Functional Servicing and Stormwater Management Report
221 Fox Street Residential Development
Queen's Court Homes
Town of Penetanguishene

WMI 09-062
July 2022

Prepared by

WMI & Associates Limited
119 Collier Street, Barrie Ontario L4M 1H5

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Appendices

1.0 Introduction

1.1 General

WMI & Associates Limited has been retained by Queen's Court Homes to prepare a Functional Servicing and Stormwater Management Report in support of a draft plan of subdivision in the Town of Penetanguishene, Ontario. The proposed development (site) is located east of Fox Street, south of Broad Street, and west of Church Street.

This Report has been based on our discussions with Town of Penetanguishene (Town) Staff. Our work conforms to the current Town Engineering Design Standards, and Ministry of the Environment (MOE) stormwater management design guidelines.

1.2 Background

The subject property comprises a total of 12.01ha and is legally described as part of Lots 104 to 113, West Side of Church Street, Registered Plan 70, Town of Penetanguishene, County of Simcoe.

The residential development portion of the property is 2.22ha and comprises 88 Residential Townhomes. The roadways, a SWM block, and open space lands, as well as the unopened portion of Beck Boulevard, comprise the remaining 9.79ha. The site is irregular in shape, and is currently a wooded area. The lands to the north, east, south and west are developed with residential lots as well as some vacant lots predominantly to the east along Church Street. The lands to the south (Bay Moorings Development) are a private residential development comprising single family lots and townhouse units. An extension of Beck Boulevard (Municipal Roadway) has been constructed as a part of that development and terminates at a cul-de-sac to the south of the site.

This report is in support of a planning application and is based upon topographic information obtained from J.D. Barnes Ltd., dated April 12, 2022, a Draft Plan of Subdivision and Draft Plan of Common Elements Condominium both prepared by Celeste Phillips Planning Inc. dated July 14, 2022. Refer to **Appendix A** for the Site Location Plan (**FIG1**), and the Draft Plan of Subdivision and Draft Plan of Common Elements Condominium.

2.0 Existing Conditions

2.1 Topography and Drainage Patterns

There are currently no stormwater controls on the site, and all runoff is in the form of sheet flow. The site drains predominantly from east to west, towards the existing lots fronting onto Fox Street. There is an existing 975mmØ concrete storm sewer located to the south west of this site which collects and conveys drainage from Fox Street, the site, and external areas prior to outletting to Georgian Bay.

The predominant topographic feature within the site is a bluff which traverses the site in the north-south direction, within the east half of the site. There is also a low-lying wetland area located centrally to the site.

The highest elevation within the site boundary is above the ridge along the eastern boundary with lots fronting onto Church Street. The lowest elevation within the site is located at the south west corner of the site.

2.2 External Drainage

There is approximately 13.91ha of external area which drains into the site. The primary outlet for these lands is from a set of catchbasins and a 300mmØ culvert along Church Street which outlets onto the site at the northeast end, into the open space of Block 4 (on the Draft Plan). This runoff is conveyed through the site, by a ditch which traverses the bluff then translates to sheet flow as the ditch flattens out and terminates partway through the site, at the toe of the bluff slope.

Smaller portions of these external lands sheet flow onto the site from the existing and vacant residential lots fronting onto Church Street, further to the south, and along the east boundary.

For pre-development drainage details, refer to the Pre-Development Drainage Plan, **FIG2** in **Appendix A**.

2.3 Existing Water and Sanitary Services

The site currently does not contain any water or sanitary services; however, municipal sanitary sewers and watermains are existing on Fox Street and Beck Boulevard. The site will connect to the Beck Boulevard sanitary sewer at the south boundary of the proposed development. A watermain connection is also proposed at this location on Beck Boulevard, as well as at the Fox Street watermain to the west of the site.

2.4 Soil Conditions

According to the Soils Map of Simcoe County, Ontario, Soil Survey Report prepared for the Department of Agriculture, the site and external areas consists of Tioga loamy sand and Alliston sandy loam. These soils have been identified as being within hydrologic soils group 'A' and 'AB' respectively; and are considered to have good to imperfect drainage. This information has been used to determine the composite runoff Curve Number for the drainage areas within and external to the site, in order to define the hydrologic losses in the SWMHYMO model.

A Preliminary Geotechnical Investigation has also been prepared by Peto MacCallum Ltd. (PML) for the development. From the soils sampling and testing conducted from three boreholes, this report finds that the predominant soil deposit below the topsoil layer is sand, with some seams of clayey silt and till. The groundwater table is approximately 1.9m to 4.4m below existing grades (average of 2.0m in depth), as measured from standpipes installed at the borehole locations. This high groundwater table may require the need for trench dewatering in some locations to facilitate sewer construction.

The investigation also reveals that the native sand soils are in a loose to very loose state which will require 1.5m of engineered fill below house foundations, or deep pilings/piers incorporated into footing designs to overcome low bearing pressures afforded by the native soils.

2.5 Hydrogeological Conditions

A Hydrogeological Study and Water Balance Analysis has been updated by Ian D. Wilson & Associates, dated December 18, 2015, revised June 24, 2022, (**Appendix E**) to determine the impacts that the development will have on the groundwater regime and the wetland/woodlot area that is to be preserved.

The study indicates a westerly flow of groundwater towards Penetang Harbour, with water table depths being within approximately 2.0m of the existing ground surface in the low-lowing western portion of the site (based on PML borehole records).

A water budget analysis that was completed as a part of this report identifies that the pre-development on-site infiltration for the 12.01ha site area is 3.41×10^7L/yr, using a water surplus of 454.6mm/yr, and based on runoff and infiltration coefficients they have determined are appropriate for the existing condition. The report further identifies that the post-development on-site infiltration is 2.49×10^7 L/yr, which requires 9191m^3/yr of runoff to be infiltrated for mitigation to the pre-development condition. Based on the existing soil conditions with a percolation rate of 0.72m/day and assuming the infiltration occurs over 30 days, an infiltration footprint of 426m^2 is required. This footprint area is accommodated through the proposed stormwater management pond (SWM Block has an area of 0.474ha) and site level infiltration.

3.0 Post-Development Conditions

3.1 Sanitary Servicing

The site will be serviced with 200mmØ sanitary sewer and 100-150mmØ laterals extended to the residential buildings.

Contributing sanitary flows from the site were calculated based on the Town of Penetanguishene Standards which reference the MOE Design Guidelines for Sewage Works (2008). Equivalent population were determined based on MOECC guidelines. According to the site statistics provided by the Architect, the proposed population is 352 people. From MOECC criteria, the average sanitary flow for a residential development is 275L/ca/day. With a peaking factor of 4.05 and an infiltration rate of 0.19L/s/ha, the sanitary design flow is 5.83L/s.

Refer to **Appendix B** for detailed calculations.

3.2 Water Servicing

The site will be serviced with 150mmØ and 200mmØ watermain that will provide potable water and fire flow distribution. Each residence will be serviced with a 19mmØ water service. The watermain termination will include a looped 50mmØ watermain or equivalent.

It is proposed to connect to the existing watermain at Beck Boulevard and Fox Street.

From fire hydrant service records provided by the Town of Penetanguishene, static pressures from existing fire hydrants to the south of the development area on Fox Street and Hunter Road are in the range of 70 - 80 P.S.I. The proposed water demand for the site has an a Maximum Day Demand (MDD) of 4.86L/s, and a required fire flow of 60L/s. Based on this, there is adequate fire flow pressures available in the watermains that are proposed for the site.

Refer to **Appendix B** for the proposed watermain calculations and **Appendix D** for the General Servicing Plan, **GEN**.

3.3 Utilities

Since the development is situated within an existing residential community that is serviced with telephone, cable TV, hydro, and gas services, it is presumed that the various utilities servicing the area can service the site without extensive area network upgrades.

3.4 Internal Grading & Drainage

To accommodate steep slopes across the northeast portion of the site, roads will be graded to a maximum of 10.0%. A retaining wall is required adjacent to the proposed cul-de-sac, along the northern property line, to accommodate the existing grades. To achieve adequate drainage to the SWM facility from the southern extremity of the site, a retaining wall is required at the southwest corner of the property with 3:1 slopes along the south and west property lines. This grading method required the Beck Boulevard to be extended at 6.0% from the start of the existing cul-de-sac to the south to achieve the required grades for positive drainage to the SWM facility for the minor and major storm events.

The lots will be graded primarily by split drainage in low lying areas, with the front yards being sloped towards the proposed right-of-way and the backyards being directed towards the rear of the lots. For lots adjacent to the bluff, walk-up lots with rear lot swales will be required.

For further grading and drainage details refer to the Site Grading Plan, **SGR**, contained in **Appendix D**.

3.5 Foundations & Groundwater Considerations

As noted in the Preliminary Geotechnical Investigation, house footing grades should be kept to a minimum of 0.6m above the seasonally high groundwater table. In this regard, proposed grades shown on the Site Grading Plan have been set as high as possible in certain critical areas, while also taking into consideration the desire to cut/fill balance the site and provide positive drainage to the drainage outlet. Future groundwater monitoring and detailed lot grading during the detailed design phase will identify particular concern areas to address this issue.

Also, the Investigation notes that loose to very loose native sand soils are present throughout the site, which will not provide adequate bearing resistances for typical house footing construction methods. To rectify this, 1.5m of engineered fill could be placed beneath footing levels or a pier/piling system could be implemented to bear foundations onto more suitable soils deeper underground.

Depending on the grading of the roadways that are to be finalized during the detailed design phase, pavement subgrade will comprise native soils or engineered fill. A typical a road base cross section should be sufficient for the subdivision, with the exception of frost-susceptible areas which may require additional granular base thickness. Proof-rolling of the subgrade will be required to identify such areas.

For further details pertaining to the groundwater table and foundation / pavement design recommendations, refer to the Preliminary Geotechnical Investigation prepared by Peto MacCallum Ltd (**Appendix E**).

4.0 Stormwater Management

4.1 Design Criteria

Internal storm sewers and a stormwater management pond are proposed for the site to ensure that drainage is safely attenuated and conveyed to the existing outlet. Drainage from the northern portion of the property (Catchment 102) and external catchments (EXT1b and EXT2) will by-pass the SWM Pond. Runoff from external areas and the site will eventually drain into the existing 975 mmØ storm sewer on Fox Street.

The stormwater management design for the site will incorporate the policies and criteria of a number of agencies, including the Ministry of the Environment (MOE), and the Town of Penetanguishene.

From these, the stormwater management design criteria for the site are summarized below:

- Stormwater Quality controls will be provided based on the guidelines described in the Ministry of the Environment 2003 Stormwater Management Planning and Design Manual at an Enhanced Level of Protection.
- The Town's Guidelines will be used as a reference for the design of the stormwater management system.
- The Town of Penetanguishene rainfall intensity-duration-frequency (IDF) curves will be used to determine the peak flow rates and runoff volumes generated on the site.
- Post-development peak flows from the site will be controlled to pre-development levels or less for the 2 through 100-year design storm events, which are based on the governing of the 24-hour SCS Type-II storm distribution and 4-hour Chicago storm distribution.
- Post-development peak flows from the site will be controlled to a level that is within the available capacity of the existing 975mmØ storm sewer on Fox Street.
- Storm flows from external lands (EXT2 and EXT1b) will continue to drain through Catchment 102 and by-pass the proposed SWM facility to match existing conditions. Catchbasin(s) will be installed to facilitate wetland drainage.
- Storm sewers will be designed to convey minor system flows and runoff from major storm events will be conveyed overland through the right-of-way.

4.2 Proposed Drainage

Post-development drainage patterns will be generally consistent with existing conditions. Runoff from the site will be conveyed to a stormwater management facility, where peak flow attenuation and quality control will be provided.

The developed portion of the site is identified as Catchment 101, and the northern portion of the property not proposed for development is identified as Catchment 102. A negligible portion of the site along the southern boundary (Catchment 103) will be uncontrolled and continue to outlet to the existing development to the south.

The upstream external lands are divided into three (3) separate post-development drainage catchments: EXT 1a, EXT1b and EXT 2. These areas are currently uncontrolled with EXT1a and EXT1b Catchments draining via overland flow from east of the site and EXT2 discharges through a 300mmØ culvert to a channel within a drainage easement on the site.

The drainage from Catchments EXT1b and EXT2 will continue to be directed to the wetland area in the northern portion of the development (Catchment 102), and in the event of flooding will be collected in the proposed storm sewer system. Catchment EXT1a will be conveyed around the proposed townhomes via swales which will discharge into the proposed storm sewer system.

Site drainage discharges to the existing 975mmØ storm sewer on Fox Street. This will require approximately 205m of external storm sewer to be constructed on Fox Street.

For further post-development drainage details, refer to the Post-Development Drainage Plan, **FIG3,** contained in **Appendix A**.

5.0 Hydrologic Analysis

5.1 Rainfall Data

The 24-hour SCS Type-II and the 4-hour Chicago Storm rainfall distributions were used for the 1:2, 1:5, 1:25, and 1:100 year storm event calculations. The Regional storm event modelled was based on the Timmins Regional Storm. The SCS and Chicago storms were developed from the recorded rainfall data from the City of Orillia Intensity-Duration-Frequency (IDF) curves/values.

5.2 Time of Concentration

The Airport Formula was used to calculate the time of concentration. The time of concentration is a function of "time to peak," which represents the time from the beginning of rainfall to the peak of the runoff hydrograph. It is indicative of the catchment area's response to storm events. It depends on the physical characteristics of the watershed, such as length, slope, area and surface cover. Estimates of time to peak were determined using the area's time of concentration determined by computing a travel time of an overland flow component and, where applicable, a channel/pipe travel time and then adding the respective travel times together. Refer to **Appendix B** for related calculations.

5.3 Pre-Development Condition Modelling Results

Using the site drainage area as illustrated on **FIG2** and the hydrologic modelling program SWMHYMO, the total flows were determined for the 2-year through to 100-year storm events. The drainage area east of Church Street was considered an external catchment area, with the area of the proposed site and external areas to the north and west taken as the pre-developed catchment for a combined drainage area of 29.34ha.

The 4-hour Chicago Storm and 24-hour SCS Type-II pre-development peak flows for the North and South Catchments are summarized in **Table 1** below.

Table 1: Storm Pre-Development Peak Flows

Design Storm	Area (ha)	Pre-Development Peak Flows			
		2 yr. m^3/s	5 yr. m^3/s	25 yr. m^3/s	100 yr. m^3/s
4-hr Chicago	29.34	0.196	0.202	0.466	0.665
24-hr SCS II	29.34	0.200	0.329	0.587	0.864

The pre-development hydrologic model runs for the 4-hour Chicago and SCS Type-II storm distributions can be found in **Appendix C**. From these models it was determined that the SCS Type-II storm is the governing storm.

5.4 Post-Development Condition Modelling Results

The 24-hour SCS Type-II uncontrolled post-development peak flows are summarized in **Table 2** below.

Table 2: 24-Hr SCS Type-II Storm Post-Development Uncontrolled Peak Flows

Catchment	Area (ha)	24-Hour SCS Type-II Distribution Uncontrolled Post-Development Peak Flows				
		2 yr. m^3/s	5 yr. m^3/s	25 yr. m^3/s	100 yr. m^3/s	Timmins m^3/s
101	4.65	0.164	0.252	0.410	0.564	0.354
102	6.58	0.040	0.074	0.141	0.209	0.311
103	0.16	0.006	0.009	0.016	0.022	0.013
EXT1a	2.38	0.033	0.058	0.105	0.151	0.157
EXT1b	5.39	0.052	0.091	0.166	0.241	0.320
EXT2	6.14	0.165	0.254	0.435	0.629	0.486
EXT3	4.02	0.039	0.068	0.123	0.175	0.247

The post-development hydrologic model runs for the SCS Type-II and 4-hour Chicago storm distributions can be found in **Appendix C**.

6.0 Quantity Control

6.1 Max Release Rate to Fox Street Sewer Outlet

Peak flow attenuation is required for all post-development flows to their respective pre-development levels or less. The release rate for 2-year through to 100-year storm events is required be within the allotted capacity of the existing 975mmØ Fox Street outlet pipe.

The allotted capacity for the site is the existing capacity of the Fox Street storm sewer less the storm flows from tributary external lands.

The capacity of the 975mmØ pipe is **2.338m³/s** (as noted in the Functional Servicing Report completed by RJ Burnside & Associates Limited for the Village at Bay Moorings Residential Development Located to the south of the subject development).

The existing 100-year flow from the development to the south is **0.933m³/s** (referenced from the Village at Bay Moorings Development Phase 4 FSR prepared by WMI & Associates Ltd., September 2012).

The 100-year flow from the undeveloped portion of the site (Catchment 102) and the external lands to the east of the site (Catchments EXT1b and EXT2) is **1.019m³/s**. The 100-year flow for the external lands to the west of the site (Catchment EXT3) is **0.175m³/s.** Therefore, the maximum permitted release rate for the site into the existing 975mmØ storm sewer of Fox Street is **0.211m³/s.**

From comparing the uncontrolled post development peak flows noted in **Table 2** for Catchment 101, it can be seen that the uncontrolled post-development peak flows exceed the allowable release rates for the 5-year through 100-year storm events, therefore peak flow attenuation is required.

6.2 Preliminary SWM Facility Design

In comparing the model run outputs from 24-hour SCS Type-II and 4-hour Chicago storm distributions, the 24-hour SCS Type-II Distribution consistently produced more conservative storage volumes, and therefore was used in establishing the size and preliminary design of the proposed stormwater management facility.

The proposed stormwater management facility will be designed to incorporate quantity controls for the runoff generated on-site. **Table 3** below provides an overall release rate and stage-storage-discharge summary for the controlled discharge from a SWM facility to attenuate all storm events up to and including the 100-year storm event to the allowable release rate levels or less.

Table 3: Release Rate & SWM Facility Stage-Storage-Discharge Summary

Storm Event (Year)	SCS Type-II Storm Pre-Development Peak Flows (m3/s) (per Table 1)	Catchment 101 Post-Development Peak Flows-Uncontrolled (m3/s) (per Table 2)	Pond Outflow-Post Development Controlled Peak Flow - Catchment 101 + EXT1a (m3/s)	Estimated SWM Facility Active Storage Volume (m3)	Estimated SWM Facility Water Levels (MASL)
2	0.200	0.164	0.036	401	186.11
5	0.329	0.252	0.066	553	186.25
25	0.587	0.409	0.105	875	186.50
100	0.864	0.562	0.132	1191	186.71

From comparing the Total Post-Development Peak Flows from **Table 2** to the allowable release flows noted previously, it can be seen that the SWM facility storage volumes and storage water levels are sufficient to attenuate peak flows to below allowable release rates, for the 2-year through 100-year design storm events.

The proposed SWM facility illustrated in **FIG3** (contained in **Appendix A**) is sized to provide adequate storage to attenuate flows to the permitted release rates noted previously, based on a permanent pool elevation of 185.70masl. The preliminary design is also in accordance with the summary of design guidance for Wet Pond facilities noted in the Ministry of the Environment's 2003 Stormwater Management Planning and Design Manual, Table 4.6.

To meet the release rate requirements at various design storm events, multiple orifice and/or weir controls will be required to restrict flows at various stages within the pond. For the 2-year pre-development release rate target, a small diameter orifice control will likely be sufficient, however to accommodate larger release flows from larger storm events, a manhole cut-out weir will likely be required.

An earthen weir and associated overland flow channel will be incorporated into the SWM facility design to permit regional storm flows to pass without overtopping the facility or flooding adjacent properties.

A detailed analysis of the SWM facility, including the stage, storage and discharge, and inlet / outlet configuration will be provided during the detailed design phase.

Other Preliminary SWM facility calculations are contained in **Appendix B** for reference.

7.0 Quality Control

The stormwater management requirements for this site were determined in consultation with the Town of Penetanguishene. The appropriate level of quality control was determined to be at an 'enhanced' level as defined by the MOE's Stormwater Management Planning & Design Manual (2003), which equates to the provision of 80% total suspended solids (TSS) removal.

An integrated treatment train approach will also be implemented to design the storm drainage system, which will help minimize any negative impacts the site may have on the existing quality of stormwater runoff. The integrated treatment train approach is premised on providing quality control at the following three separate locations within the development:

i) Lot Level Control: Reduced lot grading and roof leaders discharging to pervious surfaces on the residential lots will encourage infiltration and ultimately groundwater recharge at the source within the development.

ii) Conveyance Control: Grassed swales will be utilized where necessary to convey stormwater runoff to either the storm sewer system, or wet pond facility directly. The grassed swales within the site will not only provide stormwater conveyance but also aid in quality control enhancement of the stormwater before it enters the proposed wet pond facility and ultimately exits the site. Also, due to the nature of the development which requires the use of an urban road cross-section, all proposed catchbasins will be equipped with sumps to help promote the removal of suspended solids travelling within the storm sewer system before being released into the end-of-pipe wet pond facility.

iii) End-of-pipe Control: The final element to the treatment train approach to stormwater quality control is the use of a wet pond facility consisting of a permanent pool and extended detention storage.

The preliminary calculations contained in this report provide end of pipe quality control calculations pertaining to storage volumes and release rates within the SWM facility in accordance with MOE criteria for Catchment 101 only (although EXT1a also contributes to the SWM pond). Some quality attenuation will inherently be provided for the 10.0m buffer along the boundary as well as for the external areas draining into the wetland since this area acts as a natural attenuation buffer.

Preliminary SWM facility Calculations pertaining to quality control storage volumes are contained in **Appendix B** for reference.

8.0 Sediment and Erosion Controls

In accordance with Town policy, effective erosion and sediment control must be established prior to construction commencement and maintained until the site has been stabilized. Exposure of the soil during construction should be minimized to avoid erosion and sedimentation. The sites erosion potential may be mitigated through the use of sound erosion and sedimentation control measures. The following measures shall be carried out prior to construction and maintained until disturbed areas have regained a significant grass cover:

Topsoil Stripping: Topsoil stripping will be reduced as much as possible on-site. Where grading is necessary, the exposed soil will be stabilized by seeding immediately upon being set to grade. Should topsoil stockpiling be required, the stockpiles will be kept at manageable levels for grass/weed cutting purposes.

Silt Fence: Silt fence will be placed along the down slope of all excavated material and along the perimeter of the site to prevent sediment transport. Periodic inspections and repairs to the silt fence should be performed regularly, as well as after every rainfall event.

Mud Mat: Mud tracking from construction traffic must be controlled through the use of a mud-mat consisting of clear stone located at the site's construction entrances/ exits.

Vegetated Buffers: Existing grassland vegetation/wooded and lawn areas along the development limits are to be maintained wherever possible. These areas will provide a natural barrier to filter potentially sediment-laden overland flow before it is released from the site.

Finally, the Site Engineer will be responsible for completing routine inspections of the sediment and erosion control structures throughout the construction phase of the development, particularly after rainfall events. All damaged or clogged control devices or fencing must be repaired immediately.

9.0 Summary and Conclusions

This Functional Servicing and Stormwater Management Report demonstrates how the site can be serviced and how drainage can be accommodated. Specifically, we note the following:

- A storm sewer system will provide minor system drainage and roadways will provide major storm conveyance to the SWM facility.
- A network of sanitary sewers will service the site and connect into the existing municipal sewer on Beck Boulevard. Proposed watermains will connect to the existing mains on Fox Street and Beck Boulevard and will provide adequate potable water and fire flow service.
- The preliminary grading design has consideration for the high groundwater level. Engineered fill or pier/piling equipped house foundations may need to be implemented to overcome low bearing pressures afforded by the native soils.
- The proposed SWM facility will provide quantity controls for the site to pre-development levels for the 2 through 100-year design storm events with the flows to be attenuated to less than or equal to the available capacity of the existing storm sewer on Fox Street.
- External areas to the east will continue to be conveyed to the wetland/woodlot in Catchment 102 via overland flow.
- An 'enhanced' level of quality control, as defined in the MOE's Stormwater Management Planning & Design Manual will be provided through permanent pool and extended detention storage provided within the SWM facility.

The Functional Servicing and Stormwater Management strategy described in this report demonstrates that the site can be accommodated within the framework of existing infrastructure and with minimal impacts on the adjacent properties.

Based on the above, we request that this report be received in support of Draft Plan Approval.

Respectfully submitted,

WMI & Associates Limited

Chris Jungkunz, EIT

Dean Ives, P. Eng.

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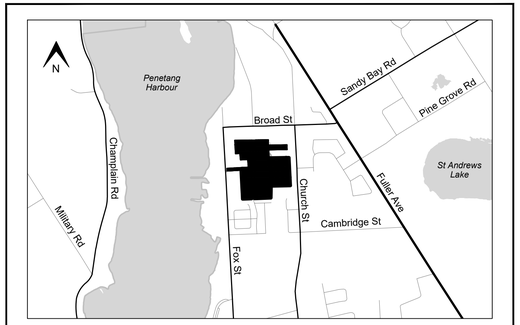
Figures

Appendix A



Key Map Scale 1 : 20,000

DRAFT PLAN OF SUBDIVISION
QUEEN'S COURT

PART OF LOTS 104 TO 113 WEST OF CHURCH STREET, REGISTERED PLAN 70,
MILITARY AND NAVAL RESERVE
TOWN OF PENETANGUISHENE, COUNTY OF SIMCOE

LAND USE SCHEDULE

USE	BLOCKS	UNITS	AREA ha	AREA ac	AREA %
RESIDENTIAL CONDOMINIUM	1 & 2	88	5.046	12.47	43.9
OPEN SPACE	3 & 4		5.229	12.92	45.5
STORMWATER MANAGEMENT	5		0.474	1.17	4.1
STREET (BECK BOULEVARD EXTENSION)			0.741	1.83	6.5
TOTAL		**88**	**11.489**	**28.39**	**100**

COUNTY OF SIMCOE APPROVAL

APPROVED IN ACCORDANCE WITH SECTION 51(31) OF THE *PLANNING ACT,* RSO, 1990, CHAPTER P.13, AS AMENDED,

THIS _____ DAY OF _____, 20_____.

_____

OWNER'S CERTIFICATE

I,_____ , BEING THE REGISTERED OWNER OF THE SUBJECT LANDS, HEREBY AUTHORIZE CELESTE PHILLIPS PLANNING INC. TO PREPARE AND SUBMIT A DRAFT PLAN OF SUBDIVISION FOR APPROVAL.

DATE: _____ _____

_____

SURVEYOR'S CERTIFICATE

I HEREBY CERTIFY THAT THE BOUNDARIES OF THE LAND TO BE SUBDIVIDED AND THEIR RELATIONSHIP TO THE ADJACENT LANDS ARE ACCURATELY AND CORRECTLY SHOWN ON THIS PLAN.

DATE: _____ _____
LAURENCE J. KUELLING, O.L.S.
J.D. BARNES LIMITED

ADDITIONAL INFORMATION
REQUIRED UNDER SECTION 51(17) OF THE PLANNING ACT

a)	AS SHOWN	f)	AS SHOWN	i)	TIOGA LOAMY SAND
b)	AS SHOWN	f1)	NONE	j)	AS SHOWN
c)	AS SHOWN	g)	AS SHOWN	k)	FULL MUNICIPAL SERVICES
d)	AS SHOWN	h)	MUNICIPAL WATER	l)	AS SHOWN
e)	AS SHOWN				

No.	DATE	REVISION	BY

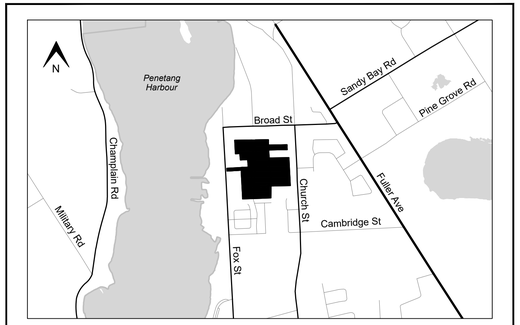
Stamp

0 25 50 75m
Scale 1 : 1,000

Date: July 14, 2022
Drawn By: AM
Checked By: CP

N

celeste PHILLIPS PLANNING INC.
85 Bayfield Street, Suite 300
Barrie, ON L4M 3A7
T: 705 797 8977
C: 705 730 8850
celeste@cplan.ca



Key Map Scale 1 : 20,000

DRAFT PLAN OF COMMON ELEMENTS CONDOMINIUM

QUEEN'S COURT

PART OF LOTS 104 TO 113 WEST OF CHURCH STREET, REGISTERED PLAN 70,
MILITARY AND NAVAL RESERVE
TOWN OF PENETANGUISHENE, COUNTY OF SIMCOE

LAND USE SCHEDULE

USE	PARTS	UNITS	AREA ha	AREA ac	AREA %
RESIDENTIAL TOWNHOMES	1 - 88	88	2.220	5.49	44.0
COMMON ELEMENT LANE	89 - 92		0.517	1.28	10.3
COMMON ELEMENT OPEN SPACE	93 - 100		2.308	5.70	45.7
TOTAL		**88**	**5.046**	**12.47**	**100**

COUNTY OF SIMCOE APPROVAL

APPROVED IN ACCORDANCE WITH SECTION 51(31) OF THE *PLANNING ACT,* RSO, 1990, CHAPTER P.13, AS AMENDED,

THIS _____ DAY OF _____, 20_____.

_____

OWNER'S CERTIFICATE

I,_____, BEING THE REGISTERED OWNER OF THE SUBJECT LANDS, HEREBY AUTHORIZE CELESTE PHILLIPS PLANNING INC. TO PREPARE AND SUBMIT A DRAFT PLAN OF SUBDIVISION FOR APPROVAL.

DATE: _____ _____

_____

SURVEYOR'S CERTIFICATE

I HEREBY CERTIFY THAT THE BOUNDARIES OF THE LAND TO BE SUBDIVIDED AND THEIR RELATIONSHIP TO THE ADJACENT LANDS ARE ACCURATELY AND CORRECTLY SHOWN ON THIS PLAN.

DATE: _____ _____
LAURENCE J. KUELLING, O.L.S.
J.D. BARNES LIMITED

ADDITIONAL INFORMATION
REQUIRED UNDER SECTION 51(17) OF THE PLANNING ACT

a)	AS SHOWN	f)	AS SHOWN	i)	TIOGA LOAMY SAND
b)	AS SHOWN	f1)	NONE	j)	AS SHOWN
c)	AS SHOWN	g)	AS SHOWN	k)	FULL MUNICIPAL SERVICES
d)	AS SHOWN	h)	MUNICIPAL WATER	l)	AS SHOWN
e)	AS SHOWN				

No.	DATE	REVISION	BY

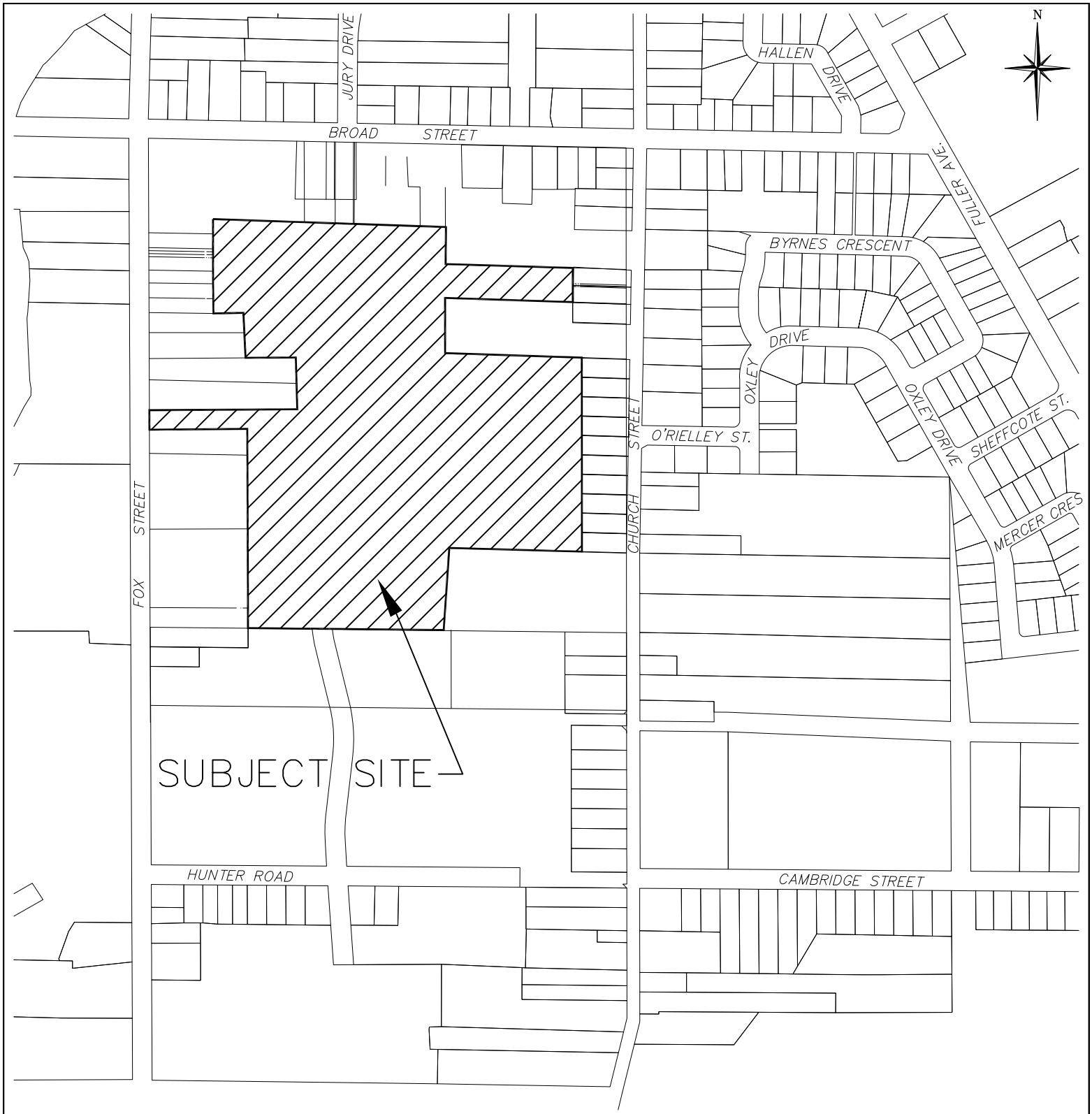
Stamp

0 25 50 75m
Scale 1 : 1,000

Date: July 14, 2022
Drawn By: AM
Checked By: CP

N

celeste PHILLIPS PLANNING INC.
85 Bayfield Street, Suite 300
Barrie, ON L4M 3A7
T: 705 797 8977
C: 705 730 8850
celeste@cplan.ca



Drawing Title

SITE LOCATION PLAN

Project Title

QUEEN'S COURT HOMES

WMI & Associates Limited
119 Collier Street
Barrie, Ontario
L4M 1H5
705-797-2027
www.wmiengineering.ca

Drawn By	Checked By	Figure No.
JR	DAI	FIG1
Scale	Project No.	
N.T.S.	09-062	

BROAD STREET

FOX STREET

CHURCH STREET

PART 1

PART 2

PART 3

PART 4

PART 5

PART 6

EX. OUTFALL & EASEMENT

EX. 300mmø STM SWR & CB

PRE 23.20

EXT 6.14

Legend:

0
0.00

CATCHMENT IDENTIFICATION

CATCHMENT AREA (HA)

LIMITS OF CATCHMENT AREA

LIMITS OF EXTERNAL CATCHMENT AREA

OVERLAND FLOW DIRECTION

N

Drawing Title

PRE-DEVELOPMENT DRAINAGE PLAN

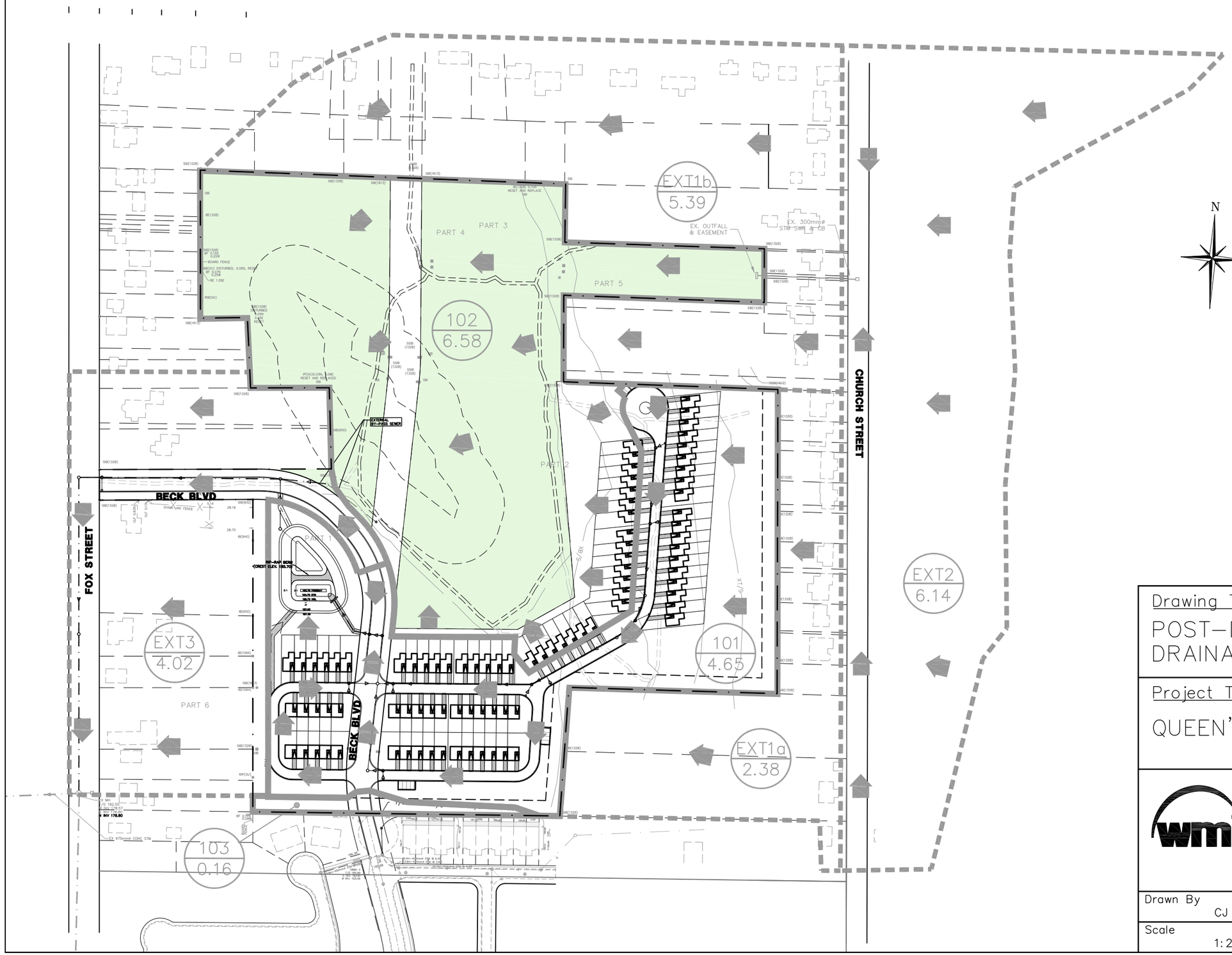
Project Title

QUEEN'S COURT HOMES

WMI & Associates Limited
119 Collier Street
Barrie, Ontario
L4M 1H5
705-797-2027
www.wmiengineering.ca

Drawn By	Checked By	Figure No.
CJ	DAI	FIG 2
Scale: 1:2500	Project No.: 09-062	

Z:\Projects\2009\09-062\CAD\WMI\3rd_Subm\09-062_SWM_Figures.dwg, FIG2, 1:1



Legend:

- CATCHMENT IDENTIFICATION (0)
- CATCHMENT AREA (HA) (0.00)
- LIMITS OF CATCHMENT AREA
- LIMITS OF EXTERNAL CATCHMENT AREA
- OVERLAND FLOW DIRECTION

TOTAL 100-YR FLOW INTO EX. 975mmø SEWER OUTLET:

101 & EXT1a (POND OUTFLOW)	0.132m^3/s
102, EXT1b & EXT2	1.019m^3/s
EXT 3	0.175m^3/s
DEV FROM SOUTH	0.933m^3/s
TOTAL	2.259m^3/s

Drawing Title

POST-DEVELOPMENT DRAINAGE PLAN

Project Title

QUEEN'S COURT HOMES

WMI & Associates Limited
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Barrie, Ontario
L4M 1H5
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Drawn By	Checked By	Figure No.
CJ	DAI	FIG 3
Scale: 1:2500	Project No.: 09-062	

Design Calculations

Appendix B

WMI & Associates Limited
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Sanitary Sewer Design Sheet
Queen's Court Homes

<<< **Elements Requiring Input Information**

Peak Flow Formulaes:

Q_{pop} = (P*q*M)/86.4 (L/s)
$Q_{Comm/Inst}$ = Design Flow x Peaking Factor (L/s)
Q_{Ind} = Design Flow x Peaking Factor (L/s)
Q_{Infilt} = i*A (L/s), where A = Area (ha)
$Q_d = Q_{pop} + Q_{Comm/Inst} + Q_{Ind} + Q_{Infilt}$ (L/s)

MOE Velocity Requirements: 0.6m/s - 3.0m/s

where, P = population in 1000's
q = residential sewage unit flow rate
M = Ultimate Flow Factor (residential peaking factor)
(Harmon) $M=1+(14/(4+P^{0.5}))$
Q_{pop} = peak population flow (L/s)
$Q_{Comm/Inst}$ = peak commercial/institutional flow (L/s)
Q_{Ind} = peak industrial flow (L/s)
Q_{Infilt} = peak extraneous (i.e. infiltration) flow (L/s)
i = **peak** extraneous (i.e. infiltration) unit flow rate
Q_d = total peak design flow (L/s)

Comm/Inst Peaking Factor: **1.5**
Industrial Peaking Factor: **2**
Res - SFD Single Family Dwellings: q: **450** L/cap./day ppd = **2.75**
Res - MFD Multi-Family Dwellings: q: **275** L/cap./day ppu = **4**
Infiltration i: **0.19** L/s/ha
(as per MOE Guidelines use 0.19 for sewer design & 0.04 (avg) - 0.11 (peak) for PS/STS)
Mannings Coefficient n: **0.013**

Date: 19-Jul-22
Project No: 09-062
Prepared by: JB

Location			Sewage Flow Calculation Data															Sewer Calculation Data					Sewer Profile Data					
Street	Upstream MH	Downstream MH	Res - SFD # of Units	Res - SFD # of People	Res - MFD # of Units	Res - MFD # of People	Comm/Inst Total Daily Flow (L/day)	Industrial Total Daily Flow (L/day)	Cum. Res - SFD # of People	Cum. Res - MFD # of People	Cum. Comm/Inst Total Daily Flow (L/day)	Cum. Industrial Total Daily Flow (L/day)	Residential Peaking Factor	Sewage Flow (L/s)	Infiltration Individual Area (ha)	Infiltration Cumulative Area (ha)	Infiltration Flow (L/s)	Total Flow (L/s)	Dia. (mm)	Slope (%)	Length (m)	Capacity (L/s)	Velocity (m/s)	Fall in Sewer (m)	Drop in MH (m) DS	Top of Grate Elevation (m) US	Top of Grate Elevation (m) DS	Invert Elevation (m) US	Invert Elevation (m) DS
Cul De Sac Private Rd	**MH K**	**MH J**		0	**7**	28			0	28	0	0	4.36	0.39	**0.65**	0.65	0.12	0.51	**200**	**1.40**	**38.8**	40.49	1.25	0.54	**0.05**	**201.45**	200.95	198.50	197.96
	MH J	**MH I**		0	**23**	92			0	120	0	0	4.22	1.61	**1.39**	2.04	0.39	2.00	**200**	**2.90**	**90.0**	58.27	1.80	2.61	**0.50**	**200.95**	198.29	197.91	195.30
	MH I	**MH H**		0	**3**	12			0	132	0	0	4.21	1.77	**0.30**	2.34	0.44	2.21	**200**	**5.08**	**17.8**	77.12	2.38	0.90	**0.50**	**198.29**	196.85	194.80	193.90
	MH H	**MH G**		0	**0**	0			0	132	0	0	4.21	1.77	**0.39**	2.73	0.52	2.29	**200**	**17.80**	**7.3**	144.36	4.45	1.30	**0.50**	**196.85**	195.05	193.40	192.10
	MH G	**MH F**		0	**7**	28			0	160	0	0	4.18	2.13	**1.19**	3.92	0.74	2.87	**200**	**64.50**	**8.6**	274.80	8.47	5.55	**0.05**	**195.05**	189.02	191.60	186.05
	MH F	**MH D**		0	**21**	84			0	244	0	0	4.12	3.20	**0.47**	4.39	0.83	4.03	**200**	**106.60**	**1.4**	353.28	10.89	1.50	**0.05**	**189.02**	187.70	186.00	184.50
Private Rd (West)	**MH E**	**MH D**		0	**11**	44			0	44	0	0	4.33	0.61	**0.28**	0.28	0.05	0.66	**200**	**1.00**	**49.8**	34.22	1.06	0.50	**0.05**	**187.95**	187.70	185.00	184.50
Beck Blvd	**MH D**	**MH A**		0	**0**	0			0	288	0	0	4.09	3.75	**0.12**	4.79	0.91	4.66	**200**	**0.53**	**57.2**	24.91	0.77	0.30	**0.05**	**187.70**	188.44	184.45	184.15
Private Rd (West)	**MH B**	**MH A**		0	**5**	20			0	20	0	0	4.38	0.28	**0.20**	0.20	0.04	0.32	**200**	**2.08**	**47.2**	49.35	1.52	0.98	**0.05**	**188.13**	188.44	185.13	184.15
Private Rd (East)	**MH C**	**MH A**		0	**11**	44			0	44	0	0	4.33	0.61	**1.49**	1.49	0.28	0.89	**200**	**1.23**	**99.7**	37.95	1.17	1.23	**0.05**	**188.83**	188.44	185.38	184.15
Beck Blvd	**MH A**	**EX MH EE**		0	**0**	0			0	352	0	0	4.05	4.54	**0.31**	6.79	1.29	5.83	**200**	**1.74**	**26.9**	45.13	1.39	0.47	**0.05**	**188.44**	**187.53**	184.10	**183.63**
		Individual Totals:	0		352	0	0								6.79														
		Cumulative # of People (SFD + MFD):	352																										

NOTES: - # of people for the Multi-Family Residential Dwellings (Townhouses, apartments, etc.) is calculated based on # of units x population density (people per unit = 4).
- # of people for the Single-Family Residential Dwellings is calculated based on # of dwellings x population density (people per dwelling).

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Storm Sewer Design Sheet
Queen's Court Homes

<<< **Elements Requiring Input Information**

Rational Method Calculation:

Q = 2.78*(C_F*C*I*A)

where,

Q = peak flow rate (L/s)
C_F = runoff coefficient factor for storms **> 10-yr**
C = runoff coefficient
I = rainfall intensity (mm/hr)
A = area (ha)

(C_F = 1.0 for the 2, 5 & 10-yr storm events and C_F = 1.1, 1.2 & 1.25 for the 25, 50 & 100-yr storm events respectively)

Manning's Formula Calculation:

$V = (k*R^{2/3}*S^{1/2}) / n$ Q = V*A

MOE Velocity Requirements: 0.8m/s - 6.0m/s

where,

V = mean velocity (m/s)
k = 1.0 for SI units
R = hydraulic radius (m)
S = friction slope (m/m)
n = Mannings Coefficient **0.013**

Rainfall Intensity Calculation:

$I = A*T^B$ Rainfall IDF Data: http://www.mto.gov.on.ca/IDF_Curves/terms.shtml

where,

I = Rainfall Intensity (mm/hr)
T = Time of Concentration (hr)
A = Rainfall IDF Coefficient
B = Rainfall IDF Coefficient

	5-year	100-year
A =	**28.0**	**46.9**
B =	**-0.699**	**-0.699**
Runoff Coeff. Factors, C_F =	1.00	1.25

Date: 19-Jul-22
Project No: 09-062
Prepared by: JB

Location			Runoff Calculation Data										Sewer Calculation Data							Sewer Profile Data					
Street	Upstream MH	Downstream MH	Drainage Areas (ha) C = 0.20	C = 0.40	C = 0.65	C = 0.75	Individual 2.78CA	Accumulated 2.78CA	Time of Concentration (mins)	Storm Event	Rainfall Intensity (mm/hr)	Peak Runoff Flow (L/s)	Diameter (mm)	Slope (%)	Length (m)	Capacity (L/s)	Velocity (m/s)	Pipe Flow Time (mins)	Pipe Storage Volume (m^3)	Fall in Sewer (m)	Drop in MH (m) DS	Top of Grate Elevation (m) US	Top of Grate Elevation (m) DS	Invert Elevation (m) US	Invert Elevation (m) DS
CUL DE SAC RD	**CBMH 13**	**CBMH 12**	**0.15**		**0.57**		1.11	1.11	**10.00**	**5-year**	97.97	109.08	**300**	**2.50**	**49.80**	159.51	2.19	0.38	3.6	1.25	**0.05**	**200.68**	199.41	199.06	197.81
	CBMH 12	**MH 11**	**0.16**		**0.39**		0.79	1.91	10.38	**5-year**	95.45	182.03	**375**	**3.00**	**47.10**	316.81	2.78	0.28	5.4	1.41	**0.10**	**199.41**	198.22	197.76	196.35
	MH 11	**CBMH 10**	**0.00**				0.00	1.91	10.66	**5-year**	93.67	178.64	**375**	**8.00**	**17.70**	517.35	4.54	0.07	2.0	1.42	**0.40**	**198.22**	196.78	196.25	194.83
	CBMH 10	**MH 9**	**0.25**		**0.55**		1.13	3.04	10.73	**5-year**	93.28	283.56	**375**	**9.00**	**16.40**	548.73	4.81	0.06	1.9	1.48	**0.40**	**196.78**	194.98	194.43	192.95
	MH 9	**CBMH 8**	**0.00**				0.00	3.04	10.78	**5-year**	92.93	282.51	**375**	**8.50**	**63.70**	533.27	4.68	0.23	7.3	5.41	**0.05**	**194.98**	188.95	192.55	187.14
PRIVATE RD EAST	**CBMH 8**	**CBMH 7**	**0.83**	**0.72**			1.26	4.30	11.01	**5-year**	91.59	394.03	**600**	**0.80**	**90.70**	572.93	1.96	0.77	26.5	0.73	**0.05**	**188.95**	187.66	187.09	186.36
	CBMH 7	**MH 4**				**0.49**	1.02	5.32	11.78	**5-year**	87.36	465.10	**600**	**0.60**	**10.20**	496.18	1.70	0.10	3.0	0.06	**0.05**	**187.66**	187.70	186.31	186.25
PRIVATE RD EAST	**CBMH 15**	**MH 6**	**0.90**			**0.53**	1.61	1.61	**10.00**	**5-year**	97.97	157.28	**450**	**0.50**	**10.00**	210.32	1.28	0.13	1.6	0.05	**0.05**	**188.30**	188.30	186.64	186.59
BECK BLVD	**MH 6**	**MH 4**	**0.00**				0.00	1.61	10.13	**5-year**	97.09	155.87	**450**	**0.50**	**57.30**	210.32	1.28	0.75	9.4	0.29	**0.05**	**188.30**	187.70	186.54	186.25
PRIVATE RD WEST	**CBMH 14**	**MH 4**				**0.10**	0.21	0.21	**10.00**	**5-year**	97.97	20.43	**300**	**0.50**	**18.80**	71.33	0.98	0.32	1.4	0.09	**0.05**	**187.80**	187.70	186.34	186.25
BECK BLVD	**MH 4**	**CBMH 3**	**0.00**				0.00	7.14	11.88	**5-year**	86.85	619.90	**750**	**0.50**	**31.50**	821.24	1.80	0.29	14.4	0.16	**0.05**	**187.70**	187.43	186.20	186.04
	CBMH 3	**CBMH 2**				**0.52**	1.08	8.22	12.17	**5-year**	85.39	702.06	**750**	**0.50**	**8.50**	821.24	1.80	0.08	3.9	0.04	**0.05**	**187.43**	187.43	185.99	185.95
	CBMH 2	**MH 1**	**0.00**				0.00	8.22	12.25	**5-year**	85.01	698.90	**750**	**0.50**	**10.70**	821.24	1.80	0.10	4.9	0.05	**0.05**	**187.43**	187.35	185.90	185.85
	MH 1	**SWM HEADWALL**	**0.00**				0.00	8.22	12.35	**5-year**	84.53	694.98	**750**	**0.41**	**24.20**	743.67	1.63	0.25	11.0	0.10	**0.05**	**187.35**	**187.30**	185.80	**185.70**

Sum of Drainage Areas (ha):	2.29	0.72	1.51	1.64
Total Drainage Area (ha):	6.16			

NOTES:

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TOTAL DAILY DOMESTIC WATER SUPPLY FLOW CALCULATIONS
221 Fox St.

Date: 19-Jul-22 **Project No.:** 09-062

Project: 221 Fox St. **Prepared By:** CJ

<<< **Elements Requiring Input Information**

Total Daily Design Flow Calculations

References: - Ontario Building Code (OBC), 2012, Division B, Part 8, Table 8.2.1.3.A. Residential Occupancy & Table 8.2.1.3.B. Other Occupancies
- Ministry of the Environment (MOE), Design Guidelines for Drinking-Water Systems (2008), Chapter 3

Proposed Condition:

Establishment:	# of people	# of water closets	# of fuel outlets	# of seats	Gross Floor Area (m^2)	Land Area (ha)	Total Daily Design Volume		Avg Day Demand ADD (L/s)	Max Day Demand MDD (L/s)	Peak Hourly Demand PHD (L/s)
								Peaking Factor =	**1.5**	**3**	
Residential Uses:											
Townhouses (88 units @ 3 bedrooms/unit)*	**528**						**275**	L/person	1.68	4.86	7.21
								L/person	0.00	0.00	0.00
Subtotal =	**528**								**1.68**	**4.86**	**7.21**
Refer to Table 3-1 and/or Table 3.3 of the MOE Design Guidelines for Drinking-Water Systems (2008) >>>								**Peaking Factor =**	**2.89**	**4.29**	

Notes:
***** - # of people for the Multi-Family Residential Dwellings (Townhouses, apartments, etc.) is calculated based on # of units x # of bedrooms x 2 people per bedroom.

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FIRE PROTECTION WATER STORAGE
DESIGN CALCULATIONS

Date: 19-Jul-22 **Project No.:** 09-062

Project: 221 Fox St. **Prepared By:** CJ

<<< Elements Requiring Input Information

Fire Protection Water Storage

Reference: Office of the Fire Marshal, OFM Guideline, Fire Protection Water Supply Guideline for Part 3 in the Ontario Building Code (OBC), October 1999
Subsection 3.2.2 of the Ontario Building Code, 2012

Calculate $Q=KVS_{TOTAL}$

Building Classification:

The proposed residential units are Group 'C', residential occupancies
It has been assumed that the building will be constructed with combustible materials and in accordance with Subsection 3.2.2. of the OBC.

Therefore, based on Table 1 of OBC A.3.2.5.7., Water Supply Coefficient, K:

K = 23

Approximate Building Volume:

(All space below and above grade within the building, measured to the underside of the roof deck, including basements and crawl spaces.)

V = Area x Height (2 storey townouse bldg. based on typ. storey height of 2.60m)
+ Roof Volume

= **661.85** m^2 x **2.6** m x **2** stories
+ **427.4** m^3 roof volume (6.2m x 15.25m footprint x 7 units; 5:12 pitch gable roof)

V = 3869.1 m^3

Approximate Exposure Distance From Proposed Buildings To:

(Exposure distances from a new building are measured from the exterior building faces to the property lines of the building. When facing a street, the property line shall be deemed to be the center of the street. When facing an existing building (exceeding 10 m^2 in building area) on the same property, the exposure distance shall be the greater of either the "limiting distance" of the new building face as obtained from Sentence 3.2.3.1.(1) of the Building Code, or the mid-point between the two buildings.)

West to P/L >=	**13.0**	m
North to bldg =	**3.0**	m
East to C/L=	**11.0**	m
South to P/L >=	**7.0**	m

from Figure 1 (OBC, A.3.2.5.7.)

S_W =	0
S_N =	0.5
S_E =	0
S_S =	0

(no unprotected openings on south side of proposed building)

S_{TOTAL} = 1 + (S_W + S_N +S_E + S_S)
= 1 + 0.5
S_{TOTAL} = 1.5 (max. allowable is 2.0)

Minimum Water Supply,

$Q = KVS_{TOTAL}$
= 23 x 3869.1 x 1.5
Q = 133,483 L

where, Q = Minimum Water Supply (L)
K = Water Supply Coefficient
V = Building Volume (m^3)
S_{TOTAL} = Total Spatial Coefficient

Check

Q_{CHECK} = 3600 L/min x 30 min
Q_{CHECK} = 108,000 L

Q_{TOTAL} = greater of Q & Q_{CHECK}

Q_{TOTAL} = 133,483 L

Required Minimum Water Supply Flow Rate = 3600L/min (Q>108000L and < 135000L)

Minimum Water Supply Flow Rate:

From Table 2, Required Minimum Water Supply Flow Rate (L/min), provided in the OBC A.3.2.5.7.,

Flow Rate = 3600 L/min
60 L/s

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Watermain Headloss Calculations
221 Fox Street, Penetanguishene

<<< **Elements Requiring Input Information**

Velocity, $V = \frac{Q}{A}$ (m/s)

where, Q = Flow (m^3/s)
A = Cross-Sectional Area (m^2)

Minor Head Loss, $H_L = (K_1+K_2+K_3...) \times V^2/2g$

where, $\sum K = (K_1+K_2+K_3...)$
V = mean velocity (m/s)
g = 9.81 (acceleration due to gravity, m/s^2)

Hazen -Williams Equation (re-arranged for Friction Slope)
(Friction Head Loss Calculation)

Friction Slope, $S = \frac{(V)^{1/0.54}}{(0.85CR^{0.63})^{1/0.54}} \times 100$ (m/100m)

where, V = mean velocity (m/s)
k = 0.85 for SI units
C = Roughness Coefficient
R = hydraulic radius (m)

Total Head Loss = Friction Head Loss + Minor Head Loss

Pressure (psi) = Pressure Head (m) x 1.422

Total HGL = Ground Elev. + Pressure Head

Date: 19-Jul-22
Project No: 09-062
Prepared by: CJ

Description	Pipe Design Coefficient C	Forcemain						Sum of Minor Loss Coeff. ∑K=	Minor Head Loss (m)	Total Head Loss (m)	Total Pressure Loss (psi)	Pressure @ Pt. A (psi)	Pressure Head @ Pt. A (m)	Ground Elev. @ Pt. A (m)	Total HGL @ Pt. A (m)	Ground Elev. @ Pt. B (m)	Total HGL @ Pt. B (m)	Pressure Head @ Pt. B (m)	Pressure @ Pt. B (psi)
		Flow (L/s)	Diameter (mm)	Velocity (m/s)	Unit Friction Head Loss (m/100m)	Distance (m)	Friction Head Loss (m)												
Fox Street	**110**	**64.86**	**200**	2.06	2.83	**595.00**	16.82	**1.80**	0.39	17.21	24.47	**70**	49.23	**186.15**	235.38	**201.40**	218.17	16.77	**23.84**

NOTES: **- Loss Coefficient** **5 - Valves @ K=0.12**
1 - 90ø Tee @ K=0.80
1- 45ø Elbow @ K=0.40

- Refer to the Total Daily Domestic Water Supply Flow calcvulations for flows.
- 70psi was the pressure used which was the lower value of the results from the fire hydrant testing, as provided by the municipality.
- Using the OFM Guideline (OFM-TG-03-1999) for fire protection water supply guideline a required flow of 60L/s plus the max day demand (MDD) of 4.86L/s was used to size the proposed watermain.

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119 Collier Street, Barrie, Ontario L4M 1H5
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RUNOFF COEFFICIENT CALCULATIONS
"C" SPREADSHEET

Date: 19-Jul-22 **Project No.:** 09-062

Project: 221 Fox St. **Prepared By:** CJ

RUNOFF COEFFICIENT NUMBERS

Land Cover		Hydrologic Soil Groups		
		A-AB	B-BC	C-D
Cultivated Land	0 - 5% grade	0.22	0.35	0.55
	5 - 10% grade	0.3	0.45	0.6
	10 - 30% grade	0.4	0.65	0.7
Pasture Land	0 - 5% grade	0.1	0.28	0.4
	5 - 10% grade	0.15	0.35	0.45
	10 - 30% grade	0.22	0.4	0.55
Woodlot or Cutover	0 - 5% grade	0.08	0.25	0.35
	5 - 10% grade	0.12	0.3	0.42
	10 - 30% grade	0.18	0.35	0.52
Lakes and Wetlands		0.05	0.05	0.05
Impervious Area	(i.e. buildings, roads, parking lot, etc.)	0.95	0.95	0.95
Gravel	(not used for proposed parking or storage areas)	0.4	0.5	0.6
Residential	Single Family	0.3	0.4	0.5
	Multiple (i.e. semi, townhouse, apartment, etc.)	0.5	0.6	0.7
Industrial	Light	0.55	0.65	0.75
	Heavy	0.65	0.75	0.85
Commercial		0.6	0.7	0.8
Unimproved Areas		0.1	0.2	0.3
Lawn	< 2% grade	0.05	0.11	0.17
	2 - 7% grade	0.1	0.16	0.22
	> 7% grade	0.15	0.25	0.35

Ref: Runoff Coefficient Numbers - Adapted from Design Chart 1.07, Ontario Ministry of Transportation, "MTO Drainage Management Manual", MTO. (1997)

<<< **Elements Requiring Input Information**

PRE-DEVELOPMENT CONDITION - PRE (existing)

Land Cover		Hydrologic Soil Groups		
		A-AB	B-BC	C-D
Cultivated Land	0 - 5% grade			
	5 - 10% grade			
	10 - 30% grade			
Pasture Land	0 - 5% grade			
	5 - 10% grade			
	10 - 30% grade			
Woodlot or Cutover	0 - 5% grade	11.02		
	5 - 10% grade	11.02		
	10 - 30% grade			
Lakes and Wetlands				
Impervious Area	(i.e. buildings, roads, parking lot, etc.)	1.17		
Gravel	(not used for proposed parking or storage areas)			
Residential	Single Family			
	Multiple (i.e. semi, townhouse, apartment, etc.)			
Industrial	Light			
	Heavy			
Commercial				
Unimproved Areas				
Lawn	< 2% grade			
	2 - 7% grade			
	> 7% grade			

Total Area (ha) = 23.20 **Runoff Coefficient, C =** **0.14**

PRE-DEVELOPMENT CONDITION - EXT

Land Cover		Hydrologic Soil Groups		
		A-AB	B-BC	C-D
Cultivated Land	0 - 5% grade			
	5 - 10% grade			
	10 - 30% grade			
Pasture Land	0 - 5% grade			
	5 - 10% grade			
	10 - 30% grade			
Woodlot or Cutover	0 - 5% grade			
	5 - 10% grade			
	10 - 30% grade			
Lakes and Wetlands				
Impervious Area	(i.e. buildings, roads, parking lot, etc.)	1.54		
Gravel	(not used for proposed parking or storage areas)			
Residential	Single Family			
	Multiple (i.e. semi, townhouse, apartment, etc.)			
Industrial	Light			
	Heavy			
Commercial				
Unimproved Areas				
Lawn	< 2% grade			
	2 - 7% grade	4.6		
	> 7% grade			

Total Area (ha) = 6.14 **Runoff Coefficient, C =** **0.31**

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RUNOFF COEFFICIENT CALCULATIONS
"C" SPREADSHEET

Date: 19-Jul-22 **Project No.:** 09-062

Project: 221 Fox St. **Prepared By:** CJ

RUNOFF COEFFICIENT NUMBERS

Land Cover		Hydrologic Soil Groups		
		A-AB	B-BC	C-D
Cultivated Land	0 - 5% grade	0.22	0.35	0.55
	5 - 10% grade	0.3	0.45	0.6
	10 - 30% grade	0.4	0.65	0.7
Pasture Land	0 - 5% grade	0.1	0.28	0.4
	5 - 10% grade	0.15	0.35	0.45
	10 - 30% grade	0.22	0.4	0.55
Woodlot or Cutover	0 - 5% grade	0.08	0.25	0.35
	5 - 10% grade	0.12	0.3	0.42
	10 - 30% grade	0.18	0.35	0.52
Lakes and Wetlands		0.05	0.05	0.05
Impervious Area	(i.e. buildings, roads, parking lot, etc.)	0.95	0.95	0.95
Gravel	(not used for proposed parking or storage areas)	0.4	0.5	0.6
Residential	Single Family	0.3	0.4	0.5
	Multiple (i.e. semi, townhouse, apartment, etc.)	0.5	0.6	0.7
Industrial	Light	0.55	0.65	0.75
	Heavy	0.65	0.75	0.85
Commercial		0.6	0.7	0.8
Unimproved Areas		0.1	0.2	0.3
Lawn	< 2% grade	0.05	0.11	0.17
	2 - 7% grade	0.1	0.16	0.22
	> 7% grade	0.15	0.25	0.35

Ref: Runoff Coefficient Numbers - Adapted from Design Chart 1.07, Ontario Ministry of Transportation, "MTO Drainage Management Manual", MTO. (1997)

<<< **Elements Requiring Input Information**

CATCHMENT AREA 101

Land Cover		Hydrologic Soil Groups		
		A-AB	B-BC	C-D
Cultivated Land	0 - 5% grade			
	5 - 10% grade			
	10 - 30% grade			
Pasture Land	0 - 5% grade			
	5 - 10% grade			
	10 - 30% grade			
Woodlot or Cutover	0 - 5% grade	0.73		
	5 - 10% grade	0.73		
	10 - 30% grade			
Lakes and Wetlands		0.44		
Impervious Area	(i.e. buildings, roads, parking lot, etc.)	1.47		
Gravel	(not used for proposed parking or storage areas)			
Residential	Single Family			
	Multiple (i.e. semi, townhouse, apartment, etc.)			
Industrial	Light			
	Heavy			
Commercial				
Unimproved Areas				
Lawn	< 2% grade			
	2 - 7% grade	1.28		
	> 7% grade			

Total Area (ha) = 4.65 **Runoff Coefficient, C =** **0.36**

CATCHMENT AREA 102

Land Cover		Hydrologic Soil Groups		
		A-AB	B-BC	C-D
Cultivated Land	0 - 5% grade			
	5 - 10% grade			
	10 - 30% grade			
Pasture Land	0 - 5% grade			
	5 - 10% grade			
	10 - 30% grade			
Woodlot or Cutover	0 - 5% grade	2.87		
	5 - 10% grade	2.87		
	10 - 30% grade			
Lakes and Wetlands		0.40		
Impervious Area	(i.e. buildings, roads, parking lot, etc.)	0.18		
Gravel	(not used for proposed parking or storage areas)			
Residential	Single Family			
	Multiple (i.e. semi, townhouse, apartment, etc.)			
Industrial	Light			
	Heavy			
Commercial				
Unimproved Areas				
Lawn	< 2% grade			
	2 - 7% grade	0.27		
	> 7% grade			

Total Area (ha) = 6.58 **Runoff Coefficient, C =** **0.12**

CATCHMENT AREA 103

Land Cover		Hydrologic Soil Groups		
		A-AB	B-BC	C-D
Cultivated Land	0 - 5% grade			
	5 - 10% grade			
	10 - 30% grade			
Pasture Land	0 - 5% grade			
	5 - 10% grade			
	10 - 30% grade			
Woodlot or Cutover	0 - 5% grade			
	5 - 10% grade			
	10 - 30% grade			
Lakes and Wetlands				
Impervious Area	(i.e. buildings, roads, parking lot, etc.)	0.01		
Gravel	(not used for proposed parking or storage areas)			
Residential	Single Family			
	Multiple (i.e. semi, townhouse, apartment, etc.)			
Industrial	Light			
	Heavy			
Commercial				
Unimproved Areas				
Lawn	< 2% grade			
	2 - 7% grade			
	> 7% grade	0.15		

Total Area (ha) = 0.16 **Runoff Coefficient, C =** **0.20**

EXTERNAL AREA - EXT1a

Land Cover		Hydrologic Soil Groups		
		A-AB	B-BC	C-D
Cultivated Land	0 - 5% grade			
	5 - 10% grade			
	10 - 30% grade			
Pasture Land	0 - 5% grade			
	5 - 10% grade			
	10 - 30% grade			
Woodlot or Cutover	0 - 5% grade			
	5 - 10% grade	1.19		
	10 - 30% grade			
Lakes and Wetlands				
Impervious Area	(i.e. buildings, roads, parking lot, etc.)	0.26		
Gravel	(not used for proposed parking or storage areas)			
Residential	Single Family			
	Multiple (i.e. semi, townhouse, apartment, etc.)			
Industrial	Light			
	Heavy			
Commercial				
Unimproved Areas				
Lawn	< 2% grade			
	2 - 7% grade			
	> 7% grade	0.93		

Total Area (ha) = 2.38 **Runoff Coefficient, C =** **0.22**

EXTERNAL AREA - EXT1b

Land Cover		Hydrologic Soil Groups		
		A-AB	B-BC	C-D
Cultivated Land	0 - 5% grade			
	5 - 10% grade			
	10 - 30% grade			
Pasture Land	0 - 5% grade			
	5 - 10% grade			
	10 - 30% grade			
Woodlot or Cutover	0 - 5% grade			
	5 - 10% grade	2.69		
	10 - 30% grade			
Lakes and Wetlands				
Impervious Area	(i.e. buildings, roads, parking lot, etc.)	0.48		
Gravel	(not used for proposed parking or storage areas)			
Residential	Single Family			
	Multiple (i.e. semi, townhouse, apartment, etc.)			
Industrial	Light			
	Heavy			
Commercial				
Unimproved Areas				
Lawn	< 2% grade			
	2 - 7% grade			
	> 7% grade	2.22		

Total Area (ha) = 5.39 **Runoff Coefficient, C =** **0.21**

EXTERNAL AREA - EXT3

Land Cover		Hydrologic Soil Groups		
		A-AB	B-BC	C-D
Cultivated Land	0 - 5% grade			
	5 - 10% grade			
	10 - 30% grade			
Pasture Land	0 - 5% grade			
	5 - 10% grade			
	10 - 30% grade			
Woodlot or Cutover	0 - 5% grade	1.69		
	5 - 10% grade			
	10 - 30% grade			
Lakes and Wetlands				
Impervious Area	(i.e. buildings, roads, parking lot, etc.)	0.64		
Gravel	(not used for proposed parking or storage areas)			
Residential	Single Family			
	Multiple (i.e. semi, townhouse, apartment, etc.)			
Industrial	Light			
	Heavy			
Commercial				
Unimproved Areas				
Lawn	< 2% grade	1.69		
	2 - 7% grade			
	> 7% grade			

Total Area (ha) = 4.02 **Runoff Coefficient, C =** **0.21**

WMI & Associates Limited
119 Collier Street, Barrie, Ontario L4M 1H5
p (705) 797-2027 f (705) 797-2028

TIME OF CONCENTRATION & TIME TO PEAK CALCULATIONS
T_C & T_P SPREADSHEET

Date: 19-Jul-22 **Project No.:** 09-062

Project: 221 Fox Street **Prepared By:** CJ

OVERLAND SHEET FLOW TIME OF CONCENTRATION (T_C) CALCULATION, $T_{C, OVER}$

The Runoff Coefficient 'C' governs which Time of Concentration Formula is used: C > 0.40 Bransby Williams Formula
C <= 0.40 Airport Formula (FAA Equation)

Ref: MTO, Drainage Management Manual, pg 28, Ch. 8, 1997

<<< **Elements Requiring Input Information**

Catchment I.D.	Area (ha)	h_1 (m)	h_2 (m)	Length (m)	Runoff Coefficient	h_{DELTA} (m)	Slope (%)	$T_{C, OVER}$ (min.) Airport Formula	$T_{C, OVER}$ (min.) Bransby Williams Formula
*PRE (a)	11.60	188	182	330	0.14	6.0	1.8	46.7	
*PRE (b)	11.60	216	188	270	0.14	28.0	10.4	23.8	

Airport Formula (FAA Equation)

$$T_{C, OVER} = \frac{3.26\ (1.1\text{-}C)\ (L)^{0.5}}{(S)^{0.33}} \quad \text{(min.)}$$

where, C = Runoff Coefficient
L = Length of Overland Flow Path, (m)
S = Avg. Slope of Overland Flow Path, (%)

Bransby Williams Formula

$$T_{C, OVER} = \frac{0.057\ (L)}{(S)^{0.2}\ (A)^{0.1}} \quad \text{(min.)}$$

where, L = Length of Overland Flow Path, (m)
S = Avg. Slope of Overland Flow Path, (%)
A = Catchment Area, (ha)

CHANNELIZED FLOW TIME OF CONCENTRATION (T_C) CALCULATION, $T_{C, CHAN}$

Refer to separate sheet attached for the calculation of the Velocity values (i.e. Flow Master Output, Manning's Channel Spreadsheet, etc.).

Catchment I.D.	Length (m)	Velocity (m/s)	$T_{C, CHAN}$ (min.)

$$T_{C, CHAN} = \frac{L}{V} \quad \text{(min.)}$$

where, L = Length of Channel, (m)
V = Flow Velocity in Channel, (m/s)

PIPED FLOW TIME OF CONCENTRATION (T_C) CALCULATION, $T_{C, PIPE}$

Refer to separate sheet attached for the calculation of the Velocity values (i.e. Culvert Master Output, Manning's Pipe Spreadsheet, etc.).

Catchment I.D.	Length (m)	Velocity (m/s)	$T_{C, PIPE}$ (min.)

$$T_{C, PIPE} = \frac{L}{V} \quad \text{(min.)}$$

where, L = Length of Pipe, (m)
V = Flow Velocity in Pipe, (m/s)

TOTAL TIME OF CONCENTRATION (T_C) AND TIME TO PEAK (T_P) CALCULATION, $T_{C, TOTAL}$, $T_{P, TOTAL}$

The Total Time of Concentration and Time to Peak values consist of a combination of the Overland, Channel and/or Pipe travel times.

Catchment I.D.	$T_{C, OVER}$ (min.)	$T_{C, CHAN}$ (min.)	$T_{C, PIPE}$ (min.)	$T_{C, TOTAL}$ (min.)	$T_{P, TOTAL}$ (min.)	$T_{P, TOTAL}$ (hr.)
PRE (a)	46.7			**46.7**	**31.3**	**0.521**
PRE (b)	23.8			**23.8**	**15.9**	**0.266**

$$T_{C, TOTAL} = T_{C, OVER} + T_{C, CHAN} + T_{C, PIPE} \quad \text{(min.)}$$

$$T_{P, TOTAL} = 0.67 \times T_{C, TOTAL} \quad \text{(min.)}$$

*Note: The flow paths for the pre-development catchments have been broken up into 2 segments - (a) representing the shallow section, and (b) representing the steep section, to give a more realistic Tc Value.

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119 Collier Street, Barrie, Ontario L4M 1H5
p (705) 797-2027 f (705) 797-2028

TIME OF CONCENTRATION & TIME TO PEAK CALCULATIONS
T_C & T_P SPREADSHEET

Date: 19-Jul-22 **Project No.:** 09-062

Project: 221 Fox St. **Prepared By:** CJ

OVERLAND SHEET FLOW TIME OF CONCENTRATION (T_C) CALCULATION, $T_{C, OVER}$

The Runoff Coefficient 'C' governs which Time of Concentration Formula is used: C > 0.40 Bransby Williams Formula
C <= 0.40 Airport Formula (FAA Equation)
Ref: MTO, Drainage Management Manual, pg 28, Ch. 8, 1997

<<< **Elements Requiring Input Information**

Catchment I.D.	Area (ha)	h_1 (m)	h_2 (m)	Length (m)	Runoff Coefficient	h_{DELTA} (m)	Slope (%)	$T_{C, OVER}$ (min.) Airport Formula	$T_{C, OVER}$ (min.) Bransby Williams Formula
EXT1a	2.38	224	187	220	0.22	37.0	16.8	16.8	
EXT1b	5.39	215.75	187	355	0.21	28.8	8.1	27.4	
EXT3	4.02	187.5	186.25	150	0.21	1.3	0.8	37.7	
102	6.58	198.5	188	240	0.12	10.5	4.4	30.4	
103	0.16	188.77	187.25	6	0.20	1.5	25.3	2.5	

Airport Formula (FAA Equation)

$$T_{C, OVER} = \frac{3.26\,(1.1-C)\,(L)^{0.5}}{(S)^{0.33}} \text{ (min.)}$$

where, C = Runoff Coefficient
L = Length of Overland Flow Path, (m)
S = Avg. Slope of Overland Flow Path, (%)

Bransby Williams Formula

$$T_{C, OVER} = \frac{0.057\,(L)}{(S)^{0.2}\,(A)^{0.1}} \text{ (min.)}$$

where, L = Length of Overland Flow Path, (m)
S = Avg. Slope of Overland Flow Path, (%)
A = Catchment Area, (ha)

CHANNELIZED FLOW TIME OF CONCENTRATION (T_C) CALCULATION, $T_{C, CHAN}$

Refer to separate sheet attached for the calculation of the Velocity values (i.e. Flow Master Output, Manning's Channel Spreadsheet, etc.).

Catchment I.D.	Length (m)	Velocity (m/s)	$T_{C, CHAN}$ (min.)
EXT1a			
EXT1b			
EXT3	240	0.8	5.0
103	50	1.1	0.8

$$T_{C, CHAN} = \frac{L}{V} \text{ (min.)}$$

where, L = Length of Channel, (m)
V = Flow Velocity in Channel, (m/s)

PIPED FLOW TIME OF CONCENTRATION (T_C) CALCULATION, $T_{C, PIPE}$

Refer to separate sheet attached for the calculation of the Velocity values (i.e. Culvert Master Output, Manning's Pipe Spreadsheet, etc.).

Catchment I.D.	Length (m)	Velocity (m/s)	$T_{C, PIPE}$ (min.)
EXT1a	210	0.9	3.9
EXT1b	370	0.9	6.9
EXT3			
102	370	0.9	6.9

$$T_{C, PIPE} = \frac{L}{V} \text{ (min.)}$$

where, L = Length of Pipe, (m)
V = Flow Velocity in Pipe, (m/s)

TOTAL TIME OF CONCENTRATION (T_C) AND TIME TO PEAK (T_P) CALCULATION, $T_{C, TOTAL}$, $T_{P, TOTAL}$

The Total Time of Concentration and Time to Peak values consist of a combination of the Overland, Channel and/or Pipe travel times.

Catchment I.D.	$T_{C, OVER}$ (min.)	$T_{C, CHAN}$ (min.)	$T_{C, PIPE}$ (min.)	$T_{C, TOTAL}$ (min.)	$T_{P, TOTAL}$ (min.)	$T_{P, TOTAL}$ (hr.)
EXT1a	16.8		3.9	**20.7**	**13.9**	**0.231**
EXT1b	27.4		6.9	**34.3**	**23.0**	**0.383**
EXT3	37.7	5.0		**42.7**	**28.6**	**0.477**
102	30.4		6.9	**37.3**	**25.0**	**0.417**
103	2.5	0.8		**3.3**	**2.2**	**0.037**

$$T_{C, TOTAL} = T_{C, OVER} + T_{C, CHAN} + T_{C, PIPE} \text{ (min.)}$$

$$T_{P, TOTAL} = 0.67 \times T_{C, TOTAL} \text{ (min.)}$$

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119 Collier Street, Barrie, Ontario L4M 1H5
p (705) 797-2027 f (705) 797-2028

CURVE NUMBER & INITIAL ABSTRACTION CALCULATIONS
CN & IA SPREADSHEET

Date: 19-Jul-22 **Project No.:** 09-062

Project: 221 Fox St. **Prepared By:** CJ

SCS CURVE NUMBERS (AMC II (NORMAL) CONDITION)

INITIAL RAINFALL ABSTRACTION

	Hydrologic Soil Groups							IA
Land Cover	**A**	**AB**	**B**	**BC**	**C**	**CD**	**D**	**(mm)**
Wetlands/Lakes/SWMF's	50	50	50	50	50	50	50	
Woods	32	46	60	67	73	76	79	10
Meadows	38	51	65	71	76	79	81	8
Pasture/Lawn	49	59	69	74	79	82	84	5
Cultivated	62	68	74	78	82	84	86	7
Impervious Areas	100	100	100	100	100	100	100	2

Ref: SCS Curve Numbers - Adapted from Design Chart 1.09, Ontario Ministry of Transportation, "MTO Drainage Management Manual", MTO.(1997)
Ref: Initial Rainfall Abstraction Values - UNESCO, Manual on Drainage in Urbanized Areas, (1987)
Ref: AMC I & III Condition SCS Curve Number Values - Modern Sewer Design, Third Edition (Canadian), pg. 69, Table 3.6, (1996)

NOTES: - **AMC II Condition** SCS Curve Number values are not applicable to frozen soils or to the period where snowmelt contributes to stormwater runoff.
- **STANDHYD COMMANDS** (Swmhymo) - CN values are based solely on the **pervious surfaces** within the catchment.
- **NASHYD COMMANDS** (Swmhymo) - CN values are based on both the **pervious and impervious surfaces** within the catchment (composite CN value).

<<< **Elements Requiring Input Information**

PRE-DEVELOPMENT CONDITION - PRE (existing)

Area per Land Cover Type and Hydrologic Soil Group

	Hydrologic Soil Groups							**(for Nashyd Command)**	
Land Cover	**A**	**AB**	**B**	**BC**	**C**	**CD**	**D**	**Total Area (ha) =**	23.20
Wetlands/Lakes/SWMF's									
Woods		22.03						**CN(I) =**	30
Meadows								**CN(II) =**	49
Pasture/Lawn								**CN(III) =**	69
Cultivated									
Impervious Areas		1.17						**IA (mm) =**	9.6

PRE-DEVELOPMENT CONDITION - EXT

Area per Land Cover Type and Hydrologic Soil Group

	Hydrologic Soil Groups							**(for Standhyd Command)**	
Land Cover	**A**	**AB**	**B**	**BC**	**C**	**CD**	**D**	**Pervious Area (ha) =**	4.60
Wetlands/Lakes/SWMF's									
Woods								**CN(I) =**	39
Meadows								**CN(II) =**	59
Pasture/Lawn		4.6						**CN(III) =**	77
Cultivated									
Impervious Areas								**IA (mm) =**	5.0

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p (705) 797-2027 f (705) 797-2028

CURVE NUMBER & INITIAL ABSTRACTION CALCULATIONS
CN & IA SPREADSHEET

Date: 19-Jul-22 **Project No.:** 09-062

Project: 221 Fox St. **Prepared By:** CJ

SCS CURVE NUMBERS (AMC II (NORMAL) CONDITION)

	Hydrologic Soil Groups							INITIAL RAINFALL ABSTRACTION
Land Cover	**A**	**AB**	**B**	**BC**	**C**	**CD**	**D**	**IA (mm)**
Wetlands/Lakes/SWMF's	50	50	50	50	50	50	50	
Woods	32	46	60	67	73	76	79	10
Meadows	38	51	65	71	76	79	81	8
Pasture/Lawn	49	59	69	74	79	82	84	5
Cultivated	62	68	74	78	82	84	86	7
Impervious Areas	100	100	100	100	100	100	100	2

Ref: SCS Curve Numbers - Adapted from Design Chart 1.09, Ontario Ministry of Transportation, "MTO Drainage Management Manual", MTO.(1997)
Ref: Initial Rainfall Abstraction Values - UNESCO, Manual on Drainage in Urbanized Areas, (1987)
Ref: AMC I & III Condition SCS Curve Number Values - Modern Sewer Design, Third Edition (Canadian), pg. 69, Table 3.6, (1996)

NOTES: - **AMC II Condition** SCS Curve Number values are not applicable to frozen soils or to the period where snowmelt contributes to stormwater runoff.
- **STANDHYD COMMANDS** (Swmhymo) - CN values are based solely on the **pervious surfaces** within the catchment.
- **NASHYD COMMANDS** (Swmhymo) - CN values are based on both the **pervious and impervious surfaces** within the catchment (composite CN value).

<<< **Elements Requiring Input Information**

CATCHMENT AREA - 101

Area per Land Cover Type and Hydrologic Soil Group

	Hydrologic Soil Groups							(for Standhyd Command)	
Land Cover	**A**	**AB**	**B**	**BC**	**C**	**CD**	**D**	**Pervious Area (ha) =**	3.18
Wetlands/Lakes/SWMF's		0.44							
Woods		1.46						**CN(I) =**	32
Meadows								**CN(II) =**	52
Pasture/Lawn		1.28						**CN(III) =**	71
Cultivated									
Impervious Areas								**IA (mm) =**	6.6

CATCHMENT AREA - 102

Area per Land Cover Type and Hydrologic Soil Group

	Hydrologic Soil Groups							(for Nashyd Command)	
Land Cover	**A**	**AB**	**B**	**BC**	**C**	**CD**	**D**	**Total Area (ha) =**	6.58
Wetlands/Lakes/SWMF's		0.4							
Woods		5.73						**CN(I) =**	29
Meadows								**CN(II) =**	48
Pasture/Lawn		0.27						**CN(III) =**	68
Cultivated									
Impervious Areas		0.18						**IA (mm) =**	9.0

CATCHMENT AREA - 103

Area per Land Cover Type and Hydrologic Soil Group

	Hydrologic Soil Groups							(for Nashyd Command)	
Land Cover	**A**	**AB**	**B**	**BC**	**C**	**CD**	**D**	**Total Area (ha) =**	0.16
Wetlands/Lakes/SWMF's									
Woods								**CN(I) =**	42
Meadows								**CN(II) =**	62
Pasture/Lawn		0.15						**CN(III) =**	79
Cultivated									
Impervious Areas		0.01						**IA (mm) =**	4.8

EXTERNAL AREA - EXT1A

Area per Land Cover Type and Hydrologic Soil Group

	Hydrologic Soil Groups							(for Nashyd Command)	
Land Cover	**A**	**AB**	**B**	**BC**	**C**	**CD**	**D**	**Total Area (ha) =**	2.38
Wetlands/Lakes/SWMF's									
Woods		1.19						**CN(I) =**	37
Meadows								**CN(II) =**	57
Pasture/Lawn		0.93						**CN(III) =**	75
Cultivated									
Impervious Areas		0.26						**IA (mm) =**	7.2

EXTERNAL AREA - EXT1B

Area per Land Cover Type and Hydrologic Soil Group

	Hydrologic Soil Groups							(for Nashyd Command)	
Land Cover	**A**	**AB**	**B**	**BC**	**C**	**CD**	**D**	**Total Area (ha) =**	5.39
Wetlands/Lakes/SWMF's									
Woods		2.69						**CN(I) =**	36
Meadows								**CN(II) =**	56
Pasture/Lawn		2.22						**CN(III) =**	75
Cultivated									
Impervious Areas		0.48						**IA (mm) =**	7.2

EXTERNAL AREA - EXT2

Area per Land Cover Type and Hydrologic Soil Group

	Hydrologic Soil Groups							(for Standhyd Command)	
Land Cover	**A**	**AB**	**B**	**BC**	**C**	**CD**	**D**	**Pervious Area (ha) =**	4.60
Wetlands/Lakes/SWMF's									
Woods								**CN(I) =**	39
Meadows								**CN(II) =**	59
Pasture/Lawn		4.6						**CN(III) =**	77
Cultivated									
Impervious Areas								**IA (mm) =**	5.0

EXTERNAL AREA - EXT3

Area per Land Cover Type and Hydrologic Soil Group

	Hydrologic Soil Groups							(for Nashyd Command)	
Land Cover	**A**	**AB**	**B**	**BC**	**C**	**CD**	**D**	**Total Area (ha) =**	4.02
Wetlands/Lakes/SWMF's									
Woods		1.69						**CN(I) =**	40
Meadows								**CN(II) =**	60
Pasture/Lawn		1.69						**CN(III) =**	78
Cultivated									
Impervious Areas		0.64						**IA (mm) =**	6.6

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QUALITY CONTROL STORAGE CALCULATIONS
SWM FACILITY DESIGN SPREADSHEET

Date: 19-Jul-22 **Project No.:** 09-062

Project: 221 Fox St. **Prepared By:** CJ

<<< **Elements Requiring Input Information**

Catchment I.D.'s	Drainage Area (ha)	Imperviousness (%)
101	4.65	31.6

Total Drainage Area (ha) = **4.65**

Total Imperviousness (%) = **32**

NOTE: For catchment areas consisting of a Total Imperviousness value less than 35% and greater than 85%, the corresponding Water Quality Storage Volume Requirement based on Table 3.2 of the 2003 MOE SWMP manual has been extrapolated from the values provided in Table 3.2.

SWM Facility Characteristics (based on 2003 MOE Guidelines, Table 3.2):

Protection Level = **Enhanced** (Options are Enhanced, Normal or Basic)
SWMP Type = **Wet Pond** (Options are Infiltration, Wetland, Hybrid, Wet Pond or Dry Pond **BUT** the Dry Pond Facility is only capable of providing a **Basic** Level of Protection)

2003 MOE Table 3.2 Water Quality Storage Requirements based on Receiving Waters:

Total Storage Volume = 134 m^3/ha
= **623 m^3**

Permanent Pool Volume = 94 m^3/ha (for wet facilities only, i.e. Wetland, Hybrid OR Wet Pond)
= **437 m^3**

Extended Detention Volume = 40 m^3/ha (Water Quality Control Volume (40m^3/ha), MOE Guidelines)
= 186 m^3
OR
= 270 m^3 (Erosion Control Volume (25mm 4-hr Chicago Storm runoff volume), MOE Guidelines)

Extended Detention Volume = **270 m^3** (greater of the Water Quality & Erosion Control Volume)

NOTE: - The Extended Detention Volume is to be the greater of the Water Quality Control Volume and the Erosion Control Volume.

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FOREBAY SIZING CALCULATIONS
SWM FACILITY DESIGN SPREADSHEET

Date: 19-Jul-22 **Project No.:** 09-062

Project: 221 Fox St. **Prepared By:** CJ

<<< Elements Requiring Input Information

Wet Facility Forebay Design Guidelines:

Forebay Settling Calculations (based on the MOE Guidelines):
1) Settling Length (Equation 4.5)

$$Dist = \frac{(r \times Q_P)^{0.5}}{(V_S)^{0.5}} \text{ (m)}$$

where,
- Dist = Forebay Settling Length (m)
- r = Length-to-Width Ratio of Forebay
- Q_P = Peak Flow Rate exiting the facility during the design Quality Storm (m^3/s)
- V_S = Settling Velocity (m/s) (Dependent on the desired particle size to settle, Recommended Settling Velocity = 0.0003m/s)

2) Dispersion Length (Equation 4.6)

$$Dist = \frac{8 \times Q}{d \times V_F} \text{ (m)}$$

where,
- Dist = Forebay Length of Dispersion (m)
- Q = Inlet Pipe Design Flow Rate (m^3/s) (for Inlet Pipes designed based on storm events greater than the 10-year storm, use 10-year storm peak flow entering the facility)
- d = Depth of the Permanent Pool in the Forebay (m)
- V_F = Desired Velocity in the Forebay (m/s) (Recommended Velocity <=0.5m/s)

Forebay Characteristics:

Length-to-Width Ratio, r	=	3		
Peak Flow Rate exiting facility during design Quality Storm, Q_P	=	0.0062	m^3/s	
Settling Velocity, V_S	=	0.0003	m/s	
Inlet Pipe Design Flow Rate, Q	=	0.145	m^3/s	(25mm storm)
Depth of Permanent Pool in Forebay, d	=	2.00	m	
Desired Velocity in Forebay, V_F	=	0.5	m/s	

Governing Forebay Length Calculations (MOE Guidelines):

Forebay Settling Length	=	7.9	m	(Equation 4.5)
Forebay Dispersion Length	=	1.2	m	(Equation 4.6)

Minimum Required Forebay Dimensions:

Length	=	**7.9**	m	
Width	=	**2.6**	m	
Depth	=	**2.00**	m	
Distance at Surface from Inlet to Forebay	=	5	m	
Min. Forebay Deep Zone Bottom Width	=	**0.6**	m	(Equation 4.7)

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STAGE-STORAGE CALCULATIONS
SWM FACILITY DESIGN SPREADSHEET

Date: 19-Jul-22 **Project No.:** 09-062

Project: 221 Fox St. **Prepared By:** CJ

<<< **Elements Requiring Input Information**

Required Permanent Pool Volume	=	437.1	m^3
Provided Permanent Pool Volume	=	587.9	m^3
Bottom Elevation, Base	=	184.70	m
Normal Water Level Elevation, NWL	=	185.70	m (for dry facilities, NWL is assumed at Base)
Top Elevation, Top	=	187.30	m

Stage-Storage Information:

Description	Elevation (m)	Stage (m)	Area 1 (m^2)	Area 2 (m^2)	Total Area (m^2)	Avg. Area (m^2)	Incremental Storage Volume (m^3)	Total Storage Volume (m^3)	Total Storage Volume Above NWL (m^3)
Base	184.70	0.00	173.4	205.6	379.0	-	-	0.0	0.0
NWL	185.70	1.00	374.9	421.8	796.7	587.9	587.9	587.9	0.0
	185.70	1.00	894.8		894.8	845.8	0.8	588.7	0.8
	187.00	2.30	1816.9		1816.9	1355.9	1761.2	2349.9	1762.1
Top	187.30	2.60	2067.4		2067.4	1942.2	582.6	2932.6	2344.7

^
Only increments of 0.01m are valid

Determining the Water Surface Elevation of a known Storage Volume:

		Total Storage Incl. P.P.	Active Storage Only
Extended Detention	Storage Volume =		270
	W.S. Elevation =		185.99
2-year	Storage Volume =		401
	W.S. Elevation =		186.11
5-year	Storage Volume =		553
	W.S. Elevation =		186.25
25-year	Storage Volume =		875
	W.S. Elevation =		186.50
100-year	Storage Volume =		1191
	W.S. Elevation =		186.71
Regional	Storage Volume =		1685
	W.S. Elevation =		187.00

Determining the Storage Volume at a known Water Surface Elevation:

Description		Total Storage Incl. P.P.	Active Storage Only
	W.S. Elevation =		
	Storage Volume =		

Z:\Projects\2009\09-062\Spreadsheets\SWM\IssueNo3\[220718_SWM_Facility_Design.xlsx]Forebay_Sizing

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EXTENDED DETENTION VOLUME DRAWDOWN TIME & PEAK FLOW CALCULATIONS
SWM FACILITY DESIGN SPREADSHEET

Date: 19-Jul-22 **Project No.:** 09-062

Project: 21 Fox St. **Prepared By:** CJ

<<< **Elements Requiring Input Information**

Active Storage Stage-Area Relationship (from Table above):

	Elevation (m)	Stage (m)	Total Area (m^2)
NWL	185.70	0.00	796.7
	185.70	0.00	894.8
	187.00	1.30	1816.9
Top	187.30	1.60	2067.4

Extended Detention Drawdown Time:

$t = 0.66C_2h^{1.5}+2C_3h^{0.5}/2.75Ao$ (MOE Equation 4.11)

where,
- t = drawdown time (sec)
- C_2 = slope coeff. from area-depth linear regression
- C_3 = intercept from area-depth linear regression
- h_{CL} = maximum head (extended detention volume) acting on centroid of orifice (m)
- Extended Detention Elev = extended detention water surface elevation (m)
- Orifice Invert Elev = control orifice invert elevation (m)
- A_O = orifice cross-sectional area (m^2)

Orifice Coefficient, C	=	0.63	(typically C=0.63 for orifice plate design)
Orifice Plate Diameter, D_O	=	75	mm (minimum recommended orifice size is a **75mm** diameter)
A_O	=	0.00442	m^2
Extended Detention Elev	=	185.99	m
Orifice Invert Elev	=	185.7	m
h_{CL}	=	0.253	m
C_2	=	758.07	**<<<**
C_3	=	844.16	**<<<**
t	=	75055	sec
t	=	**20.8**	hr

within each of these two (2) formulas the arrays must be changed to match the range of values listed in the table above (i.e. Stage & Total Area columns)

NOTE: The recommended drawdown time is 24hr but if an orifice size smaller than the required minimum (75mm dia.) is necessary to achieve the 24hr drawdown time than a minimum 12hr drawdown time is considered to be acceptable).

Quality Storm Peak Release Rate from Facility:

$Q_P = CA_O(2gh_{CL})^{0.5}$ (Orifice Flow Equation)

where,
- g = acceleration due to gravity (m/s^2)
- h_{CL} = maximum head (extended detention volume) acting on centroid of orifice (m)

g	=	9.81	m/s^2
Q_P	=	**0.0062**	m^3/s

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STAGE-STORAGE-DISCHARGE (S-S-D) CALCULATIONS
SWM FACILITY

Date: 19-Jul-22 **Project No.:** 09-062

Project: 221 Fox St. **Prepared By:** CJ

<<< **Elements Requiring Input Information**

Unsubmerged Orifice (Weir Flow)

$Q = C_W L H^{3/2}$ (m^3/s)

where, Q = Flow through unsubmerged orifice (m^3/s)
C_W = Weir Coefficient
H = Head/Depth of water acting on weir measured from above the crest/invert of orifice (m)
L = Length of weir (m)
D = Diameter of Pipe/Orifice (m)

For circular vertical weir,
L = Wetted Perimeter
$L = D \times \cos^{-1}((D/2 - H)/(D/2))$

For circular horizontal weir,
L = Circumference
L = 3.14 x D

Submerged Orifice (Orifice Flow)

$Q = C_O A_O (2gH)^{1/2}$ (m^3/s)

where, Q = Flow through submerged orifice (m^3/s)
C_O = Orifice Discharge Coefficient
A_O = Cross-sectional area of orifice (m^2)
g = Gravitational acceleration ($9.81 m^2/s$)

For circular vertical orifice,
H = Head/Depth of water acting on orifice measured from centroid of the opening (m)

For circular horizontal orifice,
H = Head/Depth of water acting on orifice measured from above the invert (m)

Unsubmerged Weir (Weir Flow)

Rectangular Broad- & Sharp-Crested Weirs
$Q = C_W L H^{3/2}$ (m^3/s)

Triangular Broad-Crested Weirs
$Q = 1.225 H^{5/2} \tan(\text{Theta}/2)$ (m^3/s)

Triangular Sharp-Crested Weirs
$Q = 0.581(8/15)(2g)^{1/2} \tan(\text{Theta}/2) H^{5/2}$ (m^3/s)

Trapezoidal Broad- & Sharp-Crested Weirs
$Q_{TRAPEZOIDAL} = Q_{RECTANGULAR} + Q_{TRIANGULAR}$ (m^3/s)

where, Q = Flow through unsubmerged weir (m^3/s)
C_W = Weir Coefficient
(1.65 for Broad-Crested)
(1.80 for Sharp-Crested)
H = Head/Depth of water acting on weir measured from above the crest (m)
L = Length of weir measured perpendicular to flow direction (m)
Theta/2 = Angle of side slope measured from vertical axis (degrees)
g = Gravitational acceleration ($9.81 m^2/s$)

Submerged Weir (Orifice Flow)

Submerged Sharp-Crested Weirs
$Q = C_O A_O (2gH)^{1/2}$ (m^3/s)

where, Q = Flow through submerged weir opening (m^3/s)
C_O = Orifice Discharge Coefficient
A_O = Cross-sectional area of opening (m^2)
g = Gravitational acceleration ($9.81 m^2/s$)
H = Head/Depth of water acting on orifice measured from centroid of the opening (m)

NOTES: **Orifice Flow Notes**

- **Vertical Orifice Flow** calculations assume weir flow up to the centroid/center of orifice and then orifice flow above the crown/top of the orifice. Between the centroid and crown of the orifice is a flow transition stage from weir to orifice flow and is calculated based on a linear interpolation between the known weir flow at the centroid of the orifice and the known orifice flow at the crown.
- **Horizontal Orifice Flow** calculations assume weir flow up to one-quarter of the orifices diameter (0.25xD) and then orifice flow above three-quarters of the orifices diameter (0.75xD). Between (0.25xD) and (0.75xD) exists a flow transition stage which is calculated based on a linear interpolation between the known weir flow at (0.25xD) and the known orifice flow at (0.75xD).

Weir Flow Notes

- **Orifice control** is only applicable if the weir opening is submerged and not exposed to atmospheric pressure for all ranges of water elevations.
- For all Weir Types, **orifice control** occurs when the water surface elevation is equal to or greater than the crown/top of the opening.

Z:\Projects\2009\09-062\Spreadsheets\SWM\IssueNo3\[220718_Detailed_S-S-D_Table.xlsx]S-S-D Table

Starting Water Elevation, m = **185.70**
Incremental Depth, m = **0.05**

	Orifice 1	Orifice 2	Orifice 3	Weir 1	Weir 2	Weir 3	
Orifice Type =	**Vertical**	**Vertical**			**Trapezoidal Broad-Crested**		= Weir Type
Orifice Invert Elev., m =	**185.70**	**186.00**			**186.75**		= Weir Crest Elev., m
Incremental Depth, m =	0.05	0.05	0.05	0.05	0.05	0.05	= Incremental Depth, m
Water Elev. @ Inflow, m =	**185.70**	**186.00**					= Weir Openings Crown Elev., m (if appl.)
Orifice Diameter, m =	**0.075**	**0.300**			**1.00**		= Weir Length, m
Centroid of Orifice, m =	185.738	186.150			**1.65**		= Weir Coefficient
Orifice Area, m^2 =	0.0044	0.0707			**3**		= Side Slope (H:1)
Orifice Coefficient =	**0.63**	**0.51**					= Theta/2, Degrees
Weir Coefficient =	**1.80**	**1.80**					= Centroid of Orifice, m (if appl.)
							= Orifice Area, m^2 (if appl.)
							= Orifice Coefficient (if appl.)

NOTES:

Elevation (m)	Area 1 (m^2)	Area 2 (m^2)	Total Area (m^2)	Storage Volume (m^3)
185.70	374.9	421.8	796.7	**0.0**
185.70	894.8		894.8	**0.8**
187.00	1816.9		1816.9	**1762.1**
187.30	2067.4		2067.4	**2344.7**

^
Only increments of 0.01m are valid

Description	Elevation (m)	Orifice 1 Flow (m^3/s)	Orifice 2 Flow (m^3/s)	Orifice 3 Flow (m^3/s)	Weir 1 Flow (m^3/s)	Weir 2 Flow (m^3/s)	Weir 3 Flow (m^3/s)	Total Flow (m^3/s)	Total Storage Volume (m^3)	Notes
Base	**185.70**	0.0000						**0.0000**	**0.0**	
	185.75	0.0015						**0.0015**	**43.0**	
	185.80	0.0031						**0.0031**	**87.4**	
	185.85	0.0041						**0.0041**	**133.2**	
	185.90	0.0050						**0.0050**	**180.5**	
	185.95	0.0057						**0.0057**	**229.4**	
	186.00	0.0063	0.0000					**0.0063**	**279.8**	**Extended Detention (Q=0.0062m3/s, V=270m3 at 185.99m)**
	186.05	0.0069	0.0051					**0.0120**	**331.8**	
	186.10	0.0074	0.0210					**0.0284**	**385.4**	**2-year storm (Q=0.037m3/s, V=401.2m3 at 186.11m)**
	186.15	0.0079	0.0493					**0.0572**	**440.8**	
	186.20	0.0084	0.0535					**0.0619**	**497.8**	
	186.25	0.0088	0.0577					**0.0665**	**556.5**	**5-year storm (Q=0.066m3/s, V=552.6m3 at 186.25m)**
	186.30	0.0092	0.0618					**0.0711**	**617.0**	
	186.35	0.0096	0.0714					**0.0811**	**679.4**	
	186.40	0.0100	0.0798					**0.0899**	**743.6**	
	186.45	0.0104	0.0875					**0.0979**	**809.7**	
	186.50	0.0108	0.0945					**0.1052**	**877.6**	**25-year storm (Q=0.105m3/s, V=874.7m3 at 186.50m)**
	186.55	0.0111	0.1010					**0.1121**	**947.6**	
	186.60	0.0114	0.1071					**0.1186**	**1019.5**	
	186.65	0.0118	0.1129					**0.1247**	**1093.5**	
Freeboard	186.70	0.0121	0.1184					**0.1305**	**1169.5**	**100-year storm (Q=0.132m3/s, V=1191m3 at 186.71m)**
	186.75	0.0124	0.1237			0.000		**0.1361**	**1247.7**	
	186.80	0.0127	0.1287			0.018		**0.1599**	**1327.9**	
	186.85	0.0130	0.1336			0.052		**0.1988**	**1410.3**	
	186.90	0.0133	0.1383			0.096		**0.2474**	**1495.0**	
	186.95	0.0136	0.1428			0.148		**0.3040**	**1581.9**	
	187.00	0.0139	0.1472			0.206		**0.3673**	**1671.0**	**Regional storm (Q=0.373m3/s, V=1685m3 at 187.00m)**
	187.05	0.0141	0.1515			0.271		**0.4367**	**1850.4**	
	187.10	0.0144	0.1556			0.342		**0.5117**	**1940.7**	
	187.15	0.0147	0.1597			0.417		**0.5918**	**2033.0**	
	187.20	0.0149	0.1636			0.498		**0.6766**	**2127.3**	
	187.25	0.0152	0.1675			0.583		**0.7660**	**2223.8**	
Top	187.30	0.0154	0.1712			0.673		**0.8597**	**2322.3**	

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119 Collier Street, Barrie, Ontario L4M 1H5
p (705) 797-2027 f (705) 797-2028

MANNING'S OPEN CHANNEL EQUATION

SWMP WEIR OVERFLOW SWALE

Date: 19-Jul-22 **Project No.:** 09-062

Project: 221 Fox St. **Prepared By:** CJ

Mannings' Equation			**TRAPEZOIDAL CHANNEL**		
Flow Depth (m) =	0.300				
Side Slope Ratio (H:V) =	3.0	**/1**	Top width	2.8	
Bed Width (m)=	1.00		Hyd. Rad, 'R'		
Area (m^2)=	0.570		**0.19673**	m	
Wetted Perimeter (m)=	2.897	m	Friction Slope Sf		
Slope (%) =	0.50		**0.0050**	m/m	
Manning 'n' =	0.035		Velocity		
Channel Capacity, Q =	**0.390**	m^3/sec	**0.683**	m/s	

NOTE: The regional storm flow from the SWMP is 0.373m3/s which is less than the capacity of the overflow swale.

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MANNING'S PIPE EQUATION
750 mm DIA. EXTERNAL STORM SEWER PIPE

Date: 19-Jul-22 **Project No.:** 09-062

Project: 221 Fox St. **Prepared By:** CJ

Mannings' Equation		
Pipe Diameter (mm) =	750	
Area =	0.442	m^2
Slope (%) =	1.80	
Manning 'n' =	0.013	
Nom'l Pipe Capacity, Q =	1.494	m^3/sec
Actual Pipe Capacity, Q =	**1.558**	m^3/sec

Box Culvert	
Height =	0.00
Width =	0
Q =	0.00

Velocity	
3.38	m/s
3.53	m/s

R=	**0.1875**
Sf=	**0.0180**

NOTE: 100-yr flows from Catchment 102, EXT1b and EXT2 are 1.019m^3/s; for SWM Pond (101 and EXT1a) are 0.132m^3/s; and, from EXT3 are 0.175m^3/s for a total of 1.326m^3/s which is less than the capacity of the proposed external storm sewer.

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Cross Section for Beck_Blvd_Overflow(ROW)

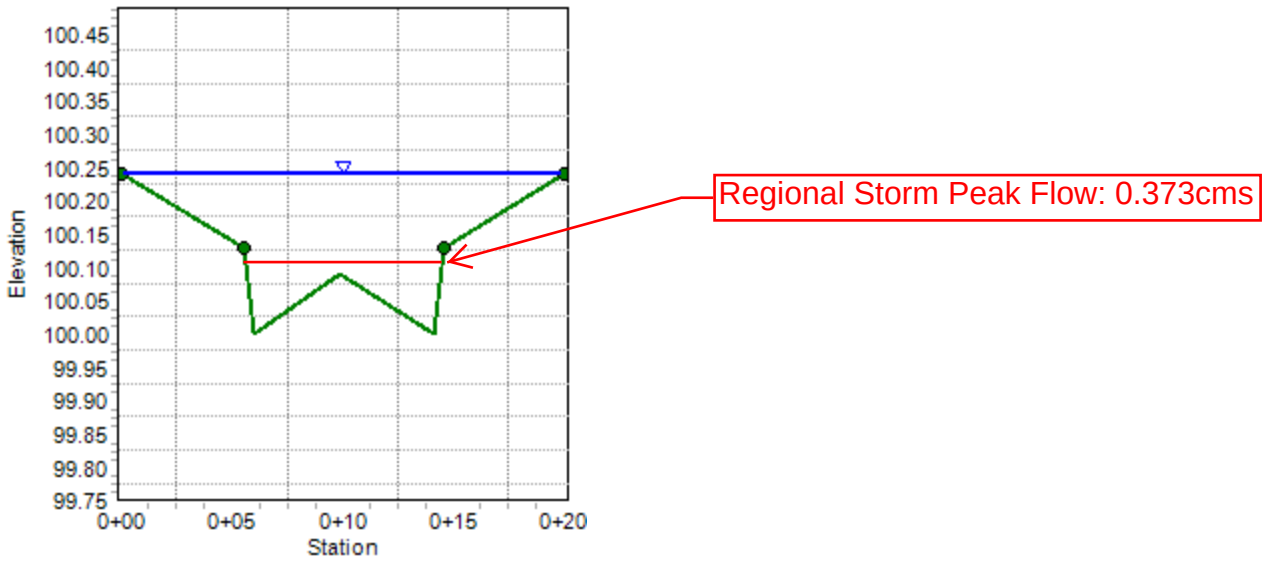
Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.50000	%
Normal Depth	0.24	m
Discharge	1.44	m³/s

Cross Section Image



Rating Table for Beck_Blvd_Overflow(ROW)

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.50000	%
Normal Depth	0.24	m

Section Definitions

Station (m)	Elevation (m)
0+00	100.24
0+06	100.13
0+06	100.00
0+10	100.09
0+14	100.00
0+15	100.13
0+20	100.24

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 100.24)	(0+06, 100.13)	0.035
(0+06, 100.13)	(0+15, 100.13)	0.013
(0+15, 100.13)	(0+20, 100.24)	0.035

Water Surface Elevation (m)	Discharge (m³/s)	Velocity (m/s)	Flow Area (m²)	Wetted Perimeter (m)	Top Width (m)
100.00					
100.01	0.00	0.16	0.01	1.04	1.03
100.02	0.01	0.25	0.02	2.07	2.07
100.03	0.02	0.33	0.05	3.11	3.10
100.04	0.03	0.40	0.08	4.14	4.13
100.05	0.06	0.46	0.13	5.18	5.16
100.06	0.10	0.52	0.19	6.21	6.20
100.07	0.15	0.58	0.25	7.25	7.23
100.08	0.21	0.64	0.33	8.28	8.26
100.09	0.30	0.71	0.42	8.84	8.82
100.10	0.41	0.80	0.51	8.92	8.90
100.11	0.53	0.89	0.59	9.01	8.98
100.12	0.67	0.97	0.69	9.09	9.06
100.13	0.69	0.89	0.78	9.62	9.59
100.14	0.66	0.76	0.88	10.60	10.57
100.15	0.68	0.69	0.99	11.59	11.55
100.16	0.73	0.65	1.11	12.57	12.53
100.17	0.78	0.63	1.24	13.55	13.52
100.18	0.86	0.62	1.38	14.53	14.50
100.19	0.94	0.61	1.53	15.52	15.48
100.20	1.03	0.61	1.69	16.50	16.46
100.21	1.14	0.61	1.86	17.48	17.45
100.22	1.25	0.61	2.04	18.46	18.43
100.23	1.38	0.62	2.23	19.45	19.41
100.24	1.54	0.63	2.43	20.04	20.00

Regional Storm Peak Flow: 0.373cms

Cross Section for Condo_Road_Overflow(road)

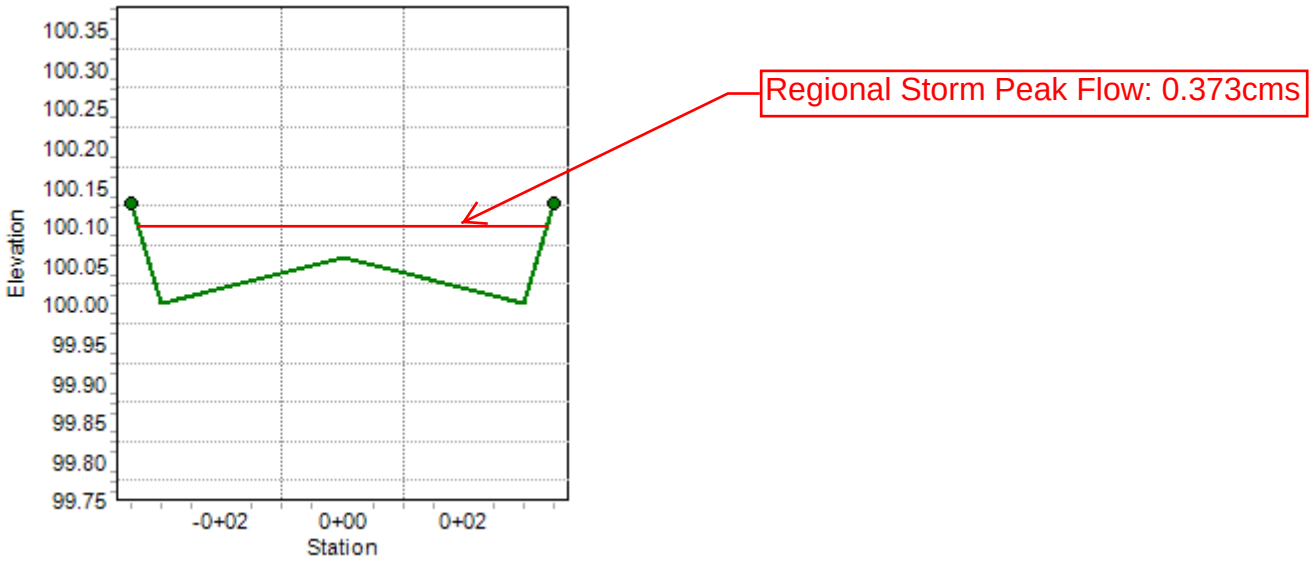
Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.50000	%
Normal Depth	0.13	m
Discharge	0.69	m³/s

Cross Section Image



Rating Table for Condo_Road_Overflow(road)

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.50000	%
Normal Depth	0.13	m

Section Definitions

Station (m)	Elevation (m)
-0+04	100.13
-0+03	100.00
0+00	100.06
0+03	100.00
0+04	100.13

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(-0+04, 100.13)	(0+04, 100.13)	0.013

Water Surface Elevation (m)	Discharge (m³/s)	Velocity (m/s)	Flow Area (m²)	Wetted Perimeter (m)	Top Width (m)
100.00					
100.01	0.00	0.16	0.01	1.08	1.08
100.02	0.01	0.25	0.02	2.17	2.16
100.03	0.02	0.33	0.05	3.25	3.24
100.04	0.03	0.40	0.09	4.33	4.32
100.05	0.06	0.46	0.14	5.41	5.40
100.06	0.10	0.52	0.19	6.50	6.48
100.07	0.16	0.63	0.26	6.58	6.56
100.08	0.24	0.73	0.33	6.66	6.64
100.09	0.32	0.82	0.39	6.74	6.72
100.10	0.41	0.90	0.46	6.83	6.80
100.11	0.52	0.98	0.53	6.91	6.88
100.12	0.63	1.06	0.60	6.99	6.96
100.13	0.75	1.13	0.67	7.04	7.00

Regional Storm Peak Flow: 0.373cms

Hydrologic Modelling (SWMHYMO)

Appendix C

Pre-Development Condition
24-hour SCS Type-II Storm Distribution

```
2     Metric units
*#*************************************************************************
*#  Project Name: [221 FOX STREET SUBDIVISION]    Project Number: [09-062]
*#  Date        : 06-24-2022
*#  Modeller    : [CJ]
*#  Company     : WMI & Associates Ltd.
*#  License #   :  2880720
*#*************************************************************************
*%
*%  PRE-DEVELOPMENT CONDITION
*%
*% 2-YEAR 24hr SCS TYPE-II STORM DISTRIBUTION ORILLIA IDF DATA
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[1]
*%                   ["2SCS24.stm"] <--storm filename, one per line for NSTORM time
*%-----------------|-----------------------------------------------------------|
READ STORM          STORM_FILENAME=["STORM.001"]
*%-----------------|-----------------------------------------------------------|
* PRE-DEVELOPMENT PRE(EXISTING)
CALIB NASHYD        ID=[1], NHYD=["PRE"], DT=[1]min, AREA=[23.20](ha),
                    DWF=[0](cms),  CN/C=[49], IA=[9.6](mm),
                    N=[3], TP=[0.787]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-----------------------------------------------------------|
* EXTERNAL AREA EXT
CALIB STANDHYD      ID=[2], NHYD=["EXT"], DT=[1](min), AREA=[6.14](ha),
                    XIMP=[0.14], TIMP=[0.25], DWF=[0](cms), LOSS=[2],
                    SCS curve number CN=[59],
                    Pervious   surfaces: IAper=[5](mm), SLPP=[8.0](%),
                                         LGP=[90](m), MNP=[0.25], SCP=[0](min),
                    Impervious surfaces: IAimp=[2.0](mm), SLPI=[3.0](%),
                                         LGI=[150](m), MNI=[0.013], SCI=[0](min),
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-----------------------------------------------------------|
SHIFT HYD           IDout=[3], NHYD=["S-EXT"], IDin=[2], TLAG=[10](min)
*%-----------------|-----------------------------------------------------------|
ADD HYD             IDsum=[4], NHYD=["S-EXT+PRE"], IDs to add=[1+3]
*%-----------------|-----------------------------------------------------------|
*% 5-YEAR 24hr SCS TYPE-II STORM DISTRIBUTION ORILLIA IDF DATA
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[2]
*%                   ["5SCS24.stm"] <--storm filename
*%-----------------|-----------------------------------------------------------|
*% 25-YEAR 24hr SCS TYPE-II STORM DISTRIBUTION ORILLIA IDF DATA
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[3]
*%                   ["25SCS24.stm"] <--storm filename
*%-----------------|-----------------------------------------------------------|
*% 100-YEAR 24hr SCS TYPE-II STORM DISTRIBUTION ORILLIA IDF DATA
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[4]
*%                   ["100SCS24.stm"] <--storm filename
*%-----------------|-----------------------------------------------------------|
*% TIMMINS REGIONAL STORM (12-HR)
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[5]
*%                   ["12REGTIM.O89"] <--storm filename
*%-----------------|-----------------------------------------------------------|
```



```
FINISH
```

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

SSSSS   W   W   M   M   H   H   Y   Y   M   M    OOO          222     000    11   77777 ==
S       W W W   MM MM   H   H    Y Y    MM MM   O   O          2    0   0   11   7   7
SSSSS   W W W   M M M   HHHHH     Y     M M M   O   O          2    0   0   11       7
    S    W W    M   M   H   H     Y     M   M   O   O        222    0   0   11      7
SSSSS    W W    M   M   H   H     Y     M   M    OOO         2      0   0   11     7   ==
                                                            2      0   0   11    7    #
      StormWater Management HYdrologic Model                 222     000    11    7    ==

********************************************************************************
************************************  SWMHYMO Ver4.05.0  ***********************
*****************  A single event and continuous hydrologic simulation model  ***********
*****************     based on the principles of HYMO and its successors      ***********
*****************                OTTHYMO-83 and OTTHYMO-89.                   ***********
********************************************************************************
***************** Distributed by:  J.F. Sabourin and Associates Inc.          ***********
*****************                  Ottawa,  Ontario: (613) 836-3884           ***********
*****************                  Gatineau, Quebec: (819) 243-6858           ***********
*****************                  E-Mail: swmhymo@jfsa.com                   ***********
********************************************************************************

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++++++++++++++++++ Licensed user: WMI & Associates Ltd.                      ++++++++++++
++++++++++++++++++                 Barrie                SERIAL#:2880720      ++++++++++++
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

********************************************************************************
*****************          ++++++ PROGRAM ARRAY DIMENSIONS ++++++           ***********
*****************          Maximum value for ID numbers  :     11           ***********
*****************          Max. number of rainfall points: 105408           ***********
*****************          Max. number of flow points    : 105408           ***********
********************************************************************************



*****************************   D E T A I L E D   O U T P U T   ********************
********************************************************************************
*                RUN DATE: 2022-06-22     TIME: 17:46:46     RUN COUNTER: 000039
********************************************************************************
 * Input   file: Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\PRE\SCS\PRE.dat
 * Output  file: Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\PRE\SCS\PRE.out
 * Summary file: Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\PRE\SCS\PRE.sum
 * User comments:
 * 1:_____________________________________________________________________________
 * 2:_____________________________________________________________________________
 * 3:_____________________________________________________________________________
 ********************************************************************************


--------------------------------------------------------------------------------
R0001:C00001-----------------------------------------------------------------------
*#*************************************************************************
*#  Project Name: [221 FOX STREET SUBDIVISION]    Project Number: [09-062]
*#  Date        : 06-24-2022
```



```
*#  Modeller    : [CJ]
*#  Company     : WMI & Associates Ltd.
*#  License #   :  2880720
*#*************************************************************************
--------------------
| START            | Project  dir.:Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\PRE\SCS\
-------------------- Rainfall dir.:Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\PRE\SCS\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 0001
    NSTORM=   1
          #  1=2SCS24.stm
--------------------------------------------------------------------------------------------
R0001:C00002-----------------------------------------------------------------------
--------------------
| READ STORM       |  Filename: Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\PRE\SCS\2SCS24.
| Ptotal=  46.70 mm|  Comments: 2-Year SCS Type-II Storm Distribution (24-hour) Orillia,
--------------------
```

TIME hh:mm	RAIN mm/hr	TIME hh:mm	RAIN mm/hr	TIME hh:mm	RAIN mm/hr	TIME hh:mm	RAIN mm/hr	TIME hh:mm	RAIN mm/hr	TIME hh:mm
0:12	.467	4:12	.934	8:12	1.401	12:12	9.340	16:12	1.168	20:12
0:24	.467	4:24	.934	8:24	1.401	12:24	5.838	16:24	1.167	20:24
0:36	.467	4:36	.934	8:36	1.401	12:36	4.203	16:36	1.167	20:36
0:48	.467	4:48	.934	8:48	1.401	12:48	3.970	16:48	1.167	20:48
1:00	.467	5:00	.934	9:00	1.401	13:00	2.802	17:00	.700	21:00
1:12	.467	5:12	.934	9:12	1.401	13:12	2.335	17:12	.701	21:12
1:24	.467	5:24	.934	9:24	1.401	13:24	2.335	17:24	.934	21:24
1:36	.467	5:36	.934	9:36	1.401	13:36	2.335	17:36	.701	21:36
1:48	.467	5:48	.934	9:48	1.401	13:48	2.335	17:48	.934	21:48
2:00	.467	6:00	.934	10:00	1.401	14:00	2.335	18:00	.701	22:00
2:12	.467	6:12	.934	10:12	2.568	14:12	1.401	18:12	.701	22:12
2:24	.467	6:24	.934	10:24	2.569	14:24	1.401	18:24	.700	22:24
2:36	.467	6:36	.934	10:36	2.568	14:36	1.401	18:36	.934	22:36
2:48	.467	6:48	.934	10:48	2.569	14:48	1.401	18:48	.701	22:48
3:00	.467	7:00	.934	11:00	2.568	15:00	1.401	19:00	.701	23:00
3:12	.467	7:12	.934	11:12	3.503	15:12	1.167	19:12	.934	23:12
3:24	.467	7:24	.934	11:24	5.137	15:24	1.167	19:24	.701	23:24
3:36	.467	7:36	.934	11:36	12.375	15:36	1.167	19:36	.934	23:36
3:48	.467	7:48	.934	11:48	25.685	15:48	1.167	19:48	.701	23:48
4:00	.467	8:00	.934	12:00	52.538	16:00	1.167	20:00	.934	24:00

```
--------------------------------------------------------------------------------------------
R0001:C00003-----------------------------------------------------------------------
* PRE-DEVELOPMENT PRE(EXISTING)
--------------------------
| CALIB NASHYD           |   Area    (ha)=   23.200   Curve Number   (CN)= 49.00
| 01:PRE        DT= 1.00 |   Ia      (mm)=    9.600   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .787

     Unit Hyd Qpeak  (cms)=    1.126

     PEAK FLOW       (cms)=     .088 (i)
     TIME TO PEAK    (hrs)=   12.850
```

```
     DURATION        (hrs)=   29.033, (dddd|hh:mm:)=   1|05:02
     AVERAGE FLOW    (cms)=     .010
     RUNOFF VOLUME    (mm)=    4.566
     TOTAL RAINFALL   (mm)=   46.701
     RUNOFF COEFFICIENT   =     .098

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

-------------------------------------------------------------------------------------------
R0001:C00004-------------------------------------------------------------------------------
* EXTERNAL AREA EXT
--------------------------
| CALIB STANDHYD         |   Area    (ha)=    6.14
| 02:EXT        DT= 1.00 |   Total Imp(%)=   25.00   Dir. Conn.(%)=   14.00
--------------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.53         4.61
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       3.00         8.00
     Length            (m)=     150.00        90.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      52.54         9.57
               over (min)        3.00        22.00
     Storage Coeff.  (min)=       3.03 (ii)   22.40 (ii)
     Unit Hyd. Tpeak (min)=       3.00        22.00
     Unit Hyd. peak  (cms)=        .37          .05
                                                    *TOTALS*
     PEAK FLOW       (cms)=        .12          .08          .165 (iii)
     TIME TO PEAK    (hrs)=      12.00        12.28        12.000
     RUNOFF VOLUME    (mm)=      44.70         9.13        14.113
     TOTAL RAINFALL   (mm)=      46.70        46.70        46.701
     RUNOFF COEFFICIENT   =        .96          .20          .302

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  59.0    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.

-------------------------------------------------------------------------------------------
R0001:C00005-------------------------------------------------------------------------------
--------------------
| SHIFT HYD        |                              AREA     QPEAK      TPEAK      R.V.
|                  |                               (ha)     (cms)      (hrs)      (mm)
|                  |         ID= 2:EXT             6.14      .165     12.000    14.113
| Shift=   10.0 min | SHIFTED ID= 3:S-EXT           6.14      .165     12.150    14.113
--------------------

-------------------------------------------------------------------------------------------
R0001:C00006-------------------------------------------------------------------------------
------------------------
| ADD HYD              |
| 04:S-EXT+PRE         |   ID:NHYD           AREA     QPEAK    TPEAK      R.V.     DWF
```



```
------------------------                      (ha)     (cms)    (hrs)      (mm)   (cms)
                      ID 1 01:PRE           23.200      .088   12.850     4.566    .000
                     +ID 2 03:S-EXT          6.140      .165   12.150    14.113    .000
                     ==========================================================================
                     SUM   04:S-EXT+PRE     29.340      .200   12.150     6.564    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------------------
R0001:C00007-------------------------------------------------------------------------------
  ** END OF RUN :    0

*******************************************************************************************




--------------------
| START            | Project  dir.:Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\PRE\SCS\
-------------------- Rainfall dir.:Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\PRE\SCS\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 0002
    NSTORM=   1
           #  1=5SCS24.stm
-------------------------------------------------------------------------------------------
R0002:C00002-------------------------------------------------------------------------------
*#*************************************************************************
*#  Project Name: [221 FOX STREET SUBDIVISION]    Project Number: [09-062]
*#  Date        : 06-24-2022
*#  Modeller    : [CJ]
*#  Company     : WMI & Associates Ltd.
*#  License #   :  2880720
*#*************************************************************************
-------------------------------------------------------------------------------------------
R0002:C00002-------------------------------------------------------------------------------
--------------------
| READ STORM       |  Filename: Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\PRE\SCS\5SCS24.
| Ptotal=  60.60 mm|  Comments: 5-Year SCS Type-II Storm Distribution (24-hour) Orillia,
--------------------
      TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME
     hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm
      0:12    .606|   4:12   1.212|   8:12   1.818|  12:12  12.120|  16:12   1.515|  20:12
      0:24    .606|   4:24   1.212|   8:24   1.818|  12:24   7.575|  16:24   1.515|  20:24
      0:36    .606|   4:36   1.212|   8:36   1.818|  12:36   5.454|  16:36   1.515|  20:36
      0:48    .606|   4:48   1.212|   8:48   1.818|  12:48   5.151|  16:48   1.515|  20:48
      1:00    .606|   5:00   1.212|   9:00   1.818|  13:00   3.636|  17:00    .909|  21:00
      1:12    .606|   5:12   1.212|   9:12   1.818|  13:12   3.030|  17:12    .909|  21:12
      1:24    .606|   5:24   1.212|   9:24   1.818|  13:24   3.030|  17:24   1.212|  21:24
      1:36    .606|   5:36   1.212|   9:36   1.818|  13:36   3.030|  17:36    .909|  21:36
      1:48    .606|   5:48   1.212|   9:48   1.818|  13:48   3.030|  17:48   1.212|  21:48
      2:00    .606|   6:00   1.212|  10:00   1.818|  14:00   3.030|  18:00    .909|  22:00
```

```
      2:12    .606|   6:12   1.212|  10:12   3.333|  14:12   1.818|  18:12    .909|  22:12
      2:24    .606|   6:24   1.212|  10:24   3.333|  14:24   1.818|  18:24    .909|  22:24
      2:36    .606|   6:36   1.212|  10:36   3.333|  14:36   1.818|  18:36   1.212|  22:36
      2:48    .606|   6:48   1.212|  10:48   3.333|  14:48   1.818|  18:48    .909|  22:48
      3:00    .606|   7:00   1.212|  11:00   3.333|  15:00   1.818|  19:00    .909|  23:00
      3:12    .606|   7:12   1.212|  11:12   4.545|  15:12   1.515|  19:12   1.212|  23:12
      3:24    .606|   7:24   1.212|  11:24   6.666|  15:24   1.515|  19:24    .909|  23:24
      3:36    .606|   7:36   1.212|  11:36  16.059|  15:36   1.515|  19:36   1.212|  23:36
      3:48    .606|   7:48   1.212|  11:48  33.330|  15:48   1.515|  19:48    .909|  23:48
      4:00    .606|   8:00   1.212|  12:00  68.175|  16:00   1.515|  20:00   1.212|  24:00

------------------------------------------------------------------------------------------
R0002:C00003------------------------------------------------------------------------------
* PRE-DEVELOPMENT PRE(EXISTING)
-------------------------
| CALIB NASHYD          |   Area    (ha)=   23.200   Curve Number   (CN)= 49.00
| 01:PRE        DT= 1.00 |   Ia      (mm)=    9.600   # of Linear Res.(N)=  3.00
-------------------------   U.H. Tp(hrs)=     .787

     Unit Hyd Qpeak  (cms)=    1.126

     PEAK FLOW       (cms)=     .167 (i)
     TIME TO PEAK    (hrs)=   12.817
     DURATION        (hrs)=   29.033, (dddd|hh:mm:)=   1|05:02
     AVERAGE FLOW    (cms)=     .018
     RUNOFF VOLUME    (mm)=    8.247
     TOTAL RAINFALL   (mm)=   60.601
     RUNOFF COEFFICIENT   =     .136

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

------------------------------------------------------------------------------------------
R0002:C00004------------------------------------------------------------------------------
* EXTERNAL AREA EXT
-------------------------
| CALIB STANDHYD        |   Area    (ha)=    6.14
| 02:EXT        DT= 1.00 |   Total Imp(%)=   25.00   Dir. Conn.(%)=   14.00
-------------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      1.53         4.61
     Dep. Storage     (mm)=      2.00         5.00
     Average Slope     (%)=      3.00         8.00
     Length            (m)=    150.00        90.00
     Mannings n           =      .013         .250

     Max.eff.Inten.(mm/hr)=     68.17        17.89
               over (min)       3.00        18.00
     Storage Coeff.  (min)=     2.73 (ii)   17.81 (ii)
     Unit Hyd. Tpeak (min)=     3.00        18.00
     Unit Hyd. peak  (cms)=      .40          .06
                                                    *TOTALS*
     PEAK FLOW       (cms)=      .16          .15          .254 (iii)
     TIME TO PEAK    (hrs)=    12.00        12.22        12.000
```



```
     RUNOFF VOLUME    (mm)=     58.60        15.05         21.146
     TOTAL RAINFALL   (mm)=     60.60        60.60         60.601
     RUNOFF COEFFICIENT   =       .97          .25           .349

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  59.0    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.

------------------------------------------------------------------------------------------
R0002:C00005------------------------------------------------------------------------------
--------------------
| SHIFT HYD        |                              AREA     QPEAK      TPEAK      R.V.
|                  |                               (ha)     (cms)      (hrs)      (mm)
|                  |         ID= 2:EXT              6.14      .254     12.000    21.146
| Shift=   10.0 min | SHIFTED ID= 3:S-EXT            6.14      .254     12.150    21.146
--------------------

------------------------------------------------------------------------------------------
R0002:C00006------------------------------------------------------------------------------
------------------------
| ADD HYD              |
| 04:S-EXT+PRE         |   ID:NHYD            AREA     QPEAK    TPEAK      R.V.     DWF
------------------------                       (ha)     (cms)    (hrs)      (mm)   (cms)
                       ID 1 01:PRE           23.200      .167   12.817     8.247    .000
                      +ID 2 03:S-EXT          6.140      .254   12.150    21.146    .000
                      ==========================================================
                      SUM   04:S-EXT+PRE     29.340      .329   12.167    10.947    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------------------
R0002:C00007------------------------------------------------------------------------------
------------------------------------------------------------------------------------------
R0002:C00002------------------------------------------------------------------------------
  ** END OF RUN :    1

******************************************************************************************




--------------------
| START            | Project  dir.:Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\PRE\SCS\
-------------------- Rainfall dir.:Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\PRE\SCS\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 0003
    NSTORM=   1
           #  1=25SCS24.stm
------------------------------------------------------------------------------------------
R0003:C00002------------------------------------------------------------------------------
```

```
*#**************************************************************************
*#  Project Name: [221 FOX STREET SUBDIVISION]    Project Number: [09-062]
*#  Date        : 06-24-2022
*#  Modeller    : [CJ]
*#  Company     : WMI & Associates Ltd.
*#  License #   :  2880720
*#**************************************************************************
```

R0003:C00002

READ STORM	Filename: Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\PRE\SCS\25SCS24.
Ptotal= 81.40 mm	Comments: 25-Year SCS Type-II Storm Distribution (24-hour) Orillia,

TIME hh:mm	RAIN mm/hr	TIME hh:mm	RAIN mm/hr	TIME hh:mm	RAIN mm/hr	TIME hh:mm	RAIN mm/hr	TIME hh:mm	RAIN mm/hr	TIME hh:mm
0:12	.814	4:12	1.628	8:12	2.442	12:12	16.280	16:12	2.035	20:12
0:24	.814	4:24	1.628	8:24	2.442	12:24	10.175	16:24	2.035	20:24
0:36	.814	4:36	1.628	8:36	2.442	12:36	7.326	16:36	2.035	20:36
0:48	.814	4:48	1.628	8:48	2.442	12:48	6.919	16:48	2.035	20:48
1:00	.814	5:00	1.628	9:00	2.442	13:00	4.884	17:00	1.221	21:00
1:12	.814	5:12	1.628	9:12	2.442	13:12	4.070	17:12	1.221	21:12
1:24	.814	5:24	1.628	9:24	2.442	13:24	4.070	17:24	1.628	21:24
1:36	.814	5:36	1.628	9:36	2.442	13:36	4.070	17:36	1.221	21:36
1:48	.814	5:48	1.628	9:48	2.442	13:48	4.070	17:48	1.628	21:48
2:00	.814	6:00	1.628	10:00	2.442	14:00	4.070	18:00	1.221	22:00
2:12	.814	6:12	1.628	10:12	4.477	14:12	2.442	18:12	1.221	22:12
2:24	.814	6:24	1.628	10:24	4.477	14:24	2.442	18:24	1.221	22:24
2:36	.814	6:36	1.628	10:36	4.477	14:36	2.442	18:36	1.628	22:36
2:48	.814	6:48	1.628	10:48	4.477	14:48	2.442	18:48	1.221	22:48
3:00	.814	7:00	1.628	11:00	4.477	15:00	2.442	19:00	1.221	23:00
3:12	.814	7:12	1.628	11:12	6.105	15:12	2.035	19:12	1.628	23:12
3:24	.814	7:24	1.628	11:24	8.954	15:24	2.035	19:24	1.221	23:24
3:36	.814	7:36	1.628	11:36	21.571	15:36	2.035	19:36	1.628	23:36
3:48	.814	7:48	1.628	11:48	44.770	15:48	2.035	19:48	1.221	23:48
4:00	.814	8:00	1.628	12:00	91.575	16:00	2.035	20:00	1.628	24:00

R0003:C00003

* PRE-DEVELOPMENT PRE(EXISTING)

CALIB NASHYD	Area (ha)= 23.200	Curve Number (CN)= 49.00
01:PRE DT= 1.00	Ia (mm)= 9.600	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= .787	

Unit Hyd Qpeak (cms)= 1.126

PEAK FLOW (cms)= .319 (i)
TIME TO PEAK (hrs)= 12.783
DURATION (hrs)= 29.033, (dddd|hh:mm:)= 1|05:02
AVERAGE FLOW (cms)= .034
RUNOFF VOLUME (mm)= 15.335
TOTAL RAINFALL (mm)= 81.400
RUNOFF COEFFICIENT = .188

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

R0003:C00004

* EXTERNAL AREA EXT

CALIB STANDHYD	Area (ha)= 6.14
02:EXT DT= 1.00	Total Imp(%)= 25.00 Dir. Conn.(%)= 14.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.53	4.61
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	3.00	8.00
Length	(m)=	150.00	90.00
Mannings n	=	.013	.250
Max.eff.Inten.(mm/hr)	=	91.58	35.51
over (min)		2.00	14.00
Storage Coeff. (min)	=	2.43 (ii)	13.89 (ii)
Unit Hyd. Tpeak (min)	=	2.00	14.00
Unit Hyd. peak (cms)	=	.49	.08

		TOTALS
PEAK FLOW	(cms)=	.435 (iii)
TIME TO PEAK	(hrs)=	12.000
RUNOFF VOLUME	(mm)=	33.215
TOTAL RAINFALL	(mm)=	81.400
RUNOFF COEFFICIENT	=	.408

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 59.0 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.

R0003:C00005

SHIFT HYD		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
	ID= 2:EXT	6.14	.435	12.000	33.215
Shift= 10.0 min	SHIFTED ID= 3:S-EXT	6.14	.435	12.150	33.215

R0003:C00006

ADD HYD	ID:NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
04:S-EXT+PRE	ID 1 01:PRE	23.200	.319	12.783	15.335	.000
	+ID 2 03:S-EXT	6.140	.435	12.150	33.215	.000
	SUM 04:S-EXT+PRE	29.340	.587	12.150	19.077	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
---------------------------------------------------------------------------------------------
R0003:C00007-----------------------------------------------------------------------------------
---------------------------------------------------------------------------------------------
R0003:C00002-----------------------------------------------------------------------------------
---------------------------------------------------------------------------------------------
R0003:C00002-----------------------------------------------------------------------------------
  ** END OF RUN :    2

*********************************************************************************************
```

```
--------------------
| START            | Project  dir.:Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\PRE\SCS\
-------------------- Rainfall dir.:Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\PRE\SCS\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 0004
    NSTORM=   1
           #  1=100SCS24.stm
---------------------------------------------------------------------------------------------
R0004:C00002-----------------------------------------------------------------------------------
*#***************************************************************************
*#  Project Name: [221 FOX STREET SUBDIVISION]    Project Number: [09-062]
*#  Date        : 06-24-2022
*#  Modeller    : [CJ]
*#  Company     : WMI & Associates Ltd.
*#  License #   :  2880720
*#***************************************************************************
---------------------------------------------------------------------------------------------
R0004:C00002-----------------------------------------------------------------------------------
--------------------
| READ STORM       |  Filename: Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\PRE\SCS\100SCS24.
| Ptotal=  98.70 mm|  Comments: 100-Year SCS Type-II Storm Distribution (24-hour) Orillia,
--------------------
```

TIME hh:mm	RAIN| mm/hr|	TIME hh:mm	RAIN| mm/hr|	TIME hh:mm	RAIN| mm/hr|	TIME hh:mm	RAIN| mm/hr|	TIME hh:mm	RAIN| mm/hr|	TIME hh:mm
0:12	.987|	4:12	1.974|	8:12	2.961|	12:12	19.740|	16:12	2.468|	20:12
0:24	.987|	4:24	1.974|	8:24	2.961|	12:24	12.338|	16:24	2.467|	20:24
0:36	.987|	4:36	1.974|	8:36	2.961|	12:36	8.883|	16:36	2.467|	20:36
0:48	.987|	4:48	1.974|	8:48	2.961|	12:48	8.390|	16:48	2.467|	20:48
1:00	.987|	5:00	1.974|	9:00	2.961|	13:00	5.922|	17:00	1.480|	21:00
1:12	.987|	5:12	1.974|	9:12	2.961|	13:12	4.935|	17:12	1.481|	21:12
1:24	.987|	5:24	1.974|	9:24	2.961|	13:24	4.935|	17:24	1.974|	21:24
1:36	.987|	5:36	1.974|	9:36	2.961|	13:36	4.935|	17:36	1.481|	21:36
1:48	.987|	5:48	1.974|	9:48	2.961|	13:48	4.935|	17:48	1.974|	21:48
2:00	.987|	6:00	1.974|	10:00	2.961|	14:00	4.935|	18:00	1.481|	22:00
2:12	.987|	6:12	1.974|	10:12	5.428|	14:12	2.961|	18:12	1.481|	22:12

2:24	.987|	6:24	1.974|	10:24	5.429|	14:24	2.961|	18:24	1.480|	22:24
2:36	.987|	6:36	1.974|	10:36	5.428|	14:36	2.961|	18:36	1.974|	22:36
2:48	.987|	6:48	1.974|	10:48	5.429|	14:48	2.961|	18:48	1.481|	22:48
3:00	.987|	7:00	1.974|	11:00	5.428|	15:00	2.961|	19:00	1.481|	23:00
3:12	.987|	7:12	1.974|	11:12	7.403|	15:12	2.467|	19:12	1.974|	23:12
3:24	.987|	7:24	1.974|	11:24	10.857|	15:24	2.467|	19:24	1.481|	23:24
3:36	.987|	7:36	1.974|	11:36	26.155|	15:36	2.467|	19:36	1.974|	23:36
3:48	.987|	7:48	1.974|	11:48	54.285|	15:48	2.467|	19:48	1.481|	23:48
4:00	.987|	8:00	1.974|	12:00	111.038|	16:00	2.467|	20:00	1.974|	24:00

```
---------------------------------------------------------------------------------------------
R0004:C00003-----------------------------------------------------------------------------------
* PRE-DEVELOPMENT PRE(EXISTING)
--------------------------
| CALIB NASHYD           |   Area    (ha)=   23.200   Curve Number   (CN)= 49.00
| 01:PRE        DT= 1.00 |   Ia      (mm)=    9.600   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .787

     Unit Hyd Qpeak  (cms)=    1.126

     PEAK FLOW       (cms)=     .474 (i)
     TIME TO PEAK    (hrs)=   12.783
     DURATION        (hrs)=   29.033, (dddd|hh:mm:)=   1|05:02
     AVERAGE FLOW    (cms)=     .050
     RUNOFF VOLUME    (mm)=   22.460
     TOTAL RAINFALL   (mm)=   98.701
     RUNOFF COEFFICIENT   =     .228

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

---------------------------------------------------------------------------------------------
R0004:C00004-----------------------------------------------------------------------------------
* EXTERNAL AREA EXT
--------------------------
| CALIB STANDHYD         |   Area    (ha)=    6.14
| 02:EXT        DT= 1.00 |   Total Imp(%)=   25.00   Dir. Conn.(%)=   14.00
--------------------------

                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.53         4.61
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       3.00         8.00
     Length            (m)=     150.00        90.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     111.04        54.33
               over (min)         2.00        12.00
     Storage Coeff.  (min)=       2.25 (ii)   11.92 (ii)
     Unit Hyd. Tpeak (min)=       2.00        12.00
     Unit Hyd. peak  (cms)=        .52          .09

                                                    *TOTALS*
     PEAK FLOW       (cms)=        .26          .45          .629 (iii)
     TIME TO PEAK    (hrs)=      12.00        12.10        12.000
     RUNOFF VOLUME    (mm)=      96.70        35.84        44.367
```

```
     TOTAL RAINFALL   (mm)=      98.70        98.70         98.701
     RUNOFF COEFFICIENT   =        .98          .36           .450

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  59.0    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.

--------------------------------------------------------------------------------------------
R0004:C00005--------------------------------------------------------------------------------
--------------------
| SHIFT HYD        |                              AREA     QPEAK      TPEAK      R.V.
|                  |                               (ha)     (cms)      (hrs)      (mm)
|                  |        ID= 2:EXT               6.14      .629     12.000    44.367
| Shift=   10.0 min | SHIFTED ID= 3:S-EXT            6.14      .629     12.150    44.367
--------------------

--------------------------------------------------------------------------------------------
R0004:C00006--------------------------------------------------------------------------------
------------------------
| ADD HYD              |
| 04:S-EXT+PRE         |   ID:NHYD            AREA     QPEAK    TPEAK      R.V.     DWF
------------------------                       (ha)     (cms)    (hrs)      (mm)   (cms)
                      ID 1 01:PRE           23.200      .474   12.783    22.460    .000
                     +ID 2 03:S-EXT          6.140      .629   12.150    44.367    .000
                     ======================================================================
                     SUM   04:S-EXT+PRE     29.340      .864   12.167    27.045    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------------------
R0004:C00007--------------------------------------------------------------------------------
--------------------------------------------------------------------------------------------
R0004:C00002--------------------------------------------------------------------------------
--------------------------------------------------------------------------------------------
R0004:C00002--------------------------------------------------------------------------------
--------------------------------------------------------------------------------------------
R0004:C00002--------------------------------------------------------------------------------
  ** END OF RUN :    3

********************************************************************************************




--------------------
| START            | Project  dir.:Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\PRE\SCS\
-------------------- Rainfall dir.:Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\PRE\SCS\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 0005
    NSTORM=   1
```



```
          #  1=12REGTIM.O89
--------------------------------------------------------------------------------------------
R0005:C00002--------------------------------------------------------------------------------
*#****************************************************************************
*#  Project Name: [221 FOX STREET SUBDIVISION]    Project Number: [09-062]
*#  Date        : 06-24-2022
*#  Modeller    : [CJ]
*#  Company     : WMI & Associates Ltd.
*#  License #   :  2880720
*#****************************************************************************
--------------------------------------------------------------------------------------------
R0005:C00002--------------------------------------------------------------------------------
--------------------
| READ STORM       |  Filename: Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\PRE\SCS\12REGTIM.
| Ptotal= 193.00 mm|  Comments: TIMMINS REGIONAL STORM (12-hour)
--------------------
      TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME
     hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm
      1:00  15.000|   3:00  10.000|   5:00   5.000|   7:00  43.000|   9:00  23.000|  11:00
      2:00  20.000|   4:00   3.000|   6:00  20.000|   8:00  20.000|  10:00  13.000|  12:00

--------------------------------------------------------------------------------------------
R0005:C00003--------------------------------------------------------------------------------
* PRE-DEVELOPMENT PRE(EXISTING)
--------------------------
| CALIB NASHYD           |   Area    (ha)=   23.200   Curve Number   (CN)= 49.00
| 01:PRE       DT= 1.00 |   Ia      (mm)=    9.600   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .787

     Unit Hyd Qpeak  (cms)=    1.126

     PEAK FLOW       (cms)=     .896 (i)
     TIME TO PEAK    (hrs)=    7.583
     DURATION        (hrs)=   17.033, (dddd|hh:mm:)=   0|17:02
     AVERAGE FLOW    (cms)=     .284
     RUNOFF VOLUME    (mm)=   75.119
     TOTAL RAINFALL   (mm)=  193.000
     RUNOFF COEFFICIENT   =     .389

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

--------------------------------------------------------------------------------------------
R0005:C00004--------------------------------------------------------------------------------
* EXTERNAL AREA EXT
--------------------------
| CALIB STANDHYD         |   Area    (ha)=    6.14
| 02:EXT       DT= 1.00 |   Total Imp(%)=   25.00   Dir. Conn.(%)=   14.00
--------------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.53         4.61
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       3.00         8.00
     Length            (m)=     150.00        90.00
```

```
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     43.00        32.04
               over (min)        3.00        15.00
     Storage Coeff.  (min)=       3.28 (ii)   15.23 (ii)
     Unit Hyd. Tpeak (min)=       3.00        15.00
     Unit Hyd. peak  (cms)=        .35          .07
                                                    *TOTALS*
     PEAK FLOW       (cms)=        .10          .38          .486 (iii)
     TIME TO PEAK    (hrs)=       7.00         7.03         7.000
     RUNOFF VOLUME    (mm)=     191.00       103.88       116.073
     TOTAL RAINFALL   (mm)=     193.00       193.00       193.000
     RUNOFF COEFFICIENT   =        .99          .54          .601

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  59.0    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.

--------------------------------------------------------------------------------
R0005:C00005------------------------------------------------------------------------
--------------------
| SHIFT HYD         |                              AREA     QPEAK      TPEAK      R.V.
|                   |                               (ha)     (cms)      (hrs)      (mm)
|                   |         ID= 2:EXT              6.14      .486      7.000   116.073
| Shift=   10.0 min | SHIFTED ID= 3:S-EXT            6.14      .486      7.150   116.073
--------------------

--------------------------------------------------------------------------------
R0005:C00006------------------------------------------------------------------------
------------------------
| ADD HYD              |
| 04:S-EXT+PRE         |   ID:NHYD            AREA     QPEAK    TPEAK      R.V.     DWF
------------------------                       (ha)     (cms)    (hrs)      (mm)   (cms)
                      ID 1 01:PRE           23.200      .896    7.583    75.119    .000
                     +ID 2 03:S-EXT          6.140      .486    7.150   116.073    .000
                     ======================================================================
                     SUM   04:S-EXT+PRE     29.340     1.287    7.183    83.689    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
R0005:C00007------------------------------------------------------------------------
--------------------------------------------------------------------------------
R0005:C00002------------------------------------------------------------------------
--------------------------------------------------------------------------------
R0005:C00002------------------------------------------------------------------------
--------------------------------------------------------------------------------
R0005:C00002------------------------------------------------------------------------
--------------------------------------------------------------------------------
R0005:C00002------------------------------------------------------------------------
--------------------
| FINISH           |
```



```
--------------------
--------------------------------------------------------------------------------
********************************************************************************
     WARNINGS / ERRORS / NOTES
     -------------------------
   Simulation ended on 2022-06-22     at 17:46:46
================================================================================
```

Pre-Development Condition
4-hour Chicago Storm Distribution

```
2     Metric units
*#**************************************************************************
*#  Project Name: [221 FOX STREET SUBDIVISION]    Project Number: [09-062]
*#  Date        : 06-24-2022
*#  Modeller    : [CJ]
*#  Company     : WMI & Associates Ltd.
*#  License #   :  2880720
*#**************************************************************************
*%
*%  PRE-DEVELOPMENT CONDITION (4-HOUR CHICAGO STORM)
*%
*% 25mm CHICAGO STORM DISTRIBUTION ORILLIA IDF DATA (4 HOUR)
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[1]
*%                   ["25mm4hr.stm"] <--storm filename,
*%-----------------|-----------------------------------------------------------|
READ STORM          STORM_FILENAME=["STORM.001"]
*%-----------------|-----------------------------------------------------------|
* PRE-DEVELOPMENT PRE(EXISTING)
CALIB NASHYD        ID=[1], NHYD=["PRE"], DT=[1]min, AREA=[23.20](ha),
                    DWF=[0](cms),  CN/C=[49], IA=[9.6](mm),
                    N=[3], TP=[0.787]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-----------------------------------------------------------|
* EXTERNAL AREA EXT
CALIB STANDHYD      ID=[2], NHYD=["EXT"], DT=[1](min), AREA=[6.14](ha),
                    XIMP=[0.14], TIMP=[0.25], DWF=[0](cms), LOSS=[2],
                    SCS curve number CN=[59],
                    Pervious   surfaces: IAper=[5](mm), SLPP=[8.0](%),
                                         LGP=[90](m), MNP=[0.25], SCP=[0](min),
                    Impervious surfaces: IAimp=[2.0](mm), SLPI=[3.0](%),
                                         LGI=[150](m), MNI=[0.013], SCI=[0](min),
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-----------------------------------------------------------|
SHIFT HYD           IDout=[3], NHYD=["S-EXT"], IDin=[2], TLAG=[10](min)
*%-----------------|-----------------------------------------------------------|
ADD HYD             IDsum=[4], NHYD=["S-EXT+PRE"], IDs to add=[1+3]
*%-----------------|-----------------------------------------------------------|
*% 2-YEAR CHICAGO STORM DISTRIBUTION ORILLIA IDF DATA (4 HOUR)
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[2]
*%                   ["2CHI4.stm"] <--storm filename
*%-----------------|-----------------------------------------------------------|
*% 5-YEAR CHICAGO STORM DISTRIBUTION ORILLIA IDF DATA (4 HOUR)
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[3]
*%                   ["5CHI4.stm"] <--storm filename
*%-----------------|-----------------------------------------------------------|
*% 25-YEAR CHICAGO STORM DISTRIBUTION ORILLIA IDF DATA (4 HOUR)
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[4]
*%                   ["25CHI4.stm"] <--storm filename
*%-----------------|-----------------------------------------------------------|
*% 100-YEAR CHICAGO STORM DISTRIBUTION ORILLIA IDF DATA (4 HOUR)
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[5]
*%                   ["100CHI4.stm"] <--storm filename
*%-----------------|-----------------------------------------------------------|
```



```
FINISH
```

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

SSSSS   W   W   M   M   H   H   Y   Y   M   M    OOO          222     000    11   77777 ==
S       W W W   MM MM   H   H    Y Y    MM MM   O   O          2    0   0   11   7   7
SSSSS   W W W   M M M   HHHHH     Y     M M M   O   O          2    0   0   11       7
    S    W W    M   M   H   H     Y     M   M   O   O        222    0   0   11      7
SSSSS    W W    M   M   H   H     Y     M   M    OOO         2      0   0   11     7   ==
                                                            2      0   0   11    7    #
      StormWater Management HYdrologic Model                 222     000    11    7    ==

********************************************************************************
************************************  SWMHYMO Ver4.05.0  ***********************
*****************  A single event and continuous hydrologic simulation model  ***********
*****************     based on the principles of HYMO and its successors      ***********
*****************                OTTHYMO-83 and OTTHYMO-89.                   ***********
********************************************************************************
***************** Distributed by:  J.F. Sabourin and Associates Inc.          ***********
*****************                  Ottawa,  Ontario: (613) 836-3884           ***********
*****************                  Gatineau, Quebec: (819) 243-6858           ***********
*****************                  E-Mail: swmhymo@jfsa.com                   ***********
********************************************************************************

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++++++++++++++++++ Licensed user: WMI & Associates Ltd.                      ++++++++++++
++++++++++++++++++                Barrie               SERIAL#:2880720       ++++++++++++
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

********************************************************************************
*****************          ++++++ PROGRAM ARRAY DIMENSIONS ++++++           ***********
*****************          Maximum value for ID numbers  :     11           ***********
*****************          Max. number of rainfall points: 105408           ***********
*****************          Max. number of flow points    : 105408           ***********
********************************************************************************



*****************************   D E T A I L E D   O U T P U T   ********************
********************************************************************************
*                RUN DATE: 2022-06-22     TIME: 17:37:16     RUN COUNTER: 000037
********************************************************************************
 * Input   file: Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\PRE\CHI\PRE.dat
 * Output  file: Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\PRE\CHI\PRE.out
 * Summary file: Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\PRE\CHI\PRE.sum
 * User comments:
 * 1:_____________________________________________________________________________
 * 2:_____________________________________________________________________________
 * 3:_____________________________________________________________________________
 ********************************************************************************


--------------------------------------------------------------------------------
R0001:C00001------------------------------------------------------------------------
*#*************************************************************************
*#  Project Name: [221 FOX STREET SUBDIVISION]    Project Number: [09-062]
*#  Date        : 06-24-2022
```



```
*#  Modeller    : [CJ]
*#  Company     : WMI & Associates Ltd.
*#  License #   :  2880720
*#*************************************************************************
--------------------
| START            | Project  dir.:Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\PRE\CHI\
------------------- Rainfall dir.:Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\PRE\CHI\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 0001
    NSTORM=   1
          #  1=25mm4hr.stm
--------------------------------------------------------------------------------------------
R0001:C00002------------------------------------------------------------------------------
--------------------
| READ STORM       |  Filename: Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\PRE\CHI\25mm4hr.
| Ptotal=  25.00 mm|  Comments: 25mm Chicago Storm Distribution (4-hour) Orillia, ON.
--------------------
      TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME
     hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm
      0:10   1.740|   0:50   3.500|   1:30  13.740|   2:10   3.750|   2:50   2.380|   3:30
      0:20   1.970|   1:00   5.020|   1:40   7.730|   2:20   3.250|   3:00   2.190|   3:40
      0:30   2.290|   1:10  10.720|   1:50   5.590|   2:30   2.890|   3:10   2.040|   3:50
      0:40   2.740|   1:20  62.850|   2:00   4.460|   2:40   2.610|   3:20   1.910|   4:00

--------------------------------------------------------------------------------------------
R0001:C00003------------------------------------------------------------------------------
* PRE-DEVELOPMENT PRE(EXISTING)
--------------------------
| CALIB NASHYD           |   Area    (ha)=   23.200   Curve Number   (CN)= 49.00
| 01:PRE       DT= 1.00 |   Ia      (mm)=    9.600   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .787

     Unit Hyd Qpeak  (cms)=    1.126

     PEAK FLOW       (cms)=     .020 (i)
     TIME TO PEAK    (hrs)=    2.717
     DURATION        (hrs)=    9.033, (dddd|hh:mm:)=   0|09:02
     AVERAGE FLOW    (cms)=     .006
     RUNOFF VOLUME    (mm)=     .848
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .034

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

--------------------------------------------------------------------------------------------
R0001:C00004------------------------------------------------------------------------------
* EXTERNAL AREA EXT
--------------------------
| CALIB STANDHYD         |   Area    (ha)=    6.14
| 02:EXT       DT= 1.00 |   Total Imp(%)=   25.00   Dir. Conn.(%)=   14.00
--------------------------
                            IMPERVIOUS    PERVIOUS (i)
```

```
     Surface Area     (ha)=       1.53         4.61
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       3.00         8.00
     Length            (m)=     150.00        90.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      62.85         2.53
               over (min)        3.00        36.00
     Storage Coeff.  (min)=       2.82 (ii)   35.81 (ii)
     Unit Hyd. Tpeak (min)=       3.00        36.00
     Unit Hyd. peak  (cms)=        .39          .03
                                                    *TOTALS*
     PEAK FLOW       (cms)=        .14          .02          .146 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.98         1.333
     RUNOFF VOLUME    (mm)=      23.00         2.44         5.319
     TOTAL RAINFALL   (mm)=      25.00        25.00        25.000
     RUNOFF COEFFICIENT   =        .92          .10          .213

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  59.0    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.

--------------------------------------------------------------------------------------------
R0001:C00005----------------------------------------------------------------------------------
--------------------
| SHIFT HYD        |                                AREA     QPEAK      TPEAK      R.V.
|                  |                                 (ha)     (cms)      (hrs)      (mm)
|                  |         ID= 2:EXT               6.14      .146      1.333     5.319
| Shift=   10.0 min | SHIFTED ID= 3:S-EXT            6.14      .146      1.483     5.319
--------------------

--------------------------------------------------------------------------------------------
R0001:C00006----------------------------------------------------------------------------------
------------------------
| ADD HYD              |
| 04:S-EXT+PRE         |   ID:NHYD            AREA     QPEAK    TPEAK      R.V.     DWF
------------------------                       (ha)     (cms)    (hrs)      (mm)   (cms)
                      ID 1 01:PRE           23.200      .020    2.717      .848    .000
                     +ID 2 03:S-EXT          6.140      .146    1.483     5.319    .000
                     ================================================================
                     SUM   04:S-EXT+PRE     29.340      .147    1.483     1.783    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------------------
R0001:C00007----------------------------------------------------------------------------------
  ** END OF RUN :    0

********************************************************************************************
```



```
--------------------
| START            | Project  dir.:Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\PRE\CHI\
-------------------- Rainfall dir.:Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\PRE\CHI\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 0002
    NSTORM=   1
           #  1=2CHI4.stm
--------------------------------------------------------------------------------------------
R0002:C00002----------------------------------------------------------------------------------
*#**************************************************************************
*#  Project Name: [221 FOX STREET SUBDIVISION]    Project Number: [09-062]
*#  Date        : 06-24-2022
*#  Modeller    : [CJ]
*#  Company     : WMI & Associates Ltd.
*#  License #   :  2880720
*#**************************************************************************
--------------------------------------------------------------------------------------------
R0002:C00002----------------------------------------------------------------------------------
--------------------
| READ STORM       |  Filename: Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\PRE\CHI\2CHI4.stm
| Ptotal=  32.77 mm|  Comments: 2-Year Chicago Storm Distribution (4-hour) Orillia, ON.
--------------------
      TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME
     hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm
      0:10   2.285|   0:50   4.586|   1:30  18.005|   2:10   4.915|   2:50   3.120|   3:30
      0:20   2.585|   1:00   6.583|   1:40  10.127|   2:20   4.266|   3:00   2.877|   3:40
      0:30   2.995|   1:10  14.057|   1:50   7.331|   2:30   3.787|   3:10   2.674|   3:50
      0:40   3.598|   1:20  82.380|   2:00   5.849|   2:40   3.416|   3:20   2.501|   4:00

--------------------------------------------------------------------------------------------
R0002:C00003----------------------------------------------------------------------------------
* PRE-DEVELOPMENT PRE(EXISTING)
--------------------------
| CALIB NASHYD           |   Area    (ha)=   23.200   Curve Number   (CN)= 49.00
| 01:PRE       DT= 1.00 |   Ia      (mm)=    9.600   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .787

     Unit Hyd Qpeak  (cms)=    1.126

     PEAK FLOW       (cms)=     .046 (i)
     TIME TO PEAK    (hrs)=    2.567
     DURATION        (hrs)=    9.033, (dddd|hh:mm:)=   0|09:02
     AVERAGE FLOW    (cms)=     .013
     RUNOFF VOLUME    (mm)=    1.867
     TOTAL RAINFALL   (mm)=   32.772
     RUNOFF COEFFICIENT   =     .057

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

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

R0002:C00004----------

* EXTERNAL AREA EXT

| CALIB STANDHYD | Area (ha)= 6.14
| 02:EXT DT= 1.00 | Total Imp(%)= 25.00 Dir. Conn.(%)= 14.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	1.53	4.61
Dep. Storage (mm)=	2.00	5.00
Average Slope (%)=	3.00	8.00
Length (m)=	150.00	90.00
Mannings n =	.013	.250
Max.eff.Inten.(mm/hr)=	82.38	5.75
over (min)	3.00	26.00
Storage Coeff. (min)=	2.53 (ii)	26.28 (ii)
Unit Hyd. Tpeak (min)=	3.00	26.00
Unit Hyd. peak (cms)=	.42	.04

			TOTALS
PEAK FLOW (cms)=	.19	.04	.197 (iii)
TIME TO PEAK (hrs)=	1.33	1.75	1.333
RUNOFF VOLUME (mm)=	30.77	4.43	8.115
TOTAL RAINFALL (mm)=	32.77	32.77	32.772
RUNOFF COEFFICIENT =	.94	.14	.248

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 59.0 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.

R0002:C00005----------

SHIFT HYD		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
	ID= 2:EXT	6.14	.197	1.333	8.115
Shift= 10.0 min	SHIFTED ID= 3:S-EXT	6.14	.197	1.483	8.115

R0002:C00006----------

ADD HYD	ID:NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
	ID 1 01:PRE	23.200	.046	2.567	1.867	.000
	+ID 2 03:S-EXT	6.140	.197	1.483	8.115	.000
	SUM 04:S-EXT+PRE	29.340	.202	1.483	3.175	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

R0002:C00007----------

R0002:C00002----------

** END OF RUN : 1

****

START	Project dir.:Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\PRE\CHI\
	Rainfall dir.:Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\PRE\CHI\

TZERO = .00 hrs on 0
METOUT= 2 (output = METRIC)
NRUN = 0003
NSTORM= 1
# 1=5CHI4.stm

R0003:C00002----------

*#**********

*# Project Name: [221 FOX STREET SUBDIVISION] Project Number: [09-062]
*# Date : 06-24-2022
*# Modeller : [CJ]
*# Company : WMI & Associates Ltd.
*# License # : 2880720

*#**********

R0003:C00002----------

READ STORM	Filename: Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\PRE\CHI\5CHI4.stm
Ptotal= 43.79 mm	Comments: 5-Year Chicago Storm Distribution (4-hour) Orillia, ON.

TIME hh:mm	RAIN mm/hr	TIME hh:mm	RAIN mm/hr	TIME hh:mm	RAIN mm/hr	TIME hh:mm	RAIN mm/hr	TIME hh:mm	RAIN mm/hr	TIME hh:mm
0:10	3.077	0:50	6.162	1:30	24.075	2:10	6.603	2:50	4.197	3:30
0:20	3.479	1:00	8.836	1:40	13.572	2:20	5.734	3:00	3.872	3:40
0:30	4.030	1:10	18.812	1:50	9.837	2:30	5.091	3:10	3.599	3:50
0:40	4.838	1:20	109.412	2:00	7.853	2:40	4.594	3:20	3.367	4:00

R0003:C00003----------

* PRE-DEVELOPMENT PRE(EXISTING)

CALIB NASHYD	Area (ha)= 23.200 Curve Number (CN)= 49.00
01:PRE DT= 1.00	Ia (mm)= 9.600 # of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= .787

Unit Hyd Qpeak (cms)= 1.126

PEAK FLOW (cms)= .101 (i)
TIME TO PEAK (hrs)= 2.467

```
     DURATION        (hrs)=    9.033, (dddd|hh:mm:)=   0|09:02
     AVERAGE FLOW    (cms)=     .028
     RUNOFF VOLUME    (mm)=    3.915
     TOTAL RAINFALL   (mm)=   43.791
     RUNOFF COEFFICIENT   =     .089

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

-------------------------------------------------------------------------------------------
R0003:C00004-------------------------------------------------------------------------------
* EXTERNAL AREA EXT
--------------------------
| CALIB STANDHYD         |   Area    (ha)=    6.14
| 02:EXT        DT= 1.00 |   Total Imp(%)=   25.00   Dir. Conn.(%)=   14.00
--------------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.53          4.61
     Dep. Storage     (mm)=       2.00          5.00
     Average Slope     (%)=       3.00          8.00
     Length            (m)=     150.00         90.00
     Mannings n           =       .013          .250

     Max.eff.Inten.(mm/hr)=     109.41         12.97
               over (min)        2.00         19.00
     Storage Coeff.  (min)=       2.26 (ii)   19.41 (ii)
     Unit Hyd. Tpeak (min)=       2.00         19.00
     Unit Hyd. peak  (cms)=        .52           .06
                                                    *TOTALS*
     PEAK FLOW       (cms)=        .26           .10          .279 (iii)
     TIME TO PEAK    (hrs)=       1.33          1.63         1.333
     RUNOFF VOLUME    (mm)=      41.79          8.04        12.766
     TOTAL RAINFALL   (mm)=      43.79         43.79        43.791
     RUNOFF COEFFICIENT   =        .95           .18          .292

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  59.0    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.

-------------------------------------------------------------------------------------------
R0003:C00005-------------------------------------------------------------------------------
--------------------
| SHIFT HYD        |                              AREA     QPEAK      TPEAK      R.V.
|                  |                               (ha)     (cms)      (hrs)      (mm)
|                  |        ID= 2:EXT              6.14      .279      1.333    12.766
| Shift=   10.0 min | SHIFTED ID= 3:S-EXT           6.14      .279      1.483    12.766
--------------------

-------------------------------------------------------------------------------------------
R0003:C00006-------------------------------------------------------------------------------
------------------------
| ADD HYD              |
| 04:S-EXT+PRE         |   ID:NHYD           AREA     QPEAK    TPEAK      R.V.     DWF
```



```
------------------------                        (ha)     (cms)    (hrs)      (mm)   (cms)
                       ID 1 01:PRE           23.200      .101    2.467     3.915    .000
                      +ID 2 03:S-EXT          6.140      .279    1.483    12.766    .000
                      ==========================================================================
                      SUM   04:S-EXT+PRE     29.340      .295    1.483     5.768    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------------------
R0003:C00007-------------------------------------------------------------------------------
-------------------------------------------------------------------------------------------
R0003:C00002-------------------------------------------------------------------------------
-------------------------------------------------------------------------------------------
R0003:C00002-------------------------------------------------------------------------------
  ** END OF RUN :    2

*******************************************************************************************




--------------------
| START            | Project  dir.:Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\PRE\CHI\
-------------------- Rainfall dir.:Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\PRE\CHI\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 0004
    NSTORM=   1
           #  1=25CHI4.stm
-------------------------------------------------------------------------------------------
R0004:C00002-------------------------------------------------------------------------------
*#***************************************************************************
*#  Project Name: [221 FOX STREET SUBDIVISION]    Project Number: [09-062]
*#  Date        : 06-24-2022
*#  Modeller    : [CJ]
*#  Company     : WMI & Associates Ltd.
*#  License #   :  2880720
*#***************************************************************************
-------------------------------------------------------------------------------------------
R0004:C00002-------------------------------------------------------------------------------
--------------------
| READ STORM       |  Filename: Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\PRE\CHI\25CHI4.
| Ptotal=  60.08 mm|  Comments: 25-Year Chicago Storm Distribution (4-hour) Orillia, ON.
--------------------
      TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME
     hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm
      0:10   4.238|   0:50   8.477|   1:30  33.039|   2:10   9.082|   2:50   5.778|   3:30
      0:20   4.791|   1:00  12.149|   1:40  18.646|   2:20   7.889|   3:00   5.330|   3:40
      0:30   5.548|   1:10  25.827|   1:50  13.522|   2:30   7.007|   3:10   4.956|   3:50
      0:40   6.658|   1:20 149.649|   2:00  10.799|   2:40   6.324|   3:20   4.637|   4:00

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

```
R0004:C00003-------------------------------------------------------------------------------
* PRE-DEVELOPMENT PRE(EXISTING)
--------------------------
| CALIB NASHYD           |   Area    (ha)=   23.200   Curve Number   (CN)= 49.00
| 01:PRE        DT= 1.00 |   Ia      (mm)=    9.600   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .787

     Unit Hyd Qpeak  (cms)=    1.126

     PEAK FLOW       (cms)=     .215 (i)
     TIME TO PEAK    (hrs)=    2.417
     DURATION        (hrs)=    9.033, (dddd|hh:mm:)=   0|09:02
     AVERAGE FLOW    (cms)=     .058
     RUNOFF VOLUME    (mm)=    8.093
     TOTAL RAINFALL   (mm)=   60.078
     RUNOFF COEFFICIENT   =     .135

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

-------------------------------------------------------------------------------------------
R0004:C00004-------------------------------------------------------------------------------
* EXTERNAL AREA EXT
--------------------------
| CALIB STANDHYD         |   Area    (ha)=    6.14
| 02:EXT        DT= 1.00 |   Total Imp(%)=   25.00   Dir. Conn.(%)=   14.00
--------------------------

                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      1.53         4.61
     Dep. Storage     (mm)=      2.00         5.00
     Average Slope     (%)=      3.00         8.00
     Length            (m)=    150.00        90.00
     Mannings n           =      .013         .250

     Max.eff.Inten.(mm/hr)=    149.65        27.78
               over (min)        2.00        15.00
     Storage Coeff.  (min)=      1.99 (ii)   14.64 (ii)
     Unit Hyd. Tpeak (min)=      2.00        15.00
     Unit Hyd. peak  (cms)=       .56          .08
                                                    *TOTALS*
     PEAK FLOW       (cms)=       .35          .22          .427 (iii)
     TIME TO PEAK    (hrs)=      1.33         1.55         1.333
     RUNOFF VOLUME    (mm)=     58.08        14.81        20.865
     TOTAL RAINFALL   (mm)=     60.08        60.08        60.078
     RUNOFF COEFFICIENT   =       .97          .25          .347

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  59.0    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.

-------------------------------------------------------------------------------------------
R0004:C00005-------------------------------------------------------------------------------
--------------------
```



```
| SHIFT HYD         |                                AREA     QPEAK      TPEAK      R.V.
|                   |                                 (ha)     (cms)      (hrs)      (mm)
|                   |         ID= 2:EXT               6.14      .427      1.333    20.865
| Shift=   10.0 min | SHIFTED ID= 3:S-EXT             6.14      .427      1.483    20.865
--------------------

-------------------------------------------------------------------------------------------
R0004:C00006-------------------------------------------------------------------------------
------------------------
| ADD HYD              |
| 04:S-EXT+PRE         |   ID:NHYD            AREA     QPEAK    TPEAK      R.V.     DWF
------------------------                       (ha)     (cms)    (hrs)      (mm)   (cms)
                       ID 1 01:PRE           23.200      .215    2.417     8.093    .000
                      +ID 2 03:S-EXT          6.140      .427    1.483    20.865    .000
                      ==========================================================================
                      SUM   04:S-EXT+PRE     29.340      .466    1.483    10.766    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------------------
R0004:C00007-------------------------------------------------------------------------------
-------------------------------------------------------------------------------------------
R0004:C00002-------------------------------------------------------------------------------
-------------------------------------------------------------------------------------------
R0004:C00002-------------------------------------------------------------------------------
-------------------------------------------------------------------------------------------
R0004:C00002-------------------------------------------------------------------------------
  ** END OF RUN :    3

*******************************************************************************************




--------------------
| START            | Project  dir.:Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\PRE\CHI\
-------------------- Rainfall dir.:Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\PRE\CHI\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 0005
    NSTORM=   1
           #  1=100CHI4.stm
-------------------------------------------------------------------------------------------
R0005:C00002-------------------------------------------------------------------------------
*#**************************************************************************
*#  Project Name: [221 FOX STREET SUBDIVISION]    Project Number: [09-062]
*#  Date        : 06-24-2022
*#  Modeller    : [CJ]
*#  Company     : WMI & Associates Ltd.
*#  License #   :  2880720
*#**************************************************************************
-------------------------------------------------------------------------------------------
```

R0005:C00002----------

| READ STORM | Filename: Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\PRE\CHI\100CHI4.
| Ptotal= 73.84 mm | Comments: 100-Year Chicago Storm Distribution (4-hour) Orillia, ON.

TIME hh:mm	RAIN mm/hr	TIME hh:mm	RAIN mm/hr	TIME hh:mm	RAIN mm/hr	TIME hh:mm	RAIN mm/hr	TIME hh:mm	RAIN mm/hr	TIME hh:mm	RAIN mm/hr
0:10	5.248	0:50	10.476	1:30	40.631	2:10	11.222	2:50	7.149	3:30	
0:20	5.931	1:00	14.996	1:40	22.982	2:20	9.752	3:00	6.596	3:40	
0:30	6.865	1:10	31.788	1:50	16.686	2:30	8.664	3:10	6.134	3:50	
0:40	8.234	1:20	182.809	2:00	13.336	2:40	7.822	3:20	5.741	4:00	

R0005:C00003----------

* PRE-DEVELOPMENT PRE(EXISTING)

| CALIB NASHYD | Area (ha)= 23.200 | Curve Number (CN)= 49.00
| 01:PRE DT= 1.00 | Ia (mm)= 9.600 | # of Linear Res.(N)= 3.00
| U.H. Tp(hrs)= .787

Unit Hyd Qpeak (cms)= 1.126

PEAK FLOW (cms)= .339 (i)
TIME TO PEAK (hrs)= 2.383
DURATION (hrs)= 9.033, (dddd|hh:mm:)= 0|09:02
AVERAGE FLOW (cms)= .090
RUNOFF VOLUME (mm)= 12.558
TOTAL RAINFALL (mm)= 73.838
RUNOFF COEFFICIENT = .170

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

R0005:C00004----------

* EXTERNAL AREA EXT

| CALIB STANDHYD | Area (ha)= 6.14
| 02:EXT DT= 1.00 | Total Imp(%)= 25.00 Dir. Conn.(%)= 14.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	1.53	4.61
Dep. Storage (mm)=	2.00	5.00
Average Slope (%)=	3.00	8.00
Length (m)=	150.00	90.00
Mannings n =	.013	.250
Max.eff.Inten.(mm/hr)=	182.81	47.07
over (min)	2.00	12.00
Storage Coeff. (min)=	1.84 (ii)	12.08 (ii)
Unit Hyd. Tpeak (min)=	2.00	12.00
Unit Hyd. peak (cms)=	.59	.09
		TOTALS
PEAK FLOW (cms)=	.43	.37 .599 (iii)
TIME TO PEAK (hrs)=	1.33	1.50 1.333
RUNOFF VOLUME (mm)=	71.84	21.61 28.639
TOTAL RAINFALL (mm)=	73.84	73.84 73.838
RUNOFF COEFFICIENT =	.97	.29 .388

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 59.0 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.

R0005:C00005----------

SHIFT HYD		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
	ID= 2:EXT	6.14	.599	1.333	28.639
Shift= 10.0 min	SHIFTED ID= 3:S-EXT	6.14	.599	1.483	28.639

R0005:C00006----------

ADD HYD	ID:NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
04:S-EXT+PRE	ID 1 01:PRE	23.200	.339	2.383	12.558	.000
	+ID 2 03:S-EXT	6.140	.599	1.483	28.639	.000
	SUM 04:S-EXT+PRE	29.340	.665	1.483	15.923	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

R0005:C00007----------

R0005:C00002----------

R0005:C00002----------

R0005:C00002----------

R0005:C00002----------

R0005:C00002----------

| FINISH |

****

WARNINGS / ERRORS / NOTES

Simulation ended on 2022-06-22 at 17:37:16

==========

Post-Development Condition
24-hour SCS Type-II Storm Distribution

```
2     Metric units
*#*************************************************************************
*#  Project Name: [221 FOX STREET SUBDIVISION]    Project Number: [09-062]
*#  Date        : 07-18-2022
*#  Modeller    : [CJ]
*#  Company     : WMI & Associates Ltd.
*#  License #   :  2880720
*#*************************************************************************
*%
*%  POST-DEVELOPMENT CONDITION
*%
*% 2-YEAR 24hr SCS TYPE-II STORM DISTRIBUTION ORILLIA IDF DATA
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[1]
*%                   ["2SCS24.stm"] <--storm filename,
*%-----------------|-------------------------------------------------------|
READ STORM          STORM_FILENAME=["STORM.001"]
*%-----------------|-------------------------------------------------------|
* EXTERNAL AREA EXT2
CALIB STANDHYD      ID=[1], NHYD=["EXT2"], DT=[1](min), AREA=[6.14](ha),
                    XIMP=[0.14], TIMP=[0.25], DWF=[0](cms), LOSS=[2],
                    SCS curve number CN=[59],
                    Pervious   surfaces: IAper=[5](mm), SLPP=[8.0](%),
                                         LGP=[90](m), MNP=[0.25], SCP=[0](min),
                    Impervious surfaces: IAimp=[2.0](mm), SLPI=[3.0](%),
                                         LGI=[150](m), MNI=[0.013], SCI=[0](min),
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------|
SHIFT HYD           IDout=[2], NHYD=["S-EXT2"], IDin=[1], TLAG=[10](min)
*%-----------------|-------------------------------------------------------|
* EXTERNAL AREA EXT1b
CALIB NASHYD        ID=[3], NHYD=["EXT1b"], DT=[1]min, AREA=[5.39](ha),
                    DWF=[0](cms),  CN/C=[56], IA=[7.2](mm),
                    N=[3], TP=[0.383]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------|
ADD HYD             IDsum=[4], NHYD=["S-EXT1b+2"], IDs to add=[2+3]
*%-----------------|-------------------------------------------------------|
* CATCHMENT 102
CALIB NASHYD        ID=[5], NHYD=["102"], DT=[1]min, AREA=[6.58](ha),
                    DWF=[0](cms),  CN/C=[48], IA=[9](mm),
                    N=[3], TP=[0.417]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------|
ADD HYD             IDsum=[6], NHYD=["S-EXT1b+2+102"], IDs to add=[4+5]
*%-----------------|-------------------------------------------------------|
* EXTERNAL AREA EXT1a
CALIB NASHYD        ID=[7], NHYD=["EXT1a"], DT=[1]min, AREA=[2.38](ha),
                    DWF=[0](cms),  CN/C=[57], IA=[7.2](mm),
                    N=[3], TP=[0.231]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------|
* CATCHMENT 101
CALIB STANDHYD      ID=[8], NHYD=["101"], DT=[1](min), AREA=[4.65](ha),
```



```
                    XIMP=[0.192], TIMP=[0.316], DWF=[0](cms), LOSS=[2],
                    SCS curve number CN=[52],
                    Pervious   surfaces: IAper=[6.6](mm), SLPP=[5.0](%),
                                         LGP=[25](m), MNP=[0.25], SCP=[0](min),
                    Impervious surfaces: IAimp=[2.0](mm), SLPI=[2.0](%),LGI=[180](m),
                    MNI=[0.013], SCI=[0](min),
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=["S-EXT1a+101"], IDs to add=[7+8]
*%-----------------|-------------------------------------------------------|
ROUTE RESERVOIR     IDout=[1],   NHYD=["POND OUT"],  IDin=[9],
                    RDT=[1](min),
                         TABLE of ( OUTFLOW-STORAGE ) values
                                  0 , 0
                                  0.0015 , 0.0043
                                  0.0031 , 0.00874
                                  0.0041 , 0.01332
                                  0.005 , 0.01805
                                  0.0057 , 0.02294
                                  0.0063 , 0.02798
                                  0.012 , 0.03318
                                  0.0284 , 0.03854
                                  0.0572 , 0.04408
                                  0.0619 , 0.04978
                                  0.0665 , 0.05565
                                  0.0711 , 0.0617
                                  0.0811 , 0.06794
                                  0.0899 , 0.07436
                                  0.0979 , 0.08097
                                  0.1052 , 0.08776
                                  0.1121 , 0.09476
                                  0.1186 , 0.10195
                                  0.1247 , 0.10935
                                  0.1305 , 0.11695
                                  0.1361 , 0.12477
                                  0.1599 , 0.13279
                                  0.1988 , 0.14103
                                  0.2474 , 0.1495
                                  0.304 , 0.15819
                                  0.3673 , 0.1671
                                  0.4367 , 0.18504
                                  0.5117 , 0.19407
                                  0.5918 , 0.2033
                                  0.6766 , 0.21273
                                  0.766 , 0.22238
                                  0.8597 , 0.23223
                                 [   -1   ,   -1   ]   (max twenty pts)
                                    IDovf=[    ], NHYDovf=[    ]
*%-----------------|-------------------------------------------------------|
* CATCHMENT 103
CALIB NASHYD        ID=[2], NHYD=["103"], DT=[1]min, AREA=[0.16](ha),
                    DWF=[0](cms),  CN/C=[62], IA=[4.8](mm),
                    N=[3], TP=[0.037]hrs,
```

```
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------|
* EXTERNAL AREA #3
CALIB NASHYD        ID=[3], NHYD=["EXT3"], DT=[1]min, AREA=[4.02](ha),
                    DWF=[0](cms),  CN/C=[60], IA=[6.6](mm),
                    N=[3], TP=[0.477]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------|
*% 5-YEAR 24hr SCS TYPE-II STORM DISTRIBUTION ORILLIA IDF DATA
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[2]
*%                   ["5SCS24.stm"] <--storm filename
*%-----------------|-------------------------------------------------------|
*% 25-YEAR 24hr SCS TYPE-II STORM DISTRIBUTION ORILLIA IDF DATA
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[3]
*%                   ["25SCS24.stm"] <--storm filename
*%-----------------|-------------------------------------------------------|
*% 100-YEAR 24hr SCS TYPE-II STORM DISTRIBUTION ORILLIA IDF DATA
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[4]
*%                   ["100SCS24.stm"] <--storm filename
*%-----------------|-------------------------------------------------------|
*% TIMMINS REGIONAL STORM (12-HR)
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[5]
*%                   ["12REGTIM.O89"] <--storm filename
*%-----------------|-------------------------------------------------------|
FINISH
```


Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\POST\SCS\POST.dat

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

 SSSSS   W   W   M   M   H   H   Y   Y   M   M    OOO          222     000    11   77777 ==
 S       W W W   MM MM   H   H    Y Y    MM MM   O   O          2   0   0   11   7   7
 SSSSS   W W W   M M M   HHHHH     Y     M M M   O   O          2   0   0   11       7
    S     W W    M   M   H   H     Y     M   M   O   O        222   0   0   11      7
 SSSSS    W W    M   M   H   H     Y     M   M    OOO         2     0   0   11     7   ==
                                                             2     0   0   11    7    #
       StormWater Management HYdrologic Model                222     000    11   7    ==

 ****************************************************************************************
 ****************************************  SWMHYMO Ver4.05.0  *************************
 ******************  A single event and continuous hydrologic simulation model  ***********
 ******************     based on the principles of HYMO and its successors      ***********
 ******************               OTTHYMO-83 and OTTHYMO-89.                    ***********
 ****************************************************************************************
 ****************** Distributed by:  J.F. Sabourin and Associates Inc.          ***********
 ******************                  Ottawa,  Ontario: (613) 836-3884           ***********
 ******************                  Gatineau, Quebec: (819) 243-6858           ***********
 ******************                  E-Mail: swmhymo@jfsa.com                   ***********
 ****************************************************************************************

 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 ++++++++++++++++++ Licensed user: WMI & Associates Ltd.                    ++++++++++++
 ++++++++++++++++++                Barrie                SERIAL#:2880720    ++++++++++++
 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 ****************************************************************************************
 ******************          ++++++ PROGRAM ARRAY DIMENSIONS ++++++            ***********
 ******************          Maximum value for ID numbers  :     11           ***********
 ******************          Max. number of rainfall points: 105408           ***********
 ******************          Max. number of flow points    : 105408           ***********
 ****************************************************************************************


 ******************************   D E T A I L E D   O U T P U T   ***********************
 ****************************************************************************************
 *                 RUN DATE: 2022-07-15     TIME: 09:43:21     RUN COUNTER: 000001
 ****************************************************************************************
 * Input   file: Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\POST\SCS\POST.dat
 * Output  file: Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\POST\SCS\POST.out
 * Summary file: Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\POST\SCS\POST.sum
 * User comments:
 * 1:_____________________________________________________________________________
 * 2:_____________________________________________________________________________
 * 3:_____________________________________________________________________________
 ****************************************************************************************

--------------------------------------------------------------------------------
R0001:C00001-----------------------------------------------------------------------
*#**************************************************************************
*#  Project Name: [221 FOX STREET SUBDIVISION]    Project Number: [09-062]
*#  Date        : 07-18-2022
*#  Modeller    : [CJ]
*#  Company     : WMI & Associates Ltd.
*#  License #   :  2880720
*#**************************************************************************
--------------------
| START            | Project  dir.:Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\POST\SCS\
-------------------- Rainfall dir.:Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\POST\SCS\
```



```
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 0001
    NSTORM=   1
          #  1=2SCS24.stm
--------------------------------------------------------------------------------
R0001:C00002-----------------------------------------------------------------------
--------------------
| READ STORM       |  Filename: Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\POST\SCS\2SCS24.
| Ptotal=  46.70 mm|  Comments: 2-Year SCS Type-II Storm Distribution (24-hour) Orillia,
--------------------
```

TIME hh:mm	RAIN| mm/hr|	TIME hh:mm	RAIN| mm/hr|	TIME hh:mm	RAIN| mm/hr|	TIME hh:mm	RAIN| mm/hr|	TIME hh:mm	RAIN| mm/hr|	TIME hh:mm
0:12	.467|	4:12	.934|	8:12	1.401|	12:12	9.340|	16:12	1.168|	20:12
0:24	.467|	4:24	.934|	8:24	1.401|	12:24	5.838|	16:24	1.167|	20:24
0:36	.467|	4:36	.934|	8:36	1.401|	12:36	4.203|	16:36	1.167|	20:36
0:48	.467|	4:48	.934|	8:48	1.401|	12:48	3.970|	16:48	1.167|	20:48
1:00	.467|	5:00	.934|	9:00	1.401|	13:00	2.802|	17:00	.700|	21:00
1:12	.467|	5:12	.934|	9:12	1.401|	13:12	2.335|	17:12	.701|	21:12
1:24	.467|	5:24	.934|	9:24	1.401|	13:24	2.335|	17:24	.934|	21:24
1:36	.467|	5:36	.934|	9:36	1.401|	13:36	2.335|	17:36	.701|	21:36
1:48	.467|	5:48	.934|	9:48	1.401|	13:48	2.335|	17:48	.934|	21:48
2:00	.467|	6:00	.934|	10:00	1.401|	14:00	2.335|	18:00	.701|	22:00
2:12	.467|	6:12	.934|	10:12	2.568|	14:12	1.401|	18:12	.701|	22:12
2:24	.467|	6:24	.934|	10:24	2.569|	14:24	1.401|	18:24	.700|	22:24
2:36	.467|	6:36	.934|	10:36	2.568|	14:36	1.401|	18:36	.934|	22:36
2:48	.467|	6:48	.934|	10:48	2.569|	14:48	1.401|	18:48	.701|	22:48
3:00	.467|	7:00	.934|	11:00	2.568|	15:00	1.401|	19:00	.701|	23:00
3:12	.467|	7:12	.934|	11:12	3.503|	15:12	1.167|	19:12	.934|	23:12
3:24	.467|	7:24	.934|	11:24	5.137|	15:24	1.167|	19:24	.701|	23:24
3:36	.467|	7:36	.934|	11:36	12.375|	15:36	1.167|	19:36	.934|	23:36
3:48	.467|	7:48	.934|	11:48	25.685|	15:48	1.167|	19:48	.701|	23:48
4:00	.467|	8:00	.934|	12:00	52.538|	16:00	1.167|	20:00	.934|	24:00

```
--------------------------------------------------------------------------------
R0001:C00003-----------------------------------------------------------------------
* EXTERNAL AREA EXT2
--------------------------
| CALID STANDARD         |   Area     (ha)=    6.14
| 01:EXT2       DT= 1.00 |   Total Imp(%)=   25.00   Dir. Conn.(%)=   14.00
--------------------------
```

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	1.53	4.61	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	3.00	8.00	
Length	(m)=	150.00	90.00	
Mannings n	=	.013	.250	
Max.eff.Inten.	(mm/hr)=	52.54	9.57	
over	(min)	3.00	22.00	
Storage Coeff.	(min)=	3.03 (ii)	22.40 (ii)	
Unit Hyd. Tpeak	(min)=	3.00	22.00	
Unit Hyd. peak	(cms)=	.37	.05	
				TOTALS
PEAK FLOW	(cms)=	.12	.08	.165 (iii)
TIME TO PEAK	(hrs)=	12.00	12.28	12.000
RUNOFF VOLUME	(mm)=	44.70	9.13	14.113
TOTAL RAINFALL	(mm)=	46.70	46.70	46.701
RUNOFF COEFFICIENT	=	.96	.20	.302

```
       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  59.0    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.
```

R0001:C00004

SHIFT HYD		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
	ID= 1:EXT2	6.14	.165	12.000	14.113
Shift= 10.0 min	SHIFTED ID= 2:S-EXT2	6.14	.165	12.150	14.113

R0001:C00005

* EXTERNAL AREA EXT1b

CALIB NASHYD			
03:EXT1b DT= 1.00	Area (ha)= 5.390	Curve Number (CN)= 56.00	
	Ia (mm)= 7.200	# of Linear Res.(N)= 3.00	
	U.H. Tp(hrs)= .383		

```
     Unit Hyd Qpeak  (cms)=     .538

     PEAK FLOW       (cms)=     .052 (i)
     TIME TO PEAK    (hrs)=   12.317
     DURATION        (hrs)=   26.617, (dddd|hh:mm:)=   1|02:37
     AVERAGE FLOW    (cms)=     .004
     RUNOFF VOLUME    (mm)=    6.527
     TOTAL RAINFALL   (mm)=   46.701
     RUNOFF COEFFICIENT   =     .140

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

R0001:C00006

ADD HYD		ID:NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
04:S-EXT1b+2	ID 1	02:S-EXT2	6.140	.165	12.150	14.113	.000
	+ID 2	03:EXT1b	5.390	.052	12.317	6.527	.000
	SUM	04:S-EXT1b+2	11.530	.209	12.150	10.567	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

R0001:C00007

* CATCHMENT 102

CALIB NASHYD			
05:102 DT= 1.00	Area (ha)= 6.580	Curve Number (CN)= 48.00	
	Ia (mm)= 9.000	# of Linear Res.(N)= 3.00	
	U.H. Tp(hrs)= .417		

```
     Unit Hyd Qpeak  (cms)=     .603

     PEAK FLOW       (cms)=     .040 (i)
     TIME TO PEAK    (hrs)=   12.367
     DURATION        (hrs)=   26.817, (dddd|hh:mm:)=   1|02:49
```



```
     AVERAGE FLOW    (cms)=     .003
     RUNOFF VOLUME    (mm)=    4.543
     TOTAL RAINFALL   (mm)=   46.701
     RUNOFF COEFFICIENT   =     .097

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

R0001:C00008

ADD HYD		ID:NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
06:S-EXT1b+2+	ID 1	04:S-EXT1b+2	11.530	.209	12.150	10.567	.000
	+ID 2	05:102	6.580	.040	12.367	4.543	.000
	SUM	06:S-EXT1b+2+	18.110	.240	12.150	8.378	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

R0001:C00009

* EXTERNAL AREA EXT1a

CALIB NASHYD			
07:EXT1a DT= 1.00	Area (ha)= 2.380	Curve Number (CN)= 57.00	
	Ia (mm)= 7.200	# of Linear Res.(N)= 3.00	
	U.H. Tp(hrs)= .231		

```
     Unit Hyd Qpeak  (cms)=     .394

     PEAK FLOW       (cms)=     .033 (i)
     TIME TO PEAK    (hrs)=   12.150
     DURATION        (hrs)=   25.617, (dddd|hh:mm:)=   1|01:37
     AVERAGE FLOW    (cms)=     .002
     RUNOFF VOLUME    (mm)=    6.751
     TOTAL RAINFALL   (mm)=   46.701
     RUNOFF COEFFICIENT   =     .145

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

R0001:C00010

* CATCHMENT 101

CALIB STANDHYD			
08:101 DT= 1.00	Area (ha)= 4.65		
	Total Imp(%)= 31.60	Dir. Conn.(%)= 19.20	

```
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=       1.47          3.18
     Dep. Storage      (mm)=       2.00          6.60
     Average Slope      (%)=       2.00          5.00
     Length             (m)=     180.00         25.00
     Mannings n            =       .013          .250

     Max.eff.Inten.(mm/hr)=      52.54          9.82
               over (min)        4.00         14.00
     Storage Coeff.  (min)=      3.82 (ii)    14.05 (ii)
     Unit Hyd. Tpeak (min)=      4.00         14.00
     Unit Hyd. peak  (cms)=       .29           .08
                                                    *TOTALS*
```

```
     PEAK FLOW       (cms)=        .13          .06          .164 (iii)
     TIME TO PEAK    (hrs)=      12.00        12.15        12.000
     RUNOFF VOLUME    (mm)=      44.70         7.06        14.283
     TOTAL RAINFALL   (mm)=      46.70        46.70        46.701
     RUNOFF COEFFICIENT   =        .96          .15          .306

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  52.0    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.

-------------------------------------------------------------------------------
R0001:C00011-----------------------------------------------------------------
-------------------------
| ADD HYD               |
| 09:S-EXT1a+10         |   ID:NHYD            AREA     QPEAK    TPEAK      R.V.     DWF
-------------------------                      (ha)     (cms)    (hrs)      (mm)    (cms)
                       ID 1 07:EXT1a          2.380      .033   12.150     6.751    .000
                      +ID 2 08:101            4.650      .164   12.000    14.283    .000
                      ======================================================================
                      SUM   09:S-EXT1a+10     7.030      .189   12.017    11.733    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
R0001:C00012-----------------------------------------------------------------
-----------------------
|  ROUTE RESERVOIR -> |    Requested routing time step =  1.0 min.
|  IN>09:S-EXT1a+10   |
| OUT<01:POND OUT     | ========================  OUTFLOW STORAGE TABLE  ================
---------------------- OUTFLOW   STORAGE| OUTFLOW   STORAGE| OUTFLOW   STORAGE| OUTFLOW
                         (cms)   (ha.m.)|   (cms)   (ha.m.)|   (cms)   (ha.m.)|   (cms)
                          .000 .0000E+00|    .057 .4408E-01|    .112 .9476E-01|    .304 .
                          .002 .4300E-02|    .062 .4978E-01|    .119 .1019E+00|    .367 .
                          .003 .8740E-02|    .067 .5565E-01|    .125 .1094E+00|    .437 .
                          .004 .1332E-01|    .071 .6170E-01|    .131 .1169E+00|    .512 .
                          .005 .1805E-01|    .081 .6794E-01|    .136 .1248E+00|    .592 .
                          .006 .2294E-01|    .090 .7436E-01|    .160 .1328E+00|    .677 .
                          .006 .2790E-01|    .090 .8097E-01|    .199 .1410E+00|    .766 .
                          .012 .3318E-01|    .105 .8776E-01|    .247 .1495E+00|    .860 .
                          .028 .3854E-01|    .112 .9476E-01|    .304 .1582E+00|    .000 .

     ROUTING RESULTS             AREA     QPEAK     TPEAK       R.V.
     ----------------------      (ha)     (cms)     (hrs)       (mm)
     INFLOW > 09:S-EXT1a+10     7.030      .189    12.017     11.733
    OUTFLOW < 01:POND OUT       7.030      .037    12.733     11.733

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=   19.377
                  TIME SHIFT OF PEAK FLOW         (min)=    43.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=.4012E-01

-------------------------------------------------------------------------------
R0001:C00013-----------------------------------------------------------------
* CATCHMENT 103
---------------------------
| CALIB NASHYD            |   Area     (ha)=     .160   Curve Number    (CN)= 62.00
| 02:103        DT= 1.00 |   Ia       (mm)=    4.800   # of Linear Res.(N)=  3.00
---------------------------   U.H. Tp(hrs)=     .037

     Unit Hyd Qpeak  (cms)=     .165
```



```
     PEAK FLOW       (cms)=     .006 (i)
     TIME TO PEAK    (hrs)=   12.000
     DURATION        (hrs)=   24.300, (dddd|hh:mm:)=   1|00:18
     AVERAGE FLOW    (cms)=     .000
     RUNOFF VOLUME    (mm)=    8.886
     TOTAL RAINFALL   (mm)=   46.701
     RUNOFF COEFFICIENT   =     .190

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

-------------------------------------------------------------------------------
R0001:C00014-----------------------------------------------------------------
* EXTERNAL AREA #3
---------------------------
| CALIB NASHYD            |   Area     (ha)=    4.020   Curve Number    (CN)= 60.00
| 03:EXT3       DT= 1.00 |   Ia       (mm)=    6.600   # of Linear Res.(N)=  3.00
---------------------------   U.H. Tp(hrs)=     .477

     Unit Hyd Qpeak  (cms)=     .322

     PEAK FLOW       (cms)=     .039 (i)
     TIME TO PEAK    (hrs)=   12.433
     DURATION        (hrs)=   27.183, (dddd|hh:mm:)=   1|03:11
     AVERAGE FLOW    (cms)=     .003
     RUNOFF VOLUME    (mm)=    7.678
     TOTAL RAINFALL   (mm)=   46.701
     RUNOFF COEFFICIENT   =     .164

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

-------------------------------------------------------------------------------
R0001:C00015-----------------------------------------------------------------
  ** END OF RUN :    0

*******************************************************************************




--------------------
| START            | Project  dir.:Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\POST\SCS\
------------------- Rainfall dir.:Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\POST\SCS\
    TZERO =    .00 hrs on        0
    METOUT=    2 (output = METRIC)
    NRUN  = 0002
    NSTORM=    1
             #  1=5SCS24.stm
-------------------------------------------------------------------------------
R0002:C00002-----------------------------------------------------------------
*#*****************************************************************************
*#  Project Name: [221 FOX STREET SUBDIVISION]    Project Number: [09-062]
*#  Date        : 07-18-2022
*#  Modeller    : [CJ]
*#  Company     : WMI & Associates Ltd.
*#  License #   :  2880720
*#*****************************************************************************
-------------------------------------------------------------------------------
R0002:C00002-----------------------------------------------------------------
```

| READ STORM | Filename: Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\POST\SCS\5SCS24.
| Ptotal= 60.60 mm | Comments: 5-Year SCS Type-II Storm Distribution (24-hour) Orillia,

TIME hh:mm	RAIN mm/hr	TIME hh:mm	RAIN mm/hr	TIME hh:mm	RAIN mm/hr	TIME hh:mm	RAIN mm/hr	TIME hh:mm	RAIN mm/hr	TIME hh:mm
0:12	.606	4:12	1.212	8:12	1.818	12:12	12.120	16:12	1.515	20:12
0:24	.606	4:24	1.212	8:24	1.818	12:24	7.575	16:24	1.515	20:24
0:36	.606	4:36	1.212	8:36	1.818	12:36	5.454	16:36	1.515	20:36
0:48	.606	4:48	1.212	8:48	1.818	12:48	5.151	16:48	1.515	20:48
1:00	.606	5:00	1.212	9:00	1.818	13:00	3.636	17:00	.909	21:00
1:12	.606	5:12	1.212	9:12	1.818	13:12	3.030	17:12	.909	21:12
1:24	.606	5:24	1.212	9:24	1.818	13:24	3.030	17:24	1.212	21:24
1:36	.606	5:36	1.212	9:36	1.818	13:36	3.030	17:36	.909	21:36
1:48	.606	5:48	1.212	9:48	1.818	13:48	3.030	17:48	1.212	21:48
2:00	.606	6:00	1.212	10:00	1.818	14:00	3.030	18:00	.909	22:00
2:12	.606	6:12	1.212	10:12	3.333	14:12	1.818	18:12	.909	22:12
2:24	.606	6:24	1.212	10:24	3.333	14:24	1.818	18:24	.909	22:24
2:36	.606	6:36	1.212	10:36	3.333	14:36	1.818	18:36	1.212	22:36
2:48	.606	6:48	1.212	10:48	3.333	14:48	1.818	18:48	.909	22:48
3:00	.606	7:00	1.212	11:00	3.333	15:00	1.818	19:00	.909	23:00
3:12	.606	7:12	1.212	11:12	4.545	15:12	1.515	19:12	1.212	23:12
3:24	.606	7:24	1.212	11:24	6.666	15:24	1.515	19:24	.909	23:24
3:36	.606	7:36	1.212	11:36	16.059	15:36	1.515	19:36	1.212	23:36
3:48	.606	7:48	1.212	11:48	33.330	15:48	1.515	19:48	.909	23:48
4:00	.606	8:00	1.212	12:00	68.175	16:00	1.515	20:00	1.212	24:00

R0002:C00003

* EXTERNAL AREA EXT2

| CALIB STANDHYD | Area (ha)= 6.14
| 01:EXT2 DT= 1.00 | Total Imp(%)= 25.00 Dir. Conn.(%)= 14.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.53	4.61
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	3.00	8.00
Length	(m)=	150.00	90.00
Mannings n	=	.013	.250
Max.eff.Inten.	(mm/hr)=	68.17	17.89
over	(min)	3.00	18.00
Storage Coeff.	(min)=	2.73 (ii)	17.81 (ii)
Unit Hyd. Tpeak	(min)=	3.00	18.00
Unit Hyd. peak	(cms)=	.40	.06

		TOTALS
PEAK FLOW	(cms)=	.16 .15 .254 (iii)
TIME TO PEAK	(hrs)=	12.00 12.22 12.000
RUNOFF VOLUME	(mm)=	58.60 15.05 21.146
TOTAL RAINFALL	(mm)=	60.60 60.60 60.601
RUNOFF COEFFICIENT	=	.97 .25 .349

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 59.0 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.

R0002:C00004

SHIFT HYD		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
	ID= 1:EXT2	6.14	.254	12.000	21.146
Shift= 10.0 min	SHIFTED ID= 2:S-EXT2	6.14	.254	12.150	21.146

R0002:C00005

* EXTERNAL AREA EXT1b

| CALIB NASHYD | Area (ha)= 5.390 Curve Number (CN)= 56.00
| 03:EXT1b DT= 1.00 | Ia (mm)= 7.200 # of Linear Res.(N)= 3.00
| | U.H. Tp(hrs)= .383

Unit Hyd Qpeak (cms)= .538

PEAK FLOW (cms)= .091 (i)
TIME TO PEAK (hrs)= 12.317
DURATION (hrs)= 26.617, (dddd|hh:mm:)= 1|02:37
AVERAGE FLOW (cms)= .006
RUNOFF VOLUME (mm)= 11.272
TOTAL RAINFALL (mm)= 60.601
RUNOFF COEFFICIENT = .186

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

R0002:C00006

ADD HYD	ID:NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
	ID 1 02:S-EXT2	6.140	.254	12.150	21.146	.000
	+ID 2 03:EXT1b	5.390	.091	12.317	11.272	.000
	SUM 04:S-EXT1b+2	11.530	.333	12.150	16.530	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

R0002:C00007

* CATCHMENT 102

| CALIB NASHYD | Area (ha)= 6.580 Curve Number (CN)= 48.00
| 05:102 DT= 1.00 | Ia (mm)= 9.000 # of Linear Res.(N)= 3.00
| | U.H. Tp(hrs)= .417

Unit Hyd Qpeak (cms)= .603

PEAK FLOW (cms)= .074 (i)
TIME TO PEAK (hrs)= 12.367
DURATION (hrs)= 26.817, (dddd|hh:mm:)= 1|02:49
AVERAGE FLOW (cms)= .006
RUNOFF VOLUME (mm)= 8.148
TOTAL RAINFALL (mm)= 60.601
RUNOFF COEFFICIENT = .134

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

```
R0002:C00008-----------------------------------------------------------------------------
| ADD HYD                |
| 06:S-EXT1b+2+          |   ID:NHYD            AREA      QPEAK    TPEAK      R.V.      DWF
                                                (ha)      (cms)    (hrs)       (mm)    (cms)
                       ID 1 04:S-EXT1b+2      11.530      .333   12.150     16.530     .000
                      +ID 2 05:102             6.580      .074   12.367      8.148     .000
                      ==========================================================
                      SUM   06:S-EXT1b+2+     18.110      .395   12.167     13.485     .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

R0002:C00009-----------------------------------------------------------------------------
* EXTERNAL AREA EXT1a
| CALIB NASHYD           |   Area     (ha)=    2.380   Curve Number    (CN)= 57.00
| 07:EXT1a      DT= 1.00 |   Ia       (mm)=    7.200   # of Linear Res.(N)=  3.00
                           U.H. Tp(hrs)=      .231

     Unit Hyd Qpeak  (cms)=      .394

     PEAK FLOW       (cms)=      .058 (i)
     TIME TO PEAK    (hrs)=    12.150
     DURATION        (hrs)=    25.617, (dddd|hh:mm:)=    1|01:37
     AVERAGE FLOW    (cms)=      .003
     RUNOFF VOLUME    (mm)=    11.638
     TOTAL RAINFALL   (mm)=    60.601
     RUNOFF COEFFICIENT   =      .192

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

R0002:C00010-----------------------------------------------------------------------------
* CATCHMENT 101
| CALIB STANDHYD         |   Area     (ha)=    4.65
| 08:101        DT= 1.00 |   Total Imp(%)=   31.60   Dir. Conn.(%)=   19.20

                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      1.47         3.18
     Dep. Storage     (mm)=      2.00         6.60
     Average Slope     (%)=      2.00         5.00
     Length            (m)=    180.00        25.00
     Mannings n            =      .013         .250

     Max.eff.Inten.(mm/hr)=     68.17        18.72
               over (min)        3.00        11.00
     Storage Coeff.  (min)=      3.44 (ii)   11.35 (ii)
     Unit Hyd. Tpeak (min)=      3.00        11.00
     Unit Hyd. peak  (cms)=       .34          .10
                                                    *TOTALS*
     PEAK FLOW       (cms)=       .17          .11          .252 (iii)
     TIME TO PEAK    (hrs)=     12.00        12.10        12.000
     RUNOFF VOLUME    (mm)=     58.60        11.94        20.898
     TOTAL RAINFALL   (mm)=     60.60        60.60        60.601
     RUNOFF COEFFICIENT   =       .97          .20          .345

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



```
          CN* =  52.0    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.

R0002:C00011-----------------------------------------------------------------------------
| ADD HYD                |
| 09:S-EXT1a+10          |   ID:NHYD            AREA      QPEAK    TPEAK      R.V.      DWF
                                                (ha)      (cms)    (hrs)       (mm)    (cms)
                       ID 1 07:EXT1a          2.380      .058   12.150     11.638     .000
                      +ID 2 08:101            4.650      .252   12.000     20.898     .000
                      ==========================================================
                      SUM   09:S-EXT1a+10     7.030      .295   12.017     17.763     .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

R0002:C00012-----------------------------------------------------------------------------
|  ROUTE RESERVOIR -> |    Requested routing time step =  1.0 min.
|  IN>09:S-EXT1a+10   |
| OUT<01:POND OUT     | ========================  OUTFLOW STORAGE TABLE  ================
                      OUTFLOW   STORAGE| OUTFLOW   STORAGE| OUTFLOW   STORAGE| OUTFLOW
                        (cms)    (ha.m.)|   (cms)   (ha.m.)|   (cms)   (ha.m.)|   (cms)
                         .000 .0000E+00|    .057 .4408E-01|    .112 .9476E-01|    .304 .
                         .002 .4300E-02|    .062 .4978E-01|    .119 .1019E+00|    .367 .
                         .003 .8740E-02|    .067 .5565E-01|    .125 .1094E+00|    .437 .
                         .004 .1332E-01|    .071 .6170E-01|    .131 .1169E+00|    .512 .
                         .005 .1805E-01|    .081 .6794E-01|    .136 .1248E+00|    .592 .
                         .006 .2294E-01|    .090 .7436E-01|    .160 .1328E+00|    .677 .
                         .006 .2798E-01|    .098 .8097E-01|    .199 .1410E+00|    .766 .
                         .012 .3318E-01|    .105 .8776E-01|    .247 .1495E+00|    .860 .
                         .028 .3854E-01|    .112 .9476E-01|    .304 .1582E+00|    .000 .

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     ---------------            (ha)     (cms)     (hrs)       (mm)
     INFLOW > 09:S-EXT1a+10     7.030      .295    12.017     17.763
    OUTFLOW < 01:POND OUT       7.030      .066    12.600     17.763

                PEAK   FLOW   REDUCTION [Qout/Qin](%)=   22.431
                TIME SHIFT OF PEAK FLOW         (min)=    35.00
                MAXIMUM  STORAGE   USED        (ha.m.)=.5526E-01

R0002:C00013-----------------------------------------------------------------------------
* CATCHMENT 103
| CALIB NASHYD           |   Area     (ha)=     .160   Curve Number    (CN)= 62.00
| 02:103        DT= 1.00 |   Ia       (mm)=    4.800   # of Linear Res.(N)=  3.00
                           U.H. Tp(hrs)=      .037

     Unit Hyd Qpeak  (cms)=      .165

     PEAK FLOW       (cms)=      .009 (i)
     TIME TO PEAK    (hrs)=    12.000
     DURATION        (hrs)=    24.300, (dddd|hh:mm:)=    1|00:18
     AVERAGE FLOW    (cms)=      .000
     RUNOFF VOLUME    (mm)=    14.723
     TOTAL RAINFALL   (mm)=    60.601
```

```
     RUNOFF COEFFICIENT    =     .243

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

-------------------------------------------------------------------------------
R0002:C00014------------------------------------------------------------------
* EXTERNAL AREA #3
--------------------------
| CALIB NASHYD           |   Area     (ha)=    4.020   Curve Number    (CN)= 60.00
| 03:EXT3       DT= 1.00 |   Ia       (mm)=    6.600   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .477

     Unit Hyd Qpeak  (cms)=     .322

     PEAK FLOW       (cms)=     .068 (i)
     TIME TO PEAK    (hrs)=   12.417
     DURATION        (hrs)=   27.183, (dddd|hh:mm:)=   1|03:11
     AVERAGE FLOW    (cms)=     .005
     RUNOFF VOLUME    (mm)=   13.057
     TOTAL RAINFALL   (mm)=   60.601
     RUNOFF COEFFICIENT    =     .215

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

-------------------------------------------------------------------------------
R0002:C00015------------------------------------------------------------------
-------------------------------------------------------------------------------
R0002:C00002------------------------------------------------------------------
  ** END OF RUN :    1

*******************************************************************************




--------------------
| START            | Project  dir.:Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\POST\SCS\
-------------------- Rainfall dir.:Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\POST\SCS\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 0003
    NSTORM=   1
           #  1=25SCS24.stm
-------------------------------------------------------------------------------
R0003:C00002------------------------------------------------------------------
*#*****************************************************************************
*#  Project Name: [221 FOX STREET SUBDIVISION]    Project Number: [09-062]
*#  Date        : 07-18-2022
*#  Modeller    : [CJ]
*#  Company     : WMI & Associates Ltd.
*#  License #   :  2880720
*#*****************************************************************************
-------------------------------------------------------------------------------
R0003:C00002------------------------------------------------------------------
--------------------
| READ STORM       |  Filename: Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\POST\SCS\25SCS24.
| Ptotal=  81.40 mm|  Comments: 25-Year SCS Type-II Storm Distribution (24-hour) Orillia,
--------------------
      TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME
```



```
     hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm
      0:12    .814|   4:12   1.628|   8:12   2.442|  12:12  16.280|  16:12   2.035|  20:12
      0:24    .814|   4:24   1.628|   8:24   2.442|  12:24  10.175|  16:24   2.035|  20:24
      0:36    .814|   4:36   1.628|   8:36   2.442|  12:36   7.326|  16:36   2.035|  20:36
      0:48    .814|   4:48   1.628|   8:48   2.442|  12:48   6.919|  16:48   2.035|  20:48
      1:00    .814|   5:00   1.628|   9:00   2.442|  13:00   4.884|  17:00   1.221|  21:00
      1:12    .814|   5:12   1.628|   9:12   2.442|  13:12   4.070|  17:12   1.221|  21:12
      1:24    .814|   5:24   1.628|   9:24   2.442|  13:24   4.070|  17:24   1.628|  21:24
      1:36    .814|   5:36   1.628|   9:36   2.442|  13:36   4.070|  17:36   1.221|  21:36
      1:48    .814|   5:48   1.628|   9:48   2.442|  13:48   4.070|  17:48   1.628|  21:48
      2:00    .814|   6:00   1.628|  10:00   2.442|  14:00   4.070|  18:00   1.221|  22:00
      2:12    .814|   6:12   1.628|  10:12   4.477|  14:12   2.442|  18:12   1.221|  22:12
      2:24    .814|   6:24   1.628|  10:24   4.477|  14:24   2.442|  18:24   1.221|  22:24
      2:36    .814|   6:36   1.628|  10:36   4.477|  14:36   2.442|  18:36   1.628|  22:36
      2:48    .814|   6:48   1.628|  10:48   4.477|  14:48   2.442|  18:48   1.221|  22:48
      3:00    .814|   7:00   1.628|  11:00   4.477|  15:00   2.442|  19:00   1.221|  23:00
      3:12    .814|   7:12   1.628|  11:12   6.105|  15:12   2.035|  19:12   1.628|  23:12
      3:24    .814|   7:24   1.628|  11:24   8.954|  15:24   2.035|  19:24   1.221|  23:24
      3:36    .814|   7:36   1.628|  11:36  21.571|  15:36   2.035|  19:36   1.628|  23:36
      3:48    .814|   7:48   1.628|  11:48  44.770|  15:48   2.035|  19:48   1.221|  23:48
      4:00    .814|   8:00   1.628|  12:00  91.575|  16:00   2.035|  20:00   1.628|  24:00

-------------------------------------------------------------------------------
R0003:C00003------------------------------------------------------------------
* EXTERNAL AREA EXT2
--------------------------
| CALIB STANDHYD         |   Area     (ha)=    6.14
| 01:EXT2       DT= 1.00 |   Total Imp(%)=   25.00   Dir. Conn.(%)=   14.00
--------------------------

                             IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=       1.53          4.61
     Dep. Storage      (mm)=       2.00          5.00
     Average Slope      (%)=       3.00          8.00
     Length             (m)=     150.00         90.00
     Mannings n            =       .013          .250

     Max.eff.Inten.(mm/hr)=      91.58         35.51
           over      (min)         2.00         14.00
     Storage Coeff.  (min)=       2.43 (ii)    13.09 (ii)
     Unit Hyd. Tpeak (min)=       2.00         14.00
     Unit Hyd. peak  (cms)=        .49           .08
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .22           .29          .435 (iii)
     TIME TO PEAK    (hrs)=      12.00         12.13        12.000
     RUNOFF VOLUME    (mm)=      79.40         25.69        33.215
     TOTAL RAINFALL   (mm)=      81.40         81.40        81.400
     RUNOFF COEFFICIENT    =      .98           .32          .408

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  59.0    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.

-------------------------------------------------------------------------------
R0003:C00004------------------------------------------------------------------
---------------------
| SHIFT HYD         |                                 AREA     QPEAK      TPEAK      R.V.
|                   |                                  (ha)     (cms)       (hrs)      (mm)
|                   |          ID= 1:EXT2              6.14      .435      12.000    33.215
| Shift=   10.0 min | SHIFTED ID= 2:S-EXT2             6.14      .435      12.150    33.215
```

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

------------------------------------------------------------------------------------------------
R0003:C00005-----------------------------------------------------------------------------------
* EXTERNAL AREA EXT1b
--------------------------
| CALIB NASHYD           |   Area     (ha)=    5.390   Curve Number    (CN)= 56.00
| 03:EXT1b      DT= 1.00 |   Ia       (mm)=    7.200   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .383

     Unit Hyd Qpeak  (cms)=     .538

     PEAK FLOW       (cms)=     .166 (i)
     TIME TO PEAK    (hrs)=   12.300
     DURATION        (hrs)=   26.617, (dddd|hh:mm:)=   1|02:37
     AVERAGE FLOW    (cms)=     .011
     RUNOFF VOLUME    (mm)=   20.110
     TOTAL RAINFALL   (mm)=   81.400
     RUNOFF COEFFICIENT   =     .247

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

------------------------------------------------------------------------------------------------
R0003:C00006-----------------------------------------------------------------------------------
------------------------
| ADD HYD              |
| 04:S-EXT1b+2         |   ID:NHYD            AREA     QPEAK    TPEAK      R.V.     DWF
------------------------                      (ha)     (cms)    (hrs)       (mm)    (cms)
                      ID 1 02:S-EXT2         6.140     .435   12.150    33.215    .000
                     +ID 2 03:EXT1b          5.390     .166   12.300    20.110    .000
                     ==========================================================
                     SUM   04:S-EXT1b+2     11.530     .582   12.150    27.089    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------------------------
R0003:C00007-----------------------------------------------------------------------------------
* CATCHMENT 102
--------------------------
| CALIB NASHYD           |   Area     (ha)=    6.580   Curve Number    (CN)= 48.00
| 05:102        DT= 1.00 |   Ia       (mm)=    9.000   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .417

     Unit Hyd Qpeak  (cms)=     .603

     PEAK FLOW       (cms)=     .141 (i)
     TIME TO PEAK    (hrs)=   12.350
     DURATION        (hrs)=   26.817, (dddd|hh:mm:)=   1|02:49
     AVERAGE FLOW    (cms)=     .010
     RUNOFF VOLUME    (mm)=   15.081
     TOTAL RAINFALL   (mm)=   81.400
     RUNOFF COEFFICIENT   =     .185

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

------------------------------------------------------------------------------------------------
R0003:C00008-----------------------------------------------------------------------------------
------------------------
| ADD HYD              |
| 06:S-EXT1b+2+        |   ID:NHYD            AREA     QPEAK    TPEAK      R.V.     DWF
```



```
------------------------                      (ha)     (cms)    (hrs)       (mm)    (cms)
                      ID 1 04:S-EXT1b+2     11.530     .582   12.150    27.089    .000
                     +ID 2 05:102            6.580     .141   12.350    15.081    .000
                     ==========================================================
                     SUM   06:S-EXT1b+2+    18.110     .698   12.150    22.726    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------------------------
R0003:C00009-----------------------------------------------------------------------------------
* EXTERNAL AREA EXT1a
--------------------------
| CALIB NASHYD           |   Area     (ha)=    2.380   Curve Number    (CN)= 57.00
| 07:EXT1a      DT= 1.00 |   Ia       (mm)=    7.200   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .231

     Unit Hyd Qpeak  (cms)=     .394

     PEAK FLOW       (cms)=     .105 (i)
     TIME TO PEAK    (hrs)=   12.133
     DURATION        (hrs)=   25.617, (dddd|hh:mm:)=   1|01:37
     AVERAGE FLOW    (cms)=     .005
     RUNOFF VOLUME    (mm)=   20.712
     TOTAL RAINFALL   (mm)=   81.400
     RUNOFF COEFFICIENT   =     .254

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

------------------------------------------------------------------------------------------------
R0003:C00010-----------------------------------------------------------------------------------
* CATCHMENT 101
--------------------------
| CALIB STANDHYD         |   Area     (ha)=    4.65
| 08:101        DT= 1.00 |   Total Imp(%)=   31.60   Dir. Conn.(%)=   19.20
--------------------------

                           IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=      1.47          3.18
     Dep. Storage      (mm)=      2.00          6.60
     Average Slope      (%)=      2.00          5.00
     Length             (m)=    180.00         25.00
     Mannings n            =      .013          .250

     Max.eff.Inten.(mm/hr)=     91.58         33.98
               over (min)        3.00          9.00
     Storage Coeff.  (min)=      3.06 (ii)     9.29 (ii)
     Unit Hyd. Tpeak (min)=      3.00          9.00
     Unit Hyd. peak  (cms)=       .37           .12
                                                      *TOTALS*
     PEAK FLOW         (cms)=     .22           .21          .410 (iii)
     TIME TO PEAK      (hrs)=   12.00         12.07         12.000
     RUNOFF VOLUME      (mm)=   79.40         20.95         32.176
     TOTAL RAINFALL     (mm)=   81.40         81.40         81.400
     RUNOFF COEFFICIENT    =     .98           .26           .395

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  52.0     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.

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

```
R0003:C00011-----------------------------------------------------------------------------------------
------------------------
| ADD HYD              |
| 09:S-EXT1a+10        |   ID:NHYD            AREA     QPEAK    TPEAK      R.V.      DWF
------------------------                      (ha)     (cms)    (hrs)       (mm)    (cms)
                      ID 1 07:EXT1a          2.380      .105   12.133    20.712    .000
                     +ID 2 08:101            4.650      .410   12.000    32.176    .000
                     ==========================================================
                     SUM   09:S-EXT1a+10     7.030      .491   12.017    28.295    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-----------------------------------------------------------------------------------------
R0003:C00012-----------------------------------------------------------------------------------------
----------------------
|  ROUTE RESERVOIR -> |    Requested routing time step =  1.0 min.
|  IN>09:S-EXT1a+10   |
| OUT<01:POND OUT     | ========================  OUTFLOW STORAGE TABLE  ================
---------------------- OUTFLOW   STORAGE| OUTFLOW   STORAGE| OUTFLOW   STORAGE| OUTFLOW
                        (cms)    (ha.m.)|   (cms)   (ha.m.)|   (cms)   (ha.m.)|   (cms)
                         .000 .0000E+00|    .057 .4408E-01|    .112 .9476E-01|    .304 .
                         .002 .4300E-02|    .062 .4978E-01|    .119 .1019E+00|    .367 .
                         .003 .8740E-02|    .067 .5565E-01|    .125 .1094E+00|    .437 .
                         .004 .1332E-01|    .071 .6170E-01|    .131 .1169E+00|    .512 .
                         .005 .1805E-01|    .081 .6794E-01|    .136 .1248E+00|    .592 .
                         .006 .2294E-01|    .090 .7436E-01|    .160 .1328E+00|    .677 .
                         .006 .2798E-01|    .098 .8097E-01|    .199 .1410E+00|    .766 .
                         .012 .3318E-01|    .105 .8776E-01|    .247 .1495E+00|    .860 .
                         .028 .3854E-01|    .112 .9476E-01|    .304 .1582E+00|    .000 .

     ROUTING RESULTS             AREA     QPEAK     TPEAK       R.V.
     ----------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW > 09:S-EXT1a+10      7.030      .491    12.017     28.295
    OUTFLOW < 01:POND OUT        7.030      .105    12.583     28.294

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=   21.369
                  TIME SHIFT OF PEAK FLOW         (min)=    34.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=.8747E-01

-----------------------------------------------------------------------------------------
R0003:C00013-----------------------------------------------------------------------------------------
* CATCHMENT 103
--------------------------
| CALIB NASHYD           |   Area     (ha)=     .160   Curve Number    (CN)= 62.00
| 02:103        DT= 1.00 |   Ia       (mm)=    4.800   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .037

     Unit Hyd Qpeak  (cms)=     .165

     PEAK FLOW       (cms)=     .016 (i)
     TIME TO PEAK    (hrs)=   12.000
     DURATION        (hrs)=   24.300, (dddd|hh:mm:)=   1|00:18
     AVERAGE FLOW    (cms)=     .000
     RUNOFF VOLUME    (mm)=   25.261
     TOTAL RAINFALL   (mm)=   81.400
     RUNOFF COEFFICIENT   =     .310

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

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R0003:C00014-----------------------------------------------------------------------------------------
* EXTERNAL AREA #3
--------------------------
| CALIB NASHYD           |   Area     (ha)=    4.020   Curve Number    (CN)= 60.00
| 03:EXT3       DT= 1.00 |   Ia       (mm)=    6.600   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .477

     Unit Hyd Qpeak  (cms)=     .322

     PEAK FLOW       (cms)=     .123 (i)
     TIME TO PEAK    (hrs)=   12.400
     DURATION        (hrs)=   27.183, (dddd|hh:mm:)=   1|03:11
     AVERAGE FLOW    (cms)=     .009
     RUNOFF VOLUME    (mm)=   22.918
     TOTAL RAINFALL   (mm)=   81.400
     RUNOFF COEFFICIENT   =     .282

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

-----------------------------------------------------------------------------------------
R0003:C00015-----------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------
R0003:C00002-----------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------
R0003:C00002-----------------------------------------------------------------------------------------
  ** END OF RUN :    2

*****************************************************************************************

--------------------
| START            | Project  dir.:Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\POST\SCS\
-------------------- Rainfall dir.:Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\POST\SCS\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 0004
    NSTORM=   1
          #  1=100SCS24.stm
-----------------------------------------------------------------------------------------
R0004:C00002-----------------------------------------------------------------------------------------
*#*************************************************************************
*#  Project Name: [221 FOX STREET SUBDIVISION]    Project Number: [09-062]
*#  Date        : 07-18-2022
*#  Modeller    : [CJ]
*#  Company     : WMI & Associates Ltd.
*#  License #   :  2880720
*#*************************************************************************
-----------------------------------------------------------------------------------------
R0004:C00002-----------------------------------------------------------------------------------------
--------------------
| READ STORM       |  Filename: Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\POST\SCS\100SCS24.
| Ptotal=  98.70 mm|  Comments: 100-Year SCS Type-II Storm Distribution (24-hour) Orillia,
--------------------
      TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME
     hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm
      0:12    .987|   4:12   1.974|   8:12   2.961|  12:12  19.740|  16:12   2.468|  20:12
      0:24    .987|   4:24   1.974|   8:24   2.961|  12:24  12.338|  16:24   2.467|  20:24
```

0:36	.987	4:36	1.974	8:36	2.961	12:36	8.883	16:36	2.467	20:36	
0:48	.987	4:48	1.974	8:48	2.961	12:48	8.390	16:48	2.467	20:48	
1:00	.987	5:00	1.974	9:00	2.961	13:00	5.922	17:00	1.480	21:00	
1:12	.987	5:12	1.974	9:12	2.961	13:12	4.935	17:12	1.481	21:12	
1:24	.987	5:24	1.974	9:24	2.961	13:24	4.935	17:24	1.974	21:24	
1:36	.987	5:36	1.974	9:36	2.961	13:36	4.935	17:36	1.481	21:36	
1:48	.987	5:48	1.974	9:48	2.961	13:48	4.935	17:48	1.974	21:48	
2:00	.987	6:00	1.974	10:00	2.961	14:00	4.935	18:00	1.481	22:00	
2:12	.987	6:12	1.974	10:12	5.428	14:12	2.961	18:12	1.481	22:12	
2:24	.987	6:24	1.974	10:24	5.429	14:24	2.961	18:24	1.480	22:24	
2:36	.987	6:36	1.974	10:36	5.428	14:36	2.961	18:36	1.974	22:36	
2:48	.987	6:48	1.974	10:48	5.429	14:48	2.961	18:48	1.481	22:48	
3:00	.987	7:00	1.974	11:00	5.428	15:00	2.961	19:00	1.481	23:00	
3:12	.987	7:12	1.974	11:12	7.403	15:12	2.467	19:12	1.974	23:12	
3:24	.987	7:24	1.974	11:24	10.857	15:24	2.467	19:24	1.481	23:24	
3:36	.987	7:36	1.974	11:36	26.155	15:36	2.467	19:36	1.974	23:36	
3:48	.987	7:48	1.974	11:48	54.285	15:48	2.467	19:48	1.481	23:48	
4:00	.987	8:00	1.974	12:00	111.038	16:00	2.467	20:00	1.974	24:00	

R0004:C00003----------

* EXTERNAL AREA EXT2

CALIB STANDHYD	Area (ha)= 6.14
01:EXT2 DT= 1.00	Total Imp(%)= 25.00 Dir. Conn.(%)= 14.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.53	4.61
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	3.00	8.00
Length	(m)=	150.00	90.00
Mannings n	=	.013	.250
Max.eff.Inten.	(mm/hr)=	111.04	54.33
over	(min)	2.00	12.00
Storage Coeff.	(min)=	2.25 (ii)	11.92 (ii)
Unit Hyd. Tpeak	(min)=	2.00	12.00
Unit Hyd. peak	(cms)=	.52	.09

				TOTALS
PEAK FLOW	(cms)=	.26	.45	.629 (iii)
TIME TO PEAK	(hrs)=	12.00	12.10	12.000
RUNOFF VOLUME	(mm)=	96.70	35.84	44.367
TOTAL RAINFALL	(mm)=	98.70	98.70	98.701
RUNOFF COEFFICIENT	=	.98	.36	.450

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 59.0 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.

R0004:C00004----------

SHIFT HYD		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
	ID= 1:EXT2	6.14	.629	12.000	44.367
Shift= 10.0 min	SHIFTED ID= 2:S-EXT2	6.14	.629	12.150	44.367

R0004:C00005----------

* EXTERNAL AREA EXT1b

CALIB NASHYD	Area (ha)= 5.390 Curve Number (CN)= 56.00
03:EXT1b DT= 1.00	Ia (mm)= 7.200 # of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= .383

Unit Hyd Qpeak (cms)= .538

PEAK FLOW (cms)= .241 (i)
TIME TO PEAK (hrs)= 12.300
DURATION (hrs)= 26.617, (dddd|hh:mm:)= 1|02:37
AVERAGE FLOW (cms)= .016
RUNOFF VOLUME (mm)= 28.764
TOTAL RAINFALL (mm)= 98.701
RUNOFF COEFFICIENT = .291

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

R0004:C00006----------

ADD HYD		ID:NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
04:S-EXT1b+2	ID 1	02:S-EXT2	6.140	.629	12.150	44.367	.000
	+ID 2	03:EXT1b	5.390	.241	12.300	28.764	.000
	SUM	04:S-EXT1b+2	11.530	.842	12.150	37.073	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

R0004:C00007----------

* CATCHMENT 102

CALIB NASHYD	Area (ha)= 6.580 Curve Number (CN)= 48.00
05:102 DT= 1.00	Ia (mm)= 9.000 # of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= .417

Unit Hyd Qpeak (cms)= .603

PEAK FLOW (cms)= .209 (i)
TIME TO PEAK (hrs)= 12.350
DURATION (hrs)= 26.817, (dddd|hh:mm:)= 1|02:49
AVERAGE FLOW (cms)= .015
RUNOFF VOLUME (mm)= 22.052
TOTAL RAINFALL (mm)= 98.701
RUNOFF COEFFICIENT = .223

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

R0004:C00008----------

ADD HYD		ID:NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
06:S-EXT1b+2+	ID 1	04:S-EXT1b+2	11.530	.842	12.150	37.073	.000
	+ID 2	05:102	6.580	.209	12.350	22.052	.000

```
                  ================================================================
                  SUM   06:S-EXT1b+2+    18.110     1.019   12.167    31.615    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------------------
R0004:C00009-------------------------------------------------------------------------------
* EXTERNAL AREA EXT1a
-------------------------
| CALIB NASHYD          |   Area     (ha)=    2.380   Curve Number    (CN)= 57.00
| 07:EXT1a      DT= 1.00 |   Ia       (mm)=    7.200   # of Linear Res.(N)=  3.00
-------------------------   U.H. Tp(hrs)=     .231

     Unit Hyd Qpeak  (cms)=     .394

     PEAK FLOW       (cms)=     .151 (i)
     TIME TO PEAK    (hrs)=   12.133
     DURATION        (hrs)=   25.617, (dddd|hh:mm:)=   1|01:37
     AVERAGE FLOW    (cms)=     .008
     RUNOFF VOLUME    (mm)=   29.572
     TOTAL RAINFALL   (mm)=   98.701
     RUNOFF COEFFICIENT   =     .300

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

--------------------------------------------------------------------------------------------
R0004:C00010-------------------------------------------------------------------------------
* CATCHMENT 101
-------------------------
| CALIB STANDHYD        |   Area     (ha)=    4.65
| 08:101        DT= 1.00 |   Total Imp(%)=   31.60   Dir. Conn.(%)=   19.20
-------------------------

                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=     1.47         3.18
     Dep. Storage     (mm)=     2.00         6.60
     Average Slope     (%)=     2.00         5.00
     Length            (m)=   180.00        25.00
     Mannings n          =     .013         .250

     Max.eff.Inten.(mm/hr)=   111.04        48.84
               over (min)        3.00         8.00
     Storage Coeff.  (min)=     2.83 (ii)    8.22 (ii)
     Unit Hyd. Tpeak (min)=     3.00         8.00
     Unit Hyd. peak  (cms)=      .39          .14
                                                      *TOTALS*
     PEAK FLOW       (cms)=      .27          .32          .564 (iii)
     TIME TO PEAK    (hrs)=    12.00        12.05        12.000
     RUNOFF VOLUME    (mm)=    96.70        29.73        42.591
     TOTAL RAINFALL   (mm)=    98.70        98.70        98.701
     RUNOFF COEFFICIENT   =      .98          .30          .432

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  52.0    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.

--------------------------------------------------------------------------------------------
R0004:C00011-------------------------------------------------------------------------------
-------------------------
| ADD HYD               |
```



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| 09:S-EXT1a+10         |   ID:NHYD             AREA      QPEAK     TPEAK      R.V.      DWF
-------------------------                        (ha)      (cms)     (hrs)       (mm)    (cms)
                       ID 1 07:EXT1a           2.380      .151   12.133     29.572    .000
                      +ID 2 08:101             4.650      .564   12.000     42.591    .000
                      ================================================================
                      SUM   09:S-EXT1a+10      7.030      .682   12.017     38.183    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------------------
R0004:C00012-------------------------------------------------------------------------------
-------------------------
|  ROUTE RESERVOIR -> |    Requested routing time step =  1.0 min.
|  IN>09:S-EXT1a+10   |
| OUT<01:POND OUT     | ========================  OUTLFOW STORAGE TABLE  ================
---------------------- OUTFLOW   STORAGE| OUTFLOW   STORAGE| OUTFLOW   STORAGE| OUTFLOW
                        (cms)    (ha.m.)|   (cms)   (ha.m.)|   (cms)   (ha.m.)|   (cms)
                         .000 .0000E+00|    .057 .4408E-01|    .112 .9476E-01|    .304 .
                         .002 .4300E-02|    .062 .4978E-01|    .119 .1019E+00|    .367 .
                         .003 .8740E-02|    .067 .5565E-01|    .125 .1094E+00|    .437 .
                         .004 .1332E-01|    .071 .6170E-01|    .131 .1169E+00|    .512 .
                         .005 .1805E-01|    .081 .6794E-01|    .136 .1248E+00|    .592 .
                         .006 .2294E-01|    .090 .7436E-01|    .160 .1328E+00|    .677 .
                         .006 .2798E-01|    .098 .8097E-01|    .199 .1410E+00|    .766 .
                         .012 .3318E-01|    .105 .8776E-01|    .247 .1495E+00|    .860 .
                         .028 .3854E-01|    .112 .9476E-01|    .304 .1582E+00|    .000 .

     ROUTING RESULTS             AREA     QPEAK     TPEAK       R.V.
     -----------------------      (ha)     (cms)     (hrs)       (mm)
     INFLOW > 09:S-EXT1a+10     7.030      .682    12.017     38.183
    OUTFLOW < 01:POND OUT       7.030      .132    12.600     38.183

                PEAK   FLOW   REDUCTION [Qout/Qin](%)=   19.365
                TIME SHIFT OF PEAK FLOW          (min)=    35.00
                MAXIMUM  STORAGE   USED        (ha.m.)=.1191E+00

--------------------------------------------------------------------------------------------
R0004:C00013-------------------------------------------------------------------------------
* CATCHMENT 103
-------------------------
| CALIB NASHYD          |   Area     (ha)=     .160   Curve Number    (CN)= 62.00
| 02:103        DT= 1.00 |   Ia       (mm)=    4.800   # of Linear Res.(N)=  3.00
-------------------------   U.H. Tp(hrs)=     .037

     Unit Hyd Qpeak  (cms)=     .165

     PEAK FLOW       (cms)=     .022 (i)
     TIME TO PEAK    (hrs)=   12.000
     DURATION        (hrs)=   24.317, (dddd|hh:mm:)=   1|00:19
     AVERAGE FLOW    (cms)=     .001
     RUNOFF VOLUME    (mm)=   35.329
     TOTAL RAINFALL   (mm)=   98.701
     RUNOFF COEFFICIENT   =     .358

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

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R0004:C00014-------------------------------------------------------------------------------
* EXTERNAL AREA #3
-------------------------
```

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| CALIB NASHYD           |   Area     (ha)=    4.020   Curve Number    (CN)= 60.00
| 03:EXT3       DT= 1.00 |   Ia       (mm)=    6.600   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .477

     Unit Hyd Qpeak  (cms)=     .322

     PEAK FLOW       (cms)=     .175 (i)
     TIME TO PEAK    (hrs)=   12.400
     DURATION        (hrs)=   27.183, (dddd|hh:mm:)=   1|03:11
     AVERAGE FLOW    (cms)=     .013
     RUNOFF VOLUME    (mm)=   32.446
     TOTAL RAINFALL   (mm)=   98.701
     RUNOFF COEFFICIENT   =     .329

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

--------------------------------------------------------------------------------------------
R0004:C00015-------------------------------------------------------------------------------
--------------------------------------------------------------------------------------------
R0004:C00002-------------------------------------------------------------------------------
--------------------------------------------------------------------------------------------
R0004:C00002-------------------------------------------------------------------------------
--------------------------------------------------------------------------------------------
R0004:C00002-------------------------------------------------------------------------------
  ** END OF RUN :    3

********************************************************************************************



--------------------
| START            | Project  dir.:Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\POST\SCS\
-------------------- Rainfall dir.:Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\POST\SCS\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 0005
    NSTORM=   1
           #  1=12REGTIM.089
--------------------------------------------------------------------------------------------
R0005:C00002-------------------------------------------------------------------------------
*#**************************************************************************
*#  Project Name: [221 FOX STREET SUBDIVISION]    Project Number: [09-062]
*#  Date        : 07-18-2022
*#  Modeller    : [CJ]
*#  Company     : WMI & Associates Ltd.
*#  License #   :  2880720
*#**************************************************************************
--------------------------------------------------------------------------------------------
R0005:C00002-------------------------------------------------------------------------------
--------------------
| READ STORM       |  Filename: Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\POST\SCS\12REGTIM.
| Ptotal= 193.00 mm|  Comments: TIMMINS REGIONAL STORM (12-hour)
--------------------
      TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME
     hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm
      1:00  15.000|   3:00  10.000|   5:00   5.000|   7:00  43.000|   9:00  23.000|  11:00
      2:00  20.000|   4:00   3.000|   6:00  20.000|   8:00  20.000|  10:00  13.000|  12:00
```



```
--------------------------------------------------------------------------------------------
R0005:C00003-------------------------------------------------------------------------------
* EXTERNAL AREA EXT2
--------------------------
| CALIB STANDHYD         |   Area     (ha)=    6.14
| 01:EXT2       DT= 1.00 |   Total Imp(%)=   25.00   Dir. Conn.(%)=   14.00
--------------------------

                                IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=        1.53          4.61
     Dep. Storage      (mm)=        2.00          5.00
     Average Slope      (%)=        3.00          8.00
     Length             (m)=      150.00         90.00
     Mannings n            =        .013          .250

     Max.eff.Inten.(mm/hr)=       43.00         32.04
               over (min)         3.00         15.00
     Storage Coeff.  (min)=        3.28 (ii)    15.23 (ii)
     Unit Hyd. Tpeak (min)=        3.00         15.00
     Unit Hyd. peak  (cms)=         .35           .07
                                                      *TOTALS*
     PEAK FLOW       (cms)=         .10           .38          .486 (iii)
     TIME TO PEAK    (hrs)=        7.00          7.03         7.000
     RUNOFF VOLUME    (mm)=      191.00        103.88       116.073
     TOTAL RAINFALL   (mm)=      193.00        193.00       193.000
     RUNOFF COEFFICIENT   =         .99           .54          .601

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  59.0    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.

--------------------------------------------------------------------------------------------
R0005:C00004-------------------------------------------------------------------------------
---------------------
| SHIFT HYD         |                                  AREA     QPEAK      TPEAK      R.V.
|                   |                                   (ha)     (cms)      (hrs)      (mm)
|                   |          ID= 1:EXT2               6.14      .486      7.000   116.073
| Shift=   10.0 min | SHIFTED ID= 2:S-EXT2              6.14      .486      7.150   116.073
---------------------


--------------------------------------------------------------------------------------------
R0005:C00005-------------------------------------------------------------------------------
* EXTERNAL AREA EXT1b
--------------------------
| CALIB NASHYD           |   Area     (ha)=    5.390   Curve Number    (CN)= 56.00
| 03:EXT1b      DT= 1.00 |   Ia       (mm)=    7.200   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .383

     Unit Hyd Qpeak  (cms)=     .538

     PEAK FLOW       (cms)=     .320 (i)
     TIME TO PEAK    (hrs)=    7.117
     DURATION        (hrs)=   14.617, (dddd|hh:mm:)=   0|14:37
     AVERAGE FLOW    (cms)=     .092
     RUNOFF VOLUME    (mm)=   89.580
     TOTAL RAINFALL   (mm)=  193.000
     RUNOFF COEFFICIENT   =     .464

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

R0005:C00006----------

ADD HYD		ID:NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
04:S-EXT1b+2	ID 1	02:S-EXT2	6.140	.486	7.150	116.073	.000
	+ID 2	03:EXT1b	5.390	.320	7.117	89.580	.000
	SUM	04:S-EXT1b+2	11.530	.806	7.150	103.688	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

R0005:C00007----------

* CATCHMENT 102

CALIB NASHYD					
05:102 DT= 1.00	Area (ha)=	6.580	Curve Number (CN)=	48.00	
	Ia (mm)=	9.000	# of Linear Res.(N)=	3.00	
	U.H. Tp(hrs)=	.417			

Unit Hyd Qpeak (cms)= .603

PEAK FLOW (cms)= .311 (i)
TIME TO PEAK (hrs)= 7.150
DURATION (hrs)= 14.817, (dddd|hh:mm:)= 0|14:49
AVERAGE FLOW (cms)= .091
RUNOFF VOLUME (mm)= 73.734
TOTAL RAINFALL (mm)= 193.000
RUNOFF COEFFICIENT = .382

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

R0005:C00008----------

ADD HYD		ID:NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
06:S-EXT1b+2+	ID 1	04:S-EXT1b+2	11.530	.806	7.150	103.688	.000
	+ID 2	05:102	6.580	.311	7.150	73.734	.000
	SUM	06:S-EXT1b+2+	18.110	1.117	7.150	92.805	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

R0005:C00009----------

* EXTERNAL AREA EXT1a

CALIB NASHYD					
07:EXT1a DT= 1.00	Area (ha)=	2.380	Curve Number (CN)=	57.00	
	Ia (mm)=	7.200	# of Linear Res.(N)=	3.00	
	U.H. Tp(hrs)=	.231			

Unit Hyd Qpeak (cms)= .394

PEAK FLOW (cms)= .157 (i)
TIME TO PEAK (hrs)= 7.033
DURATION (hrs)= 13.617, (dddd|hh:mm:)= 0|13:37
AVERAGE FLOW (cms)= .044

RUNOFF VOLUME (mm)= 91.469
TOTAL RAINFALL (mm)= 193.000
RUNOFF COEFFICIENT = .474

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

R0005:C00010----------

* CATCHMENT 101

CALIB STANDHYD					
08:101 DT= 1.00	Area (ha)=	4.65			
	Total Imp(%)=	31.60	Dir. Conn.(%)=	19.20	

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	1.47	3.18	
Dep. Storage	(mm)=	2.00	6.60	
Average Slope	(%)=	2.00	5.00	
Length	(m)=	180.00	25.00	
Mannings n	=	.013	.250	
Max.eff.Inten.	(mm/hr)=	43.00	29.27	
over	(min)	4.00	11.00	
Storage Coeff.	(min)=	4.14 (ii)	10.75 (ii)	
Unit Hyd. Tpeak	(min)=	4.00	11.00	
Unit Hyd. peak	(cms)=	.28	.10	
				TOTALS
PEAK FLOW	(cms)=	.11	.25	.354 (iii)
TIME TO PEAK	(hrs)=	6.98	7.02	7.000
RUNOFF VOLUME	(mm)=	191.00	91.02	110.215
TOTAL RAINFALL	(mm)=	193.00	193.00	193.000
RUNOFF COEFFICIENT	=	.99	.47	.571

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 52.0 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.

R0005:C00011----------

ADD HYD		ID:NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
09:S-EXT1a+10	ID 1	07:EXT1a	2.380	.157	7.033	91.469	.000
	+ID 2	08:101	4.650	.354	7.000	110.215	.000
	SUM	09:S-EXT1a+10	7.030	.510	7.000	103.869	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

R0005:C00012----------

ROUTE RESERVOIR -> / IN>09:S-EXT1a+10 / OUT<01:POND OUT	Requested routing time step = 1.0 min.

OUTFLOW STORAGE TABLE

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)
.000	.0000E+00	.057	.4408E-01	.112	.9476E-01	.304
.002	.4300E-02	.062	.4978E-01	.119	.1019E+00	.367

```
                        .003 .8740E-02|    .067 .5565E-01|    .125 .1094E+00|    .437 .
                        .004 .1332E-01|    .071 .6170E-01|    .131 .1169E+00|    .512 .
                        .005 .1805E-01|    .081 .6794E-01|    .136 .1248E+00|    .592 .
                        .006 .2294E-01|    .090 .7436E-01|    .160 .1328E+00|    .677 .
                        .006 .2798E-01|    .098 .8097E-01|    .199 .1410E+00|    .766 .
                        .012 .3318E-01|    .105 .8776E-01|    .247 .1495E+00|    .860 .
                        .028 .3854E-01|    .112 .9476E-01|    .304 .1582E+00|    .000 .

     ROUTING RESULTS              AREA     QPEAK     TPEAK       R.V.
     ---------------------        (ha)     (cms)     (hrs)       (mm)
     INFLOW > 09:S-EXT1a+10      7.030      .510     7.000    103.869
    OUTFLOW < 01:POND OUT        7.030      .373     7.233    103.867

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=   73.083
                  TIME SHIFT OF PEAK FLOW         (min)=    14.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=.1685E+00

--------------------------------------------------------------------------------
R0005:C00013------------------------------------------------------------------
* CATCHMENT 103
--------------------------
| CALIB NASHYD           |   Area     (ha)=     .160   Curve Number    (CN)= 62.00
| 02:103       DT= 1.00 |   Ia       (mm)=    4.800   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .037

     Unit Hyd Qpeak  (cms)=     .165

     PEAK FLOW       (cms)=     .013 (i)
     TIME TO PEAK    (hrs)=    7.000
     DURATION        (hrs)=   12.317, (dddd|hh:mm:)=   0|12:19
     AVERAGE FLOW    (cms)=     .004
     RUNOFF VOLUME    (mm)=  103.000
     TOTAL RAINFALL   (mm)=  193.000
     RUNOFF COEFFICIENT   =     .534

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

--------------------------------------------------------------------------------
R0005:C00014------------------------------------------------------------------
* EXTERNAL AREA #3
--------------------------
| CALIB NASHYD           |   Area     (ha)=    4.020   Curve Number    (CN)= 60.00
| 03:EXT3      DT= 1.00 |   Ia       (mm)=    6.600   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .477

     Unit Hyd Qpeak  (cms)=     .322

     PEAK FLOW       (cms)=     .247 (i)
     TIME TO PEAK    (hrs)=    7.200
     DURATION        (hrs)=   15.183, (dddd|hh:mm:)=   0|15:11
     AVERAGE FLOW    (cms)=     .072
     RUNOFF VOLUME    (mm)=   97.671
     TOTAL RAINFALL   (mm)=  193.000
     RUNOFF COEFFICIENT   =     .506

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

--------------------------------------------------------------------------------
R0005:C00015------------------------------------------------------------------
--------------------------------------------------------------------------------
```



```
R0005:C00002------------------------------------------------------------------
--------------------------------------------------------------------------------
R0005:C00002------------------------------------------------------------------
--------------------------------------------------------------------------------
R0005:C00002------------------------------------------------------------------
--------------------------------------------------------------------------------
R0005:C00002------------------------------------------------------------------
--------------------
| FINISH           |
--------------------
--------------------------------------------------------------------------------
********************************************************************************
     WARNINGS / ERRORS / NOTES
     -------------------------
   Simulation ended on 2022-07-15     at 09:43:21
================================================================================
```

Post-Development Condition
4-hour Chicago Storm Distribution

```
2     Metric units
*#*************************************************************************
*#  Project Name: [221 FOX STREET SUBDIVISION]    Project Number: [09-062]
*#  Date        : 07-18-2022
*#  Modeller    : [CJ]
*#  Company     : WMI & Associates Ltd.
*#  License #   :  2880720
*#*************************************************************************
*%
*%  POST-DEVELOPMENT CONDITION (4HR CHICAGO STORM)
*%
*% 25mm CHICAGO STORM DISTRIBUTION ORILLIA IDF DATA (4 HOUR)
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[1]
*%                   ["25mm4hr.stm"] <--storm filename,
*%-----------------|-------------------------------------------------------|
READ STORM          STORM_FILENAME=["STORM.001"]
*%-----------------|-------------------------------------------------------|
* EXTERNAL AREA EXT2
CALIB STANDHYD      ID=[1], NHYD=["EXT2"], DT=[1](min), AREA=[6.14](ha),
                    XIMP=[0.14], TIMP=[0.25], DWF=[0](cms), LOSS=[2],
                    SCS curve number CN=[59],
                    Pervious   surfaces: IAper=[5](mm), SLPP=[8.0](%),
                                         LGP=[90](m), MNP=[0.25], SCP=[0](min),
                    Impervious surfaces: IAimp=[2.0](mm), SLPI=[3.0](%),
                                         LGI=[150](m), MNI=[0.013], SCI=[0](min),
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------|
SHIFT HYD           IDout=[2], NHYD=["S-EXT2"], IDin=[1], TLAG=[10](min)
*%-----------------|-------------------------------------------------------|
* EXTERNAL AREA EXT1b
CALIB NASHYD        ID=[3], NHYD=["EXT1b"], DT=[1]min, AREA=[5.39](ha),
                    DWF=[0](cms),  CN/C=[56], IA=[7.2](mm),
                    N=[3], TP=[0.383]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------|
ADD HYD             IDsum=[4], NHYD=["S-EXT1b+2"], IDs to add=[2+3]
*%-----------------|-------------------------------------------------------|
* CATCHMENT 102
CALIB NASHYD        ID=[5], NHYD=["102"], DT=[1]min, AREA=[6.58](ha),
                    DWF=[0](cms),  CN/C=[48], IA=[9.0](mm),
                    N=[3], TP=[0.417]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------|
ADD HYD             IDsum=[6], NHYD=["S-EXT1b+2+102"], IDs to add=[4+5]
*%-----------------|-------------------------------------------------------|
* EXTERNAL AREA EXT1a
CALIB NASHYD        ID=[7], NHYD=["EXT1a"], DT=[1]min, AREA=[2.38](ha),
                    DWF=[0](cms),  CN/C=[57], IA=[7.2](mm),
                    N=[3], TP=[0.231]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------|
* CATCHMENT 101
CALIB STANDHYD      ID=[8], NHYD=["101"], DT=[1](min), AREA=[4.65](ha),
```



```
                    XIMP=[0.192], TIMP=[0.316], DWF=[0](cms), LOSS=[2],
                    SCS curve number CN=[52],
                    Pervious   surfaces: IAper=[6.6](mm), SLPP=[5.0](%),
                                         LGP=[25](m), MNP=[0.25], SCP=[0](min),
                    Impervious surfaces: IAimp=[2.0](mm), SLPI=[2.0](%),LGI=[180](m),
                    MNI=[0.013], SCI=[0](min),
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=["S-EXT1a+101"], IDs to add=[7+8]
*%-----------------|-------------------------------------------------------|
ROUTE RESERVOIR     IDout=[1],   NHYD=["POND OUT"],  IDin=[9],
                    RDT=[1](min),
                          TABLE of ( OUTFLOW-STORAGE ) values
                                0 , 0
                                0.0015 , 0.0043
                                0.0031 , 0.00874
                                0.0041 , 0.01332
                                0.005 , 0.01805
                                0.0057 , 0.02294
                                0.0063 , 0.02798
                                0.012 , 0.03318
                                0.0284 , 0.03854
                                0.0572 , 0.04408
                                0.0619 , 0.04978
                                0.0665 , 0.05565
                                0.0711 , 0.0617
                                0.0811 , 0.06794
                                0.0899 , 0.07436
                                0.0979 , 0.08097
                                0.1052 , 0.08776
                                0.1121 , 0.09476
                                0.1186 , 0.10195
                                0.1247 , 0.10935
                                0.1305 , 0.11695
                                0.1361 , 0.12477
                                0.1599 , 0.13279
                                0.1988 , 0.14103
                                0.2474 , 0.1495
                                0.304 , 0.15819
                                0.3673 , 0.1671
                                0.4367 , 0.18504
                                0.5117 , 0.19407
                                0.5918 , 0.2033
                                0.6766 , 0.21273
                                0.766 , 0.22238
                                0.8597 , 0.23223
                                    [   -1   ,  -1   ]   (max twenty pts)
                                  IDovf=[    ], NHYDovf=[    ]
*%-----------------|-------------------------------------------------------|
* CATCHMENT 103
CALIB NASHYD        ID=[2], NHYD=["103"], DT=[1]min, AREA=[0.16](ha),
                    DWF=[0](cms),  CN/C=[62], IA=[4.8](mm),
                    N=[3], TP=[0.037]hrs,
```

```
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------|
* EXTERNAL AREA #3
CALIB NASHYD        ID=[3], NHYD=["EXT3"], DT=[1]min, AREA=[4.02](ha),
                    DWF=[0](cms),  CN/C=[60], IA=[6.6](mm),
                    N=[3], TP=[0.477]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------|

*% 2-YEAR CHICAGO STORM DISTRIBUTION ORILLIA IDF DATA (4 HOUR)
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[2]
*%                   ["2CHI4.stm"] <--storm filename
*%-----------------|-------------------------------------------------------|
*% 5-YEAR CHICAGO STORM DISTRIBUTION ORILLIA IDF DATA (4 HOUR)
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[3]
*%                   ["5CHI4.stm"] <--storm filename
*%-----------------|-------------------------------------------------------|
*% 25-YEAR CHICAGO STORM DISTRIBUTION ORILLIA IDF DATA (4 HOUR)
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[4]
*%                   ["25CHI4.stm"] <--storm filename
*%-----------------|-------------------------------------------------------|
*% 100-YEAR CHICAGO STORM DISTRIBUTION ORILLIA IDF DATA (4 HOUR)
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[5]
*%                   ["100CHI4.stm"] <--storm filename
*%-----------------|-------------------------------------------------------|
FINISH
```

```
SSSSS   W   W   M   M   H   H   Y   Y   M   M    OOO          222     000    11   77777 ==
S       W W W   MM MM   H   H    Y Y    MM MM   O   O          2     0   0   11   7   7
SSSSS   W W W   M M M   HHHHH     Y     M M M   O   O          2     0   0   11       7
    S    W W    M   M   H   H     Y     M   M   O   O        222     0   0   11      7
SSSSS    W W    M   M   H   H     Y     M   M    OOO         2       0   0   11     7   ==
                                                            2       0   0   11    7    #
      StormWater Management HYdrologic Model                222     000    11    7    ==

*****************************************************************************************
**************************************  SWMHYMO Ver4.05.0  ******************************
******************  A single event and continuous hydrologic simulation model  ************
******************     based on the principles of HYMO and its successors      ************
******************                 OTTHYMO-83 and OTTHYMO-89.                  ************
*****************************************************************************************
****************** Distributed by:  J.F. Sabourin and Associates Inc.          ************
******************                   Ottawa,  Ontario: (613) 836-3884          ************
******************                   Gatineau, Quebec: (819) 243-6858          ************
******************                   E-Mail: swmhymo@jfsa.com                  ************
*****************************************************************************************

+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++++++++++++++++++ Licensed user: WMI & Associates Ltd.                      ++++++++++++
++++++++++++++++++                 Barrie                SERIAL#:2880720     ++++++++++++
+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

*****************************************************************************************
******************           ++++++ PROGRAM ARRAY DIMENSIONS ++++++           ************
******************           Maximum value for ID numbers  :     11          ************
******************           Max. number of rainfall points: 105408          ************
******************           Max. number of flow points    : 105408          ************
*****************************************************************************************


*****************************   D E T A I L E D   O U T P U T   *************************
*****************************************************************************************
*                 RUN DATE: 2022-07-15     TIME: 09:49:44     RUN COUNTER: 000002
*****************************************************************************************
* Input   file: Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\POST\CHI\POST.dat
* Output  file: Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\POST\CHI\POST.out
* Summary file: Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\POST\CHI\POST.sum
* User comments:
* 1:_____________________________________________________________________________________
* 2:_____________________________________________________________________________________
* 3:_____________________________________________________________________________________
*****************************************************************************************

-----------------------------------------------------------------------------------------
R0001:C00001-----------------------------------------------------------------------------
*#*************************************************************************
*#  Project Name: [221 FOX STREET SUBDIVISION]    Project Number: [09-062]
*#  Date        : 07-18-2022
```



```
*#  Modeller    : [CJ]
*#  Company     : WMI & Associates Ltd.
*#  License #   :  2880720
*#*************************************************************************
--------------------
| START            | Project  dir.:Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\POST\CHI\
-------------------- Rainfall dir.:Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\POST\CHI\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 0001
    NSTORM=   1
          #  1=25mm4hr.stm
-----------------------------------------------------------------------------------------
R0001:C00002-----------------------------------------------------------------------------
--------------------
| READ STORM       |  Filename: Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\POST\CHI\25mm4hr.
| Ptotal=  25.00 mm|  Comments: 25mm Chicago Storm Distribution (4-hour) Orillia, ON.
--------------------
      TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME
     hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm
      0:10   1.740|   0:50   3.500|   1:30  13.740|   2:10   3.750|   2:50   2.380|   3:30
      0:20   1.970|   1:00   5.020|   1:40   7.730|   2:20   3.250|   3:00   2.190|   3:40
      0:30   2.290|   1:10  10.720|   1:50   5.590|   2:30   2.890|   3:10   2.040|   3:50
      0:40   2.740|   1:20  62.850|   2:00   4.460|   2:40   2.610|   3:20   1.910|   4:00

-----------------------------------------------------------------------------------------
R0001:C00003-----------------------------------------------------------------------------
* EXTERNAL AREA EXT2
--------------------------
| CALIB STANDHYD         |   Area     (ha)=    6.14
| 01:EXT2       DT= 1.00 |   Total Imp(%)=   25.00   Dir. Conn.(%)=   14.00
--------------------------

                                IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=        1.53          4.61
     Dep. Storage      (mm)=        2.00          5.00
     Average Slope      (%)=        3.00          8.00
     Length             (m)=      150.00         90.00
     Mannings n            =        .013          .250

     Max.eff.Inten.(mm/hr)=       62.85          2.53
               over (min)         3.00         36.00
     Storage Coeff.  (min)=        2.82 (ii)    35.81 (ii)
     Unit Hyd. Tpeak (min)=        3.00         36.00
     Unit Hyd. peak  (cms)=         .39           .03

                                                          *TOTALS*
     PEAK FLOW         (cms)=         .14           .02          .146 (iii)
     TIME TO PEAK      (hrs)=        1.33          1.98         1.333
     RUNOFF VOLUME      (mm)=       23.00          2.44         5.319
     TOTAL RAINFALL     (mm)=       25.00         25.00        25.000
     RUNOFF COEFFICIENT    =         .92           .10          .213

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  59.0    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.

R0001:C00004

SHIFT HYD		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
	ID= 1:EXT2	6.14	.146	1.333	5.319
Shift= 10.0 min	SHIFTED ID= 2:S-EXT2	6.14	.146	1.483	5.319

R0001:C00005

* EXTERNAL AREA EXT1b

CALIB NASHYD					
03:EXT1b	DT= 1.00	Area (ha)= 5.390	Curve Number (CN)= 56.00		
		Ia (mm)= 7.200	# of Linear Res.(N)= 3.00		
		U.H. Tp(hrs)= .383			

Unit Hyd Qpeak (cms)= .538

PEAK FLOW (cms)= .013 (i)
TIME TO PEAK (hrs)= 1.883
DURATION (hrs)= 6.617, (dddd|hh:mm:)= 0|06:37
AVERAGE FLOW (cms)= .003
RUNOFF VOLUME (mm)= 1.458
TOTAL RAINFALL (mm)= 25.000
RUNOFF COEFFICIENT = .058

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

R0001:C00006

ADD HYD		ID:NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
04:S-EXT1b+2	ID 1	02:S-EXT2	6.140	.146	1.483	5.319	.000
	+ID 2	03:EXT1b	5.390	.013	1.883	1.458	.000
	SUM	04:S-EXT1b+2	11.530	.151	1.483	3.514	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

R0001:C00007

* CATCHMENT 102

CALIB NASHYD					
05:102	DT= 1.00	Area (ha)= 6.580	Curve Number (CN)= 48.00		
		Ia (mm)= 9.000	# of Linear Res.(N)= 3.00		
		U.H. Tp(hrs)= .417			

Unit Hyd Qpeak (cms)= .603

PEAK FLOW (cms)= .008 (i)
TIME TO PEAK (hrs)= 2.017
DURATION (hrs)= 6.817, (dddd|hh:mm:)= 0|06:49
AVERAGE FLOW (cms)= .002
RUNOFF VOLUME (mm)= .879
TOTAL RAINFALL (mm)= 25.000
RUNOFF COEFFICIENT = .035

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

R0001:C00008

ADD HYD		ID:NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
06:S-EXT1b+2+	ID 1	04:S-EXT1b+2	11.530	.151	1.483	3.514	.000
	+ID 2	05:102	6.580	.008	2.017	.879	.000
	SUM	06:S-EXT1b+2+	18.110	.154	1.483	2.556	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

R0001:C00009

* EXTERNAL AREA EXT1a

CALIB NASHYD					
07:EXT1a	DT= 1.00	Area (ha)= 2.380	Curve Number (CN)= 57.00		
		Ia (mm)= 7.200	# of Linear Res.(N)= 3.00		
		U.H. Tp(hrs)= .231			

Unit Hyd Qpeak (cms)= .394

PEAK FLOW (cms)= .008 (i)
TIME TO PEAK (hrs)= 1.650
DURATION (hrs)= 5.617, (dddd|hh:mm:)= 0|05:37
AVERAGE FLOW (cms)= .002
RUNOFF VOLUME (mm)= 1.513
TOTAL RAINFALL (mm)= 25.000
RUNOFF COEFFICIENT = .061

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

R0001:C00010

* CATCHMENT 101

CALIB STANDHYD					
08:101	DT= 1.00	Area (ha)= 4.65			
		Total Imp(%)= 31.60	Dir. Conn.(%)= 19.20		
		IMPERVIOUS	PERVIOUS (i)		

```
     Surface Area      (ha)=       1.47          3.18
     Dep. Storage      (mm)=       2.00          6.60
     Average Slope      (%)=       2.00          5.00
     Length             (m)=     180.00         25.00
     Mannings n            =       .013          .250

     Max.eff.Inten.(mm/hr)=      62.85          2.31
               over (min)        4.00         22.00
     Storage Coeff.  (min)=      3.56 (ii)    21.81 (ii)
     Unit Hyd. Tpeak (min)=      4.00         22.00
     Unit Hyd. peak  (cms)=       .30           .05
                                                *TOTALS*
     PEAK FLOW       (cms)=       .14           .01          .144 (iii)
     TIME TO PEAK    (hrs)=      1.33          1.72         1.333
     RUNOFF VOLUME    (mm)=     23.00          1.73         5.813
     TOTAL RAINFALL   (mm)=     25.00         25.00        25.000
     RUNOFF COEFFICIENT    =       .92           .07          .233

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  52.0     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.

-------------------------------------------------------------------------------
R0001:C00011-----------------------------------------------------------------
------------------------
| ADD HYD              |
| 09:S-EXT1a+10        |   ID:NHYD            AREA     QPEAK    TPEAK      R.V.     DWF
------------------------                       (ha)     (cms)    (hrs)      (mm)    (cms)
                     ID 1 07:EXT1a          2.380      .008    1.650     1.513     .000
                    +ID 2 08:101            4.650      .144    1.333     5.813     .000
                    ==========================================================
                    SUM   09:S-EXT1a+10     7.030      .145    1.333     4.358     .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
R0001:C00012-----------------------------------------------------------------
------------------------
|  ROUTE RESERVOIR -> |    Requested routing time step =  1.0 min.
|  IN>09:S-EXT1a+10   |
| OUT<01:POND OUT     | ========================  OUTFLOW STORAGE TABLE  ================
------------------------ OUTFLOW   STORAGE| OUTFLOW   STORAGE| OUTFLOW   STORAGE| OUTFLOW
                          (cms)   (ha.m.)|   (cms)   (ha.m.)|   (cms)   (ha.m.)|   (cms)
                           .000 .0000E+00|    .057 .4408E-01|    .112 .9476E-01|    .304 .
                           .002 .4300E-02|    .062 .4978E-01|    .119 .1019E+00|    .367 .
                           .003 .8740E-02|    .067 .5565E-01|    .125 .1094E+00|    .437 .
                           .004 .1332E-01|    .071 .6170E-01|    .131 .1169E+00|    .512 .
                           .005 .1805E-01|    .081 .6794E-01|    .136 .1248E+00|    .592 .
                           .006 .2294E-01|    .090 .7436E-01|    .160 .1328E+00|    .677 .
                           .006 .2798E-01|    .098 .8097E-01|    .199 .1410E+00|    .766 .
                           .012 .3318E-01|    .105 .8776E-01|    .247 .1495E+00|    .860 .
                           .028 .3854E-01|    .112 .9476E-01|    .304 .1582E+00|    .000 .
```



```
     ROUTING RESULTS              AREA      QPEAK      TPEAK       R.V.
     ----------------------       (ha)      (cms)      (hrs)       (mm)
      INFLOW > 09:S-EXT1a+10     7.030       .145      1.333      4.358
     OUTFLOW < 01:POND OUT       7.030       .006      4.100      4.357

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=    4.062
                   TIME SHIFT OF PEAK FLOW          (min)=   166.00
                   MAXIMUM  STORAGE   USED        (ha.m.)=.2460E-01

-------------------------------------------------------------------------------
R0001:C00013-----------------------------------------------------------------
* CATCHMENT 103
-------------------------
| CALIB NASHYD          |   Area     (ha)=     .160   Curve Number    (CN)= 62.00
| 02:103       DT= 1.00 |   Ia       (mm)=    4.800   # of Linear Res.(N)=  3.00
-------------------------   U.H. Tp(hrs)=     .037

     Unit Hyd Qpeak  (cms)=     .165

     PEAK FLOW       (cms)=     .002 (i)
     TIME TO PEAK    (hrs)=    1.333
     DURATION        (hrs)=    4.300, (dddd|hh:mm:)=   0|04:18
     AVERAGE FLOW    (cms)=     .000
     RUNOFF VOLUME    (mm)=    2.320
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT    =     .093

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

-------------------------------------------------------------------------------
R0001:C00014-----------------------------------------------------------------
* EXTERNAL AREA #3
-------------------------
| CALIB NASHYD          |   Area     (ha)=    4.020   Curve Number    (CN)= 60.00
| 03:EXT3      DT= 1.00 |   Ia       (mm)=    6.600   # of Linear Res.(N)=  3.00
-------------------------   U.H. Tp(hrs)=     .477

     Unit Hyd Qpeak  (cms)=     .322

     PEAK FLOW       (cms)=     .011 (i)
     TIME TO PEAK    (hrs)=    2.017
     DURATION        (hrs)=    7.183, (dddd|hh:mm:)=   0|07:11
     AVERAGE FLOW    (cms)=     .003
     RUNOFF VOLUME    (mm)=    1.803
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT    =     .072

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

-------------------------------------------------------------------------------
R0001:C00015-----------------------------------------------------------------
  ** END OF RUN :    0
```

```
**********************************************************************************************
```

```
--------------------
| START            | Project  dir.:Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\POST\CHI\
-------------------- Rainfall dir.:Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\POST\CHI\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 0002
    NSTORM=   1
           #  1=2CHI4.stm
```

```
R0002:C00002-----------------------------------------------------------------------------------
*#**************************************************************************
*#  Project Name: [221 FOX STREET SUBDIVISION]    Project Number: [09-062]
*#  Date        : 07-18-2022
*#  Modeller    : [CJ]
*#  Company     : WMI & Associates Ltd.
*#  License #   :  2880720
*#**************************************************************************
```

```
R0002:C00002-----------------------------------------------------------------------------------
--------------------
| READ STORM       |  Filename: Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\POST\CHI\2CHI4.
| Ptotal=  32.77 mm|  Comments: 2-Year Chicago Storm Distribution (4-hour) Orillia, ON.
--------------------
      TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME    RAIN|   TIME
     hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm   mm/hr|  hh:mm
      0:10   2.285|   0:50   4.586|   1:30  18.005|   2:10   4.915|   2:50   3.120|   3:30
      0:20   2.585|   1:00   6.583|   1:40  10.127|   2:20   4.266|   3:00   2.877|   3:40
      0:30   2.995|   1:10  14.057|   1:50   7.331|   2:30   3.787|   3:10   2.674|   3:50
      0:40   3.598|   1:20  82.380|   2:00   5.849|   2:40   3.416|   3:20   2.501|   4:00
```

```
R0002:C00003-----------------------------------------------------------------------------------
* EXTERNAL AREA EXT2
--------------------------
| CALIB STANDHYD         |   Area     (ha)=    6.14
| 01:EXT2       DT= 1.00 |   Total Imp(%)=   25.00   Dir. Conn.(%)=   14.00
--------------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.53         4.61
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       3.00         8.00
     Length            (m)=     150.00        90.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      82.38         5.75
               over (min)        3.00        26.00
```



```
     Storage Coeff.  (min)=       2.53 (ii)   26.28 (ii)
     Unit Hyd. Tpeak (min)=       3.00        26.00
     Unit Hyd. peak  (cms)=        .42          .04
                                                *TOTALS*
     PEAK FLOW       (cms)=        .19          .04          .197 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.75         1.333
     RUNOFF VOLUME    (mm)=      30.77         4.43         8.115
     TOTAL RAINFALL   (mm)=      32.77        32.77        32.772
     RUNOFF COEFFICIENT   =        .94          .14          .248

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  59.0    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.
```

```
R0002:C00004-----------------------------------------------------------------------------------
--------------------
| SHIFT HYD        |                                AREA     QPEAK      TPEAK      R.V.
|                  |                                 (ha)     (cms)      (hrs)      (mm)
|                  |         ID= 1:EXT2              6.14      .197      1.333     8.115
| Shift=   10.0 min | SHIFTED ID= 2:S-EXT2            6.14      .197      1.483     8.115
--------------------
```

```
R0002:C00005-----------------------------------------------------------------------------------
* EXTERNAL AREA EXT1b
--------------------------
| CALIB NASHYD           |   Area     (ha)=    5.390   Curve Number    (CN)= 56.00
| 03:EXT1b      DT= 1.00 |   Ia       (mm)=    7.200   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .383

     Unit Hyd Qpeak  (cms)=     .538

     PEAK FLOW       (cms)=     .027 (i)
     TIME TO PEAK    (hrs)=    1.850
     DURATION        (hrs)=    6.617, (dddd|hh:mm:)=   0|06:37
     AVERAGE FLOW    (cms)=     .007
     RUNOFF VOLUME    (mm)=    2.904
     TOTAL RAINFALL   (mm)=   32.772
     RUNOFF COEFFICIENT   =     .089

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

```
R0002:C00006-----------------------------------------------------------------------------------
------------------------
| ADD HYD              |
| 04:S-EXT1b+2         |   ID:NHYD            AREA     QPEAK     TPEAK      R.V.      DWF
------------------------                       (ha)     (cms)     (hrs)      (mm)     (cms)
                      ID 1 02:S-EXT2         6.140      .197     1.483     8.115     .000
                     +ID 2 03:EXT1b          5.390      .027     1.850     2.904     .000
                     ==========================================================
```

```
                    SUM   04:S-EXT1b+2     11.530      .210    1.483     5.679    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------------------
R0002:C00007-------------------------------------------------------------------------------
* CATCHMENT 102
-------------------------
| CALIB NASHYD          |   Area     (ha)=    6.580   Curve Number    (CN)= 48.00
| 05:102        DT= 1.00 |   Ia       (mm)=    9.000   # of Linear Res.(N)=  3.00
-------------------------   U.H. Tp(hrs)=     .417

     Unit Hyd Qpeak  (cms)=     .603

     PEAK FLOW       (cms)=     .019 (i)
     TIME TO PEAK    (hrs)=    1.933
     DURATION        (hrs)=    6.817, (dddd|hh:mm:)=   0|06:49
     AVERAGE FLOW    (cms)=     .005
     RUNOFF VOLUME    (mm)=    1.890
     TOTAL RAINFALL   (mm)=   32.772
     RUNOFF COEFFICIENT   =     .058

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

--------------------------------------------------------------------------------------------
R0002:C00008-------------------------------------------------------------------------------
------------------------
| ADD HYD              |
| 06:S-EXT1b+2+        |   ID:NHYD            AREA     QPEAK    TPEAK      R.V.     DWF
------------------------                       (ha)     (cms)    (hrs)      (mm)    (cms)
                      ID 1 04:S-EXT1b+2     11.530      .210    1.483     5.679    .000
                     +ID 2 05:102            6.580      .019    1.933     1.890    .000
                     ==========================================================
                     SUM   06:S-EXT1b+2+    18.110      .218    1.483     4.303    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------------------
R0002:C00009-------------------------------------------------------------------------------
* EXTERNAL AREA EXT1a
-------------------------
| CALIB NASHYD          |   Area     (ha)=    2.380   Curve Number    (CN)= 57.00
| 07:EXT1a      DT= 1.00 |   Ia       (mm)=    7.200   # of Linear Res.(N)=  3.00
-------------------------   U.H. Tp(hrs)=     .231

     Unit Hyd Qpeak  (cms)=     .394

     PEAK FLOW       (cms)=     .017 (i)
     TIME TO PEAK    (hrs)=    1.617
     DURATION        (hrs)=    5.617, (dddd|hh:mm:)=   0|05:37
     AVERAGE FLOW    (cms)=     .004
     RUNOFF VOLUME    (mm)=    3.011
     TOTAL RAINFALL   (mm)=   32.772
```



```
     RUNOFF COEFFICIENT   =     .092

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

--------------------------------------------------------------------------------------------
R0002:C00010-------------------------------------------------------------------------------
* CATCHMENT 101
-------------------------
| CALIB STANDHYD        |   Area     (ha)=    4.65
| 08:101        DT= 1.00 |   Total Imp(%)=   31.60   Dir. Conn.(%)=   19.20
-------------------------

                                IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=       1.47         3.18
     Dep. Storage      (mm)=       2.00         6.60
     Average Slope      (%)=       2.00         5.00
     Length             (m)=     180.00        25.00
     Mannings n            =       .013         .250

     Max.eff.Inten.(mm/hr)=      82.38         5.48
           over (min)            3.00        16.00
     Storage Coeff.  (min)=       3.19 (ii)   16.11 (ii)
     Unit Hyd. Tpeak (min)=       3.00        16.00
     Unit Hyd. peak  (cms)=        .36          .07
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .19          .03          .200 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.58         1.333
     RUNOFF VOLUME    (mm)=      30.77         3.27         8.554
     TOTAL RAINFALL   (mm)=      32.77        32.77        32.772
     RUNOFF COEFFICIENT   =        .94          .10          .261

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  52.0    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.

--------------------------------------------------------------------------------------------
R0002:C00011-------------------------------------------------------------------------------
------------------------
| ADD HYD              |
| 09:S-EXT1a+10        |   ID:NHYD            AREA     QPEAK    TPEAK      R.V.     DWF
------------------------                       (ha)     (cms)    (hrs)      (mm)    (cms)
                      ID 1 07:EXT1a          2.380      .017    1.617     3.011    .000
                     +ID 2 08:101            4.650      .200    1.333     8.554    .000
                     ==========================================================
                     SUM   09:S-EXT1a+10     7.030      .203    1.333     6.677    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------------------
R0002:C00012-------------------------------------------------------------------------------
------------------------
|  ROUTE RESERVOIR -> |    Requested routing time step =  1.0 min.
|  IN>09:S-EXT1a+10   |
```

OUT<01:POND OUT	========== OUTLFOW STORAGE TABLE ==========							
	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	
	.000	.0000E+00	.057	.4408E-01	.112	.9476E-01	.304	.
	.002	.4300E-02	.062	.4978E-01	.119	.1019E+00	.367	.
	.003	.8740E-02	.067	.5565E-01	.125	.1094E+00	.437	.
	.004	.1332E-01	.071	.6170E-01	.131	.1169E+00	.512	.
	.005	.1805E-01	.081	.6794E-01	.136	.1248E+00	.592	.
	.006	.2294E-01	.090	.7436E-01	.160	.1328E+00	.677	.
	.006	.2798E-01	.098	.8097E-01	.199	.1410E+00	.766	.
	.012	.3318E-01	.105	.8776E-01	.247	.1495E+00	.860	.
	.028	.3854E-01	.112	.9476E-01	.304	.1582E+00	.000	.

ROUTING RESULTS	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW > 09:S-EXT1a+10	7.030	.203	1.333	6.677
OUTFLOW < 01:POND OUT	7.030	.016	3.367	6.677

PEAK FLOW REDUCTION [Qout/Qin](%)= 7.927
TIME SHIFT OF PEAK FLOW (min)= 122.00
MAXIMUM STORAGE USED (ha.m.)=.3453E-01

R0002:C00013

* CATCHMENT 103

CALIB NASHYD					
02:103	DT= 1.00	Area (ha)=	.160	Curve Number (CN)=	62.00
		Ia (mm)=	4.800	# of Linear Res.(N)=	3.00
		U.H. Tp(hrs)=	.037		

Unit Hyd Qpeak (cms)= .165

PEAK FLOW (cms)= .005 (i)
TIME TO PEAK (hrs)= 1.333
DURATION (hrs)= 4.317, (dddd|hh:mm:)= 0|04:19
AVERAGE FLOW (cms)= .000
RUNOFF VOLUME (mm)= 4.260
TOTAL RAINFALL (mm)= 32.772
RUNOFF COEFFICIENT = .130

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

R0002:C00014

* EXTERNAL AREA #3

CALIB NASHYD					
03:EXT3	DT= 1.00	Area (ha)=	4.020	Curve Number (CN)=	60.00
		Ia (mm)=	6.600	# of Linear Res.(N)=	3.00
		U.H. Tp(hrs)=	.477		

Unit Hyd Qpeak (cms)= .322

PEAK FLOW (cms)= .022 (i)

TIME TO PEAK (hrs)= 1.967
DURATION (hrs)= 7.183, (dddd|hh:mm:)= 0|07:11
AVERAGE FLOW (cms)= .005
RUNOFF VOLUME (mm)= 3.503
TOTAL RAINFALL (mm)= 32.772
RUNOFF COEFFICIENT = .107

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

R0002:C00015

R0002:C00002

** END OF RUN : 1

****

START	Project dir.:Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\POST\CHI\
	Rainfall dir.:Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\POST\CHI\

TZERO = .00 hrs on 0
METOUT= 2 (output = METRIC)
NRUN = 0003
NSTORM= 1
# 1=5CHI4.stm

R0003:C00002

*#**********
*# Project Name: [221 FOX STREET SUBDIVISION] Project Number: [09-062]
*# Date : 07-18-2022
*# Modeller : [CJ]
*# Company : WMI & Associates Ltd.
*# License # : 2880720
*#**********

R0003:C00002

READ STORM	Filename: Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\POST\CHI\5CHI4.
Ptotal= 43.79 mm	Comments: 5-Year Chicago Storm Distribution (4-hour) Orillia, ON.

TIME hh:mm	RAIN mm/hr	TIME hh:mm	RAIN mm/hr	TIME hh:mm	RAIN mm/hr	TIME hh:mm	RAIN mm/hr	TIME hh:mm	RAIN mm/hr	TIME hh:mm
0:10	3.077	0:50	6.162	1:30	24.075	2:10	6.603	2:50	4.197	3:30
0:20	3.479	1:00	8.836	1:40	13.572	2:20	5.734	3:00	3.872	3:40
0:30	4.030	1:10	18.812	1:50	9.837	2:30	5.091	3:10	3.599	3:50
0:40	4.838	1:20	109.412	2:00	7.853	2:40	4.594	3:20	3.367	4:00

R0003:C00003

```
* EXTERNAL AREA EXT2
--------------------------
| CALIB STANDHYD         |   Area    (ha)=    6.14
| 01:EXT2       DT= 1.00 |   Total Imp(%)=   25.00   Dir. Conn.(%)=   14.00
--------------------------

                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      1.53         4.61
     Dep. Storage     (mm)=      2.00         5.00
     Average Slope     (%)=      3.00         8.00
     Length            (m)=    150.00        90.00
     Mannings n            =      .013         .250

     Max.eff.Inten.(mm/hr)=    109.41        12.97
               over (min)        2.00        19.00
     Storage Coeff.  (min)=      2.26 (ii)   19.41 (ii)
     Unit Hyd. Tpeak (min)=      2.00        19.00
     Unit Hyd. peak  (cms)=       .52          .06
                                                    *TOTALS*
     PEAK FLOW       (cms)=       .26          .10          .279 (iii)
     TIME TO PEAK    (hrs)=      1.33         1.63         1.333
     RUNOFF VOLUME    (mm)=     41.79         8.04        12.766
     TOTAL RAINFALL   (mm)=     43.79        43.79        43.791
     RUNOFF COEFFICIENT    =     .95          .18          .292

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  59.0    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.

--------------------------------------------------------------------------------
R0003:C00004------------------------------------------------------------------------
--------------------
| SHIFT HYD        |                              AREA     QPEAK      TPEAK      R.V.
|                  |                               (ha)      (cms)      (hrs)       (mm)
|                  |         ID= 1:EXT2            6.14      .279      1.333     12.766
| Shift=   10.0 min | SHIFTED ID= 2:S-EXT2          6.14      .279      1.483     12.766
--------------------

--------------------------------------------------------------------------------
R0003:C00005------------------------------------------------------------------------
* EXTERNAL AREA EXT1b
--------------------------
| CALIB NASHYD           |   Area    (ha)=    5.390   Curve Number    (CN)= 56.00
| 03:EXT1b      DT= 1.00 |   Ia      (mm)=    7.200   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .383

     Unit Hyd Qpeak  (cms)=     .538

     PEAK FLOW       (cms)=     .056 (i)
     TIME TO PEAK    (hrs)=    1.817
     DURATION        (hrs)=    6.617, (dddd|hh:mm:)=   0|06:37
     AVERAGE FLOW    (cms)=     .013
     RUNOFF VOLUME    (mm)=    5.669
```



```
     TOTAL RAINFALL   (mm)=   43.791
     RUNOFF COEFFICIENT    =     .129

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

--------------------------------------------------------------------------------
R0003:C00006------------------------------------------------------------------------
------------------------
| ADD HYD              |
| 04:S-EXT1b+2         |   ID:NHYD            AREA     QPEAK    TPEAK      R.V.     DWF
------------------------                       (ha)     (cms)    (hrs)       (mm)    (cms)
                      ID 1 02:S-EXT2         6.140      .279    1.483     12.766    .000
                     +ID 2 03:EXT1b          5.390      .056    1.817      5.669    .000
                     ==========================================================
                     SUM   04:S-EXT1b+2     11.530      .309    1.483      9.448    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
R0003:C00007------------------------------------------------------------------------
* CATCHMENT 102
--------------------------
| CALIB NASHYD           |   Area    (ha)=    6.580   Curve Number    (CN)= 48.00
| 05:102        DT= 1.00 |   Ia      (mm)=    9.000   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .417

     Unit Hyd Qpeak  (cms)=     .603

     PEAK FLOW       (cms)=     .042 (i)
     TIME TO PEAK    (hrs)=    1.883
     DURATION        (hrs)=    6.817, (dddd|hh:mm:)=   0|06:49
     AVERAGE FLOW    (cms)=     .010
     RUNOFF VOLUME    (mm)=    3.905
     TOTAL RAINFALL   (mm)=   43.791
     RUNOFF COEFFICIENT    =     .089

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

--------------------------------------------------------------------------------
R0003:C00008------------------------------------------------------------------------
------------------------
| ADD HYD              |
| 06:S-EXT1b+2+        |   ID:NHYD            AREA     QPEAK    TPEAK      R.V.     DWF
------------------------                       (ha)     (cms)    (hrs)       (mm)    (cms)
                      ID 1 04:S-EXT1b+2     11.530      .309    1.483      9.448    .000
                     +ID 2 05:102            6.580      .042    1.883      3.905    .000
                     ==========================================================
                     SUM   06:S-EXT1b+2+    18.110      .328    1.483      7.434    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
R0003:C00009------------------------------------------------------------------------
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```
* EXTERNAL AREA EXT1a
--------------------------
| CALIB NASHYD           |   Area     (ha)=    2.380   Curve Number    (CN)= 57.00
| 07:EXT1a      DT= 1.00 |   Ia       (mm)=    7.200   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .231

     Unit Hyd Qpeak  (cms)=     .394

     PEAK FLOW       (cms)=     .035 (i)
     TIME TO PEAK    (hrs)=    1.583
     DURATION        (hrs)=    5.617, (dddd|hh:mm:)=   0|05:37
     AVERAGE FLOW    (cms)=     .007
     RUNOFF VOLUME    (mm)=    5.867
     TOTAL RAINFALL   (mm)=   43.791
     RUNOFF COEFFICIENT   =     .134

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

-------------------------------------------------------------------------------
R0003:C00010-----------------------------------------------------------------------
* CATCHMENT 101
--------------------------
| CALIB STANDHYD         |   Area     (ha)=    4.65
| 08:101        DT= 1.00 |   Total Imp(%)=   31.60   Dir. Conn.(%)=   19.20
--------------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.47         3.18
     Dep. Storage     (mm)=       2.00         6.60
     Average Slope     (%)=       2.00         5.00
     Length            (m)=     180.00        25.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     109.41        12.46
               over (min)          3.00        12.00
     Storage Coeff.  (min)=       2.85 (ii)   12.15 (ii)
     Unit Hyd. Tpeak (min)=       3.00        12.00
     Unit Hyd. peak  (cms)=        .39          .09
                                                    *TOTALS*
     PEAK FLOW       (cms)=        .26          .07          .286 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.50         1.333
     RUNOFF VOLUME    (mm)=      41.79         6.17        13.006
     TOTAL RAINFALL   (mm)=      43.79        43.79        43.791
     RUNOFF COEFFICIENT   =        .95          .14          .297

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  52.0    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.

-------------------------------------------------------------------------------
R0003:C00011-----------------------------------------------------------------------
------------------------
| ADD HYD              |
```



```
| 09:S-EXT1a+10        |   ID:NHYD            AREA      QPEAK     TPEAK      R.V.      DWF
------------------------                      (ha)      (cms)     (hrs)      (mm)    (cms)
                       ID 1 07:EXT1a         2.380      .035     1.583     5.867    .000
                      +ID 2 08:101           4.650      .286     1.333    13.006    .000
                      ==========================================================================
                      SUM   09:S-EXT1a+10     7.030      .296     1.333    10.589    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
R0003:C00012-----------------------------------------------------------------------
------------------------
|  ROUTE RESERVOIR -> |    Requested routing time step =  1.0 min.
|  IN>09:S-EXT1a+10   |
| OUT<01:POND OUT     | ========================  OUTLFOW STORAGE TABLE  ================
---------------------- OUTFLOW   STORAGE| OUTFLOW   STORAGE| OUTFLOW   STORAGE| OUTFLOW
                         (cms)    (ha.m.)|   (cms)    (ha.m.)|   (cms)    (ha.m.)|   (cms)
                          .000 .0000E+00|    .057 .4408E-01|    .112 .9476E-01|    .304 .
                          .002 .4300E-02|    .062 .4978E-01|    .119 .1019E+00|    .367 .
                          .003 .8740E-02|    .067 .5565E-01|    .125 .1094E+00|    .437 .
                          .004 .1332E-01|    .071 .6170E-01|    .131 .1169E+00|    .512 .
                          .005 .1805E-01|    .081 .6794E-01|    .136 .1248E+00|    .592 .
                          .006 .2294E-01|    .090 .7436E-01|    .160 .1328E+00|    .677 .
                          .006 .2798E-01|    .098 .8097E-01|    .199 .1410E+00|    .766 .
                          .012 .3318E-01|    .105 .8776E-01|    .247 .1495E+00|    .860 .
                          .028 .3854E-01|    .112 .9476E-01|    .304 .1582E+00|    .000 .

     ROUTING RESULTS             AREA     QPEAK     TPEAK       R.V.
     ----------------------       (ha)     (cms)     (hrs)       (mm)
      INFLOW > 09:S-EXT1a+10     7.030      .296     1.333     10.589
     OUTFLOW < 01:POND OUT       7.030      .052     2.217     10.589

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=   17.713
                  TIME SHIFT OF PEAK FLOW          (min)=    53.00
                  MAXIMUM  STORAGE   USED        (ha.m.)=.4316E-01

-------------------------------------------------------------------------------
R0003:C00013-----------------------------------------------------------------------
* CATCHMENT 103
--------------------------
| CALIB NASHYD           |   Area     (ha)=     .160   Curve Number    (CN)= 62.00
| 02:103        DT= 1.00 |   Ia       (mm)=    4.800   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .037

     Unit Hyd Qpeak  (cms)=     .165

     PEAK FLOW       (cms)=     .009 (i)
     TIME TO PEAK    (hrs)=    1.333
     DURATION        (hrs)=    4.317, (dddd|hh:mm:)=   0|04:19
     AVERAGE FLOW    (cms)=     .001
     RUNOFF VOLUME    (mm)=    7.810
     TOTAL RAINFALL   (mm)=   43.791
     RUNOFF COEFFICIENT   =     .178
```

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

R0003:C00014
* EXTERNAL AREA #3

CALIB NASHYD		Area (ha)= 4.020	Curve Number (CN)= 60.00
03:EXT3 DT= 1.00		Ia (mm)= 6.600	# of Linear Res.(N)= 3.00
		U.H. Tp(hrs)= .477	

Unit Hyd Qpeak (cms)= .322

PEAK FLOW (cms)= .043 (i)
TIME TO PEAK (hrs)= 1.950
DURATION (hrs)= 7.183, (dddd|hh:mm:)= 0|07:11
AVERAGE FLOW (cms)= .010
RUNOFF VOLUME (mm)= 6.697
TOTAL RAINFALL (mm)= 43.791
RUNOFF COEFFICIENT = .153

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

R0003:C00015
R0003:C00002
R0003:C00002
** END OF RUN : 2

****

START	Project dir.:Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\POST\CHI\
	Rainfall dir.:Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\POST\CHI\

TZERO = .00 hrs on 0
METOUT= 2 (output = METRIC)
NRUN = 0004
NSTORM= 1
# 1=25CHI4.stm

R0004:C00002
*#**********
*# Project Name: [221 FOX STREET SUBDIVISION] Project Number: [09-062]
*# Date : 07-18-2022
*# Modeller : [CJ]
*# Company : WMI & Associates Ltd.
*# License # : 2880720

*#**********
R0004:C00002

READ STORM	Filename: Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\POST\CHI\25CHI4.
Ptotal= 60.08 mm	Comments: 25-Year Chicago Storm Distribution (4-hour) Orillia, ON.

TIME hh:mm	RAIN| mm/hr|	TIME hh:mm	RAIN| mm/hr|	TIME hh:mm	RAIN| mm/hr|	TIME hh:mm	RAIN| mm/hr|	TIME hh:mm	RAIN| mm/hr|	TIME hh:mm
0:10	4.238|	0:50	8.477|	1:30	33.039|	2:10	9.082|	2:50	5.778|	3:30
0:20	4.791|	1:00	12.149|	1:40	18.646|	2:20	7.889|	3:00	5.330|	3:40
0:30	5.548|	1:10	25.827|	1:50	13.522|	2:30	7.007|	3:10	4.956|	3:50
0:40	6.658|	1:20	149.649|	2:00	10.799|	2:40	6.324|	3:20	4.637|	4:00

R0004:C00003
* EXTERNAL AREA EXT2

CALIB STANDHYD		Area (ha)= 6.14	
01:EXT2 DT= 1.00		Total Imp(%)= 25.00	Dir. Conn.(%)= 14.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.53	4.61
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	3.00	8.00
Length	(m)=	150.00	90.00
Mannings n	=	.013	.250
Max.eff.Inten.	(mm/hr)=	149.65	27.78
over	(min)	2.00	15.00
Storage Coeff.	(min)=	1.99 (ii)	14.64 (ii)
Unit Hyd. Tpeak	(min)=	2.00	15.00
Unit Hyd. peak	(cms)=	.56	.08

				TOTALS
PEAK FLOW	(cms)=	.35	.22	.427 (iii)
TIME TO PEAK	(hrs)=	1.33	1.55	1.333
RUNOFF VOLUME	(mm)=	58.08	14.81	20.865
TOTAL RAINFALL	(mm)=	60.08	60.08	60.078
RUNOFF COEFFICIENT	=	.97	.25	.347

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 59.0 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.

R0004:C00004

SHIFT HYD			AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
		ID= 1:EXT2	6.14	.427	1.333	20.865
Shift= 10.0 min	SHIFTED	ID= 2:S-EXT2	6.14	.427	1.483	20.865

R0004:C00005
* EXTERNAL AREA EXT1b

CALIB NASHYD		Area (ha)= 5.390	Curve Number (CN)= 56.00
03:EXT1b	DT= 1.00	Ia (mm)= 7.200	# of Linear Res.(N)= 3.00
		U.H. Tp(hrs)= .383	

Unit Hyd Qpeak (cms)= .538

PEAK FLOW (cms)= .114 (i)
TIME TO PEAK (hrs)= 1.783
DURATION (hrs)= 6.617, (dddd|hh:mm:)= 0|06:37
AVERAGE FLOW (cms)= .025
RUNOFF VOLUME (mm)= 11.076
TOTAL RAINFALL (mm)= 60.078
RUNOFF COEFFICIENT = .184

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

R0004:C00006
ADD HYD							
04:S-EXT1b+2		ID:NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
	ID 1	02:S-EXT2	6.140	.427	1.483	20.865	.000
	+ID 2	03:EXT1b	5.390	.114	1.783	11.076	.000
	SUM	04:S-EXT1b+2	11.530	.493	1.483	16.289	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

R0004:C00007
* CATCHMENT 102

CALIB NASHYD		Area (ha)= 6.580	Curve Number (CN)= 48.00
05:102	DT= 1.00	Ia (mm)= 9.000	# of Linear Res.(N)= 3.00
		U.H. Tp(hrs)= .417	

Unit Hyd Qpeak (cms)= .603

PEAK FLOW (cms)= .091 (i)
TIME TO PEAK (hrs)= 1.867
DURATION (hrs)= 6.817, (dddd|hh:mm:)= 0|06:49
AVERAGE FLOW (cms)= .021
RUNOFF VOLUME (mm)= 7.997
TOTAL RAINFALL (mm)= 60.078
RUNOFF COEFFICIENT = .133

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

R0004:C00008
ADD HYD							
06:S-EXT1b+2+		ID:NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
	ID 1	04:S-EXT1b+2	11.530	.493	1.483	16.289	.000
	+ID 2	05:102	6.580	.091	1.867	7.997	.000
	SUM	06:S-EXT1b+2+	18.110	.538	1.483	13.276	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

R0004:C00009
* EXTERNAL AREA EXT1a

CALIB NASHYD		Area (ha)= 2.380	Curve Number (CN)= 57.00
07:EXT1a	DT= 1.00	Ia (mm)= 7.200	# of Linear Res.(N)= 3.00
		U.H. Tp(hrs)= .231	

Unit Hyd Qpeak (cms)= .394

PEAK FLOW (cms)= .072 (i)
TIME TO PEAK (hrs)= 1.583
DURATION (hrs)= 5.617, (dddd|hh:mm:)= 0|05:37
AVERAGE FLOW (cms)= .013
RUNOFF VOLUME (mm)= 11.436
TOTAL RAINFALL (mm)= 60.078
RUNOFF COEFFICIENT = .190

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

R0004:C00010
* CATCHMENT 101

CALIB STANDHYD		Area (ha)= 4.65	
08:101	DT= 1.00	Total Imp(%)= 31.60	Dir. Conn.(%)= 19.20

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.47	3.18
Dep. Storage	(mm)=	2.00	6.60
Average Slope	(%)=	2.00	5.00
Length	(m)=	180.00	25.00
Mannings n	=	.013	.250
Max.eff.Inten.	(mm/hr)=	149.65	29.71
over	(min)	3.00	9.00
Storage Coeff.	(min)=	2.51 (ii)	9.08 (ii)
Unit Hyd. Tpeak	(min)=	3.00	9.00
Unit Hyd. peak	(cms)=	.42	.13

				TOTALS
PEAK FLOW	(cms)=	.36	.16	.454 (iii)
TIME TO PEAK	(hrs)=	1.33	1.45	1.333
RUNOFF VOLUME	(mm)=	58.08	11.74	20.635
TOTAL RAINFALL	(mm)=	60.08	60.08	60.078
RUNOFF COEFFICIENT	=	.97	.20	.343

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 52.0 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.

R0004:C00011----------

ADD HYD		ID:NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
09:S-EXT1a+10	ID 1	07:EXT1a	2.380	.072	1.583	11.436	.000
	+ID 2	08:101	4.650	.454	1.333	20.635	.000
	SUM	09:S-EXT1a+10	7.030	.480	1.350	17.521	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

R0004:C00012----------

ROUTE RESERVOIR ->	Requested routing time step = 1.0 min.
IN>09:S-EXT1a+10	
OUT<01:POND OUT	OUTFLOW STORAGE TABLE

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)
.000	.0000E+00	.057	.4408E-01	.112	.9476E-01	.304 .
.002	.4300E-02	.062	.4978E-01	.119	.1019E+00	.367 .
.003	.8740E-02	.067	.5565E-01	.125	.1094E+00	.437 .
.004	.1332E-01	.071	.6170E-01	.131	.1169E+00	.512 .
.005	.1805E-01	.081	.6794E-01	.136	.1248E+00	.592 .
.006	.2294E-01	.090	.7436E-01	.160	.1328E+00	.677 .
.006	.2798E-01	.098	.8097E-01	.199	.1410E+00	.766 .
.012	.3318E-01	.105	.8776E-01	.247	.1495E+00	.860 .
.028	.3854E-01	.112	.9476E-01	.304	.1582E+00	.000 .

ROUTING RESULTS	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW > 09:S-EXT1a+10	7.030	.480	1.350	17.521
OUTFLOW < 01:POND OUT	7.030	.080	2.250	17.520

PEAK FLOW REDUCTION [Qout/Qin](%)= 16.755
TIME SHIFT OF PEAK FLOW (min)= 54.00
MAXIMUM STORAGE USED (ha.m.)=.6749E-01

R0004:C00013----------
* CATCHMENT 103

CALIB NASHYD		Area (ha)= .160	Curve Number (CN)= 62.00
02:103 DT= 1.00		Ia (mm)= 4.800	# of Linear Res.(N)= 3.00
		U.H. Tp(hrs)= .037	

Unit Hyd Qpeak (cms)= .165

PEAK FLOW (cms)= .017 (i)
TIME TO PEAK (hrs)= 1.333
DURATION (hrs)= 4.317, (dddd|hh:mm:)= 0|04:19
AVERAGE FLOW (cms)= .001
RUNOFF VOLUME (mm)= 14.485
TOTAL RAINFALL (mm)= 60.078
RUNOFF COEFFICIENT = .241

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

R0004:C00014----------
* EXTERNAL AREA #3

CALIB NASHYD		Area (ha)= 4.020	Curve Number (CN)= 60.00
03:EXT3 DT= 1.00		Ia (mm)= 6.600	# of Linear Res.(N)= 3.00
		U.H. Tp(hrs)= .477	

Unit Hyd Qpeak (cms)= .322

PEAK FLOW (cms)= .086 (i)
TIME TO PEAK (hrs)= 1.917
DURATION (hrs)= 7.183, (dddd|hh:mm:)= 0|07:11
AVERAGE FLOW (cms)= .020
RUNOFF VOLUME (mm)= 12.835
TOTAL RAINFALL (mm)= 60.078
RUNOFF COEFFICIENT = .214

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

R0004:C00015----------

R0004:C00002----------

R0004:C00002----------

R0004:C00002----------
** END OF RUN : 3

****

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--------------------
| START            | Project  dir.:Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\POST\CHI\
-------------------- Rainfall dir.:Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\POST\CHI\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 0005
    NSTORM=   1
           #  1=100CHI4.stm
```

R0005:C00002

```
*#**************************************************************************
*#  Project Name: [221 FOX STREET SUBDIVISION]    Project Number: [09-062]
*#  Date        : 07-18-2022
*#  Modeller    : [CJ]
*#  Company     : WMI & Associates Ltd.
*#  License #   :  2880720
*#**************************************************************************
```

R0005:C00002

```
--------------------
| READ STORM       |  Filename: Z:\Projects\2009\09-062\SWMHYMO\3rd_Subm\POST\CHI\100CHI4.
| Ptotal=  73.84 mm|  Comments: 100-Year Chicago Storm Distribution (4-hour) Orillia, ON.
--------------------
```

TIME hh:mm	RAIN mm/hr	TIME hh:mm	RAIN mm/hr	TIME hh:mm	RAIN mm/hr	TIME hh:mm	RAIN mm/hr	TIME hh:mm	RAIN mm/hr	TIME hh:mm
0:10	5.248	0:50	10.476	1:30	40.631	2:10	11.222	2:50	7.149	3:30
0:20	5.931	1:00	14.996	1:40	22.982	2:20	9.752	3:00	6.596	3:40
0:30	6.865	1:10	31.788	1:50	16.686	2:30	8.664	3:10	6.134	3:50
0:40	8.234	1:20	182.809	2:00	13.336	2:40	7.822	3:20	5.741	4:00

R0005:C00003

```
* EXTERNAL AREA EXT2
--------------------------
| CALIB STANDHYD         |   Area     (ha)=    6.14
| 01:EXT2       DT= 1.00 |   Total Imp(%)=   25.00   Dir. Conn.(%)=   14.00
--------------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      1.53          4.61
     Dep. Storage     (mm)=      2.00          5.00
     Average Slope     (%)=      3.00          8.00
     Length            (m)=    150.00         90.00
     Mannings n           =      .013          .250

     Max.eff.Inten.(mm/hr)=    182.81         47.07
               over (min)        2.00         12.00
     Storage Coeff.  (min)=      1.84 (ii)     12.08 (ii)
     Unit Hyd. Tpeak (min)=      2.00         12.00
     Unit Hyd. peak  (cms)=       .59           .09
                                                    *TOTALS*
     PEAK FLOW       (cms)=       .43           .37          .599 (iii)
```



```
     TIME TO PEAK     (hrs)=      1.33          1.50          1.333
     RUNOFF VOLUME     (mm)=     71.84         21.61         28.639
     TOTAL RAINFALL    (mm)=     73.84         73.84         73.838
     RUNOFF COEFFICIENT   =       .97           .29           .388

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  59.0    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.
```

R0005:C00004

```
--------------------
| SHIFT HYD        |                                  AREA     QPEAK      TPEAK      R.V.
|                  |                                   (ha)     (cms)      (hrs)       (mm)
|                  |          ID= 1:EXT2               6.14      .599      1.333     28.639
| Shift=   10.0 min | SHIFTED ID= 2:S-EXT2              6.14      .599      1.483     28.639
--------------------
```

R0005:C00005

```
* EXTERNAL AREA EXT1b
--------------------------
| CALIB NASHYD           |   Area     (ha)=    5.390   Curve Number    (CN)= 56.00
| 03:EXT1b      DT= 1.00 |   Ia       (mm)=    7.200   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .383

     Unit Hyd Qpeak  (cms)=     .538

     PEAK FLOW       (cms)=     .175 (i)
     TIME TO PEAK    (hrs)=    1.783
     DURATION        (hrs)=    6.617, (dddd|hh:mm:)=   0|06:37
     AVERAGE FLOW    (cms)=     .038
     RUNOFF VOLUME    (mm)=   16.681
     TOTAL RAINFALL   (mm)=   73.838
     RUNOFF COEFFICIENT   =     .226

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

R0005:C00006

```
------------------------
| ADD HYD              |
| 04:S-EXT1b+2         |   ID:NHYD            AREA      QPEAK    TPEAK      R.V.      DWF
------------------------                      (ha)      (cms)    (hrs)       (mm)    (cms)
                      ID 1 02:S-EXT2         6.140      .599    1.483     28.639    .000
                     +ID 2 03:EXT1b          5.390      .175    1.783     16.681    .000
                     ==========================================================================
                     SUM   04:S-EXT1b+2     11.530      .704    1.483     23.049    .000

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

```
R0005:C00007-------------------------------------------------------------------------------
* CATCHMENT 102
--------------------------
| CALIB NASHYD           |   Area     (ha)=    6.580   Curve Number    (CN)= 48.00
| 05:102        DT= 1.00 |   Ia       (mm)=    9.000   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .417

     Unit Hyd Qpeak  (cms)=     .603

     PEAK FLOW       (cms)=     .145 (i)
     TIME TO PEAK    (hrs)=    1.850
     DURATION        (hrs)=    6.817, (dddd|hh:mm:)=   0|06:49
     AVERAGE FLOW    (cms)=     .033
     RUNOFF VOLUME    (mm)=   12.364
     TOTAL RAINFALL   (mm)=   73.838
     RUNOFF COEFFICIENT   =     .167

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

-------------------------------------------------------------------------------------------
R0005:C00008-------------------------------------------------------------------------------
------------------------
| ADD HYD              |
| 06:S-EXT1b+2+        |   ID:NHYD            AREA     QPEAK    TPEAK      R.V.     DWF
------------------------                      (ha)     (cms)    (hrs)      (mm)    (cms)
                      ID 1 04:S-EXT1b+2     11.530      .704    1.483    23.049    .000
                     +ID 2 05:102            6.580      .145    1.850    12.364    .000
                     ================================================================
                     SUM   06:S-EXT1b+2+    18.110      .779    1.483    19.167    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------------------
R0005:C00009-------------------------------------------------------------------------------
* EXTERNAL AREA EXT1a
--------------------------
| CALIB NASHYD           |   Area     (ha)=    2.380   Curve Number    (CN)= 57.00
| 07:EXT1a      DT= 1.00 |   Ia       (mm)=    7.200   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .231

     Unit Hyd Qpeak  (cms)=     .394

     PEAK FLOW       (cms)=     .111 (i)
     TIME TO PEAK    (hrs)=    1.567
     DURATION        (hrs)=    5.617, (dddd|hh:mm:)=   0|05:37
     AVERAGE FLOW    (cms)=     .020
     RUNOFF VOLUME    (mm)=   17.195
     TOTAL RAINFALL   (mm)=   73.838
     RUNOFF COEFFICIENT   =     .233

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

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



```
R0005:C00010-------------------------------------------------------------------------------
* CATCHMENT 101
--------------------------
| CALIB STANDHYD         |   Area     (ha)=    4.65
| 08:101        DT= 1.00 |   Total Imp(%)=   31.60   Dir. Conn.(%)=   19.20
--------------------------

                                IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=       1.47          3.18
     Dep. Storage      (mm)=       2.00          6.60
     Average Slope      (%)=       2.00          5.00
     Length             (m)=     180.00         25.00
     Mannings n            =       .013          .250

     Max.eff.Inten.(mm/hr)=     182.81         47.56
               over (min)          2.00          8.00
     Storage Coeff.  (min)=       2.32 (ii)     7.76 (ii)
     Unit Hyd. Tpeak (min)=       2.00          8.00
     Unit Hyd. peak  (cms)=        .51           .14
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .45           .26          .625 (iii)
     TIME TO PEAK    (hrs)=       1.33          1.42         1.333
     RUNOFF VOLUME    (mm)=      71.84         17.46        27.904
     TOTAL RAINFALL   (mm)=      73.84         73.84        73.838
     RUNOFF COEFFICIENT   =        .97           .24          .378

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  52.0    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.

-------------------------------------------------------------------------------------------
R0005:C00011-------------------------------------------------------------------------------
------------------------
| ADD HYD              |
| 09:S-EXT1a+10        |   ID:NHYD            AREA     QPEAK    TPEAK      R.V.     DWF
------------------------                      (ha)     (cms)    (hrs)      (mm)    (cms)
                      ID 1 07:EXT1a          2.380      .111    1.567    17.195    .000
                     +ID 2 08:101            4.650      .625    1.333    27.904    .000
                     ================================================================
                     SUM   09:S-EXT1a+10     7.030      .664    1.333    24.278    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------------------
R0005:C00012-------------------------------------------------------------------------------
------------------------
|  ROUTE RESERVOIR -> |    Requested routing time step =  1.0 min.
|  IN>09:S-EXT1a+10   |
| OUT<01:POND OUT     | ========================  OUTLFOW STORAGE TABLE  ================
---------------------- OUTFLOW   STORAGE| OUTFLOW   STORAGE| OUTFLOW   STORAGE| OUTFLOW
                        (cms)   (ha.m.)|   (cms)   (ha.m.)|   (cms)   (ha.m.)|   (cms)
                         .000 .0000E+00|    .057 .4408E-01|    .112 .9476E-01|    .304 .
                         .002 .4300E-02|    .062 .4978E-01|    .119 .1019E+00|    .367 .
```

```
                      .003 .8740E-02|    .067 .5565E-01|    .125 .1094E+00|    .437 .
                      .004 .1332E-01|    .071 .6170E-01|    .131 .1169E+00|    .512 .
                      .005 .1805E-01|    .081 .6794E-01|    .136 .1248E+00|    .592 .
                      .006 .2294E-01|    .090 .7436E-01|    .160 .1328E+00|    .677 .
                      .006 .2798E-01|    .098 .8097E-01|    .199 .1410E+00|    .766 .
                      .012 .3318E-01|    .105 .8776E-01|    .247 .1495E+00|    .860 .
                      .028 .3854E-01|    .112 .9476E-01|    .304 .1582E+00|    .000 .

     ROUTING RESULTS             AREA     QPEAK     TPEAK       R.V.
     ----------------------      (ha)     (cms)     (hrs)       (mm)
     INFLOW > 09:S-EXT1a+10     7.030      .664     1.333     24.278
    OUTFLOW < 01:POND OUT       7.030      .110     2.250     24.278

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=   16.580
                  TIME SHIFT OF PEAK FLOW         (min)=    55.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=.9276E-01

----------------------------------------------------------------------------------------
R0005:C00013-----------------------------------------------------------------------------
* CATCHMENT 103
--------------------------
| CALIB NASHYD           |   Area    (ha)=     .160   Curve Number    (CN)= 62.00
| 02:103        DT= 1.00 |   Ia      (mm)=    4.800   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .037

     Unit Hyd Qpeak  (cms)=     .165

     PEAK FLOW       (cms)=     .025 (i)
     TIME TO PEAK    (hrs)=    1.333
     DURATION        (hrs)=    4.317, (dddd|hh:mm:)=   0|04:19
     AVERAGE FLOW    (cms)=     .002
     RUNOFF VOLUME    (mm)=   21.210
     TOTAL RAINFALL   (mm)=   73.838
     RUNOFF COEFFICIENT   =     .287

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

----------------------------------------------------------------------------------------
R0005:C00014-----------------------------------------------------------------------------
* EXTERNAL AREA #3
--------------------------
| CALIB NASHYD           |   Area    (ha)=    4.020   Curve Number    (CN)= 60.00
| 03:EXT3       DT= 1.00 |   Ia      (mm)=    6.600   # of Linear Res.(N)=  3.00
--------------------------   U.H. Tp(hrs)=     .477

     Unit Hyd Qpeak  (cms)=     .322

     PEAK FLOW       (cms)=     .130 (i)
     TIME TO PEAK    (hrs)=    1.900
     DURATION        (hrs)=    7.183, (dddd|hh:mm:)=   0|07:11
     AVERAGE FLOW    (cms)=     .030
     RUNOFF VOLUME    (mm)=   19.110
     TOTAL RAINFALL   (mm)=   73.838
```



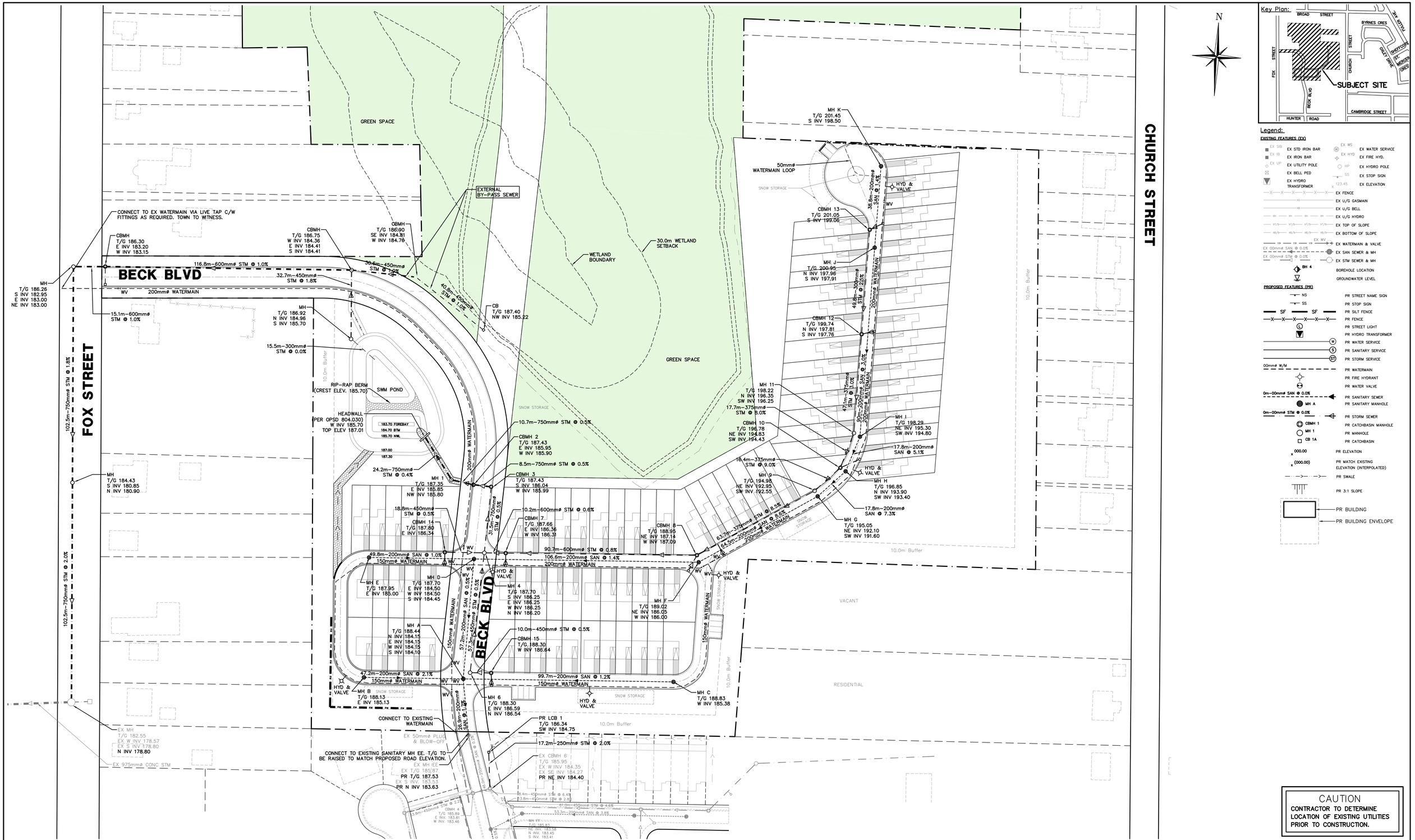
```
     RUNOFF COEFFICIENT   =     .259

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

----------------------------------------------------------------------------------------
R0005:C00015-----------------------------------------------------------------------------
----------------------------------------------------------------------------------------
R0005:C00002-----------------------------------------------------------------------------
----------------------------------------------------------------------------------------
R0005:C00002-----------------------------------------------------------------------------
----------------------------------------------------------------------------------------
R0005:C00002-----------------------------------------------------------------------------
----------------------------------------------------------------------------------------
R0005:C00002-----------------------------------------------------------------------------
--------------------
| FINISH           |
--------------------
----------------------------------------------------------------------------------------
****************************************************************************************
     WARNINGS / ERRORS / NOTES
     -------------------------
   Simulation ended on 2022-07-15     at 09:49:45
========================================================================================
```

General Servicing and Site Grading Plans

Appendix D



Legend:

EXISTING FEATURES (EX)

- EX STD IRON BAR
- EX IRON BAR
- EX UTILITY POLE
- EX BELL PED
- EX HYDRO TRANSFORMER
- EX WATER SERVICE
- EX FIRE HYD.
- EX HYDRO POLE
- EX STOP SIGN
- EX ELEVATION
- EX FENCE
- EX U/G GASMAIN
- EX U/G BELL
- EX U/G HYDRO
- EX TOP OF SLOPE
- EX BOTTOM OF SLOPE
- EX WATERMAIN & VALVE
- EX SAN SEWER & MH
- EX STM SEWER & MH
- BH 4 BOREHOLE LOCATION
- GROUNDWATER LEVEL

PROPOSED FEATURES (PR)

- PR STREET NAME SIGN
- PR STOP SIGN
- PR SILT FENCE
- PR FENCE
- PR STREET LIGHT
- PR HYDRO TRANSFORMER
- PR WATER SERVICE
- PR SANITARY SERVICE
- PR STORM SERVICE
- 00mmø W/M PR WATERMAIN
- PR FIRE HYDRANT
- PR WATER VALVE
- 0m–00mmø SAN @ 0.0% PR SANITARY SEWER
- MH A PR SANITARY MANHOLE
- 0m–00mmø STM @ 0.0% PR STORM SEWER
- CBMH 1 PR CATCHBASIN MANHOLE
- MH 1 PR MANHOLE
- CB 1A PR CATCHBASIN
- 000.00 PR ELEVATION
- (000.00) PR MATCH EXISTING ELEVATION (INTERPOLATED)
- PR SWALE
- PR 3:1 SLOPE
- PR BUILDING
- PR BUILDING ENVELOPE

CAUTION
CONTRACTOR TO DETERMINE LOCATION OF EXISTING UTILITIES PRIOR TO CONSTRUCTION.

Notes:

1. Unless noted otherwise, the measurements and distances shown on this drawing are shown in meters.
2. Do not scale drawings.
3. It is the contractor's responsibility to verify all dimensions, levels and datums on site and report any discrepancies or omissions to WMI & Associates Ltd. prior to construction.
4. This drawing is to be read and understood in conjunction with all other relevant documents applicable to this project.
5. This drawing is the exclusive property of WMI & Associates Ltd. and the reproduction of any part of this document without prior written consent is strictly prohibited.

Benchmark: 180.16m

MONUMENT IS LOCATED IN THE TOWN OF PENETANGUISHENE ON THE SOUTH SIDE OF BROAD STREET, BEING ON THE CENTRELINE PRODUCTION OF THE ASPHALT DRIVEWAY TO #19 BROAD STREET, AND WEST OF THE CENTRELINE OF JURY DRIVE. MONUMENT IS 4.8 METRES SOUTH OF THE CENTRELINE BROAD STREET AND 23.3 METRES WEST OF THE CENTRELINE OF JURY DRIVE.

REGISTERED PROFESSIONAL ENGINEER D.A. IVES July 19, 2022 PROVINCE OF ONTARIO

No.	Issue / Revision	Date
1	FSR SUBMISSION	JULY 19, 2022

QUEEN'S COURT HOMES

GENERAL SERVICING PLAN

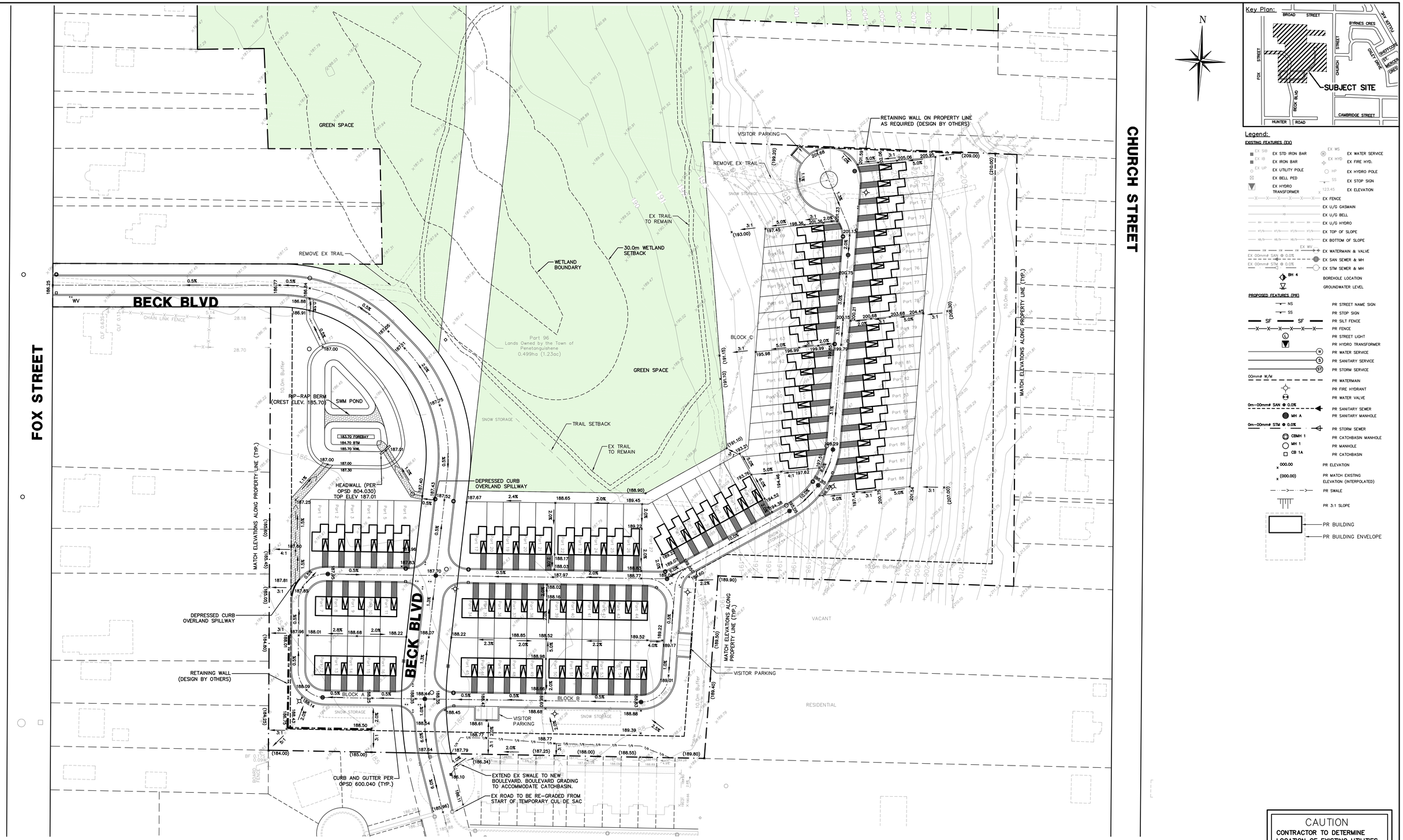
Client:
Queen's Court Development Limited
55 Temperance St. Suite 700
Toronto, Ontario
M5H 3V5

WMI & Associates Limited
119 Collier Street
Barrie, Ontario
L4M 1H5
Ph 705-797-2027
www.wmiengineering.ca

Drawn By	Checked By	Drawing No.
JB	DAI	GEN

Scale 1:750 Project No. 09-062

Z:\Projects\2009\09-062\CAD\WMI\3rd_Subm\220719_09-062_Base.dwg



Legend:

EXISTING FEATURES (EX)

- EX STD IRON BAR
- EX IRON BAR
- EX UTILITY POLE
- EX BELL PED
- EX HYDRO TRANSFORMER
- EX WS — EX WATER SERVICE
- EX HYD — EX FIRE HYD.
- HP — EX HYDRO POLE
- SS — EX STOP SIGN
- 123.45 — EX ELEVATION
- EX FENCE
- EX U/G GASMAIN
- EX U/G BELL
- EX U/G HYDRO
- EX TOP OF SLOPE
- EX BOTTOM OF SLOPE
- EX WATERMAIN & VALVE
- EX 00mm# SAN @ 0.0% — EX SAN SEWER & MH
- EX 00mm# STM @ 0.0% — EX STM SEWER & MH
- BH 4 — BOREHOLE LOCATION
- GROUNDWATER LEVEL

PROPOSED FEATURES (PR)

- NS — PR STREET NAME SIGN
- SS — PR STOP SIGN
- SF SF — PR SILT FENCE
- PR FENCE
- L — PR STREET LIGHT
- PR HYDRO TRANSFORMER
- W — PR WATER SERVICE
- S — PR SANITARY SERVICE
- ST — PR STORM SERVICE
- 00mm# W/M — PR WATERMAIN
- PR FIRE HYDRANT
- PR WATER VALVE
- 0m-00mm# SAN @ 0.0% — PR SANITARY SEWER
- MH A — PR SANITARY MANHOLE
- 0m-00mm# STM @ 0.0% — PR STORM SEWER
- CBMH 1 — PR CATCHBASIN MANHOLE
- MH 1 — PR MANHOLE
- CB 1A — PR CATCHBASIN
- 000.00 — PR ELEVATION
- (000.00) — PR MATCH EXISTING ELEVATION (INTERPOLATED)
- PR SWALE
- PR 3:1 SLOPE
- PR BUILDING
- PR BUILDING ENVELOPE

CAUTION
CONTRACTOR TO DETERMINE LOCATION OF EXISTING UTILITIES PRIOR TO CONSTRUCTION.

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Benchmark: 180.16m

MONUMENT IS LOCATED IN THE TOWN OF PENETANGUISHENE ON THE SOUTH SIDE OF BROAD STREET, BEING ON THE CENTRELINE PRODUCTION OF THE ASPHALT DRIVEWAY TO #19 BROAD STREET, AND WEST OF THE CENTRELINE OF JURY DRIVE. MONUMENT IS 4.8 METRES SOUTH OF THE CENTRELINE BROAD STREET AND 23.3 METRES WEST OF THE CENTRELINE OF JURY DRIVE.

REGISTERED PROFESSIONAL ENGINEER — D.A. IVES — July 19, 2022 — PROVINCE OF ONTARIO

No.	Issue / Revision	Date
1	FSR SUBMISSION	JULY 19, 2022

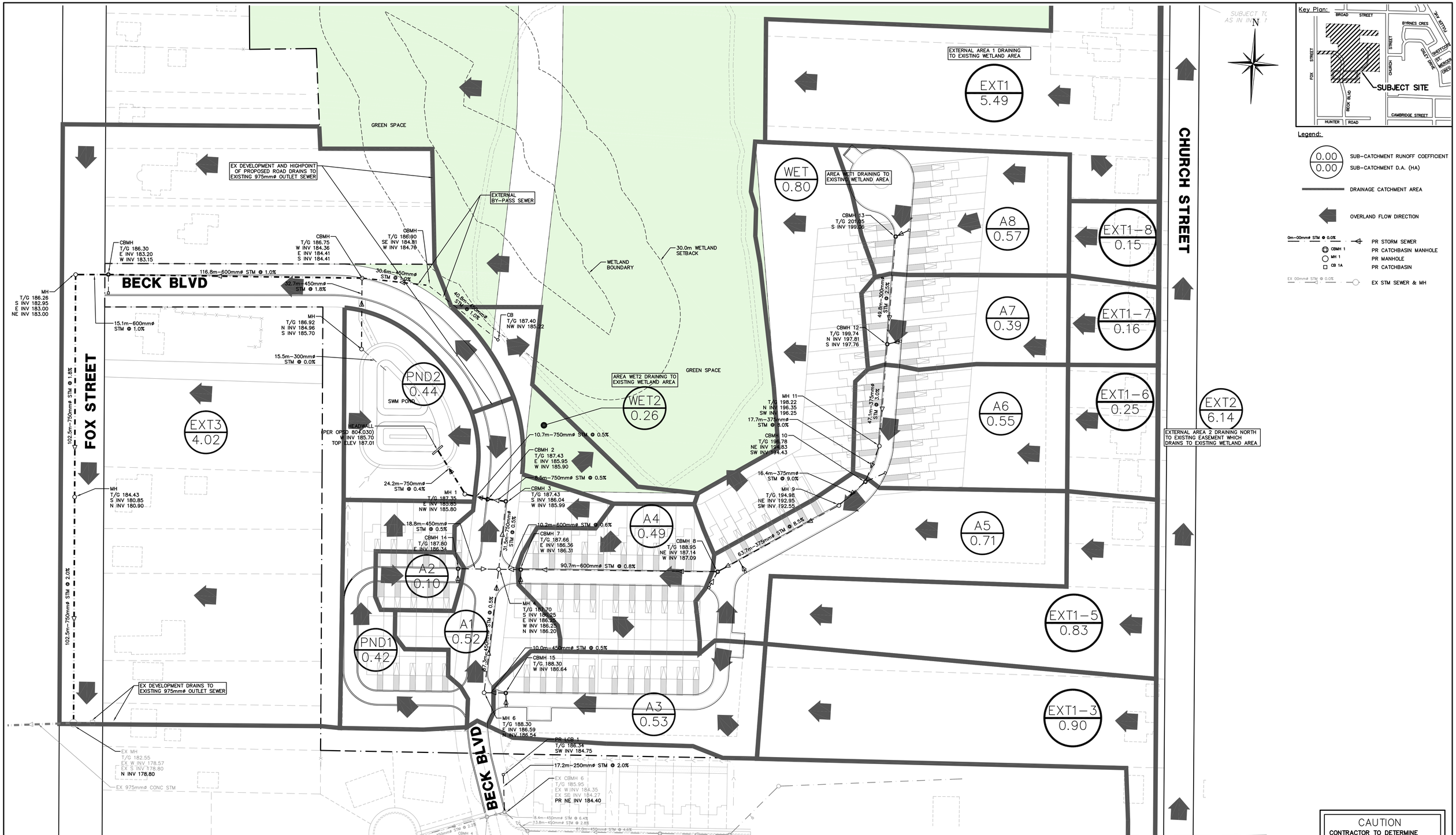
QUEEN'S COURT HOMES

SITE GRADING PLAN

Client:
Queen's Court Development Limited
55 Temperance St. Suite 700
Toronto, Ontario
M5H 3V5

WMI & Associates Limited
119 Collier Street
Barrie, Ontario
L4M 1H5
Ph 705-797-2027
www.wmiengineering.ca

Drawn By	JB	Checked By	DAI	Drawing No.
Scale	1:750	Project No.	09-062	SGR



CAUTION
CONTRACTOR TO DETERMINE LOCATION OF EXISTING UTILITIES PRIOR TO CONSTRUCTION.

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MONUMENT IS LOCATED IN THE TOWN OF PENETANGUISHENE ON THE SOUTH SIDE OF BROAD STREET, BEING ON THE CENTRELINE PRODUCTION OF THE ASPHALT DRIVEWAY TO #19 BROAD STREET, AND WEST OF THE CENTRELINE OF JURY DRIVE. MONUMENT IS 4.8 METRES SOUTH OF THE CENTRELINE BROAD STREET AND 23.3 METRES WEST OF THE CENTRELINE OF JURY DRIVE.

REGISTERED PROFESSIONAL ENGINEER
D.A. IVES
July 19, 2022
PROVINCE OF ONTARIO

No.	Issue / Revision	Date
1	FSR SUBMISSION	JULY 19, 2022

QUEEN'S COURT HOMES

STORMWATER DRAINAGE AREA PLAN

Client:
Queen's Court Development Limited
55 Temperance St. Suite 700
Toronto, Ontario
M5H 3V5

WMI & Associates Limited
119 Collier Street
Barrie, Ontario
L4M 1H5
Ph 705-797-2027
www.wmiengineering.ca

Drawn By	Checked By	Drawing No.
JB	DAI	STM
Scale 1:750	Project No. 09-062	

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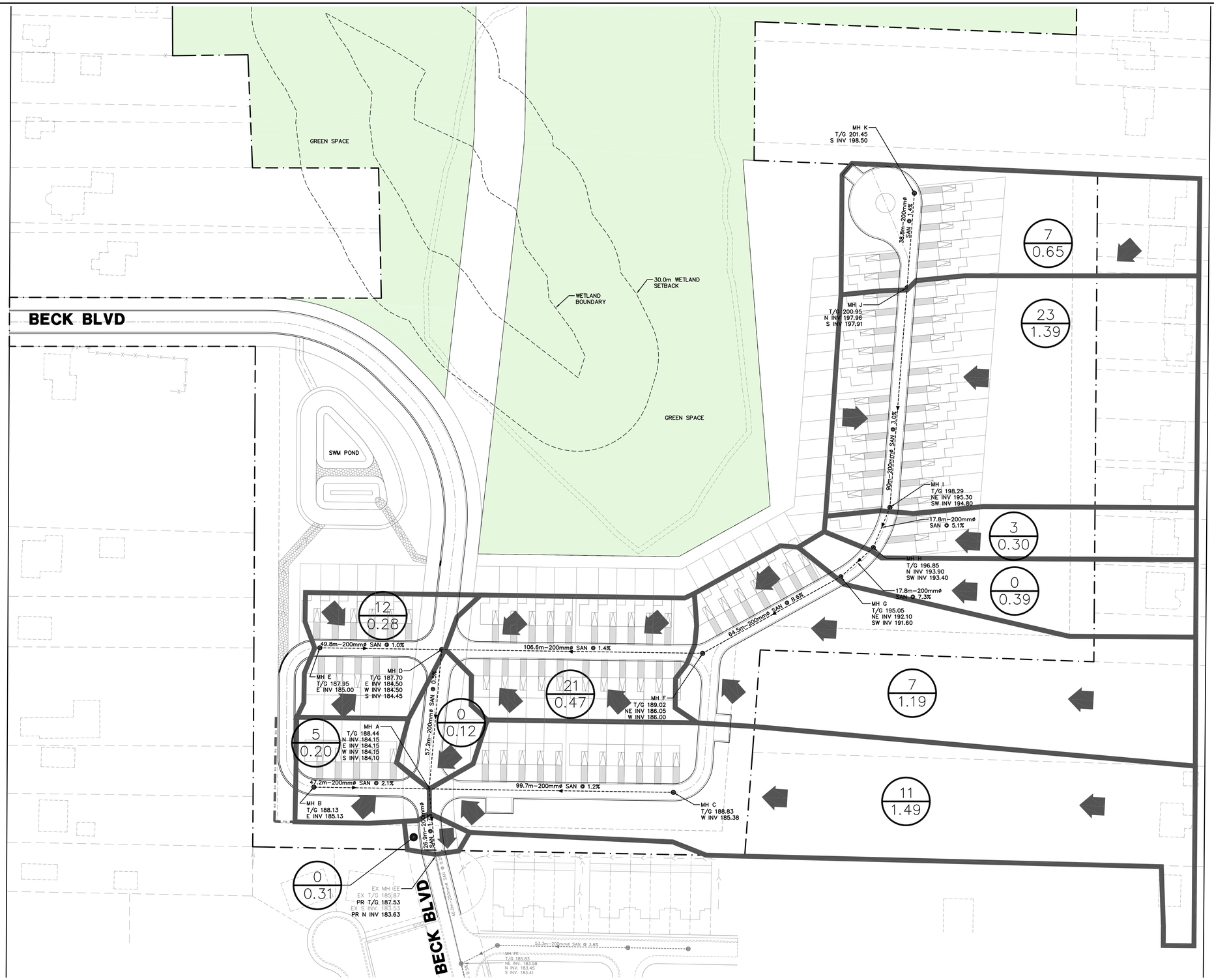

CAUTION
CONTRACTOR TO DETERMINE LOCATION OF EXISTING UTILITIES PRIOR TO CONSTRUCTION.

Notes:

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Benchmark: 180.16m

MONUMENT IS LOCATED IN THE TOWN OF PENETANGUISHENE ON THE SOUTH SIDE OF BROAD STREET, BEING ON THE CENTRELINE PRODUCTION OF THE ASPHALT DRIVEWAY TO #19 BROAD STREET, AND WEST OF THE CENTRELINE OF JURY DRIVE. MONUMENT IS 4.8 METRES SOUTH OF THE CENTRELINE BROAD STREET AND 23.3 METRES WEST OF THE CENTRELINE OF JURY DRIVE.

REGISTERED PROFESSIONAL ENGINEER
D.A. IVES
July 19, 2022
PROVINCE OF ONTARIO

No.	Issue / Revision	Date
1	FSR SUBMISSION	JULY 19, 2022

QUEEN'S COURT HOMES

SANITARY DRAINAGE AREA PLAN

Client:
Queen's Court Development Limited
55 Temperance St. Suite 700
Toronto, Ontario
M5H 3V5

WMI & Associates Limited
119 Collier Street
Barrie, Ontario
L4M 1H5
Ph 705-797-2027
www.wmiengineering.ca

Drawn By	Checked By	Drawing No.
JB	DAI	SAN
Scale 1:750	Project No. 09-062	

Z:\Projects\2009\09-062\CAD\WMI\3rd_Subm\220719_09-062_Base.dwg

Hydrogeological Study and Water Balance Analysis
Preliminary Geotechnical Investigation

Appendix E

Ian D. Wilson Associates Ltd.
since 1974

Tel: 519.233.3500
Fax: 519.233.3501

P. O. Box 299
Clinton, Ontario
N0M 1L0

Wilson Associates

Consulting Hydrogeologists

December 18, 2015
Revised June 24, 2022

Ms. Veronica Green
Slate Asset Management
121 King St W
Suite 200
Toronto, ON
M5H 3T9

Dear Ms. Green:

Re: Revised Hydrogeological Study and Water Balance Analysis
Proposed 221 Fox Street Residential Development
Queen's Court Homes
Town of Penetanguishene

It is proposed to develop a 12.004ha property at 221 Fox Street, in the Town of Penetanguishene, as 88 residential townhomes.

This report revises the December 18, 2015 version of this report to reflect the current development proposal, the 2015 report originally prepared to address the Town of Penetanguishene requirement to address the "Hydrogeological Assessment Submissions: Conservation Authority Guidelines for Development Applications" (the CA Guideline).

Provided for this revised study were the following documentation:

- Preliminary Geotechnical Investigation, Peto MacCallum Ltd. (PML). November 2012.
- Draft Plan of Common Elements Condominium, Celeste Philips Planning Inc., May 9, 2022.
- Post-Development Drainage Plan, WMI & Associates Limited, undated draft.

LOCATION AND HYDROGEOLOGICAL SETTING

The subject lands are located in the undeveloped space between Fox Street and Church Street, south of Broad Street, within the northern periphery of the Town of Penetanguishene. The lands slope steeply westwards, with a north-south trending raised shore bluff situated in the eastern half of the site, which divides the site into a low-lying, western half and a steeply-sloped eastern half. The lands are currently mainly forested. No permanent surface water bodies are mapped on-site, although portions of the low-lying western half of the site are understood to become seasonally wet. Penetang Harbour is located about 300m west of the western property line and St. Andrews Lake is located on the uplands about 1,300m to the east.

The subject lands are located within the Simcoe Uplands physiographic region of southern Ontario, an area of northern Simcoe County characterized by till upland plains and steep-sided, flat floored valleys. The raised shore bluff was once the shore of glacial Lake Algonquin.

According to Ontario Geological Survey Open File Map 194 "Quaternary Geology of the Penetanguishene and Christian Island Areas", the upper soils in the eastern highland portion of the site consist of glaciofluvial deposits of fine sand. The upper soils in the western lower portion of the site consist of lacustrine deposits of fine sand. The PML report identified a variable sequence of granular deposits, fine-grained deposits mainly of silty sand with occasional clayey silt and sand till deposits, in the lowland portion of the site.

As the area is municipally serviced, few water well records are available in the close vicinity from which to characterize the sequence of overburden formations. However, a small number of well records are mapped in the general area, and the attached geological cross-section has been prepared using the available data plus the PML report data. Generally, the overburden beneath the eastern portion of the site, and beneath the uplands east of the site, is indicated by the available water well records to consist almost entirely of granular deposits of sand or gravel. Occasional minor, discontinuous fine-grained lenses are reported at various depths. In the western, lower portion of the site, the PML boreholes have identified a variable sequence of granular deposits, fine-grained deposits mainly of silty sand with occasional clayey silt and sand till deposits.

The PML borehole records and representative water well record print-outs utilized for the preparation of the cross-section are attached.

According to interpretation provided by the 2005 North Simcoe Municipal Groundwater Study (NSMGS), the bedrock beneath the site is situated at an approximate elevation of 150m above sea level (asl) (per Figure 4.5.2 of the NSMGS). As such, the overburden will be in the range of 37m deep beneath the western, lowland portion of the site, and in the range of 70m deep at the upper, eastern periphery of the site. The NSMGS also reports the majority of the overburden to be granular.

HYDROGEOLOGICAL SETTING

Water levels were observed in the three borehole monitoring wells by PML on October 16, 2012. The following table provides a summary of the PML water level observations:

Borehole	Ground Elevation (m asl)	Water Level (m below grade)	Water Level Elevation (m asl)
BH1	189.65	1.9	187.75
BH2	187.73	4.4	183.33
BH3	187.83	2.2	185.63

The attached map shows the locations of the three PML boreholes, contours of the watertable surface in the vicinity of the three boreholes and inferred direction of groundwater flow. The inferred direction of shallow groundwater flow is generally westerly towards Penetang Harbour.

Locally (i.e. the area between Penetang Harbour and St. Andrews Lake), Figures 4.4.1 and 4.4.2 of the NSMGS indicates a westward direction of groundwater flow. Both Figures 4.4.1 and 4.4.2 of the NSMGS indicate a groundwater level of about 180m asl to 190m asl from west-to-east across the site. Figure 4.4.5 of the NSGMS classifies the western, lower half of the site as a major groundwater discharge area. As shown on the attached cross-section, the regional watertable surface slopes westwards from about 193 to 195 m asl near St. Andrews Lake, to about 185m asl in the lower portion of the subject lands, to about 178m asl at Penetang Harbour. It should be noted that perched watertable conditions in the close vicinity of St. Andrews Lake east of the site appear to support the small lake, this localized aquifer perched well above the regional watertable surface.

According to the Simcoe County website interactive mapping, the site is located within Well Head Protection Zone WHPA-Q2. The Simcoe County website interactive mapping indicates that the site is mapped as a highly vulnerable aquifer and a significant groundwater recharge area (per Source Water Protection mapping).

GROUNDWATER QUALITY

To establish background shallow groundwater quality, typically a monitoring well installed during the geotechnical investigation is sampled. However, none of the 2012 PML monitoring wells could be located during several site reconnaissances in 2015. WMI & Associates Limited arranged for the installation of a shallow monitoring well at the location shown on the attached diagram for the purposes of establishing background groundwater quality per the CA Guideline. The monitoring well consisted of 3.8cm-diameter ABS pipe with saw-cut screen installed in a backfilled test pit to an approximate depth of 2.5 metres.

The monitoring well was sampled by Wilson Associates on November 5, 2015. The well was purged of all standing water and allowed to recover prior to sampling using a Waterra inertial pump. Water samples were collected in laboratory-supplied bottles, stored in an ice-packed cooler and submitted to Maxxam Analytics Inc. the same day for an analysis of general chemistry and heavy metals parameters.

The analytical results indicate that for the parameters determined, all (except DOC) were at levels typical of shallow groundwater in a municipally-serviced area. The dissolved organic carbon content of the sample was somewhat elevated at 42mg/L (above the Ontario Drinking Water Quality Standard of 5mg/L), but is not unexpected in a low-lying, seasonally wet area.

A copy of the analytical results are attached.

WATER BUDGET ANALYSIS

The following assumptions are made for this assessment:

- Overall drainage from the site is generally westwards following site topography, and for water budget analysis, the site is assumed to act as one catchment in two slope environments and two soil environments. The upper portion of the site (~50% of the site area) is considered to exhibit a hilly topography and sandy soil conditions. The lower portion of the site (~50% of the site area) is considered to exhibit a rolling to hilly topography and soils of a medium combination of clay and loam.

- The entire un-developed existing site is assumed to be pervious. Impervious area calculations are provided by WMI & Associates Limited, and are indicated to be 21.6% imperviousness under full build-out.

- The water surplus for the site is calculated to be 454.6mm/year, derived from the normal precipitation for the area of 1040.6mm/year (1981-2010 precipitation normal for the closest Environment Canada weather station - Midland WPCP weather station) minus the actual evapotranspiration of 586mm/year for the subwatershed (per Penetanguishene and Tay Point subwatershed, Tier One Water Budget, 2015 Approved Assessment Report, Severn Sound Source Protection Area).

The following tables provide a water budget analysis following the general guidance of the April 2013 Conservation Authority Guidelines for Hydrogeological Assessments.

Table 1 - Water Budget - Current Conditions

Catchment Designation	Site		
	Existing Upland Pervious	Existing Lowland Pervious	Totals
Area (m^2)	60020	60020	120040
Pervious Area (m^2)	60020	60020	120020
Impervious Area (m^2)	0	0	0
Impervious Factors (Per MECP Guidelines)			
Topography Infiltration Factor	Hilly 0.1	Rolling to Hilly 0.15	
Soil Infiltration Factor	Sand 0.4	Medium 0.2	
Land Cover Infiltration Factor	Woodland 0.2	Woodland 0.2	
MOECC Infiltration Factor	0.7	0.55	
Actual Infiltration Factor	0.7	0.55	
Run-Off Coefficient	0.3	0.45	
Runoff from Impervious Surfaces*	0	0	
Inputs (per Unit Area)			
Precipitation (mm/year)	1041	1041	1041
Run-On (mm/year)	0	0	0
Other Inputs (mm/year)	0	0	0
Total Inputs (mm/year)	1041	1041	1041
Outputs (per Unit Area)			
Precipitation Surplus (mm/year)	455	455	455
Net Surplus (mm/year)	455	455	4555
Evapotranspiration (mm/year)	586	586	586

Infiltration (mm/year)	318.5	250	284
Impervious Area Infiltration (mm/year)	0	0	0
Total Infiltration (mm/year)	318.5	250	284
Runoff Pervious Areas (mm/year)	136.5	205	171
Runoff Impervious Areas (mm/year)	0	0	0
Total Runoff (mm/year)	136.5	205	171
Total Outputs (mm/year)	1041	1041	1041
Difference (Inputs - Outputs) (mm/year)	0	0	0
Inputs (Volume)			
Precipitation (m^3/year)	62480	62480	124960
Run-On (m^3/year)	0	0	0
Other Inputs (m^3/year)	0	0	0
Total Inputs (m^3/year)	62480	62480	124960
Outputs (Volume)			
Precipitation Surplus (m^3/year)	27309	27309	54618
Net Surplus (m^3/year)	27309	27309	54618
Evapotranspiration (m^3/year)	35172	35172	70344
Infiltration (m^3/year)	19116	15005	34121
Impervious Area Infiltration (m^3/year)	0	0	0
Total Infiltration (m^3/year)	19116	15005	34121
Runoff Pervious Areas (m^3/year)	8193	12304	20497
Runoff Impervious Areas (m^3/year)	0	0	0
Total Runoff (m^3/year)	8193	12304	20497

Total Outputs (m^3/year)	62481	62481	124962
Difference (Inputs - Outputs) (m^3/year)	+1**	+1**	+2**

Note: ** Minor differences attributable to rounding.

Table 2 - Water Budget - Post-Development Conditions

Under Post-Development conditions, based on information provided by WMI & Associates Limited it is estimated that approximately ⅔ of the site's impervious areas (totaling 21.6% of the site, or 25,929m^2) will be situated in the lowland portion of the site (~17,286m^2), and that approximately ⅓ of the site's impervious areas will be situated in the upland portion of the site (~8,643m^2). The remainder of the site is assumed to remain as mix of woodland and partly cleared areas, and are accounted for in the Land Cover Infiltration Factors in the table below.

Catchment Designation	Site				
	Upland Pervious	Upland Impervious	Lowland Pervious	Lowland Impervious	Totals
Area (m^2)	51377	8643	42734	17286	120040
Pervious Area (m^2)	51377	0	42734	0	93751
Impervious Area (m^2)	0	8643	0	17286	26289
Impervious Factors (Per MECP Guidelines)					
Topography Infiltration Factor	Hilly 0.1	Hilly	Rolling to Hilly 0.15	Rolling to Hilly 0.15	
Soil Infiltration Factor	Sand 0.4	Sand 0.4	Medium 0.2	Medium 0.2	
Land Cover Infiltration Factor	Cleared / Woodland 0.15	0	Cleared / Woodland 0.15	0	
MOECC Infiltration Factor	0.65	0	0.50	0	
Actual Infiltration Factor	0.65	0	0.50	0	
Run-Off Coefficient	0.35	1	0.50	1	
Runoff from Impervious Surfaces*	0	0.8	0	0.8	
Inputs (per Unit Area)					
Precipitation (mm/year)	1041	1041	1041	1041	1041
Run-On (mm/year)	0	0	0	0	0
Other Inputs (mm/year)	0	0	0	0	0

Total Inputs (mm/year)	1041	1041	1041	1041	1041
Outputs (per Unit Area)					
Precipitation Surplus (mm/year)	455	833	455	833	595
Net Surplus (mm/year)	455	833	455	833	595
Evapotranspiration (mm/year)	586	208	586	208	504
Infiltration (mm/year)	296	0	227.5	0	208
Impervious Area Infiltration (mm/year)	0	0	0	0	0
Total Infiltration (mm/year)	296	0	227.5	0	208
Runoff Pervious Areas (mm/year)	159	0	227.5	0	149
Runoff Impervious Areas (mm/year)	0	833	0	833	180
Total Runoff (mm/year)	159	833	227.5	833	329
Total Outputs (mm/year)	1041	1041	1041	1041	1041
Difference (Inputs - Outputs) (mm/year)	0	0	0	0	0
Inputs (Volume)					
Precipitation (m^3/year)	53483	8997	44486	17995	124961
Run-On (m^3/year)	0	0	0	0	0
Other Inputs (m^3/year)	0	0	0	0	0
Total Inputs (m^3/year)	53483	8997	44486	17995	124961
Outputs (Volume)					
Precipitation Surplus (m^3/year)	23377	7200	19444	14399	64420
Net Surplus (m^3/year)	23377	7200	19444	14399	64420
Evapotranspiration (m^3/year)	30107	1798	25042	3595	60542
Infiltration (m^3/year)	15208	0	9722	0	24930

Impervious Area Infiltration (m^3/year)	0	0	0	0	0
Total Infiltration (m^3/year)	15208	0	9722	0	24930
Runoff Pervious Areas (m^3/year)	8169	0	9722	0	17891
Runoff Impervious Areas (m^3/year)	0	7200	0	14399	21599
Total Runoff (m^3/year)	8169	7200	9722	14399	39490
Total Outputs (m^3/year)	53484	8998	44486	17994	124962
Difference (Inputs - Outputs) (m^3/year)	1**	1**	0	-1**	1**

Note: * Per guidelines, evaporation from impervious areas assumed to be 20% of precipitation.
** Minor differences attributable to rounding.

Table 3 - Water Budget - Post-Development Conditions with Mitigation

Based on the above assessment, approximately 43% of the runoff from the impervious areas of the site (9,191m^3, assumed to be 2/3 in the lowland and 1/3 in the upland) will need to be infiltrated on the site in order to maintain the overall rate of infiltration relative to pre-development conditions. The viability of infiltrating this volume of water is discussed below.

Catchment Designation	Site				
	Upland Pervious	Upland Impervious	Lowland Pervious	Lowland Impervious	Totals
Area (m^2)	51377	8643	42734	17286	120040
Pervious Area (m^2)	51377	0	42734	0	93751
Impervious Area (m^2)	0	8643	0	17286	26289
Impervious Factors (Per MECP Guidelines)					
Topography Infiltration Factor	Hilly 0.1	Hilly	Rolling to Hilly 0.15	Rolling to Hilly 0.15	
Soil Infiltration Factor	Sand 0.4	Sand 0.4	Medium 0.2	Medium 0.2	
Land Cover Infiltration Factor	Cleared / Woodland 0.15	0	Cleared / Woodland 0.15	0	
MOECC Infiltration Factor	0.65	0	0.50	0	
Actual Infiltration Factor	0.65	0	0.50	0	
Run-Off Coefficient	0.35	1	0.50	1	
Runoff from Impervious Surfaces*	0	0.8	0	0.8	
Inputs (per Unit Area)					
Precipitation (mm/year)	1041	1041	1041	1041	1041
Run-On (mm/year)	0	0	0	0	0
Other Inputs (mm/year)	0	0	0	0	0
Total Inputs (mm/year)	1041	1041	1041	1041	1041

Outputs (per Unit Area)					
Precipitation Surplus (mm/year)	455	833	455	833	595
Net Surplus (mm/year)	455	833	455	833	595
Evapotranspiration (mm/year)	586	208	586	208	504
Infiltration (mm/year)	296	0	227.5	0	208
Impervious Area Infiltration (mm/year)	0	355	0	355	77
Total Infiltration (mm/year)	296	355	227.5	355	285
Runoff Pervious Areas (mm/year)	159	0	227.5	0	149
Runoff Impervious Areas (mm/year)	0	478	0	478	103
Total Runoff (mm/year)	159	478	227.5	478	252
Total Outputs (mm/year)	1041	1041	1041	1041	1041
Difference (Inputs - Outputs) (mm/year)	0	0	0	0	0
Inputs (Volume)					
Precipitation (m^3/year)	53483	8997	44486	17995	124961
Run-On (m^3/year)	0	0	0	0	0
Other Inputs (m^3/year)	0	0	0	0	0
Total Inputs (m^3/year)	53483	8997	44486	17995	124961
Outputs (Volume)					
Precipitation Surplus (m^3/year)	23377	7200	19444	14399	64420
Net Surplus (m^3/year)	23377	7200	19444	14399	64420
Evapotranspiration (m^3/year)	30107	1798	25042	3595	60542
Infiltration (m^3/year)	15208	0	9722	0	24930
Impervious Area Infiltration (m^3/year)	0	3064	0	6127	9191

Total Infiltration (m^3/year)	15208	3064	9722	6127	34121
Runoff Pervious Areas (m^3/year)	8169	0	9722	0	17891
Runoff Impervious Areas (m^3/year)	0	4136	0	8272	12408
Total Runoff (m^3/year)	8169	4136	9722	8272	30299
Total Outputs (m^3/year)	53484	8998	44486	17994	124962
Difference (inputs - Outputs) (m^3/year)	1**	1**	0	-1**	1**

Note: * Per guidelines, evaporation from impervious areas assumed to be 20% of precipitation.
** Minor differences attributable to rounding.

Table 4 - Water Budget Summary

Characteristic	Site				
	Current	Post-Development	% Change (Current to Post)	Post Development with Mitigation	Change (Current to Post with Mitigation)
Inputs (Volumes)					
Precipitation (m^3/year)	124960	124961	0**	124961	0**
Run-On (m^3/year)	0	0	0	0	0
Other Inputs (m^3/year)	0	0	0	0	0
Total Inputs (m^3/year)	124960	124961	0**	124961	0**
Outputs (Volumes)					
Precipitation Surplus (m^3/year)	54618	64420	+18	64420	+18
Net Surplus (m^3/year)	54618	64420	+18	64420	+18
Evapotranspiration (m^3/year)	70344	60542	-14	60542	-22
Infiltration (m^3/year)	34121	24930	-27	24930	-427
Impervious Area Infiltration (m^3/year)	0	0	0	9191	+100
Total Infiltration (m^3/year)	34121	24930	-27	34121	0
Runoff Pervious Areas (m^3/year)	20497	17891	-13	17891	-13
Runoff Impervious Areas (m^3/year)	0	21599	+21599 m^3/year	12408	+12408 m^3/year
Total Runoff (m^3/year)	20497	39490	+93	30299	+48
Total Outputs (m^3/year)	124962	124962	0	124962	0

** Minor differences attributable to rounding.

Mitigation assumes that about 43% of runoff from the impervious areas of the site can be infiltrated on-site, or about 9,191m^3/year. While about 1/3 of this infiltration is assumed to be able to occur in the sandier upland portion of the site, as a conservative measure soil conditions are assumed from the lowland portion of the site. According to the grain-size analyses provided in the PML report (attached), the predominant native soils in the lowland area (i.e. a silty fine sand) will exhibit a percolation rate (T-time) in the range of 15 to 20 min/cm (based on the Hazen approximation for a Unified Soil Classification "SM" soil), or about 0.72m/day. Conservatively assuming that the impervious area drainage of 9,191m^3/year is to be infiltrated over 30 days throughout the year, approximately 306.4m^3 of water needs to be infiltrated per day. Based on an infiltration rate of 0.72m/day, an infiltration system with a footprint of at least 426m^2 is required. It is assumed that most of this will be infiltrated into grass swales, infiltration galleries, or other equivalent Low Impact Development (LID) measures

SUMMARY

1. The overburden in the vicinity of the site is reported to be primarily granular, with discontinuous fine-grained lenses in the lowland portion of the site.

2. Based on a review of the PML borehole data, local water well records and the 2005 NSMGS, the regional watertable surface slopes westward with a gradient of about 0.004m/m. The surface of the regional watertable is situated near ground surface beneath the westerly, lowland portion of the site.

3. It is our opinion that the wet area in the westerly, lowland portion of the site functions primarily as a seasonal emergence feature/discharge zone of the regional watertable surface. Groundwater emergence/discharge will be most pronounced in wet years with a high watertable surface, and most limited in dry years with a lowered watertable surface.

4. Shallow groundwater quality is typical of shallow groundwater in a municipally-serviced area with few indicators of urban impact. The dissolved organic carbon content of shallow was somewhat elevated at 42mg/L (above the Ontario Drinking Water Quality Standard of 5mg/L), but is not unexpected in a low-lying, seasonally wet area.

5. Based on known site conditions (i.e. sandy or medium silt/sand till soils, hilly relief, woodland cover), an MECP infiltration factor of 0.55 to 0.7 is indicated for the undeveloped site.

6. Water budget analysis indicates that the development proposal of the site will reduce overall infiltration by about 27% from current conditions.

7. Due to the calculated loss in overall infiltration of the development proposal in comparison to existing conditions, infiltration enhancement measures must be adopted to infiltrate approximately 43% of runoff from impervious surfaces. It is assumed that most of this will be infiltrated into grass swales, infiltration galleries, or other equivalent Low Impact Development (LID) measures (see above for minimum LID areas). The

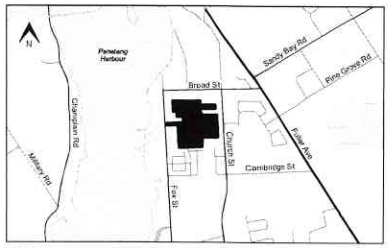
infiltration measures need to be maintained in a low-sediment condition to avoid infiltration loss over time.

Should there be any questions regarding the above information and analysis, please feel free to contact this office.

Yours sincerely.
IAN D. WILSON ASSOCIATES LIMITED

Geoffrey Rether, P.Geo.

PROFESSIONAL GEOSCIENTIST
GEOFFREY B. RETHER
PRACTISING MEMBER
0426
ONTARIO



KEY MAP

Scale 1 : 20,000

DRAFT PLAN OF COMMON ELEMENTS CONDOMINIUM

QUEEN'S COURT

PART OF LOTS 104 TO 113 WEST OF CHURCH STREET, REGISTERED PLAN 70,
MILITARY AND NAVAL RESERVE
TOWN OF PENETANGUISHENE, COUNTY OF SIMCOE

LAND USE SCHEDULE

USE	PARTS	UNITS	AREA ha	AREA ac	%
RESIDENTIAL TOWNHOMES (6.7m)	1 - 60	60	1.325	3.28	11.0
RESIDENTIAL TOWNHOMES (6.2m)	61 - 88	28	0.728	1.80	6.1
COMMON ELEMENT LANE	89 & 90		0.496	1.23	4.1
COMMON ELEMENT OPEN SPACE	91 - 93		7.743	19.13	64.5
COMMON ELEMENT STORMWATER MANAGEMENT	94		0.462	1.14	3.8
LANDS OWNED BY THE TOWN OF PENETANGUISHENE	95		0.498	1.23	4.2
PRIVATE STREET			0.751	1.86	6.3
TOTAL		88	12.004	29.66	100

OWNER'S CERTIFICATE

I _____ BEING THE REGISTERED OWNER OF THE SUBJECT LANDS, HEREBY AUTHORIZE CELESTE PHILLIPS PLANNING INC. TO PREPARE AND SUBMIT A DRAFT PLAN OF SUBDIVISION FOR APPROVAL.

DATE _____

SURVEYOR'S CERTIFICATE

I HEREBY CERTIFY THAT THE BOUNDARIES OF THE LAND TO BE SUBDIVIDED AND THEIR RELATIONSHIP TO THE ADJACENT LANDS ARE ACCURATELY AND CORRECTLY SHOWN ON THIS PLAN.

DATE _____

LAURENCE J. KUELLING, O.L.S.
J.D. BARNES LIMITED

ADDITIONAL INFORMATION
REQUIRED UNDER SECTION 51(17) OF THE PLANNING ACT

a) AS SHOWN
b) AS SHOWN
c) AS SHOWN
d) AS SHOWN
e) AS SHOWN
f) AS SHOWN
f1) NONE
g) AS SHOWN
h) MUNICIPAL WATER
i) TIOGA LOAMY SAND
j) AS SHOWN
k) FULL MUNICIPAL SERVICES
l) AS SHOWN

No.	DATE	REVISION	BY

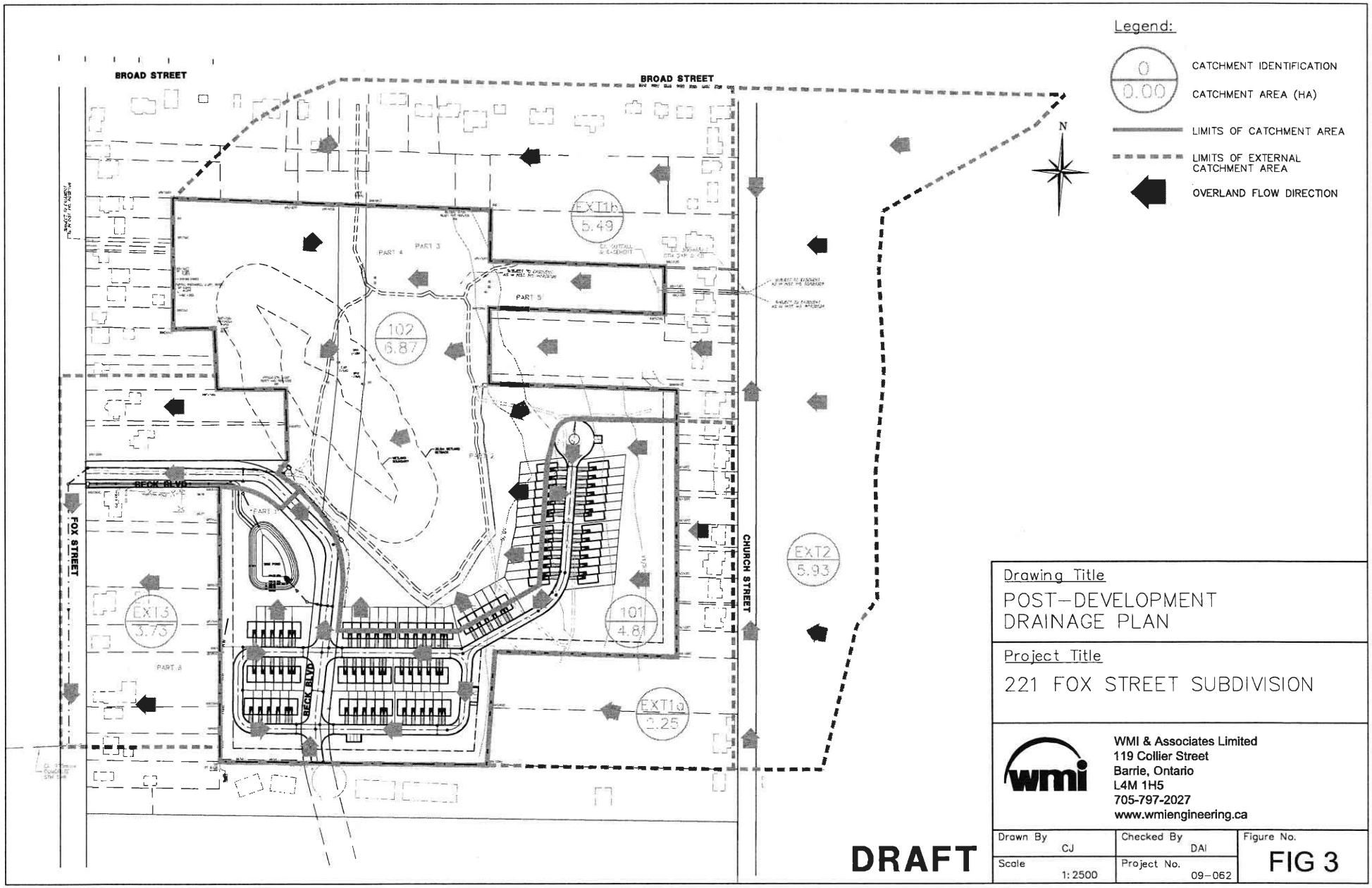
Stamp

0 25 50 75m
Scale 1 : 1,000

Date: May 9, 2022
Drawn By: AM
Checked By: CP

N

85 Bayfield Street, Suite 300
Barrie, ON L4M 3A7
T. 705 797 8977
C. 705 730 8850
celeste@cplan.ca



DRAFT

Drawing Title

POST-DEVELOPMENT DRAINAGE PLAN

Project Title

221 FOX STREET SUBDIVISION

WMI & Associates Limited
119 Collier Street
Barrie, Ontario
L4M 1H5
705-797-2027
www.wmiengineering.ca

Drawn By	Checked By	Figure No.
CJ	DAI	FIG 3
Scale: 1:2500	Project No.: 09-062	

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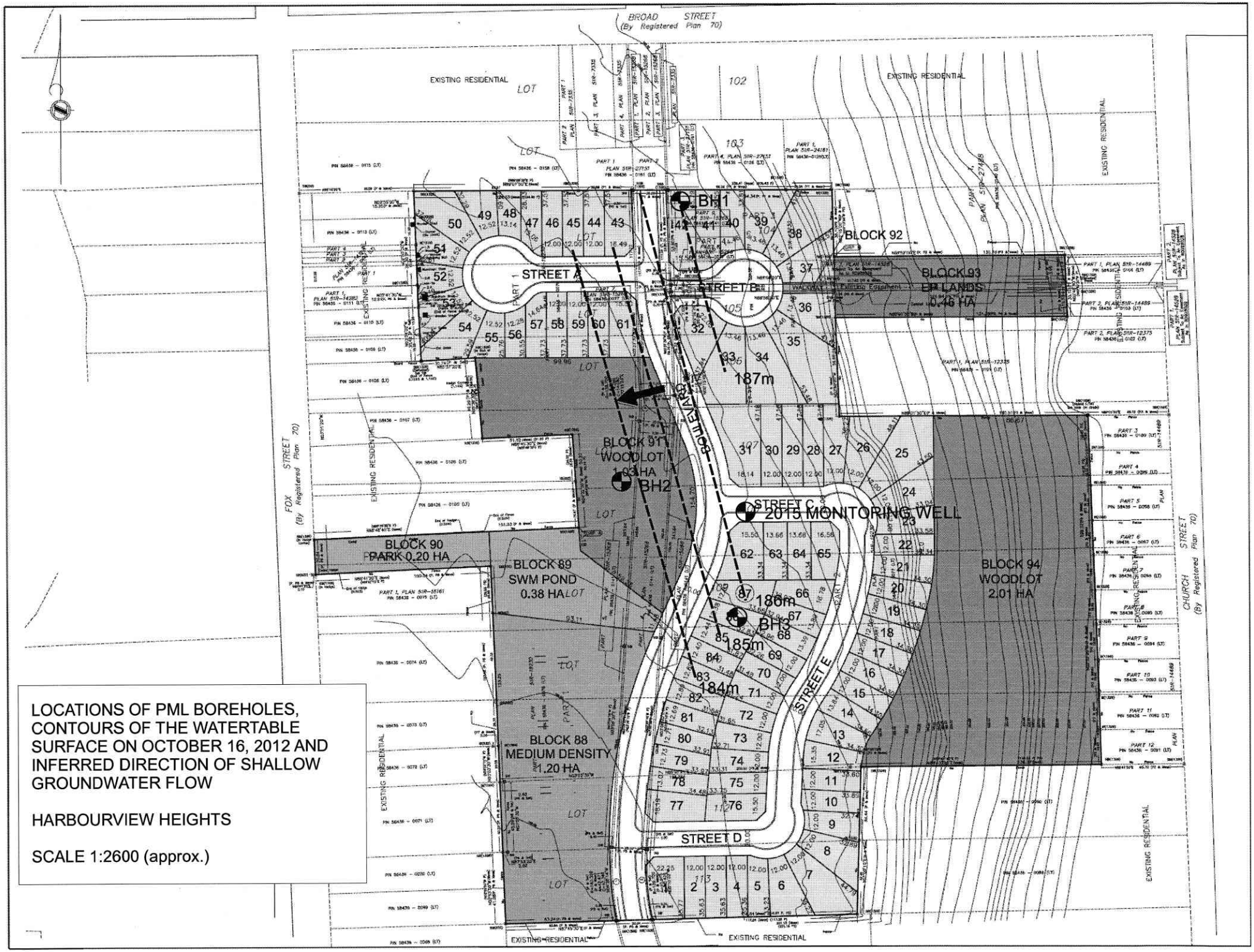
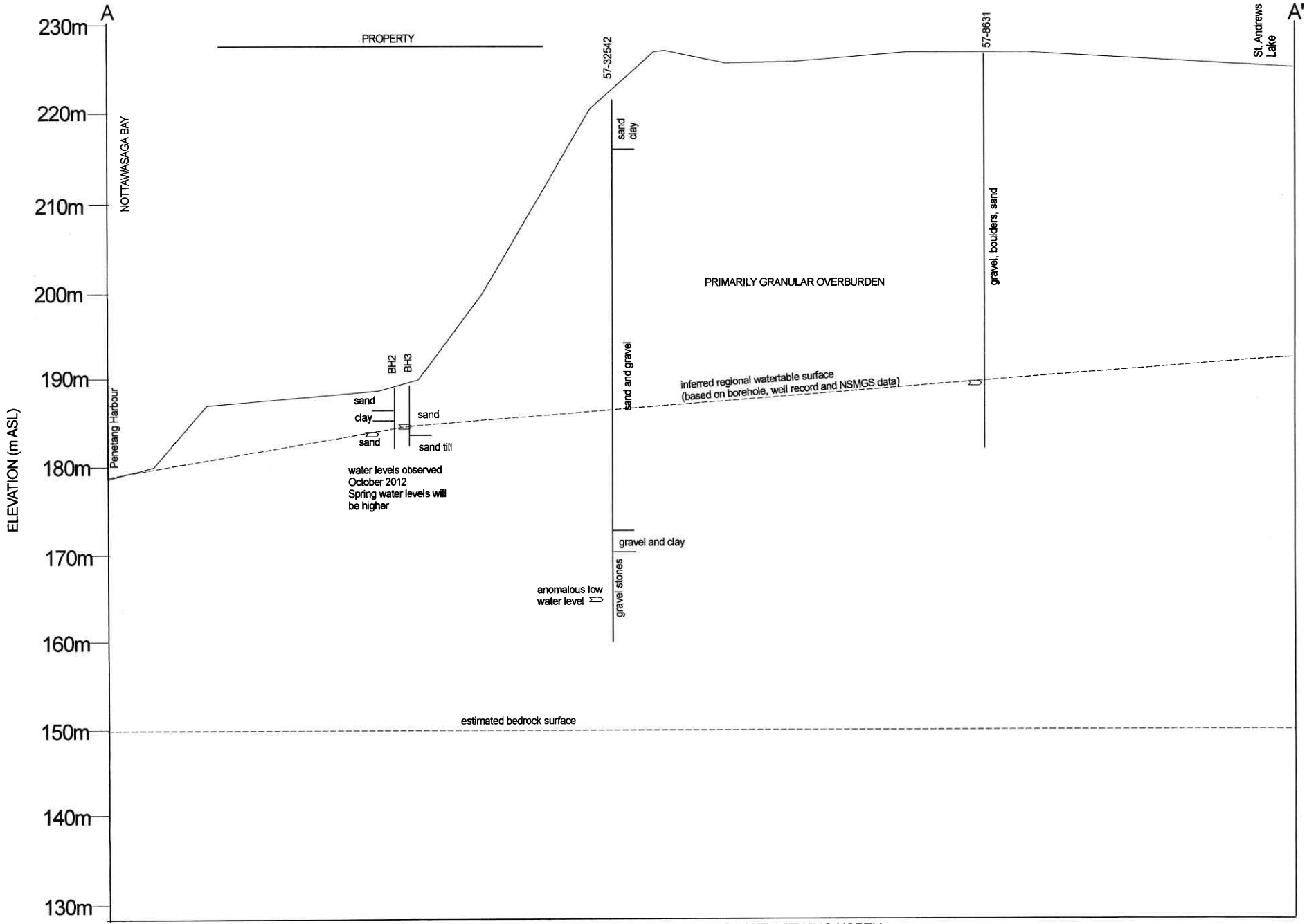


LOCATIONS OF PML BOREHOLES, CONTOURS OF THE WATERTABLE SURFACE ON OCTOBER 16, 2012 AND INFERRED DIRECTION OF SHALLOW GROUNDWATER FLOW

HARBOURVIEW HEIGHTS

SCALE 1:2600 (approx.)



SCHEMATIC CROSS SECTION FROM SHORE OF PENTANG HARBOUR TO SHORE OF ST. ANDREWS LAKE, VIEWING NORTH
TOWN OF PENETANGUISHENE

HORIZONTAL SCALE 1:10,000, VERTICAL SCALE 1:600, VERTICAL EXAGGERATION 17x

IAN D. WILSON ASSOCIATES LIMITED

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 1

PROJECT Proposed Residential Development
LOCATION 221 Fox Street, Penetanguishene, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE: October 11, 2012
OUR PROJECT NO. 12BF046
ENGINEER GW
TECHNICIAN TP

DEPTH in METRES	DESCRIPTION	NUMBER	TYPE	BLOWS/0.3m N - VALUES
GROUND ELEVATION				
0.15	TOPSOIL: Dark brown, silty sand, trace roots, moist	1	SS	5
	SAND: Loose, light brown, sand, trace silt, moist to wet			
0.80	CLAYEY SILT: Firm, brown, clayey silt, some sand, WTPL	2	SS	6
1.4	SAND: Compact to loose, silty sand, trace gravel, saturated	3	SS	10
		4	SS	12
		5	SS	8
4.0	TILL: Dense to very dense, brown, silty sand, trace gravel, cobbles and boulders, wet to moist	6	SS	31
6.2	BOREHOLE TERMINATED AT 6.2 m	7	SS	50/120 mm

SHEAR STRENGTH C_u (kPa) 20 40 60 80
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M 20 40 60 80

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ___ W
W_P W W_L
WATER CONTENT % 10 20 30

UNIT WEIGHT γ kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI CL

Bentonite
Slotted pipe
Filter sand

Upon completion of augering
Wet cave at 5.8 m

Water Level Readings

Date	Depth (m)
Oct 16	1.9 m

NOTES:

+ᵛ SENSITIVITY
+ UNDISTURBED FIELD VANE
⊕ REMOLDED FIELD VANE
⊗ LAB SHEAR TEST
▲ POCKET PENETROMETER

CHECKED BY

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 2

PROJECT Proposed Residential Development
LOCATION 221 Fox Street, Penetanguishene, Ontario
BORING METHOD Continuous Flight Solid Stem Augers

BORING DATE: October 11, 2012

OUR PROJECT NO. 12BF046
ENGINEER GW
TECHNICIAN TP

DEPTH In METRES	DESCRIPTION (GROUND ELEVATION)	LEGEND	NUMBER	TYPE	BLOWS/0.3m N - VALUES	ELEVATION SCALE
0.0						
0.15	TOPSOIL: Dark brown, silty sand, trace roots, moist		1	SS	4	
	SAND: Loose, light brown, sand, trace silt, moist to saturated					
1.0	Sandy silt layers		2	SS	7	
	Becoming silty sand, trace clay		3	SS	7	
2.0						
			4	SS	8	
2.9	CLAYEY SILT: Soft, brown, clayey silt, APL to WTPL		5	SS	3	
4.0	SAND: Compact to dense, grey, sand, some silt, trace gravel, saturated					
5.0			6	SS	15	
6.0			7	SS	31	
6.5	BOREHOLE TERMINATED AT 6.5 m					
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						
14.0						
15.0						

SHEAR STRENGTH C_u (kPa) 20 40 60 80
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M 20 40 60 80

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ____ W
W_P W W_L
WATER CONTENT % 10 20 30

UNIT WEIGHT γ kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

Bentonite
Slotted pipe
Filter sand

Upon completion of augering
Water at 3.0 m
Cave at 5.2 m

Water Level Readings

Date	Depth (m)
Oct 16	4.4 m

NOTES:

SENSITIVITY
UNDISTURBED FIELD VANE
REMOLDED FIELD VANE
LAB SHEAR TEST
POCKET PENETROMETER

CHECKED BY

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 3

PROJECT Proposed Residential Development
LOCATION 221 Fox Street, Penetanguishene, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE: October 11, 2012
OUR PROJECT NO. 12BF046
ENGINEER GW
TECHNICIAN TP

DEPTH In METRES	DESCRIPTION (GROUND ELEVATION)	LEGEND	NUMBER	TYPE	BLOWS/0.3m N - VALUES	ELEVATION SCALE
0.0						
0.15	TOPSOIL: Dark brown, silty sand, trace roots, moist		1	SS	6	
	SAND: Compact to very loose, brown, sand, trace silt, sandy silt layers, moist		2	SS	11	
	Becoming silty sand, trace clay, saturated		3	SS	7	
			4	SS	3	
			5	SS	2	
	Becoming sand, trace to some silt, trace gravel		6	SS	12	
5.5	TILL: Compact, brown, silty sand, trace gravel, cobbles and boulders, wet		7	SS	21	
6.5	BOREHOLE TERMINATED AT 6.5 m					

SHEAR STRENGTH C_u (kPa) 20 40 60 80
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M 20 40 60 80

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ___ W
W_P W W_L
WATER CONTENT % 10 20 30

UNIT WEIGHT γ kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI CL

Bentonite
Slotted pipe
Filter sand

Upon completion of augering
Wet cave at 4.9 m

Water Level Readings

Date	Depth (m)
Oct 16	2.2 m

NOTES:

$+^s$ SENSITIVITY
+ UNDISTURBED FIELD VANE
⊕ REMOLDED FIELD VANE
⊛ LAB SHEAR TEST
▲ POCKET PENETROMETER

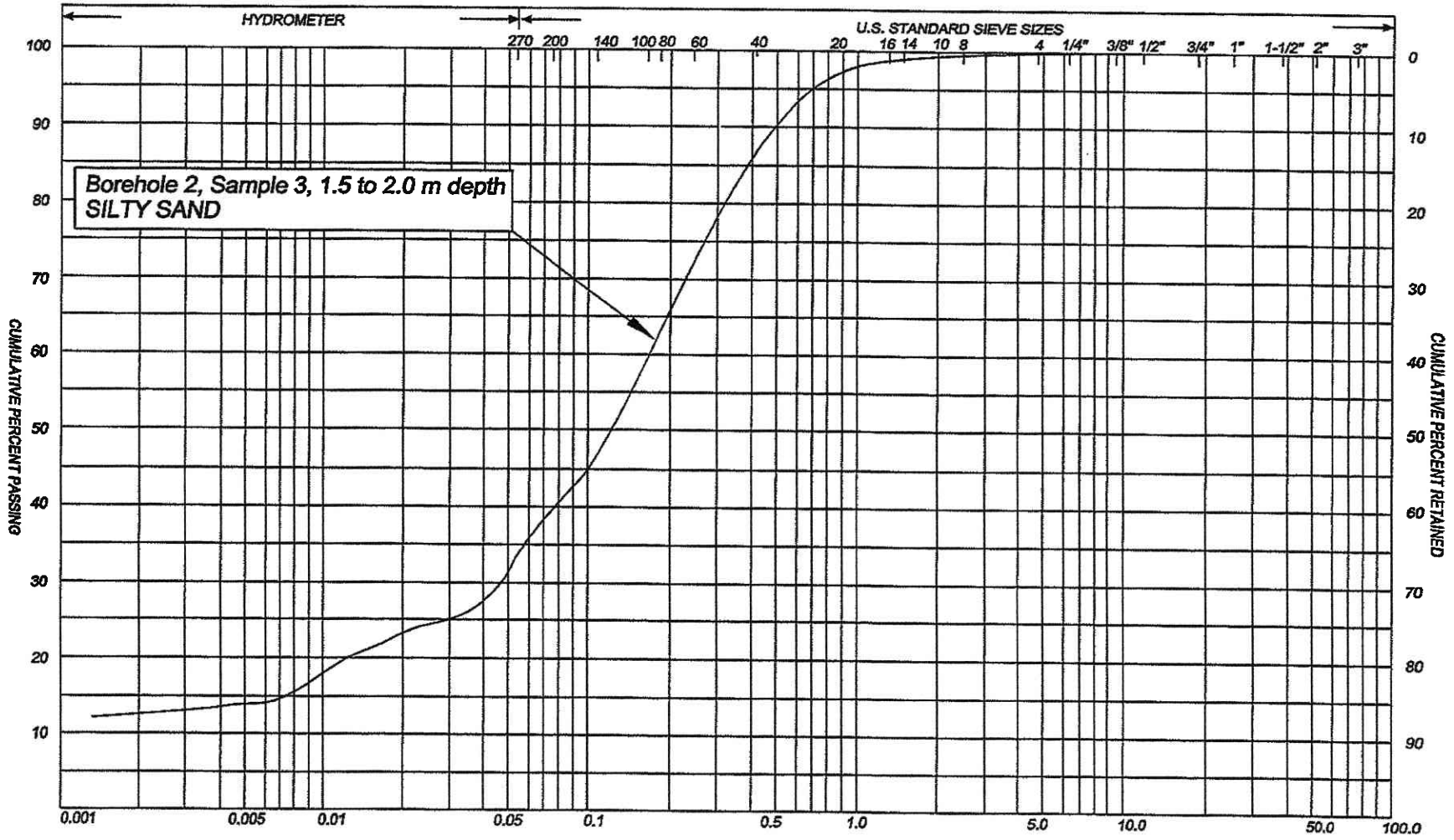
CHECKED BY

Peto MacCallum Ltd.

CONSULTING ENGINEERS

PARTICLE SIZE DISTRIBUTION CHART

PML Ref.: 12BF046
Lab No.: L20340
Figure No.: 1



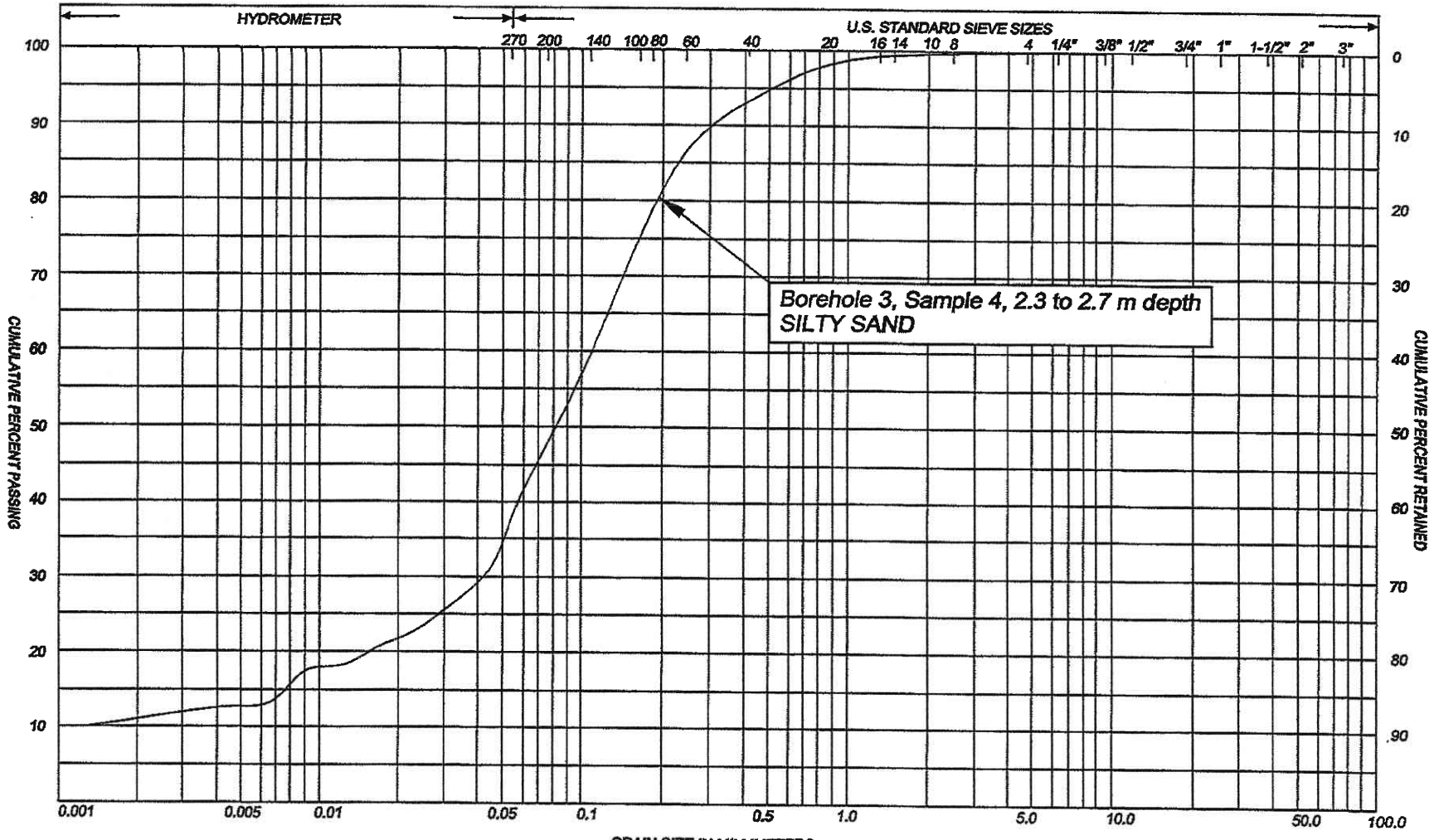
SILT & CLAY				FINE	MEDIUM	COARSE	GRAVEL			COBBLES	UNIFIED
				SAND							
CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	GRAVEL			COBBLES	M.I.T.
	SILT			SAND							
CLAY	SILT			V. FINE	FINE	MED	COARSE	GRAVEL			U.S. BUREAU
				SAND							

Peto MacCallum Ltd.

CONSULTING ENGINEERS

PARTICLE SIZE DISTRIBUTION CHART

PML Ref.: 12BF046
Lab No.: L20341
Figure No.: 2



Well ID Number: 5708631

Well Audit Number: *none*
Well Tag Number: *none*

This table contains information from the original well record and any subsequent updates.

Well Location

Address of Well Location	*Township*	*Lot*	*Concession*
not available	Tay Township	120	PR E 02
County/District/Municipality	*City/Town/Village*	*Province*	*Postal Code*
SIMCOE		ON	n/a

UTM Coordinates *Municipal Plan and Sublot Number* *Other*

NAD83 — Zone 17
Easting: 585389.2
Northing: 4960421

Overburden and Bedrock Materials Interval

General Colour	*Most Common Material*	*Other Materials*	*General Description*	*Depth From*	*Depth To*
BRWN	LOAM			0 ft	2 ft
BRWN	GRVL	BLDR		2 ft	145 ft
YLLW	GRVL	SAND		145 ft	148 ft

Annular Space/Abandonment Sealing Record

Depth From	*Depth To*	*Type of Sealant Used (Material and Type)*	*Volume Placed*

Method of Construction

Cable Tool

Well Use

Domestic

Status of Well

Water Supply

Construction Record - Casing

Inside Diameter	*Open Hole OR material*	*Depth From*	*Depth To*
6 inch	STEEL		148 ft

Construction Record - Screen

Outside Diameter	*Material*	*Depth From*	*Depth To*
	X		

Well Contractor and Well Technician Information

Well Contractor's Licence Number 2514

Results of Well Yield Testing

After test of well yield, water was CLEAR

If pumping discontinued, give reason

Pump intake set at

Pumping Rate 10 GPM

Duration of Pumping 2 h:30 m

Final water level 140 ft

If flowing give rate

Recommended pump depth 145 ft

Recommended pump rate 10 GPM

Well Production BAILER

Disinfected?

Draw Down Time (min)	*Draw Down Water level*	*Recovery Time (min)*	*Recovery Water level*
SWL	124 ft		
1			
2			
3			
4			
5			
10			
15		15	124 ft
20			
25			
30		30	124 ft
40			
45		45	124 ft
50			
60		60	124 ft

Water Details		Hole Diameter	
Water Found at Depth	*Kind*	*Depth*	*Diameter*
		From *To*	
145 ft	Fresh		

Audit Number: *none*
Date Well Completed: January 15, 1972
Date Well Record Received by MOE: February 14, 1972

Well ID Number: 5732542

Well Audit Number: *176791*
Well Tag Number: *none*

This table contains information from the original well record and any subsequent updates.

Well Location

Address of Well Location	*Township*	*Lot*	*Concession*
not available	Penetanguishene Town		
County/District/Municipality	*City/Town/Village*	*Province*	*Postal Code*
SIMCOE		ON	n/a
UTM Coordinates	*Municipal Plan and Sublot Number*	*Other*	

NAD83 — Zone 17
Easting: 584900.7
Northing: 4960057

Overburden and Bedrock Materials Interval

General Colour	*Most Common Material*	*Other Materials*	*General Description*	*Depth From*	*Depth To*
	FILL			0 ft	3 ft
BRWN	SAND	CLAY		3 ft	15 ft
BRWN	SAND	GRVL		15 ft	160 ft
BRWN	GRVL	CLAY		160 ft	170 ft
BRWN	GRVL	STNS	HARD	170 ft	203 ft

Annular Space/Abandonment Sealing Record

Depth From	*Depth To*	*Type of Sealant Used (Material and Type)*	*Volume Placed*
0 ft	190 ft		
190 ft	203 ft		

Method of Construction

Rotary (Air)

Well Use

Status of Well

Construction Record - Casing

Inside Diameter	*Open Hole OR material*	*Depth From*	*To*
6 inch	OPEN HOLE		20 ft
2 inch	PLASTIC		193 ft

Construction Record - Screen

Outside Diameter	*Material*	*Depth From*	*To*
	X		

Results of Well Yield Testing

After test of well yield, water was	*Draw Down Time (min)*	*Draw Down Water level*	*Recovery Time (min)*	*Recovery Water level*
If pumping discontinued, give reason		SWL 173 ft		
	1			
Pump intake set at	2			
Pumping Rate	3			
	4			
Duration of Pumping	5			
Final water level	10			
If flowing give rate	15			
	20			
Recommended pump depth	25			
Recommended pump rate	30			
	40			
Well Production	45			

2 inch	193 ft	203 ft	*Disinfected?*	50 60	

Well Contractor and Well Technician Information

Well Contractor's Licence Number 2514

Water Details

Water Found at Depth Kind

Hole Diameter

Depth From *Diameter To*

Audit Number: 176791
Date Well Completed: November 08, 1996
Date Well Record Received by MOE: November 18, 1996

Maxxam
A Bureau Veritas Group Company

Your Project #: FOX STREET
Your C.O.C. #: 69227

Attention:Geoff Rether

Ian D Wilson Associates Ltd
PO Box 299
76722 Airport Rd
Clinton, ON
N0M 1L0

Report Date: 2015/11/13
Report #: R3766871
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B5M7356
Received: 2015/11/05, 15:20

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Alkalinity	1	N/A	2015/11/07	CAM SOP-00448	SM 22 2320 B m
Carbonate, Bicarbonate and Hydroxide	1	N/A	2015/11/09	CAM SOP-00102	APHA 4500-CO2 D
Chloride by Automated Colourimetry	1	N/A	2015/11/09	CAM SOP-00463	EPA 325.2 m
Conductivity	1	N/A	2015/11/07	CAM SOP-00414	SM 22 2510 m
Dissolved Organic Carbon (DOC) (1)	1	N/A	2015/11/06	CAM SOP-00446	SM 22 5310 B m
Hardness (calculated as CaCO3)	1	N/A	2015/11/09	CAM SOP 00102/00408/00447	SM 2340 B
Lab Filtered Metals by ICPMS	1	2015/11/06	2015/11/09	CAM SOP-00447	EPA 6020A m
Ion Balance (% Difference)	1	N/A	2015/11/09		
Anion and Cation Sum	1	N/A	2015/11/09		
Total Ammonia-N	1	N/A	2015/11/12	CAM SOP-00441	EPA GS I-2522-90 m
Nitrate (NO3) and Nitrite (NO2) in Water (2)	1	N/A	2015/11/11	CAM SOP-00440	SM 22 4500-NO3I/NO2B
pH	1	N/A	2015/11/07	CAM SOP-00413	SM 4500H+ B m
Orthophosphate	1	N/A	2015/11/09	CAM SOP-00461	EPA 365.1 m
Sat. pH and Langelier Index (@ 20C)	1	N/A	2015/11/09		
Sat. pH and Langelier Index (@ 4C)	1	N/A	2015/11/09		
Sulphate by Automated Colourimetry	1	N/A	2015/11/09	CAM SOP-00464	EPA 375.4 m
Total Dissolved Solids (TDS calc)	1	N/A	2015/11/09		

Remarks:

Maxxam Analytics has performed all analytical testing herein in accordance with ISO 17025 and the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act. All methodologies comply with this document and are validated for use in the laboratory. The methods and techniques employed in this analysis conform to the performance criteria (detection limits, accuracy and precision) as outlined in the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act.

Maxxam Analytics is accredited for all specific parameters as required by Ontario Regulation 153/04. Maxxam Analytics is limited in liability to the actual cost of analysis unless otherwise agreed in writing. There is no other warranty expressed or implied. Samples will be retained at Maxxam Analytics for three weeks from receipt of data or as per contract.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Maxxam
A Bureau Veritas Group Company

Your Project #: FOX STREET
Your C.O.C. #: 69227

Attention:Geoff Rether

Ian D Wilson Associates Ltd
PO Box 299
76722 Airport Rd
Clinton, ON
N0M 1L0

Report Date: 2015/11/13
Report #: R3766871
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B5M7356
Received: 2015/11/05, 15:20

(1) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.
(2) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

Encryption Key Antonella Brasil 13 Nov 2015 16:47:55 -05:00

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Stephen McMillan, Project Manager
Email: xxsmcmillan@maxxam.ca
Phone# (905)817-5700 Ext:5735

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B5M7356
Report Date: 2015/11/13

Ian D Wilson Associates Ltd
Client Project #: FOX STREET

RCAP - COMPREHENSIVE (LAB FILTERED)

Maxxam ID		BHJ788		
Sampling Date		2015/11/05 12:00		
	UNITS	QUEENS COURT	RDL	QC Batch
Calculated Parameters				
Anion Sum	me/L	8.01	N/A	4260739
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	360	1.0	4260020
Calculated TDS	mg/L	430	1.0	4260561
Carb. Alkalinity (calc. as CaCO3)	mg/L	1.2	1.0	4260020
Cation Sum	me/L	8.75	N/A	4260739
Hardness (CaCO3)	mg/L	420	1.0	4261075
Ion Balance (% Difference)	%	4.44	N/A	4260738
Langelier Index (@ 20C)	N/A	0.743		4260740
Langelier Index (@ 4C)	N/A	0.495		4260741
Saturation pH (@ 20C)	N/A	6.81		4260740
Saturation pH (@ 4C)	N/A	7.06		4260741
Inorganics				
Total Ammonia-N	mg/L	0.50	0.050	4266655
Conductivity	umho/cm	730	1.0	4262853
Dissolved Organic Carbon	mg/L	42	0.20	4262345
Orthophosphate (P)	mg/L	ND	0.010	4263259
pH	pH	7.55	N/A	4262857
Dissolved Sulphate (SO4)	mg/L	33	1.0	4263258
Alkalinity (Total as CaCO3)	mg/L	360	1.0	4262852
Dissolved Chloride (Cl)	mg/L	5.2	1.0	4263256
Nitrite (N)	mg/L	ND	0.010	4263255
Nitrate (N)	mg/L	ND	0.10	4263255
Metals				
Dissolved Aluminum (Al)	ug/L	19	5.0	4262285
Dissolved Antimony (Sb)	ug/L	ND	0.50	4262285
Dissolved Arsenic (As)	ug/L	ND	1.0	4262285
Dissolved Barium (Ba)	ug/L	150	2.0	4262285
Dissolved Beryllium (Be)	ug/L	ND	0.50	4262285
Dissolved Boron (B)	ug/L	15	10	4262285
Dissolved Cadmium (Cd)	ug/L	0.10	0.10	4262285
Dissolved Calcium (Ca)	ug/L	120000	200	4262285
Dissolved Chromium (Cr)	ug/L	ND	5.0	4262285
Dissolved Cobalt (Co)	ug/L	0.82	0.50	4262285
Dissolved Copper (Cu)	ug/L	4.2	1.0	4262285

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
ND = Not detected

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RCAP - COMPREHENSIVE (LAB FILTERED)

Maxxam ID		BHJ788		
Sampling Date		2015/11/05 12:00		
	UNITS	QUEENS COURT	RDL	QC Batch
Dissolved Iron (Fe)	ug/L	ND	100	4262285
Dissolved Lead (Pb)	ug/L	ND	0.50	4262285
Dissolved Magnesium (Mg)	ug/L	28000	50	4262285
Dissolved Manganese (Mn)	ug/L	200	2.0	4262285
Dissolved Molybdenum (Mo)	ug/L	1.7	0.50	4262285
Dissolved Nickel (Ni)	ug/L	2.7	1.0	4262285
Dissolved Phosphorus (P)	ug/L	ND	100	4262285
Dissolved Potassium (K)	ug/L	2700	200	4262285
Dissolved Selenium (Se)	ug/L	ND	2.0	4262285
Dissolved Silicon (Si)	ug/L	6300	50	4262285
Dissolved Silver (Ag)	ug/L	ND	0.10	4262285
Dissolved Sodium (Na)	ug/L	5300	100	4262285
Dissolved Strontium (Sr)	ug/L	250	1.0	4262285
Dissolved Thallium (Tl)	ug/L	ND	0.050	4262285
Dissolved Titanium (Ti)	ug/L	ND	5.0	4262285
Dissolved Uranium (U)	ug/L	26	0.10	4262285
Dissolved Vanadium (V)	ug/L	1.2	0.50	4262285
Dissolved Zinc (Zn)	ug/L	20	5.0	4262285

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

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A Bureau Veritas Group Company

Maxxam Job #: B5M7356
Report Date: 2015/11/13

Ian D Wilson Associates Ltd
Client Project #: FOX STREET

TEST SUMMARY

Maxxam ID: BHJ788
Sample ID: QUEENS COURT
Matrix: Water

Collected: 2015/11/05
Shipped:
Received: 2015/11/05

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4262852	N/A	2015/11/07	Yogesh Patel
Carbonate, Bicarbonate and Hydroxide	CALC	4260020	N/A	2015/11/09	Automated Statchk
Chloride by Automated Colourimetry	KONE	4263256	N/A	2015/11/09	Deonarine Ramnarine
Conductivity	AT	4262853	N/A	2015/11/07	Yogesh Patel
Dissolved Organic Carbon (DOC)	TOCV/NDIR	4262345	N/A	2015/11/06	Anastasia Hamanov
Hardness (calculated as CaCO3)		4261075	N/A	2015/11/09	Automated Statchk
Lab Filtered Metals by ICPMS	ICP/MS	4262285	2015/11/06	2015/11/09	John Bowman
Ion Balance (% Difference)	CALC	4260738	N/A	2015/11/09	Automated Statchk
Anion and Cation Sum	CALC	4260739	N/A	2015/11/09	Automated Statchk
Total Ammonia-N	LACH/NH4	4266655	N/A	2015/11/12	Chandra Nandlal
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4263255	N/A	2015/11/11	Chandra Nandlal
pH	AT	4262857	N/A	2015/11/07	Yogesh Patel
Orthophosphate	KONE	4263259	N/A	2015/11/09	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	4260740	N/A	2015/11/09	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	4260741	N/A	2015/11/09	Automated Statchk
Sulphate by Automated Colourimetry	KONE	4263258	N/A	2015/11/09	Alina Dobreanu
Total Dissolved Solids (TDS calc)	CALC	4260561	N/A	2015/11/09	Automated Statchk

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GENERAL COMMENTS

Results relate only to the items tested.

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Maxxam
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Maxxam Job #: B5M7356
Report Date: 2015/11/13

Ian D Wilson Associates Ltd
Client Project #: FOX STREET

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4262285	JBW	Matrix Spike	Dissolved Aluminum (Al)	2015/11/09		102	%	80 - 120
			Dissolved Antimony (Sb)	2015/11/09		109	%	80 - 120
			Dissolved Arsenic (As)	2015/11/09		100	%	80 - 120
			Dissolved Barium (Ba)	2015/11/09		NC	%	80 - 120
			Dissolved Beryllium (Be)	2015/11/09		101	%	80 - 120
			Dissolved Boron (B)	2015/11/09		99	%	80 - 120
			Dissolved Cadmium (Cd)	2015/11/09		103	%	80 - 120
			Dissolved Calcium (Ca)	2015/11/09		NC	%	80 - 120
			Dissolved Chromium (Cr)	2015/11/09		95	%	80 - 120
			Dissolved Cobalt (Co)	2015/11/09		97	%	80 - 120
			Dissolved Copper (Cu)	2015/11/09		99	%	80 - 120
			Dissolved Iron (Fe)	2015/11/09		98	%	80 - 120
			Dissolved Lead (Pb)	2015/11/09		93	%	80 - 120
			Dissolved Magnesium (Mg)	2015/11/09		NC	%	80 - 120
			Dissolved Manganese (Mn)	2015/11/09		97	%	80 - 120
			Dissolved Molybdenum (Mo)	2015/11/09		103	%	80 - 120
			Dissolved Nickel (Ni)	2015/11/09		94	%	80 - 120
			Dissolved Phosphorus (P)	2015/11/09		110	%	80 - 120
			Dissolved Potassium (K)	2015/11/09		103	%	80 - 120
			Dissolved Selenium (Se)	2015/11/09		98	%	80 - 120
			Dissolved Silicon (Si)	2015/11/09		105	%	80 - 120
			Dissolved Silver (Ag)	2015/11/09		94	%	80 - 120
			Dissolved Sodium (Na)	2015/11/09		NC	%	80 - 120
			Dissolved Strontium (Sr)	2015/11/09		NC	%	80 - 120
			Dissolved Thallium (Tl)	2015/11/09		93	%	80 - 120
			Dissolved Titanium (Ti)	2015/11/09		100	%	80 - 120
			Dissolved Uranium (U)	2015/11/09		97	%	80 - 120
			Dissolved Vanadium (V)	2015/11/09		98	%	80 - 120
			Dissolved Zinc (Zn)	2015/11/09		97	%	80 - 120
4262285	JBW	Spiked Blank	Dissolved Aluminum (Al)	2015/11/09		100	%	80 - 120
			Dissolved Antimony (Sb)	2015/11/09		102	%	80 - 120
			Dissolved Arsenic (As)	2015/11/09		99	%	80 - 120
			Dissolved Barium (Ba)	2015/11/09		101	%	80 - 120
			Dissolved Beryllium (Be)	2015/11/09		98	%	80 - 120
			Dissolved Boron (B)	2015/11/09		96	%	80 - 120
			Dissolved Cadmium (Cd)	2015/11/09		100	%	80 - 120
			Dissolved Calcium (Ca)	2015/11/09		98	%	80 - 120
			Dissolved Chromium (Cr)	2015/11/09		93	%	80 - 120
			Dissolved Cobalt (Co)	2015/11/09		97	%	80 - 120
			Dissolved Copper (Cu)	2015/11/09		96	%	80 - 120
			Dissolved Iron (Fe)	2015/11/09		99	%	80 - 120
			Dissolved Lead (Pb)	2015/11/09		97	%	80 - 120
			Dissolved Magnesium (Mg)	2015/11/09		101	%	80 - 120
			Dissolved Manganese (Mn)	2015/11/09		97	%	80 - 120
			Dissolved Molybdenum (Mo)	2015/11/09		96	%	80 - 120
			Dissolved Nickel (Ni)	2015/11/09		96	%	80 - 120
			Dissolved Phosphorus (P)	2015/11/09		106	%	80 - 120
			Dissolved Potassium (K)	2015/11/09		101	%	80 - 120
			Dissolved Selenium (Se)	2015/11/09		97	%	80 - 120
			Dissolved Silicon (Si)	2015/11/09		101	%	80 - 120
			Dissolved Silver (Ag)	2015/11/09		95	%	80 - 120
			Dissolved Sodium (Na)	2015/11/09		100	%	80 - 120
			Dissolved Strontium (Sr)	2015/11/09		99	%	80 - 120
			Dissolved Thallium (Tl)	2015/11/09		97	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Titanium (Ti)	2015/11/09		96	%	80 - 120
			Dissolved Uranium (U)	2015/11/09		101	%	80 - 120
			Dissolved Vanadium (V)	2015/11/09		94	%	80 - 120
			Dissolved Zinc (Zn)	2015/11/09		98	%	80 - 120
4262285	JBW	Method Blank	Dissolved Aluminum (Al)	2015/11/09	ND, RDL=5.0		ug/L	
			Dissolved Antimony (Sb)	2015/11/09	ND, RDL=0.50		ug/L	
			Dissolved Arsenic (As)	2015/11/09	ND, RDL=1.0		ug/L	
			Dissolved Barium (Ba)	2015/11/09	ND, RDL=2.0		ug/L	
			Dissolved Beryllium (Be)	2015/11/09	ND, RDL=0.50		ug/L	
			Dissolved Boron (B)	2015/11/09	ND, RDL=10		ug/L	
			Dissolved Cadmium (Cd)	2015/11/09	ND, RDL=0.10		ug/L	
			Dissolved Calcium (Ca)	2015/11/09	ND, RDL=200		ug/L	
			Dissolved Chromium (Cr)	2015/11/09	ND, RDL=5.0		ug/L	
			Dissolved Cobalt (Co)	2015/11/09	ND, RDL=0.50		ug/L	
			Dissolved Copper (Cu)	2015/11/09	ND, RDL=1.0		ug/L	
			Dissolved Iron (Fe)	2015/11/09	ND, RDL=100		ug/L	
			Dissolved Lead (Pb)	2015/11/09	ND, RDL=0.50		ug/L	
			Dissolved Magnesium (Mg)	2015/11/09	ND, RDL=50		ug/L	
			Dissolved Manganese (Mn)	2015/11/09	ND, RDL=2.0		ug/L	
			Dissolved Molybdenum (Mo)	2015/11/09	ND, RDL=0.50		ug/L	
			Dissolved Nickel (Ni)	2015/11/09	ND, RDL=1.0		ug/L	
			Dissolved Phosphorus (P)	2015/11/09	ND, RDL=100		ug/L	
			Dissolved Potassium (K)	2015/11/09	ND, RDL=200		ug/L	
			Dissolved Selenium (Se)	2015/11/09	ND, RDL=2.0		ug/L	
			Dissolved Silicon (Si)	2015/11/09	ND, RDL=50		ug/L	
			Dissolved Silver (Ag)	2015/11/09	ND, RDL=0.10		ug/L	
			Dissolved Sodium (Na)	2015/11/09	ND, RDL=100		ug/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Strontium (Sr)	2015/11/09	ND, RDL=1.0		ug/L	
			Dissolved Thallium (Tl)	2015/11/09	ND, RDL=0.050		ug/L	
			Dissolved Titanium (Ti)	2015/11/09	ND, RDL=5.0		ug/L	
			Dissolved Uranium (U)	2015/11/09	ND, RDL=0.10		ug/L	
			Dissolved Vanadium (V)	2015/11/09	ND, RDL=0.50		ug/L	
			Dissolved Zinc (Zn)	2015/11/09	ND, RDL=5.0		ug/L	
4262285	JBW	RPD	Dissolved Calcium (Ca)	2015/11/09	2.5		%	20
			Dissolved Iron (Fe)	2015/11/09	NC		%	20
			Dissolved Magnesium (Mg)	2015/11/09	1.2		%	20
4262345	AHA	Matrix Spike	Dissolved Organic Carbon	2015/11/06		99	%	80 - 120
4262345	AHA	Spiked Blank	Dissolved Organic Carbon	2015/11/06		100	%	80 - 120
4262345	AHA	Method Blank	Dissolved Organic Carbon	2015/11/06	ND, RDL=0.20		mg/L	
4262345	AHA	RPD	Dissolved Organic Carbon	2015/11/06	0.52		%	20
4262852	YPA	Spiked Blank	Alkalinity (Total as CaCO3)	2015/11/07		95	%	85 - 115
4262852	YPA	Method Blank	Alkalinity (Total as CaCO3)	2015/11/07	ND, RDL=1.0		mg/L	
4262852	YPA	RPD	Alkalinity (Total as CaCO3)	2015/11/07	10		%	25
4262853	YPA	Spiked Blank	Conductivity	2015/11/07		101	%	85 - 115
4262853	YPA	Method Blank	Conductivity	2015/11/07	1.2, RDL=1.0		umho/cm	
4262853	YPA	RPD	Conductivity	2015/11/07	0.68		%	25
4262857	YPA	Spiked Blank	pH	2015/11/07		101	%	98 - 103
4262857	YPA	RPD	pH	2015/11/07	0.60		%	N/A
4263255	C_N	Matrix Spike	Nitrite (N)	2015/11/11		108	%	80 - 120
			Nitrate (N)	2015/11/11		108	%	80 - 120
4263255	C_N	Spiked Blank	Nitrite (N)	2015/11/11		101	%	80 - 120
			Nitrate (N)	2015/11/11		102	%	80 - 120
4263255	C_N	Method Blank	Nitrite (N)	2015/11/11	ND, RDL=0.010		mg/L	
			Nitrate (N)	2015/11/11	ND, RDL=0.10		mg/L	
4263255	C_N	RPD	Nitrite (N)	2015/11/11	NC		%	25
			Nitrate (N)	2015/11/11	NC		%	25
4263256	DRM	Matrix Spike	Dissolved Chloride (Cl)	2015/11/09		NC	%	80 - 120
4263256	DRM	Spiked Blank	Dissolved Chloride (Cl)	2015/11/09		102	%	80 - 120
4263256	DRM	Method Blank	Dissolved Chloride (Cl)	2015/11/09	ND, RDL=1.0		mg/L	
4263256	DRM	RPD	Dissolved Chloride (Cl)	2015/11/09	3.2		%	20
4263258	ADB	Matrix Spike	Dissolved Sulphate (SO4)	2015/11/09		71 (1)	%	75 - 125
4263258	ADB	Spiked Blank	Dissolved Sulphate (SO4)	2015/11/09		95	%	80 - 120
4263258	ADB	Method Blank	Dissolved Sulphate (SO4)	2015/11/09	ND, RDL=1.0		mg/L	
4263258	ADB	RPD	Dissolved Sulphate (SO4)	2015/11/09	0.039		%	20
4263259	ADB	Matrix Spike	Orthophosphate (P)	2015/11/09		115	%	75 - 125
4263259	ADB	Spiked Blank	Orthophosphate (P)	2015/11/09		101	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4263259	ADB	Method Blank	Orthophosphate (P)	2015/11/09	ND, RDL=0.010		mg/L	
4263259	ADB	RPD	Orthophosphate (P)	2015/11/09	NC		%	25
4266655	C_N	Matrix Spike	Total Ammonia-N	2015/11/12		100	%	80 - 120
4266655	C_N	Spiked Blank	Total Ammonia-N	2015/11/12		103	%	85 - 115
4266655	C_N	Method Blank	Total Ammonia-N	2015/11/12	ND, RDL=0.050		mg/L	
4266655	C_N	RPD	Total Ammonia-N	2015/11/12	0.36		%	20

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of the native sample concentration).

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

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Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B5M7356
Report Date: 2015/11/13

Ian D Wilson Associates Ltd
Client Project #: FOX STREET

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Brad Newman, Scientific Specialist

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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