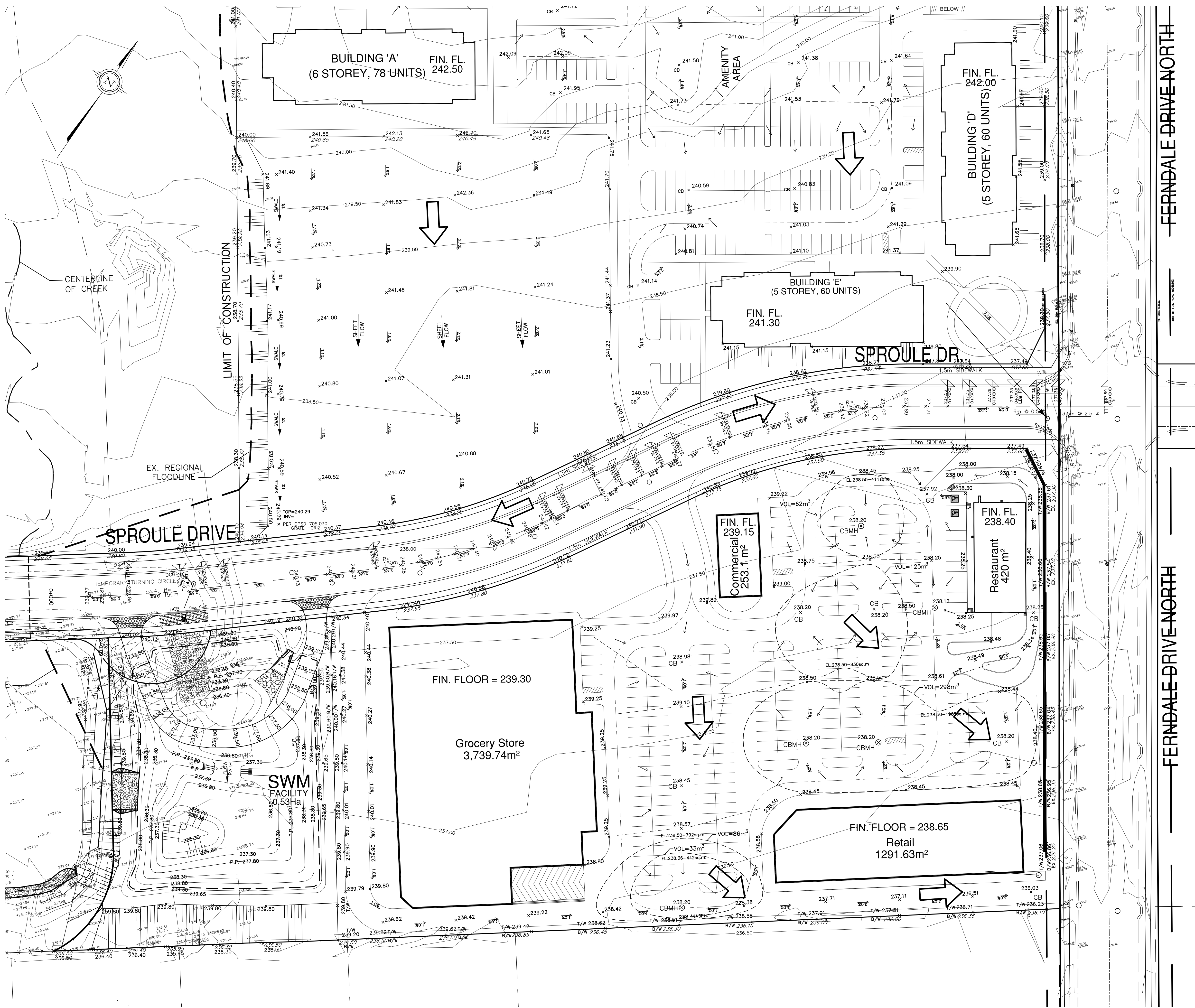
CITY OF BARRIE
ENGINEERING DEPARTMENT

FILE No 19T-XXXXX

PRELIMINARY GRADING PLAN

Designed By	D.J.S.	Date	OCT. 2019	Checked By	R.S.
Drawn By	V.T.			Approved By	
Scale:	1:500	Project No.	07002	Drawing No.	GR-1

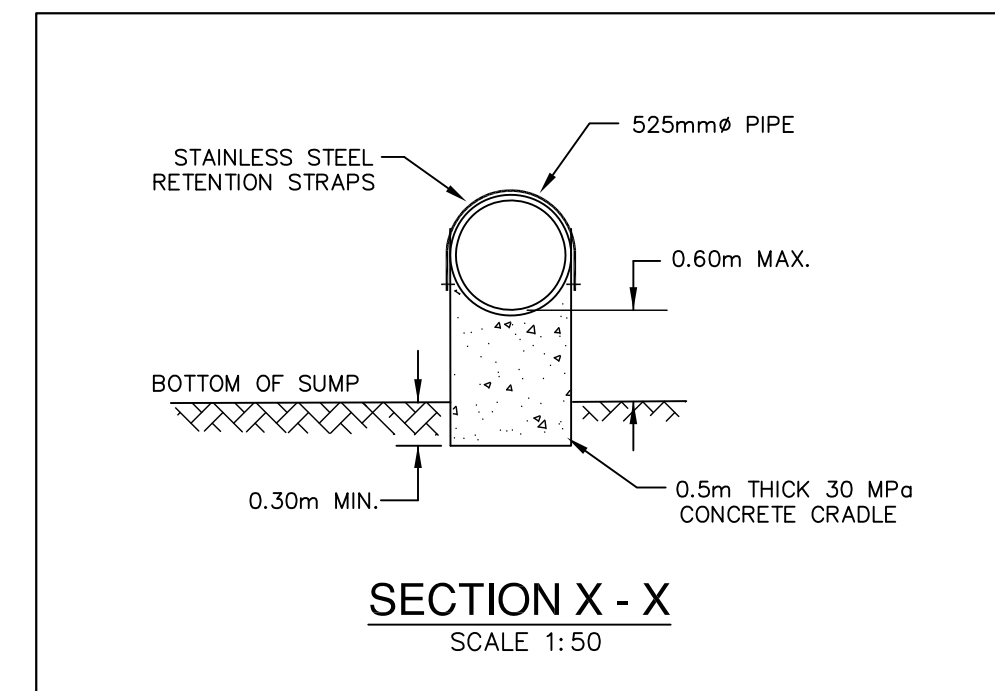
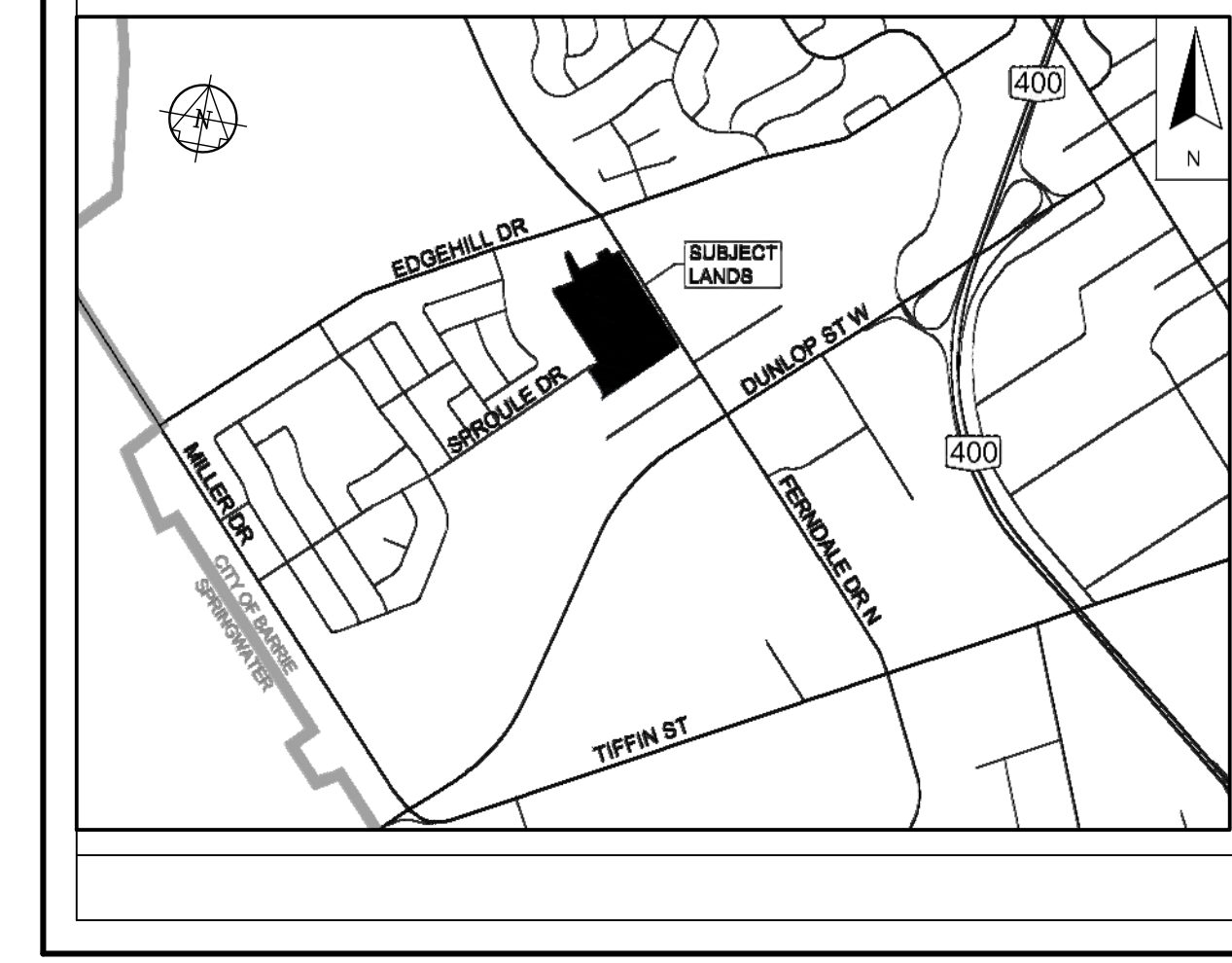
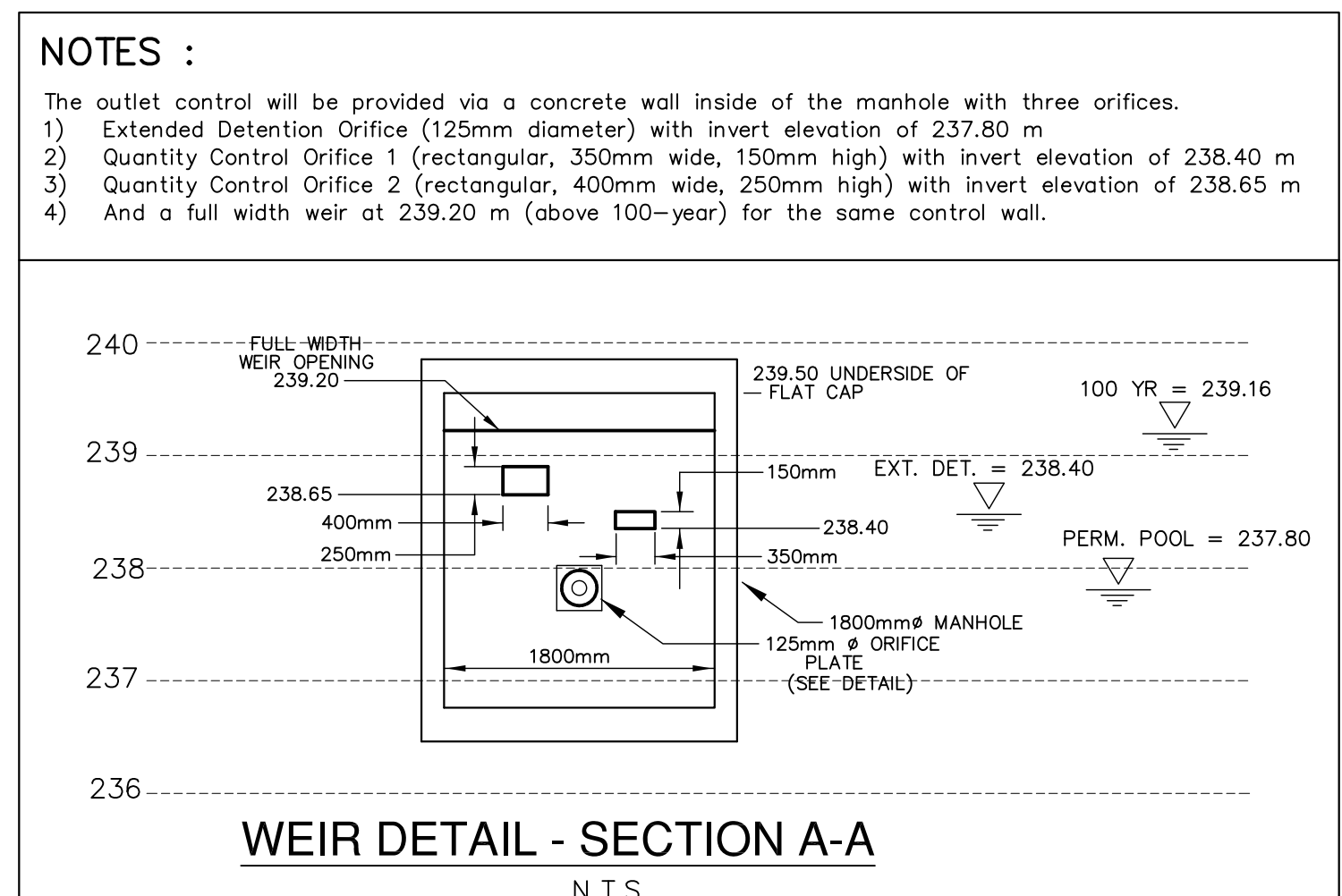
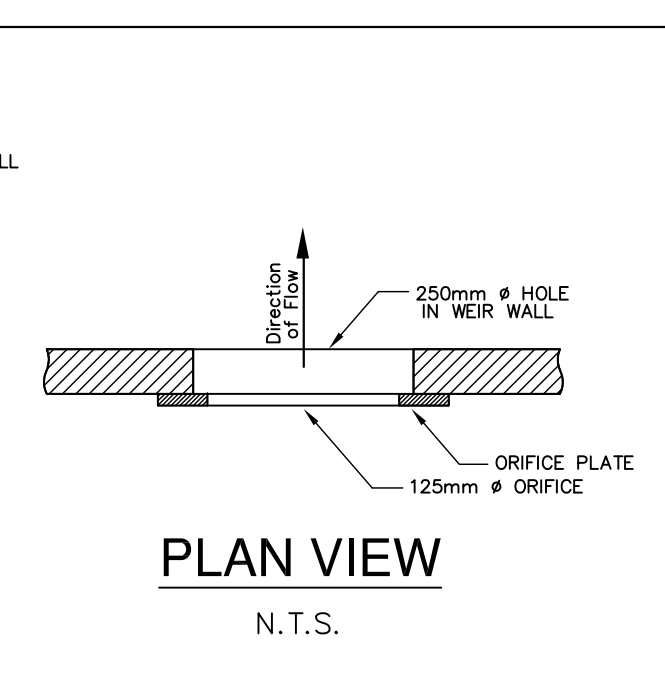
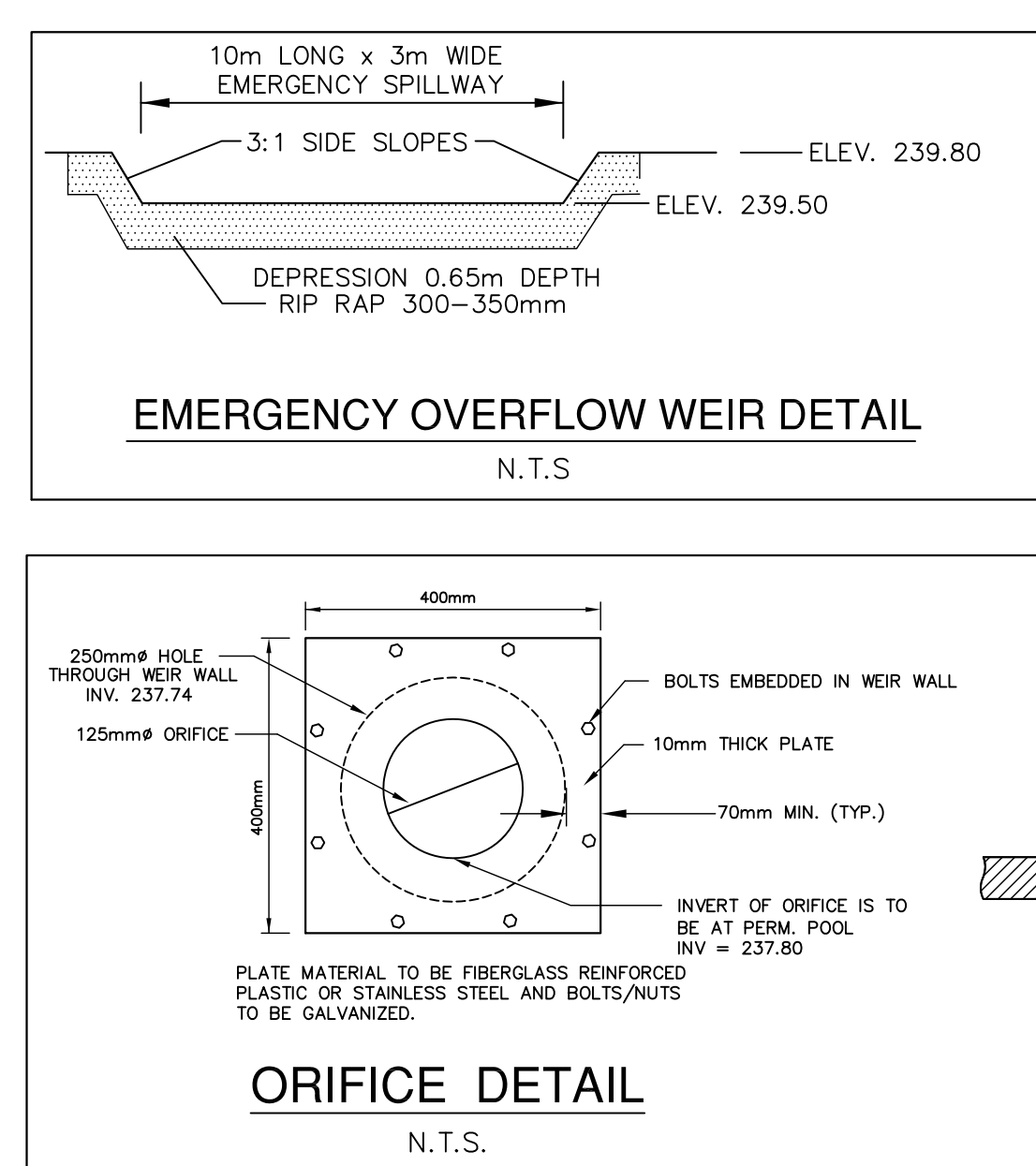
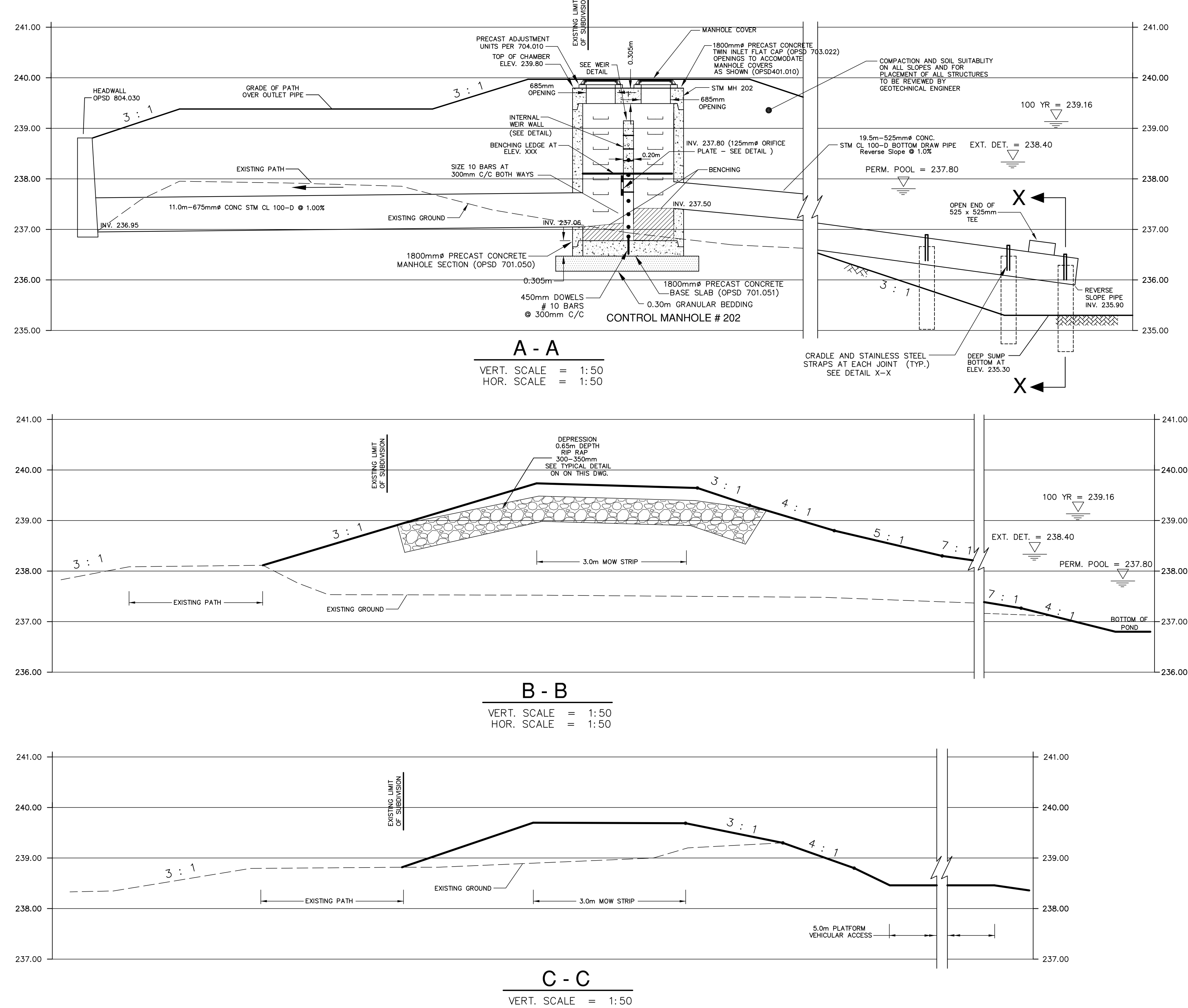
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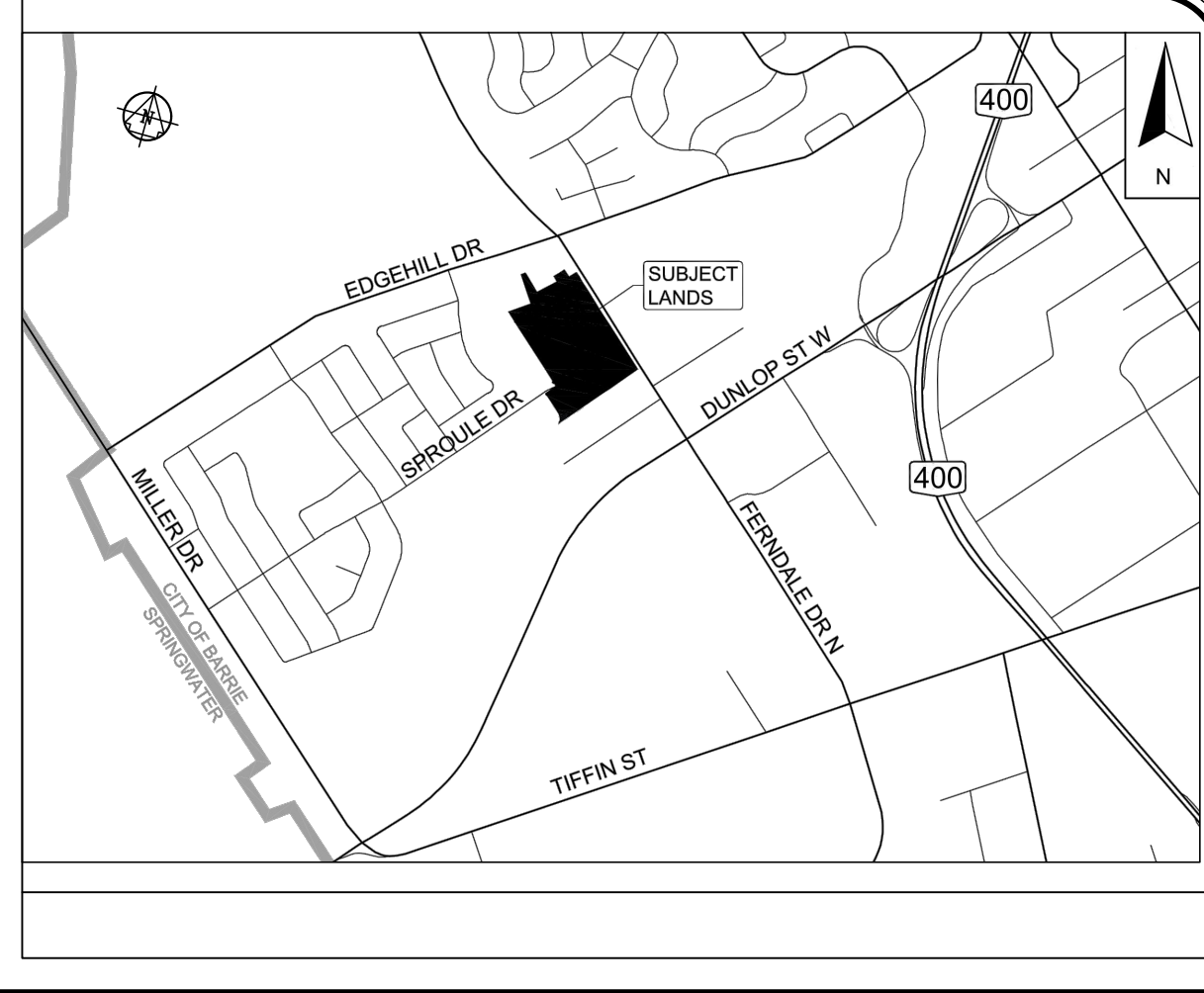
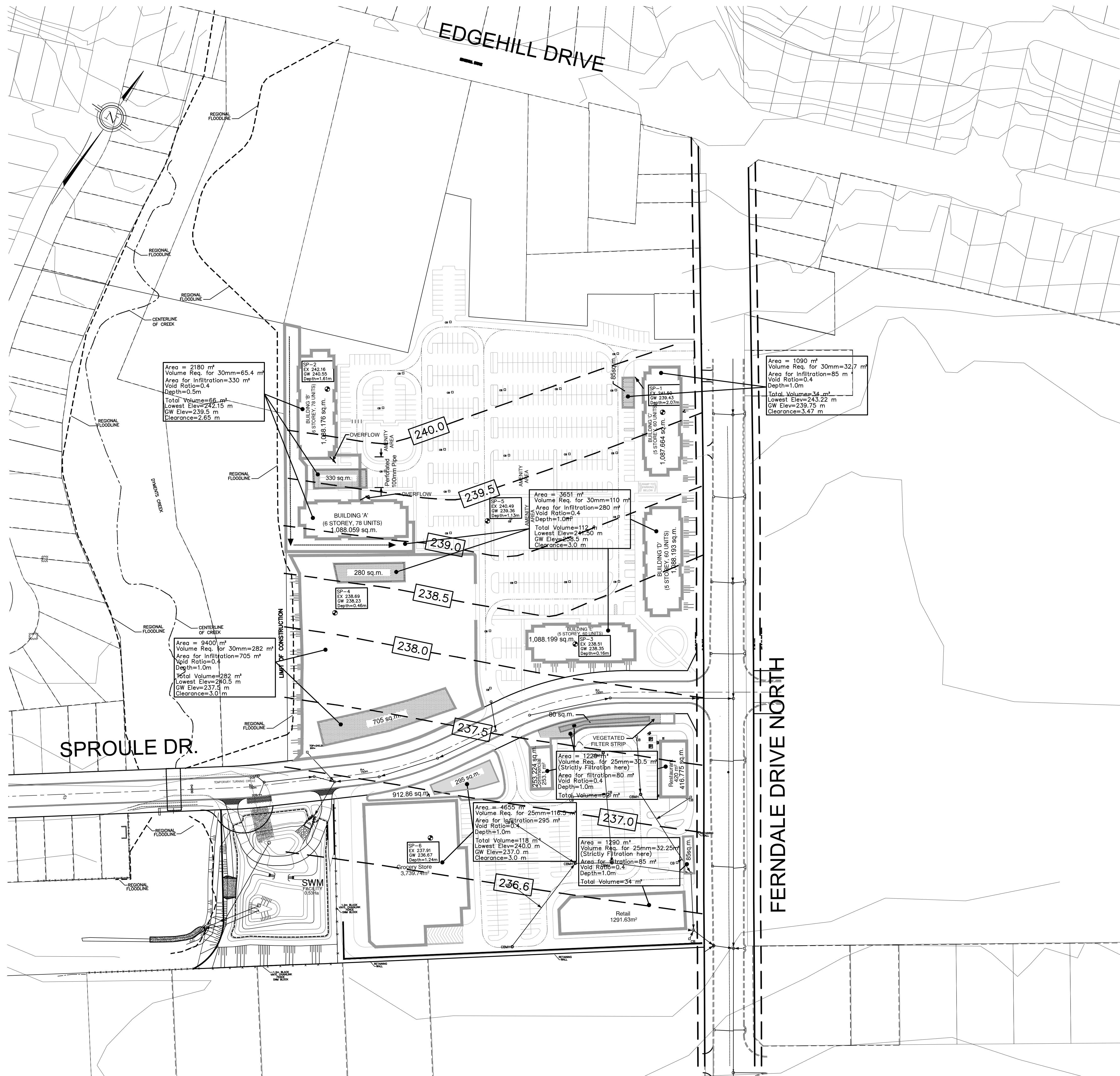


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Director of Development Engineering										Date														
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HORIZONTAL 10 0 10 20 30																								
CITY OF BARRIE ENGINEERING DEPARTMENT																								
FILE No 19T-XXXXX																								
PRELIMINARY GRADING PLAN																								
Designed By D.J.S.					Date OCT. 2019					Checked By R.S.														
Drawn By V.T.										Approved By														
Scale: 1:500					Project No. 07002					Drawing No. GR-2														

[illegible]



NOTE

Soils Report indicates permeability of 10^{-3} cm/s
Conservatively, assume 10^{-3} cm/s
CVC/TRCA Guidelines has fitted an equation to determine infiltration rate from given permeability
 $x = (y/6E-11)^{0.725}$
Using conservative value infiltration rate = 86 mm/hr
As the soil horizon is consistent, safety factor of 2.5 was applied to give design infiltration of 34 mm/hr

LEGEND

--- 238.0 --- 0.5m Ground Water Contours
(REFER TO AZIMUTH ENVIRONMENTAL CONSULTING - WATER LEVEL MONITORING REPORT DATED OCTOBER 2nd, 2019.)

No.	By	Date	Revision	Checked

APPROVED AS TO FORM IN RELIANCE UPON THE PROFESSIONAL SKILL AND ABILITY OF URBAN ECOSYSTEMS LIMITED AS TO DESIGN AND SPECIFICATION.



Director of Development Engineering Date

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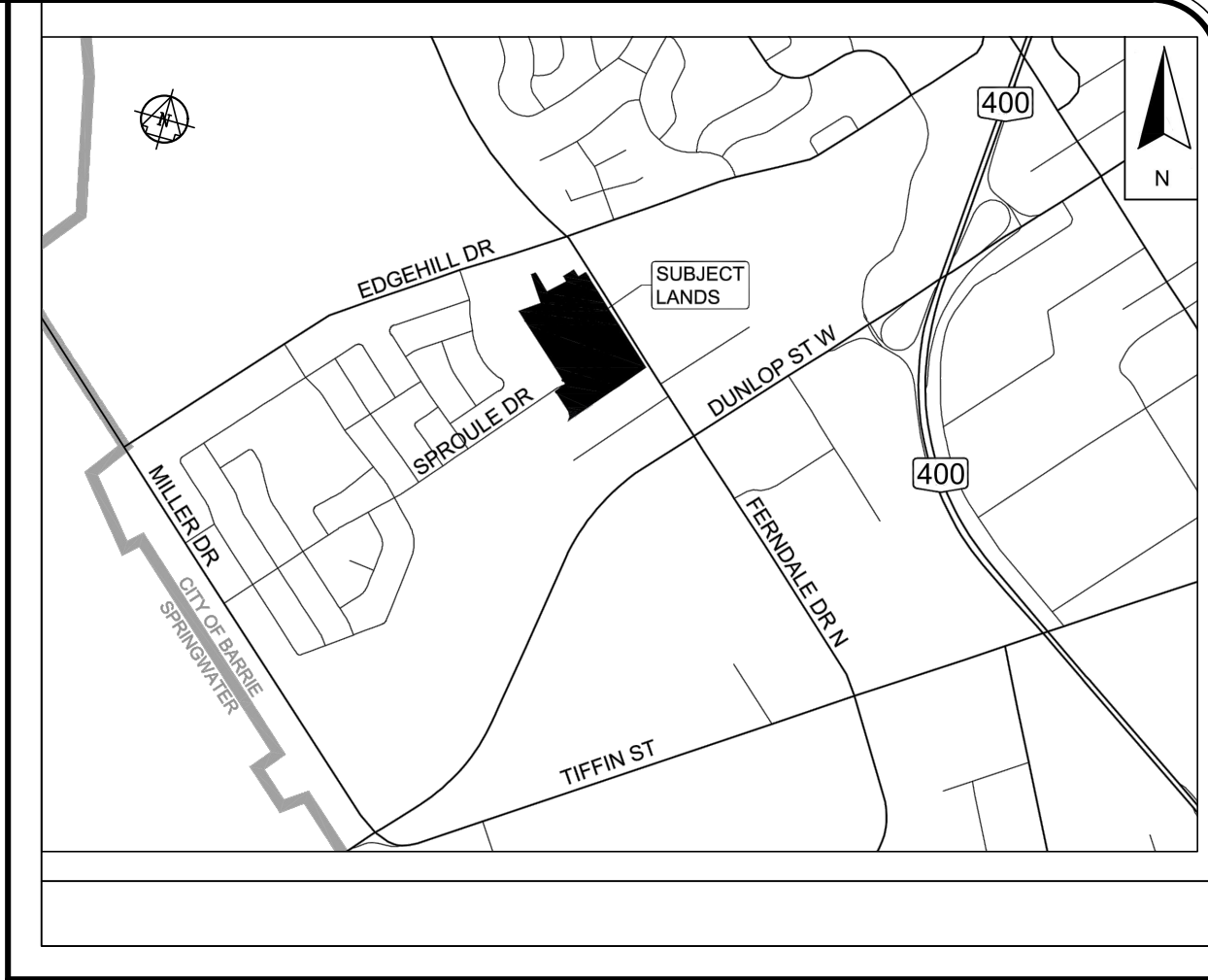
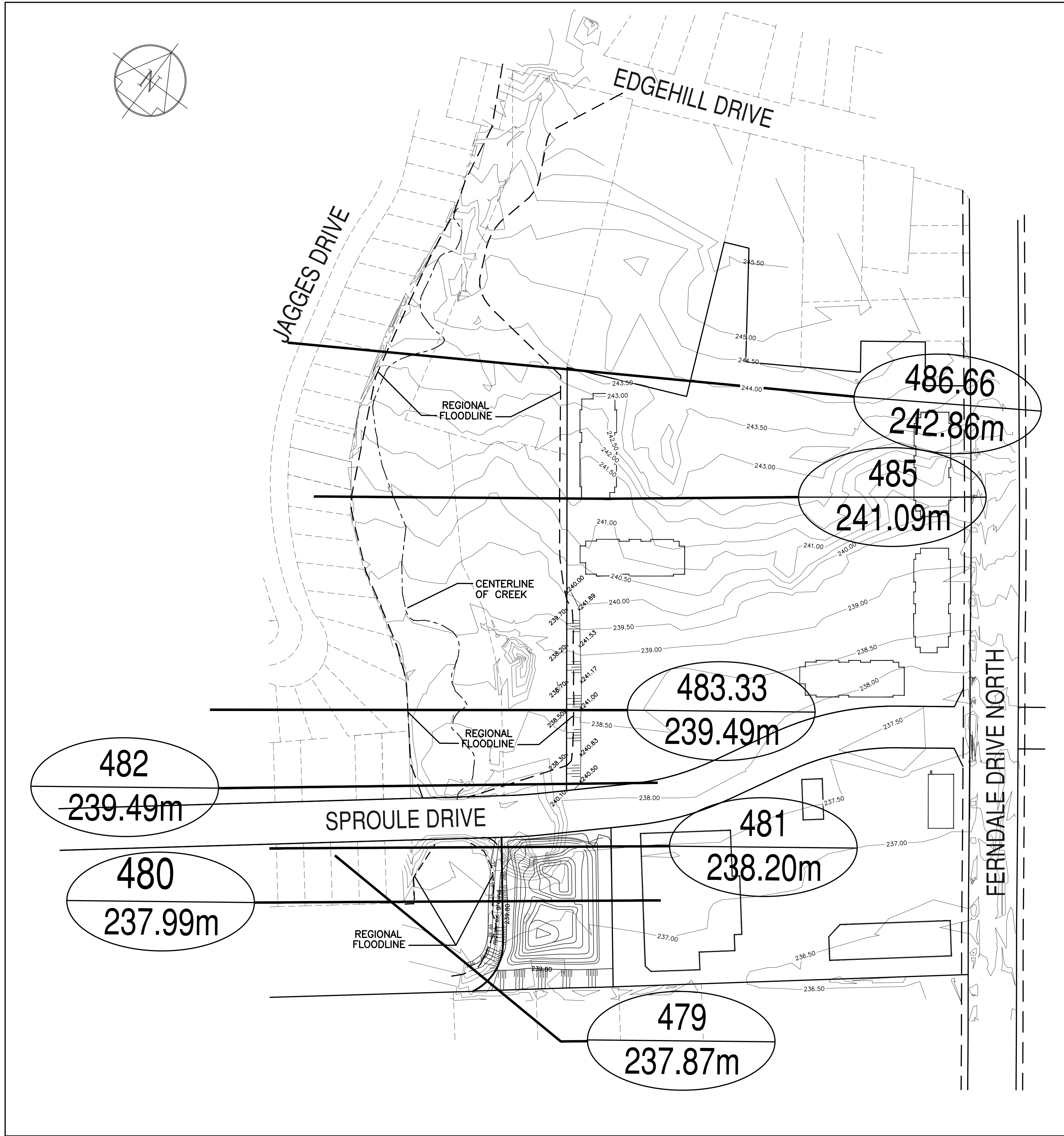
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CITY OF BARRIE
ENGINEERING DEPARTMENT

FILE No 19T-XXXXX

RUNOFF - INFILTRATION PLAN

Designed By	D.J.S.	Date	OCT. 2019	Checked By	R.S.
Drawn By	V.T.			Approved By	
Scale:	1:1000	Project No.	07002	Drawing No.	INF-1



No.	By	Date	Revision	Checked

APPROVED AS TO FORM IN RELIANCE UPON THE PROFESSIONAL SKILL AND ABILITY OF URBAN ECOSYSTEMS LIMITED AS TO DESIGN AND SPECIFICATION.

Director of Development Engineering Date

REGISTERED PROFESSIONAL ENGINEER
ROSARIO SACCO
NOV 1, 2019
PROVINCE OF ONTARIO

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Barrie

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CITY OF BARRIE
ENGINEERING DEPARTMENT

FILE No 19T-XXXXX

HEC-RAS FLOODPLAIN MAPPING

Designed By	D.J.S.	Date	OCT. 2019	Checked By	R.S.
Drawn By	V.T.	Project No.	07002	Approved By	
Scale:	1 : 1250	Drawing No.	HEC-1		