

RADBOURNE SEVERANCE  
130 MAPLE RIDGE RD.  
STORMWATER  
MANAGEMENT REPORT

Prepared for:  
Cherilyn Radbourne, Blair Radbourne  
& Dennis Radbourne  
558 Punkinseed Lane  
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N0H 1S0

Prepared by:  
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519-795-7094

# RADBOURNE SERVERANCE – 130 MAPLE RIDGE RD.

GEORGIAN BLUFFS, ONTARIO

## STORMWATER MANAGEMENT REPORT

November 2021

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Nitrate Study prepared by Peto MacCallum dated September 13, 2021



## 1. INTRODUCTION

### 1.1 Background

Darryl M. Robins Consulting Inc. (DMRC) has been retained by the Radbourne family to prepare a Stormwater Management Report for the purpose of obtaining a severance of their property at 130 Maple Ridge Road, in Georgian Bluffs (subject property). The property is legally described as Part of Lot 17, Concession 2. The clients wish to sever the property into 4 parcels to establish 3 residential lots and a retained farm parcel. The residential development will be limited to the most easterly portion of the property. Please refer to the Site Plan (M20005-SP and the Location Plan (Figure No. 1) for the property and development limits.

### 1.2 Purpose of Report

The purpose of this report is to present a preliminary assessment of the subject development's ability to provide quantity and quality controls for stormwater management.

### 1.3 Lot Layout

An Natural Heritage Environmental Impact Study (EIS) was completed by AWS Environmental Consulting for the client in December 2020. The EIS identified that the building envelopes (including area of all structures, septic treatment area, access laneway & servicing corridors) shall not exceed 0.4ha and a minimum retained forest environment width of 15m between forest clearing / building envelope areas. Three (3) new lots are proposed on the south side of the central watercourse. The retained portion will provide access to the lands behind the new residential lots. The complete EIS is available on the CD.

## 2. EXISTING CONDITIONS

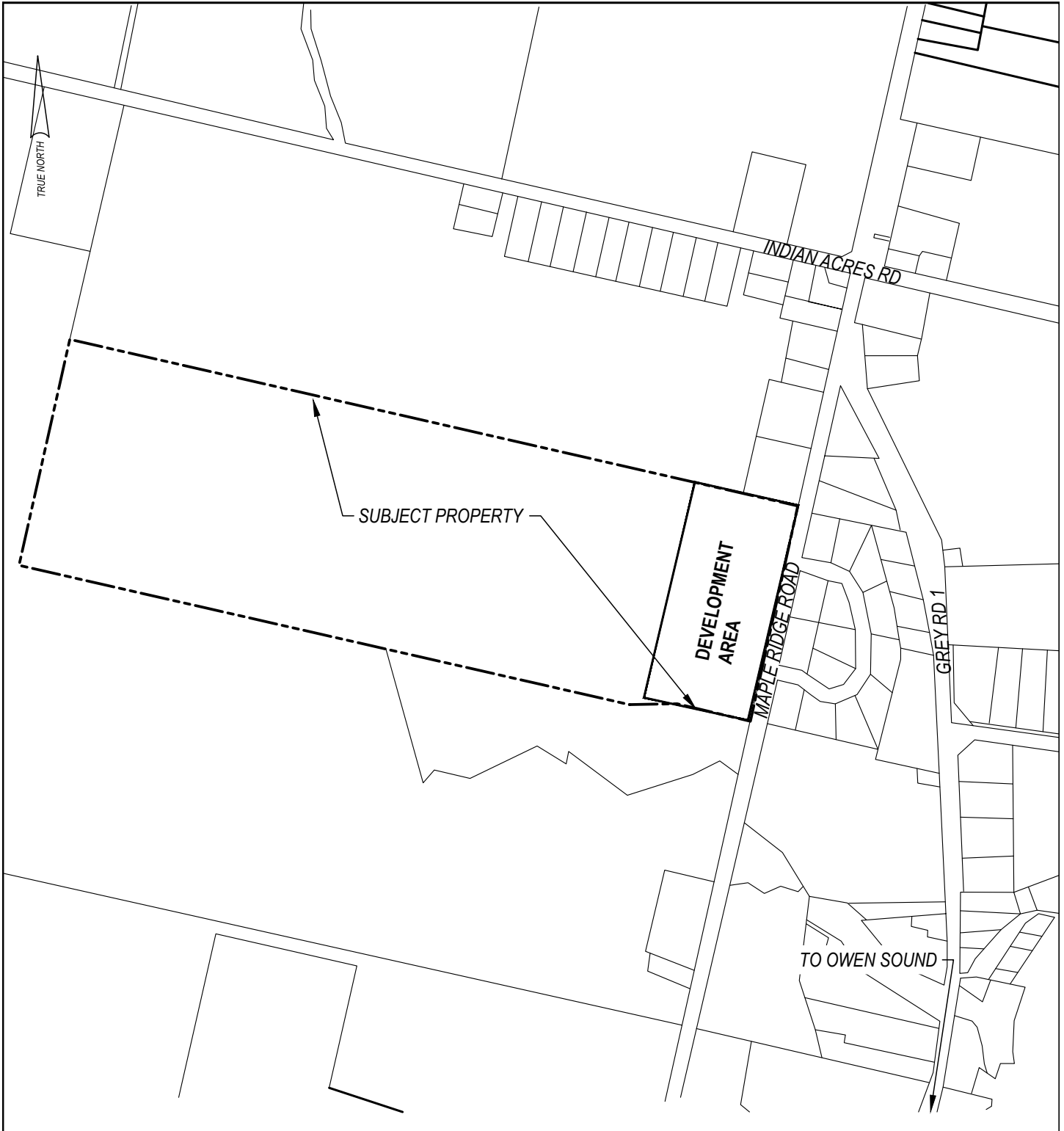
### 2.1 General

The subject property is located on the west side of Maple Ridge Road, in Georgian Bluffs. The existing property description is summarized below in Table 2.1 below:

**Table 2.1: Property Description**

| Legal Description            | Civic Address        | Area (Ha) | Existing Use  | Zoning     |
|------------------------------|----------------------|-----------|---------------|------------|
| Part of Lot 17, Concession 2 | 130 Maple Ridge Road | 31.25     | Farm and Bush | PD and NEC |

The property is bounded by properties zoned NEC to the west north and south. Some properties to the north are also zoned R1. The properties on the east side of Maple Ridge Road are zoned R1.



# **LOCATION PLAN** **130 MAPLE RIDGE DR.** **GEORGIAN BLUFFS, ON**

CLIENT:

CHERILYN & BLAIR RADBOURNE

**DARRYL M. ROBINS**  
**CONSULTING INC.**

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DESIGN:

L A S

DRAWN:

W K

CHECK:

L A S

DATE:

mm/dd/yy  
10/05/21

PROJECT No.:

M20005

SCALE:

1:7500

FIG:

1.0

The three (3) new residential lots are proposed in the area south of the central watercourse with the zoning designation of Plan Development (PD). For the purpose of this severance, it is assumed that the retained parcel will also be developed.

## 2.2 Topography

The topography of the property is variable with significant hills and valleys (ravines). Overall the property slopes from west to east with a slope of approximately 1%. There are areas with significant slopes of 2.5H:1V. The top of bank of the Indian Creek watercourse is located along the southern property line. There is a watercourse located in the centre of the property. An additional minor water course is located on the north side of the property. However, the overall slope of the development area is 3%.

## 2.3 Geology/Soils

The property is approximately 31.25 Ha. and as such, contains various soil types within the property.

The soils map entitled Soils of Grey County – North Sheet – Ontario (Soil Survey Report No. 17), Agriculture Canada, 1983; identifies that the development area is composed of “Osprey” (Ol) and “Breyden” (Bp) depending on the location. “Breyden” soil consists of 0-12 inches of soil mantle over limestone bedrock. Numerous outcroppings and large boulders. Drainage is considered to be variable. Topography and surface stoniness is described as: Nearly Level with numerous rock outcrops very stony.

“Osprey” soil consists of 4 inches of very dark brown loam; over 2 -4 inches of brown loam over 2 inches of brown clay over grey-brown stony calcareous till. Drainage is considered to be Good. Topography and surface stoniness is described as: Irregular moderately sloping to irregular steeply sloping. Very stony.

Other soil types identified on the subject property include “Toledo” (Tc) and “Warton” (Ws) but these soil types are not located within the development area.

A hydrogeological assessment has been prepared within the development area by Peto MacCallum. The results of investigation are included in Appendix A. Peto MacCallum described the soil as sandy silt or silt. Groundwater was noted at depth of 2.9m.

## 3. STORMWATER MANAGEMENT

### 3.1 Existing Drainage

The subject property falls from the west to the east with a slope of approximately 1%. The Indian Creek crosses through the western portion of the property. There is significant variability in the topography of the property depending on the location. Within the development area there are a couple valleys containing

watercourses. The majority of the development area drains towards the central water course. A portion of the side drains towards the Indian creek and a portion drains to the watercourse located on the north side of the property. Please refer to the Overall Topographic Mapping Figure No. 2, which shows the overall topography of the area.

## 3.2 Quality Controls

The Grey Sauble Conservation Authority (GSCA) has advised that the stormwater management report shall address quality controls. Typically, developments are required to provide 'Enhanced' level Quality Controls. The "enhanced" level of protection requires that the stormwater management facilities be designed to remove 80% of the total suspended solids (TSS) on a net annual basis.

### 3.2.1 Selection of Quality Treatment Facility

In selecting a suitable stormwater management facility for this project, we have reviewed the constraints for stormwater management facilities in conjunction with Table 4.1 – "Physical Constraints of SWMP Types" of the "MOE's Stormwater Management Planning & Design Manual". A summary is provided below (see Table 3.2.1).

**Table 3.2.1: Summary of SWMP Constraints**

| SWMP                | Constraint  | Requirement | Achieved |
|---------------------|-------------|-------------|----------|
| Reduced Lot Grading | Topography  | < 5%        | variable |
|                     | Soils       | > 15mm/hr   | N        |
|                     | Bedrock     | none        | Y        |
|                     | Groundwater | none        | Y        |
|                     | Area        | none        | Y        |
| Wet Pond            | Topography  | None        | Y        |
|                     | Soils       | None        | Y        |
|                     | Bedrock     | None        | Y        |
|                     | Groundwater | None        | Y        |
|                     | Area        | >5 ha       | Y        |
| Grassed Swale       | Topography  | < 5%        | Y        |
|                     | Soils       | none        | Y        |
|                     | Bedrock     | none        | Y        |
|                     | Groundwater | none        | Y        |
|                     | Area        | < 2 ha      | Y*       |
| Oil/ grit Separator | Topography  | None        | Y        |
|                     | Soils       | None        | Y        |
|                     | Bedrock     | None        | Y        |
|                     | Groundwater | None        | Y        |
|                     | Area        | < 2 ha      | Y        |



TOPOGRAPHIC DATA (CONTOURS AND LOT FABRIC OBTAINED FROM GREY COUNTY.

DRAINAGE AREA LIMITS WERE ESTABLISHED USING TOPOGRAPHIC DATA (5m CONTOURS), GOOGLE EARTH AND A SITE VISIT.

**OVERALL TOPOGRAPHIC  
MAPPING  
RADBOURNE DEVELOPMENT  
130 MAPLE RIDGE ROAD.  
GEORGIAN BLUFFS**

CLIENT: CHERILYN & BLAIR RADBOURNE  
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|        |                     |             |        |
|--------|---------------------|-------------|--------|
| DESIGN | L A S               | PROJECT No: | M20005 |
| DRAWN  | L A S               | SCALE:      | 1:1000 |
| CHECK  | L A S               | FIG:        |        |
| DATE   | mm/dd/yy<br>6/29/21 |             | 2.0    |

\*The development areas are less than 2 hectares.

There is not sufficient space to accommodate a stormwater management Pond. Grassed swales can provide capacity to provide the quantity controls. So the Grassed Swales appear to be the most suitable option to address quality controls.

### 3.3 Quantitative Controls

The Grey Sauble Conservation Authority has requested that a stormwater management report be prepared to address the stormwater quantity and quality concerns. Copies of the correspondence are located in Appendix B. Autodesk's Storm & Sanitary Analysis modeling software was used to model the pre-development and post-development conditions for the 2, 5, 10, 25, and 100 year design storms. The SCS was the Hydrology method used in the storm modeling and a six (6) hour storm was run using rainfall data for Owen Sound from the Ministry of Transportation's IDF Curve Look-up website. Please refer to the storm data and the modelling input parameters in Appendix B.

MTO Design Chart 1.02 – "Spatial Extent of Zones for Application of Regional Storms" identifies that the Timmins OR the 100-year storm is to be considered for the Regional Storm. As such, it is understood that the review of the 100-year storm will be sufficient. A copy of MTO Design Chart 1.02 is enclosed in Appendix B for easy reference.

#### 3.3.1 Pre-Development Flows

The drainage patterns of the subject property were reviewed and the "CN" values were calculated for the drainage areas. The property appears to have 2 catchment areas. The Time of Concentration (Tc) was calculated using the Bransby-Williams Formula. Please refer to Figure 3 which identifies the pre-development areas. The outlet in the stormwater model is the downstream culvert crossing Maple Ridge Road.

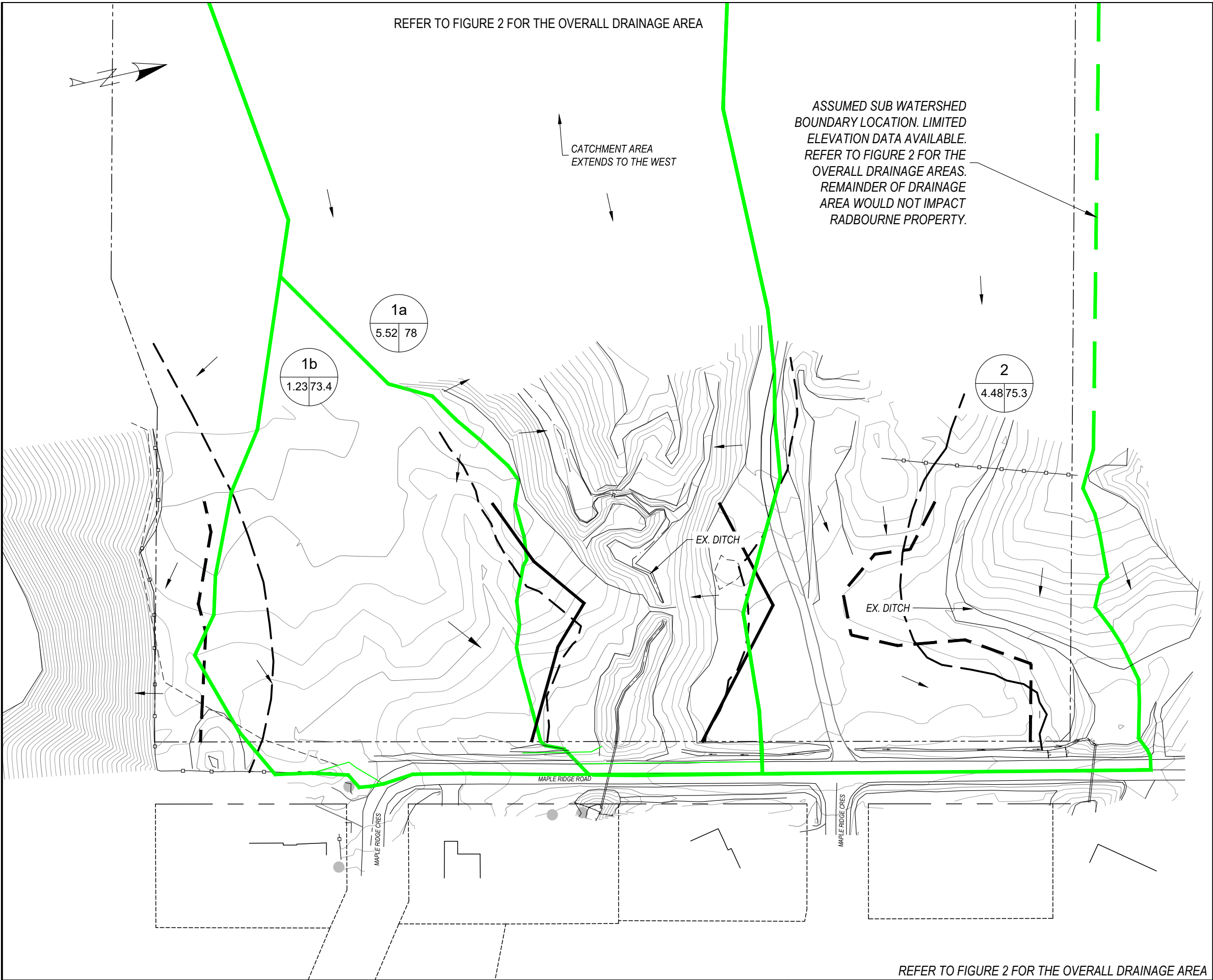
A summary of pre-development flows is provided below in Table 3.3.1. Please refer to the calculations and modelling results included in Appendix C.

Table 3.3.1: Pre-development Flows

| Area   | Storm Event (Design Flow - L/s) |        |        |        |        |
|--------|---------------------------------|--------|--------|--------|--------|
|        | 2                               | 5      | 10     | 25     | 100    |
| 1      | 46.79                           | 125.98 | 191.27 | 284.1  | 436.3  |
| 2      | 22.19                           | 59.11  | 95.40  | 148.62 | 241.32 |
| Outlet | 64.99                           | 179.39 | 281.79 | 431.18 | 674.07 |

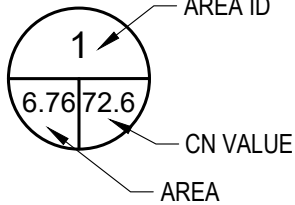
It is noted that the 450mm dia. culvert crossing Maple Ridge Road and conveys flows from the central watercourse surcharges in the 100 Year design storm. Typically, culverts are only sized to handle the 25 year storm, so this would be considered acceptable.

P:\2020\20005 - Radbourne 130 Maple Ridge Road\Drawings\20005-NOV-15-21.DWG  
Nov 17, 2021 - 8:28am



LEGEND

- EX. PROPERTY BOUNDARY
- STORM CATCHMENT BOUNDARY
- BUILDING ENVELOPE
- ROAD CENTRE LINE
- EDGE OF STREET / DRIVEWAY
- EX. CONTOUR LINE
- EX. TREE LINE
- HAZARD SETBACK LINE (PER GSCA)
- SETBACK PER EIS
- FLOW ARROW



TOPOGRAPHICAL SURVEY COMPLETED BY SMC GEOMATICS ON MAY 4-5, 2021. ADDITIONAL TOPOGRAPHIC DETAIL FROM GREY COUNTY. LIMITED TOPOGRAPHIC DATA AVAILABLE OUTSIDE DEVELOPABLE AREA.

**PRE DEVELOPMENT PLAN  
130 MAPLE RIDGE DR.  
GEORGIAN BLUFFS, ON**

CLIENT: CHERILYN & BLAIR RADBOURNE  
**DARRYL M. ROBINS  
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|         |                      |              |        |
|---------|----------------------|--------------|--------|
| DESIGN: | L A S                | PROJECT No.: | M20005 |
| DRAWN:  | W K                  | SCALE:       | 1:1250 |
| CHECK:  | L A S                | FIG:         |        |
| DATE:   | mm/dd/yy<br>07/06/21 |              | 3      |

### 3.3.2 Proposed Stormwater Works

The property will be severed into four (4) parcels. Three (3) residential lots are proposed on the south side of the property subject property and one (1) parcel is to be retained for farming purposes. It is assumed that retained parcel for farming may also be developed with a dwelling. The proposed house design (size) and driveway configuration for the new lots are unknown at this time. It was assumed for the purposes of this assessment that the proposed houses/ structures would be approximately 3,227 square feet (300 square meters) and the surface area of the driveway would be approximately 110 to 190 square meters. Please refer to the Post Development Plan (Figure 4). It was assumed that the driveways would be asphalt or another impervious surface type.

It is proposed that the new lots will drain towards the existing Maple Ridge Road allowance. A minimum of 0.75m wide grassed swale is proposed within the Maple Ridge Road allowance provide quantity and quality controls. The design for grassed swale was established to comply with grassed swales design criteria in the Ministry of the Environment's Stormwater Management Planning and Design Manual dated March 2003. The guidelines identify a minimum bottom width is 0.75m with a maximum of 2.5H to 1V side slopes. Based on the existing contours it appears that there is a poorly defined watercourse or that some overland flow may occur towards the east across lot 3. It is proposed to install a grassed swale between lots 2 and 3 to redirect the surface water along the property line and not across the development area. The ultimate outlet would remain the same.

Please refer to the Grading Plan (GP1) which identifies a grassed swale with a 0.75m – 1m base width on Maple Ridge road along lots 1 to 3. Please refer to the Grading Plan (GP2) for the grassed swale with a 1m wide base width which is also proposed on Maple Ridge Road along lot 4.

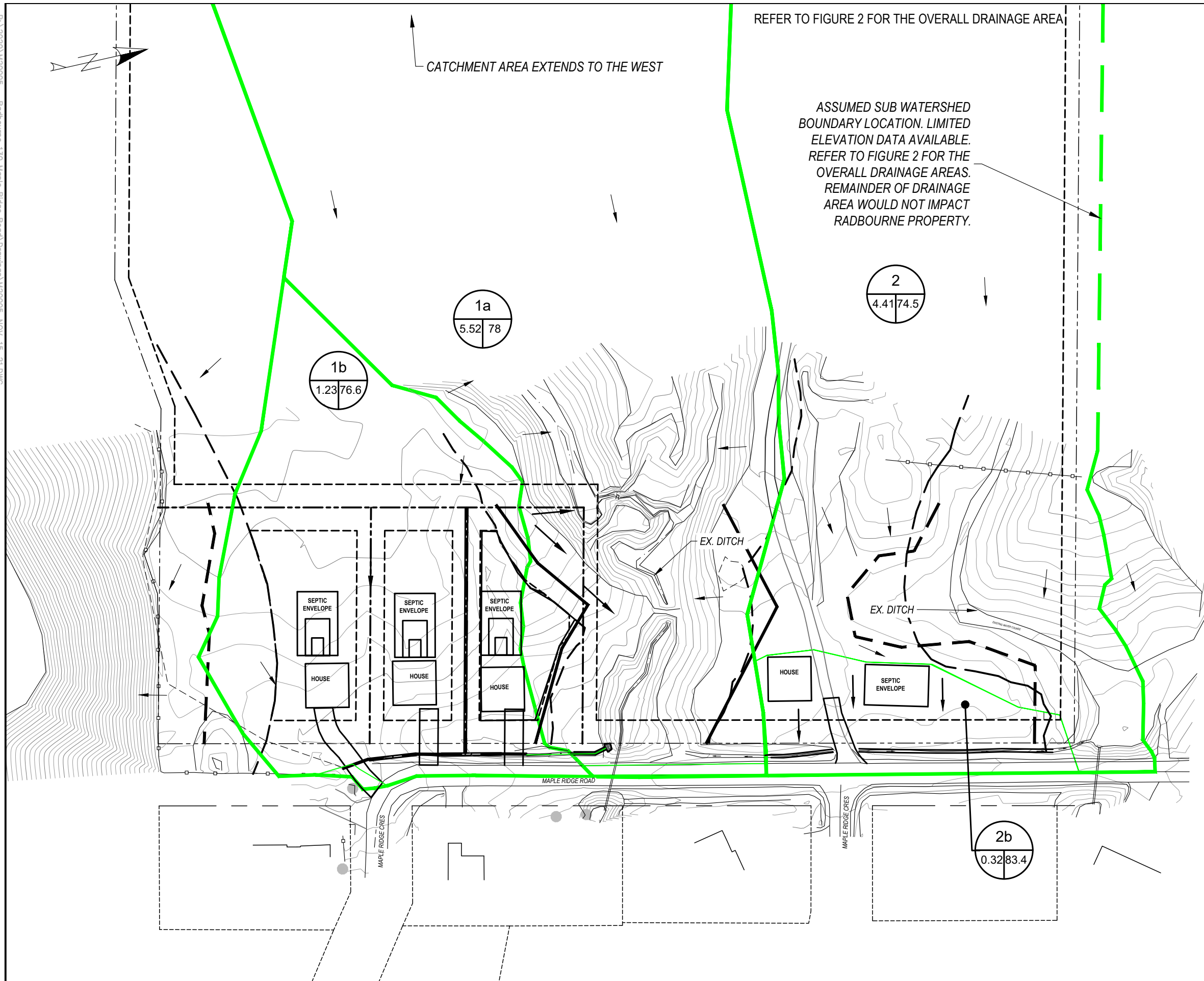
### 3.3.3 Post-Development Flows

The development was divided into sub-catchment areas with varying run-off coefficients 74.5 – 83.4. The Time of Concentration (Tc) was calculated using the Bransby-Williams Formula for each sub-catchment area. Please refer to the Post-Development Area Plan (Fig. 4) which identifies the post-development areas and the respective run-off coefficients. Please refer to the calculations and modelling results in Appendix B.

A summary of the Post-Development Flows for each design storm is provided in Table 3.3.3.

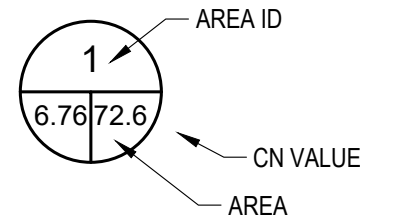


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Nov 17, 2021 - 8:56am



#### LEGEND

- EX. PROPERTY BOUNDARY
- STORM CATCHMENT BOUNDARY
- BUILDING ENVELOPE
- ROAD CENTRE LINE
- EDGE OF STREET / DRIVEWAY
- EX. CONTOUR LINE
- EX. TREE LINE
- HAZARD SETBACK LINE (PER GSCA)
- SETBACK PER EIS
- FLOW ARROW



TOPOGRAPHICAL SURVEY COMPLETED BY SMC GEOMATICS ON MAY 4-5, 2021. ADDITIONAL TOPOGRAPHIC DETAIL FROM GREY COUNTY. LIMITED TOPOGRAPHIC DATA AVAILABLE OUTSIDE DEVELOPABLE AREA.

HOUSE SIZE SHOWN IS 200m<sup>2</sup> FOR PRELIMINARY SEWAGE FOOTPRINT. IMPERMEABLE AREA USED IN STORMWATER CALCULATIONS WAS 300m<sup>2</sup>.

#### POST DEVELOPMENT PLAN 130 MAPLE RIDGE DR. GEORGIAN BLUFFS, ON

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|         |                      |              |        |
|---------|----------------------|--------------|--------|
| DESIGN: | L A S                | PROJECT No.: | M20005 |
| DRAWN:  | W K                  | SCALE:       | 1:1250 |
| CHECK:  | L A S                | FIG:         |        |
| DATE:   | mm/dd/yy<br>07/06/21 |              | 4      |

**Table 3.3.3: Post-development Peak Flow**

| Area   | Storm Event (Design Flow - L/s) |        |        |        |        |
|--------|---------------------------------|--------|--------|--------|--------|
|        | 2                               | 5      | 10     | 25     | 100    |
| 1      | 40.36                           | 108.44 | 189.78 | 282.77 | 440.62 |
| 2      | 14.20                           | 50.90  | 85.36  | 137.05 | 225.82 |
| System | 52.89                           | 157.61 | 274.71 | 418.9  | 665.94 |

Overall, the post-development flows have been controlled to the pre-development levels using the grassed swales in the 2, 5, 25, 10 25 and the 100 Year design storm. Area 1's outlet post-development flow slightly exceeds the pre-development flow in the 100 Year design storm. Post development flow for area 1 is controlled for all the other storms noted above. There are some limitations to the controls due to the topography of the site. The outlet in the storm model was the downstream size of the culvert. The EIS identified that the central watercourse with fish habitat so we would like to minimize disturbance to this area. We considered increasing the base width of the grassed swale along lots 1 to 3 to 1m reduce the flow. But it appears that the flows through this property are significant, so it did not make an impact in further reducing the flows. Area 1 post development flow is 4.33 L/s higher than the pre-development flow which is not significant; it is less than 1% higher. Ultimately, we would consider the flows being controlled to pre-development levels.

In the 100 Year design storm the last section of the swale which discharges to the central watercourse is approximately 64% full. There is at least 0.5m clearance before the water would overtop the road at this location. The culvert crossing Maple Ridge Road which conveys the central watercourse is still surcharging in the 100 Year design storm. It was surcharging in the Pre-Development Condition and culverts are typically sized for the 25 Year design storm so this is acceptable. The last section of the swale fronting Lot 4 is approximately at 28% full in for the 100-year design storm. There is at least 0.4m clearance before the stormwater would overtop the road at this location in the 100-year storm.

#### **4.0 SEDIMENT AND EROSION CONTROL**

Precautions should be taken to ensure that erosion and sediment transport is controlled during the construction phases and until final landscaping covers have matured. The recommendations are as follows:

1. Temporary silt fence should be installed along the most down-gradient edge of any disturbed area on-site and maintained until the affected area has received final surfacing treatment and/or new vegetation has matured; and
2. Temporary straw bale check dams may be implemented where determined necessary during construction.

The measures above should be maintained until the proposed site surfacing is completed and vegetation has matured as applicable.

## 7.0 MAINTENANCE

The proposed grassed swale must be maintained by the Township. The Township should inspect the grass swale each spring and fall and after any major storm events. Accumulated sediment in the swale should be removed.

## 8.0 CONCLUSIONS

Based on the findings of this report, the following conclusions are made:

1. Stormwater management measures to address runoff quantity and quality concerns can be addressed successfully for the site. However, depending on the final building options (size and location of the dwelling) other design options could be considered.

## 9.0 RECOMMENDATIONS

It is recommended that the approval authorities support this development.

## 10.0 REFERENCES

The following documents were referenced in the preparation of the drainage study:

- MOE's Stormwater Management Planning & Design Manual (2003); and
- Soils of Grey County – North Sheet – Ontario (Soil Survey Report No. 17), Agriculture Canada, 1983.

Respectfully submitted by,

**DARRYL M. ROBINS CONSULTING INC.**

Laura Swanson, P. Eng.  
Vice-President  
Civil-Environmental Engineer



## Appendix A

### Peto MacCallum Ltd's Test Pit Logs

## LOG OF TEST PIT NO. 1

1 of 1

**PROJECT** Nitrate Study

**LOCATION** 130 Maple Ridge Road

**EXCAVATION METHOD** Rubber Track Excavator

**BORING DATE** July 28, 2021

**PML REF.** 21CX007

**ENGINEER** GW

**TECHNICIAN** NT

| SOIL PROFILE              |  |            | SAMPLES |      |            | SHEAR STRENGTH (kPa) |              |           |      | PLASTIC LIMIT         |     |   | NATURAL MOISTURE CONTENT |   |                | LIQUID LIMIT   |   |                | UNIT WEIGHT<br>kN/m <sup>3</sup> | GROUND WATER<br>OBSERVATIONS<br>AND REMARKS |
|---------------------------|--|------------|---------|------|------------|----------------------|--------------|-----------|------|-----------------------|-----|---|--------------------------|---|----------------|----------------|---|----------------|----------------------------------|---|
| DEPTH<br>ELEV<br>(metres) | DESCRIPTION  | STRAT PLOT | NUMBER  | TYPE | "N" VALUES | ELEVATION SCALE      | + FIELD VANE | △ TORVANE | ○ Qu | △ POCKET PENETROMETER | ○ Q | × | W <sub>p</sub>           | W | W <sub>L</sub> | W <sub>p</sub> | W | W <sub>L</sub> |                                  |   |
| 0.0                       | SURFACE ELEVATION 204.30   |            |         |      |            |                      |              |           |      |                       |     |   |                          |   |                |                |   |                |                                  |   |
| 0.70                      | TOPSOIL: Dark brown, silty sand/sandy silt, trace organics, moist  |            |         |      |            | 204                  |              |           |      |                       |     |   |                          |   |                |                |   |                |                                  |   |
| 203.60                    | SANDY SILT: Loose, brown to light brown, sandy silt, trace organics, trace gravel, trace clay, clay pockets, very moist to wet |            |         |      |            | 203                  |              |           |      |                       |     |   |                          |   |                |                |   |                |                                  |   |
| 1.0                       |  |            |         |      |            |                      |              |           |      |                       |     |   |                          |   |                |                |   |                |                                  |   |
| 2.0                       |  |            |         |      |            | 202                  |              |           |      |                       |     |   |                          |   |                |                |   |                |                                  |   |
| 3.0                       |  |            | 1       | GS   |            |                      |              |           |      |                       |     |   |                          |   |                |                |   |                |                                  |   |
| 3.0                       | TEST PIT TERMINATED AT 3.0 m   |            |         |      |            |                      |              |           |      |                       |     |   |                          |   |                |                |   |                |                                  |   |
| 201.3                     |  |            |         |      |            |                      |              |           |      |                       |     |   |                          |   |                |                |   |                |                                  |   |
| 4.0                       |  |            |         |      |            |                      |              |           |      |                       |     |   |                          |   |                |                |   |                |                                  |   |
| 5.0                       |  |            |         |      |            |                      |              |           |      |                       |     |   |                          |   |                |                |   |                |                                  |   |

19 mm slotted pipe

Upon completion of excavating:  
No sloughing  
Water at 2.9 m  
Water Level Readings:  
Date      Depth(m)      Elev.  
2021-08-11      1.4      202.9

**NOTES**



## LOG OF TEST PIT NO. 2

17T 504027E 4941003N

1 of 1

**PROJECT** Nitrate Study

**LOCATION** 130 Maple Ridge Road

**EXCAVATION METHOD** Rubber Track Excavator

**BORING DATE** July 28, 2021

**PML REF.** 21CX007

**ENGINEER** GW

**TECHNICIAN** NT

| SOIL PROFILE              |   |            | SAMPLES |      |            | SHEAR STRENGTH (kPa)                               |     |     |     | PLASTIC NATURAL LIQUID |                  |                | UNIT WEIGHT | GROUND WATER OBSERVATIONS AND REMARKS |                   |
|---------------------------|---|------------|---------|------|------------|--|-----|-----|-----|------------------------|------------------|----------------|-------------|---------------------------------------|-------------------|
| DEPTH<br>ELEV<br>(metres) | DESCRIPTION   | STRAT PLOT | NUMBER  | TYPE | "N" VALUES | + FIELD VANE    Δ TORVANE    ○ Qu                  |     |     |     | LIMIT                  | MOISTURE CONTENT | LIMIT          |             |                                       |                   |
|                           |   |            |         |      |            | ▲ POCKET PENETROMETER    ○ Q                       |     |     |     |                        |                  |                |             |                                       |                   |
|                           |   |            |         |      |            | DYNAMIC CONE PENETRATION STANDARD PENETRATION TEST |     |     |     |                        |                  |                |             |                                       | WATER CONTENT (%) |
|                           |   |            |         |      |            | 50   | 100 | 150 | 200 | W <sub>p</sub>         | W                | W <sub>L</sub> |             |                                       |                   |
|                           |   |            |         |      |            | 20   | 40  | 60  | 80  |                        | 10               | 20             | 30          | 40                                    |                   |
| 0.0                       | SURFACE ELEVATION 201.20  |            |         |      |            |  |     |     |     |                        |                  |                |             |                                       |                   |
| 0.20                      | TOPSOIL: Dark brown, silty sand/sandy silt, trace organics, moist                 |            |         |      |            | 201  |     |     |     |                        |                  |                |             |                                       |                   |
| 201.00                    | SANDY SILT: Loose, brown, sandy silt, trace clay, trace gravel, very moist to wet |            |         |      |            |  |     |     |     |                        |                  |                |             |                                       |                   |
|                           |   |            |         |      |            |  |     |     |     |                        |                  |                |             |                                       |                   |
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|                           |   |            |         |      |            |  |     |     |     |                        |                  |                |             |                                       |                   |
|                           |   |            |         |      |            |  |     |     |     |                        |                  |                |             |                                       |                   |
|                           |   |            |         |      |            |  |     |     |     |                        |                  |                |             |                                       |                   |
|                           |   |            |         |      |            |  |     |     |     |                        |                  |                |             |                                       |                   |
|                           |   |            |         |      |            |  |     |     |     |                        |                  |                |             |                                       |                   |
|                           |   |            |         |      |            |  |     |     |     |                        |                  |                |             |                                       |                   |
|                           |   |            |         |      |            |  |     |     |     |                        |                  |                |             |                                       |                   |
|                           |   |            |         |      |            |  |     |     |     |                        |                  |                |             |                                       |                   |
|                           |   |            |         |      |            |  |     |     |     |                        |                  |                |             |                                       |                   |
|                           |   |            |         |      |            |  |     |     |     |                        |                  |                |             |                                       |                   |
|                           |   |            |         |      |            |  |     |     |     |                        |                  |                |             |                                       |                   |
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|                           |   |            | </      |      |            |  |     |     |     |                        |                  |                |             |                                       |                   |

19 mm slotted pipe

Upon completion of excavating:  
No sloughing  
Water at 2.9 m  
Water Level Readings:  
Date      Depth(m)      Elev.  
2021-08-11      0.7      200.5

**NOTES**

## LOG OF TEST PIT NO. 3

17T 504030E 4941032N

1 of 1

**PROJECT** Nitrate Study

**LOCATION** 130 Maple Ridge Road

**EXCAVATION METHOD** Rubber Track Excavator

**BORING DATE** July 28, 2021

**PML REF.** 21CX007

**ENGINEER** GW

**TECHNICIAN** NT

| SOIL PROFILE              |   |            | SAMPLES |      |            | SHEAR STRENGTH (kPa) |  |     |     | PLASTIC NATURAL LIQUID |                         |                          |                         | UNIT WEIGHT<br>kN/m <sup>3</sup> | GROUND WATER<br>OBSERVATIONS<br>AND REMARKS |
|---------------------------|---|------------|---------|------|------------|----------------------|--|-----|-----|------------------------|-------------------------|--------------------------|-------------------------|----------------------------------|---|
| DEPTH<br>ELEV<br>(metres) | DESCRIPTION   | STRAT PLOT | NUMBER  | TYPE | "N" VALUES | ELEVATION SCALE      | + FIELD VANE   Δ TORVANE   ○ Qu<br>▲ POCKET PENETROMETER   ○ Q |     |     |                        | LIMIT<br>W <sub>p</sub> | MOISTURE<br>CONTENT<br>W | LIMIT<br>W <sub>L</sub> |                                  |   |
|                           |   |            |         |      |            |                      | DYNAMIC CONE PENETRATION<br>STANDARD PENETRATION TEST   ×   ●  |     |     |                        |                         |                          |                         |                                  |   |
|                           |   |            |         |      |            |                      | 50   | 100 | 150 | 200                    |                         |                          |                         |                                  |   |
| 0.0                       | SURFACE ELEVATION 199.00  |            |         |      |            |                      | 20   | 40  | 60  | 80                     |                         | 10                       | 20                      | 30                               | 40  |
| 0.40                      | TOPSOIL: Dark brown, silty sand/sandy silt, trace organics, moist         |            |         |      |            |                      |  |     |     |                        |                         |                          |                         |                                  |   |
| 198.60                    | SILT: Loose, brown, silt, some sand, trace clay, trace gravel, very moist |            |         |      |            |                      |  |     |     |                        |                         |                          |                         |                                  |   |
| 1.0                       |   |            |         |      |            | 198                  |  |     |     |                        |                         |                          |                         |                                  |   |
| 2.0                       |   |            |         |      |            | 197                  |  |     |     |                        |                         |                          |                         |                                  |   |
|                           |   |            | 1       | GS   |            |                      |  |     |     |                        |                         |                          |                         |                                  |   |
| 3.0                       | TEST PIT TERMINATED AT 3.0 m  |            |         |      |            | 196                  |  |     |     |                        |                         |                          |                         |                                  |   |
| 196.0                     |   |            |         |      |            |                      |  |     |     |                        |                         |                          |                         |                                  |   |
| 4.0                       |   |            |         |      |            |                      |  |     |     |                        |                         |                          |                         |                                  |   |
| 5.0                       |   |            |         |      |            |                      |  |     |     |                        |                         |                          |                         |                                  |   |

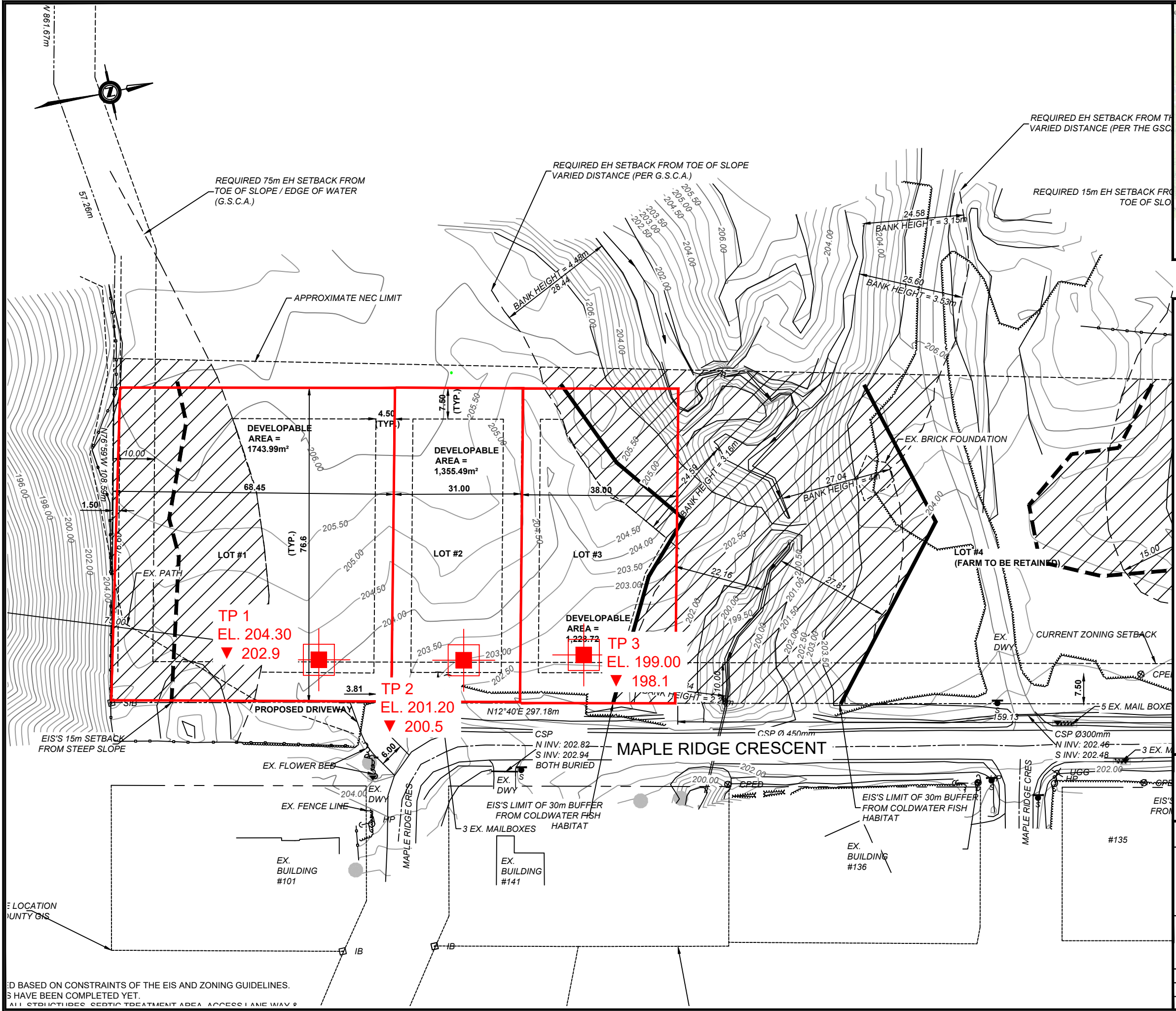
19 mm slotted pipe

Upon completion of excavating:  
No sloughing  
Water at 2.9 m  
Water Level Readings:  
Date      Depth(m)      Elev.  
2021-08-11      0.9      198.1

19 mm slotted pipe

Upon completion of excavating:  
No sloughing  
Water at 2.9 m  
Water Level Readings:  
Date      Depth(m)      Elev.  
2021-08-11      0.9      198.1

**NOTES**



KEY PLAN  
GEORGIAN BLUFFS, OWEN SOUND

**LEGEND:**

- PROPOSED LOT LIMITS
- TP 1 EL. 204.30
- EL. 202.9
- TEST PIT 1 LOCATION
- GROUND SURFACE ELEVATION
- GROUND WATER ELEVATION

**REFERENCE:**  
PLAN PROVIDED BY THE CLIENT.

0m 10 20 30 40 50  
SCALE

TEST PIT LOCATION PLAN

NITRATE STUDY  
130 MAPLE RIDGE ROAD  
TOWNSHIP OF GEORGIAN BLUFFS, ONTARIO

**PML Peto MacCallum Ltd.**  
CONSULTING ENGINEERS

|          |    |           |          |          |             |
|----------|----|-----------|----------|----------|-------------|
| DRAWN    | AK | DATE      | SCALE    | PML REF. | DRAWING NO. |
| CHECKED  | GW | SEPT 2021 | AS SHOWN | 21CX007  | 1           |
| APPROVED | GW |           |          |          |             |

ED BASED ON CONSTRAINTS OF THE EIS AND ZONING GUIDELINES.  
S HAVE BEEN COMPLETED YET.  
ALL STRUCTURES, SEPTIC TREATMENT AREA, ACCESS LANE, WAY &



Appendix B  
GSCA Correspondence



237897 Inglis Falls Road, R.R.#4, Owen Sound, ON N4K 5N6  
Telephone: 519.376.3076 Fax: 519.371.0437  
[www.greysauble.on.ca](http://www.greysauble.on.ca)

November 22, 2019

Cherilyn Anne Radbourne & Blair Edward Radbourne  
558 Punkinseed Lane  
Kemble, ON  
N0H 1S0

Dear Cherilyn and Blair,

**RE: Potential Severances for Residential Development  
Part of Lot 17, Concession 2  
130 Maple Ridge Road; Roll No. 42-03-580-003-00  
Township of Georgian Bluffs, former Sarawak Township  
Our File: P19467**

Grey Sauble Conservation Authority (GSCA) has reviewed the subject property at your request to consider potential severance applications to create three new lots for residential development purposes and leaving one retained lot. GSCA has conducted this preliminary review in accordance with our mandate and policies for natural hazards, for natural heritage concerns under the Planning Act, and relative to our policies for the implementation of Ontario Regulation 151/06. We offer the following comments.

#### **Site Description**

The property is located on the west side of Maple Ridge Road, approximately 180 metres south of Grey Road 1, in the Township of Georgian Bluffs, former Sarawak Township. The property is approximately 31 hectares (77 acres) in area and is currently vacant. Historically the property featured structures, which were recently demolished. Portions of the property are utilized for agricultural purposes with naturalized areas featuring woodlands, watercourses and valleys. Given the size of the property and the conceptual proposal, GSCA's site inspection was limited to the eastern portion of the property within the area subject to municipal zoning. We note, a large portion of the property falls within Niagara Escarpment Development Control. The eastern portion of the property features two minor valley systems that convey watercourses easterly to their outlet at Georgian Bay. A large valley feature associated with Indian Creek is adjacent to the south of the property. The south east woodland is comprised largely of upland deciduous trees with an understory consisting of ostrich fern and sensitive fern. The north eastern woodland features some mixed tree species and is more evident of historical site disturbance as a result of previously existing development and anthropogenic activities on the property.

#### **GSCA Regulations**

Portions of the property are regulated under Ontario Regulation 151/06: Regulation of Development, Interference with Wetlands & Alteration to Shorelines & Watercourses. The regulated areas within the eastern portion of the property include the meander belt and valley lands of two unnamed watercourses, and the valley of Indian Creek.

1 of 4



#### **Watershed Municipalities**

Arran-Elderslie, Chatsworth, Georgian Bluffs, Grey Highlands  
Meaford, Owen Sound, South Bruce Peninsula, Blue Mountains

Under this regulation a permit is required from this office prior to the construction, reconstruction, erection or placing of a building or structure of any kind; any change to a building or structure that would have the effect of altering the use or potential use of the building or structures, increasing the size of the building or structure, or increasing the number of dwelling units in the building or structure; site grading; or, the temporary or permanent placing, dumping or removal of any material originating on the site or elsewhere, if occurring within the regulated area. Also, a permit is required for interference with a wetland, and/or the straightening, changing, diverting or in any way interfering with an existing channel of a river, lake, creek stream or watercourse.

The regulated areas are shown on the attached map. Please note, if there is a conflict between the description of the areas regulated and the map, the description of regulated areas prevails.

## **Provincial Policy Statement**

### **3.1 Natural Hazards**

Flood and erosion hazards on the eastern portion of the property are associated with the minor valley systems and the valley of Indian Creek.

*3.1.1. Development shall generally be directed to areas outside of:*

- b) hazardous lands adjacent to river, stream and small inland lake systems which are impacted by flooding hazards and/or erosion hazards.*

The extent of the slope hazard associated with the steep valley wall of Indian Creek includes an assumed stable slope line measured at 3 horizontal units to 1 vertical unit (3:1) applied from the toe of the slope to a point of intersection with the earth's surface. Where a watercourse is located at the toe of the slope an additional 15 metres is applied for toe erosion. Based on the newly acquired 0.5 metre LiDAR contours and additional review in 3D stereo pairs and 5 metre contours, we estimate the height of the valley slope to be 20 metres. As such, the 3:1 plus 15 metre toe erosion allowance is considered to be 75 metres applied from the toe of the slope. Any reduction in this allowance is to be supported with by a geotechnical study completed by a qualified professional engineer with the appropriate consideration for a factor of safety.

The height of the valley associated with the central watercourse feature was found to be in the range of 3.5 – 4 metres depending on the location with evidence of minor erosion occurring. The hazard area was mapped in accordance with the same criteria noted in the previous paragraph (3:1 plus 15 metre). Further assessment by an engineer is required to consider any reductions in the hazard allowance.

The northerly watercourse does not feature a well-defined valley within the area subject to municipal zoning. As such, a minimum 15 metre allowance was applied from the watercourse for flood and erosion concerns.

The attached map shows the revised hazard mapping for the subject property. These areas are recommended to be included in the Township Comprehensive Zoning By-law as Environmental Protection.

### **2.1 Natural Heritage**

Natural heritage features identified on the subject property include significant woodland as mapped in the County of Grey Official Plan, potential for significant wildlife habitat, indirect fish habitat associated with the unnamed watercourses, potential for habitat of endangered species and threatened species,

adjacent lands to the natural heritage features, including fish habitat associated with Indian Creek. The following policies are relevant:

*2.1.5 Development and site alteration shall not be permitted in:*

- b) significant woodlands in Ecoregions 6E and 7E (excluding islands in Lake Huron and the St. Marys River);*
- d) significant wildlife habitat;*

*2.1.6 Development and site alteration shall not be permitted in fish habitat except in accordance with provincial and federal requirements.*

*2.1.7 Development and site alteration shall not be permitted in habitat of endangered species and threatened species, except in accordance with provincial and federal requirements.*

*2.1.8 Development and site alteration shall not be permitted on adjacent lands to the natural heritage features and areas identified in policies 2.1.4, 2.1.5, and 2.1.6 unless the ecological function of the adjacent lands has been evaluated and it has been demonstrated that there will be no negative impacts on the natural features or on their ecological functions.*

Given the above policies and GSCA's review of the property, a satisfactory Environmental Impact Study (EIS) is warranted as part of any severance application submitted for the property. We recommend your chosen consultant contact our office to establish a terms of reference prior to commencing any study work.

### **Stormwater Management**

Surface drainage within the eastern portion of the property appears to be largely directed to the smaller valley features and watercourses, which flow easterly towards their outlet in Georgian Bay. As the area being considered for the severances features woodlands and pervious surfaces, the proposed severances have the potential to increase peak flows leaving the site, which may impact downstream areas. We recommend any consent proposal include a stormwater management report completed by a qualified engineer to address stormwater quantity and quality concerns. Part of this report is to include a topography survey outlining the proposed lots with limits of proposed development.

### **Additional Comments & Recommendations**

From GSCA's perspective, the following studies/technical information is to be competed for consideration of the formal consent applications:


1. Environmental Impact Study completed by a qualified professional. We recommend a terms of reference be established prior to commencing any study work.
2. Stormwater Management Report completed by a qualified engineer. The report is to demonstrate how the proposal addresses stormwater quantity and quality concerns.
3. Topographic plan for the proposed lots and development areas

We recommend consulting with the Township of Georgian Bluffs, Grey County, and the Niagara Escarpment Commission to determine any other requirements for the proposal.

We note, the delineation of the regulated and hazard areas on the attached map may be subject to change pending the outcome of the topographic survey. GSCA reserves the right to request more information and/or clarification of the proposal as more details are presented. These comments are considered preliminary at this time and for pre-consultation purposes only.

If any questions should arise, please contact the undersigned.

Sincerely,



Mac Plewes  
Watershed Planner







Enclosure

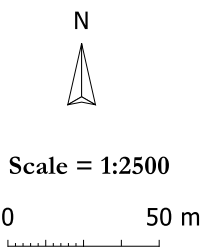
cc via email: Mr. Dwight Burley, GSCA Director, Township of Georgian Bluffs  
Ms. Sue Carleton, GSCA Director, Township of Georgian Bluffs  
Mr. Rick Winters, CAO/Director of Operations, Township of Georgian Bluffs  
Mr. Brandon Henderson, Senior Planner, Niagara Escarpment Commission  
Planning & Building Departments, Township of Georgian Bluffs  
Planning Department, County of Grey  
Mr. Dennis Radbourne



# GSCA: Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses (Ontario Regulation 151/06)



-  ON Parcels (Approx.)
-  Subject Property (Approx.)
-  Area Subject to Zoning & Proposed Lots (Approx.)
-  ON Regulation 151/06
-  Natural Hazard Area
-  GSC Streams



GSCA Map  
130 Maple Ridge Road  
Roll No. 42-03-580-003-033-00  
Township of Georgian Bluffs (Sarawak)  
Our File: P19467

Friday, November 22, 2019

The included mapping has been compiled from various sources and is for information purposes only. Grey Sauble Conservation is not responsible for, and cannot guarantee, the accuracy of all the information contained within the map. Regulation lines were created by Grey Sauble Conservation (GSC) using 1 metre contours interpolated from the Provincial (10 metre) Digital Elevation Model Version 1 & 2 & 1:10000 scale mapping.

By accepting this map you agree not to edit the map or disclaimer without the exclusive written permission of Grey Sauble Conservation. You also acknowledge that the information on this map is relevant only to the subject property and may be subject to change.

Produced by GSC with Data supplied under Licence by Members of Ontario Geospatial Data Exchange.

© Queen's Printer for Ontario and its licensors. [2014] May Not be Reproduced without Permission. THIS IS NOT A PLAN OF SURVEY

This mapping contains products of the South Western Ontario Orthophotography Project (SWOOP). These images were taken in 2015 at 20cm resolution. They are the property of Grey Sauble Conservation © 2019



## Appendix C

### Stormwater Management Calculations & Modelling



## Active coordinate

44° 36' 15" N, 80° 57' 14" W (44.604167,-80.954167)

Retrieved: Mon, 28 Jun 2021 17:25:30 GMT



### Location summary

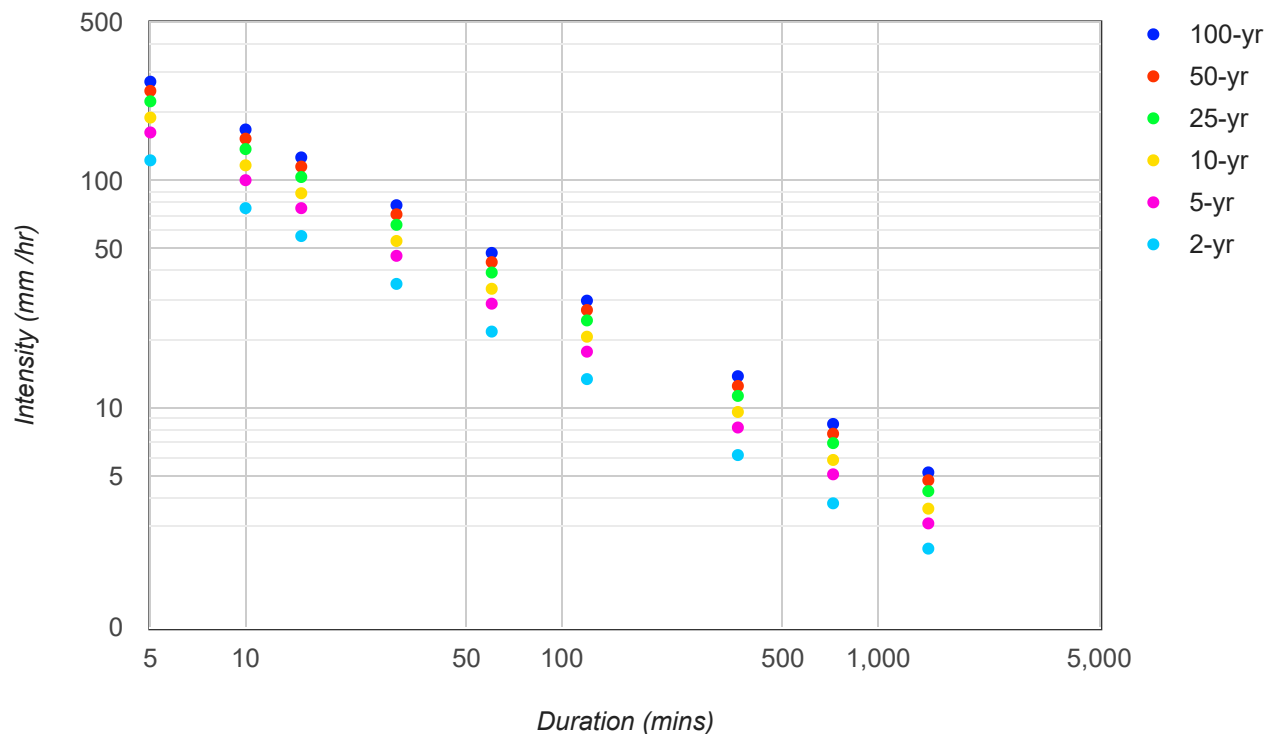
These are the locations in the selection.

**IDF Curve:** 44° 36' 15" N, 80° 57' 14" W (44.604167,-80.954167)

### Results

An IDF curve was found.

Coordinate: 44.604167, -80.954167  
IDF curve year: 2010





**Coefficient summary****IDF Curve:** 44° 36' 15" N, 80° 57' 14" W (44.604167,-80.954167)

Retrieved: Mon, 28 Jun 2021 17:25:30 GMT

**Data year:** 2010**IDF curve year:** 2010

| Return period | 2-yr   | 5-yr   | 10-yr  | 25-yr  | 50-yr  | 100-yr |
|---------------|--------|--------|--------|--------|--------|--------|
| <b>A</b>      | 21.7   | 28.8   | 33.5   | 39.5   | 43.9   | 48.2   |
| <b>B</b>      | -0.699 | -0.699 | -0.699 | -0.699 | -0.699 | -0.699 |

**Statistics****Rainfall intensity (mm hr<sup>-1</sup>)**

| Duration      | 5-min | 10-min | 15-min | 30-min | 1-hr | 2-hr | 6-hr | 12-hr | 24-hr |
|---------------|-------|--------|--------|--------|------|------|------|-------|-------|
| <b>2-yr</b>   | 123.3 | 75.9   | 57.2   | 35.2   | 21.7 | 13.4 | 6.2  | 3.8   | 2.4   |
| <b>5-yr</b>   | 163.6 | 100.8  | 75.9   | 46.8   | 28.8 | 17.7 | 8.2  | 5.1   | 3.1   |
| <b>10-yr</b>  | 190.3 | 117.2  | 88.3   | 54.4   | 33.5 | 20.6 | 9.6  | 5.9   | 3.6   |
| <b>25-yr</b>  | 224.4 | 138.2  | 104.1  | 64.1   | 39.5 | 24.3 | 11.3 | 7.0   | 4.3   |
| <b>50-yr</b>  | 249.4 | 153.6  | 115.7  | 71.3   | 43.9 | 27.0 | 12.5 | 7.7   | 4.8   |
| <b>100-yr</b> | 273.8 | 168.6  | 127.0  | 78.2   | 48.2 | 29.7 | 13.8 | 8.5   | 5.2   |

**Rainfall depth (mm)**

| Duration      | 5-min | 10-min | 15-min | 30-min | 1-hr | 2-hr | 6-hr | 12-hr | 24-hr |
|---------------|-------|--------|--------|--------|------|------|------|-------|-------|
| <b>2-yr</b>   | 10.3  | 12.7   | 14.3   | 17.6   | 21.7 | 26.7 | 37.2 | 45.8  | 56.5  |
| <b>5-yr</b>   | 13.6  | 16.8   | 19.0   | 23.4   | 28.8 | 35.5 | 49.4 | 60.8  | 75.0  |
| <b>10-yr</b>  | 15.9  | 19.5   | 22.1   | 27.2   | 33.5 | 41.3 | 57.4 | 70.8  | 87.2  |
| <b>25-yr</b>  | 18.7  | 23.0   | 26.0   | 32.1   | 39.5 | 48.7 | 67.7 | 83.5  | 102.8 |
| <b>50-yr</b>  | 20.8  | 25.6   | 28.9   | 35.6   | 43.9 | 54.1 | 75.3 | 92.7  | 114.3 |
| <b>100-yr</b> | 22.8  | 28.1   | 31.8   | 39.1   | 48.2 | 59.4 | 82.7 | 101.8 | 125.5 |

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Last Modified: September 2016

## TC Calculations

| SubCatchment | Area (ha) | Slope (%) | Length (m) | Tc (min) | Tc(hr) |
|--------------|-----------|-----------|------------|----------|--------|
| Area 1       | 6.76      | 2.83      | 428.0      | 16.36    | 0.27   |
| 1a           | 5.53      | 2.83      | 428.0      | 16.70    | 0.28   |
| 1b           | 1.24      | 2.80      | 178.3      | 8.09     | 0.13   |
| 2            | 4.16      | 1.51      | 472.6      | 21.50    | 0.36   |
| 2b           | 0.32      | 3.52      | 33.0       | 1.64     | 0.03   |

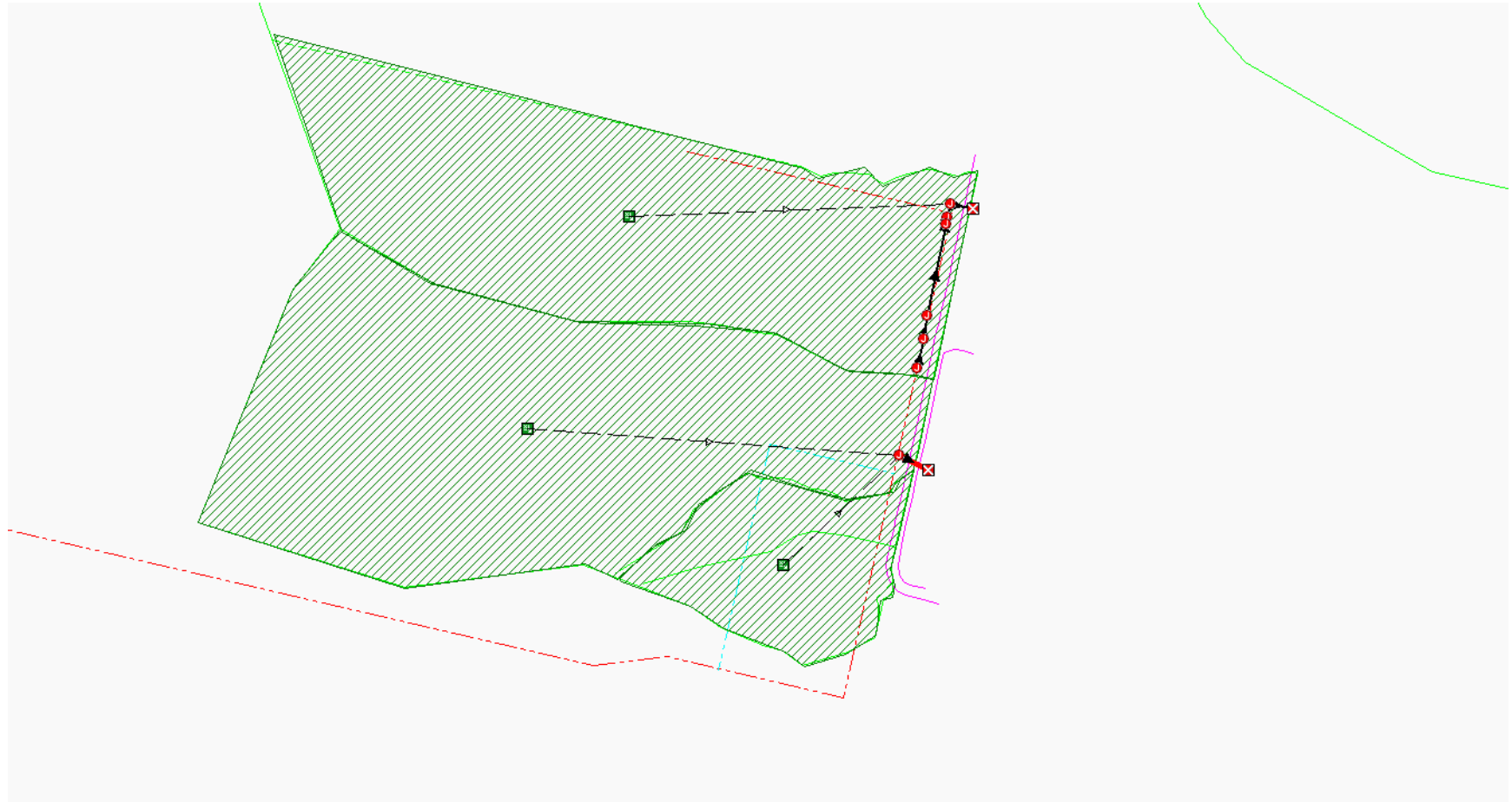
Calculated using the Bransby William Formula

Pre Development

Radbourne Severance

Model

Pre-Development



Autodesk® Storm and Sanitary Analysis 2016 - Version 13.4.121 (Build 0)

\*\*\*\*\*

Project Description

\*\*\*\*\*

File Name ..... M20005-PRE-NOV9-21-1.SPF

\*\*\*\*\*

Analysis Options

\*\*\*\*\*

Flow Units ..... LPS  
 Subbasin Hydrograph Method. SCS TR-20  
 Time of Concentration..... User-Defined  
 Link Routing Method ..... Hydrodynamic  
 Storage Node Exfiltration.. None  
 Starting Date ..... NOV-09-2021 00:00:00  
 Ending Date ..... NOV-09-2021 06:00:00  
 Report Time Step ..... 00:05:00

\*\*\*\*\*

Element Count

\*\*\*\*\*

Number of rain gages ..... 1  
 Number of subbasins ..... 3  
 Number of nodes ..... 9  
 Number of links ..... 7

\*\*\*\*\*

Raingage Summary

\*\*\*\*\*

| Gage ID      | Data Source | Data Type  | Recording Interval |
|--------------|-------------|------------|--------------------|
| Rain Gage-01 | 2 Year      | CUMULATIVE | 6.00 min           |

\*\*\*\*\*

Subbasin Summary

\*\*\*\*\*

| Subbasin ID | Total Area<br>hectares | Peak Rate<br>Factor |
|-------------|------------------------|---------------------|
| Sub-01a     | 5.53                   | 484.00              |
| Sub-01b     | 1.24                   | 484.00              |
| Sub-02      | 4.48                   | 484.00              |

\*\*\*\*\*

Node Summary

\*\*\*\*\*

| Node ID | Element Type | Invert Elevation<br>m | Maximum Elev.<br>m | Ponded Area<br>m <sup>2</sup> | External Inflow |
|---------|--------------|-----------------------|--------------------|-------------------------------|-----------------|
| Jun-01  | JUNCTION     | 198.90                | 201.00             | 0.00                          |                 |
| Jun-02  | JUNCTION     | 199.84                | 201.60             | 0.00                          |                 |
| Jun-03  | JUNCTION     | 201.60                | 202.00             | 0.00                          |                 |
| Jun-04  | JUNCTION     | 202.46                | 204.00             | 0.00                          |                 |
| Jun-05  | JUNCTION     | 202.48                | 204.00             | 0.00                          |                 |
| Jun-06  | JUNCTION     | 202.72                | 203.05             | 0.00                          |                 |

|        |          |        |        |      |
|--------|----------|--------|--------|------|
| Jun-07 | JUNCTION | 201.87 | 202.10 | 0.00 |
| Out-01 | OUTFALL  | 198.56 | 199.01 | 0.00 |
| Out-02 | OUTFALL  | 199.65 | 200.15 | 0.00 |

\*\*\*\*\*  
Link Summary  
\*\*\*\*\*

| Link ID | From Node | To Node | Element Type | Length m | Slope % | Manning's Roughness |
|---------|-----------|---------|--------------|----------|---------|---------------------|
| Link-01 | Jun-01    | Out-01  | CONDUIT      | 19.0     | 1.7867  | 0.0150              |
| Link-02 | Jun-02    | Out-02  | CONDUIT      | 12.7     | 1.4961  | 0.0150              |
| Link-03 | Jun-03    | Jun-02  | CHANNEL      | 10.0     | 17.6000 | 0.0320              |
| Link-04 | Jun-04    | Jun-07  | CHANNEL      | 63.2     | 0.9328  | 0.0320              |
| Link-05 | Jun-05    | Jun-04  | CONDUIT      | 8.2      | 0.2439  | 0.0150              |
| Link-06 | Jun-06    | Jun-05  | CHANNEL      | 21.0     | 1.1407  | 0.0320              |
| Link-07 | Jun-07    | Jun-03  | CHANNEL      | 5.0      | 5.4000  | 0.0320              |

\*\*\*\*\*  
Cross Section Summary  
\*\*\*\*\*

| Link Design ID Flow Capacity | Shape | Depth/<br>Diameter<br>m | Width<br>m | No. of<br>Barrels | Cross<br>Sectional<br>Area<br>m <sup>2</sup> | Full Flow<br>Hydraulic<br>Radius<br>m |
|------------------------------|-------|-------------------------|------------|-------------------|--|---------------------------------------|
|------------------------------|-------|-------------------------|------------|-------------------|--|---------------------------------------|

|                   |             |      |      |   |      |      |
|-------------------|-------------|------|------|---|------|------|
| Link-01<br>330.30 | CIRCULAR    | 0.45 | 0.45 | 1 | 0.16 | 0.11 |
| Link-02<br>400.29 | CIRCULAR    | 0.50 | 0.50 | 1 | 0.20 | 0.12 |
| Link-03<br>926.98 | TRAPEZOIDAL | 0.20 | 1.95 | 1 | 0.27 | 0.13 |
| Link-04<br>243.76 | TRAPEZOIDAL | 0.20 | 2.90 | 1 | 0.34 | 0.12 |
| Link-05<br>41.39  | CIRCULAR    | 0.30 | 0.30 | 1 | 0.07 | 0.07 |
| Link-06<br>241.07 | TRAPEZOIDAL | 0.20 | 2.50 | 1 | 0.30 | 0.12 |
| Link-07<br>201.32 | TRAPEZOIDAL | 0.10 | 2.20 | 1 | 0.16 | 0.07 |

| Runoff Quantity Continuity | Volume<br>hectare-m | Depth<br>mm |
|----------------------------|---------------------|-------------|
| *****                      | -----               | -----       |
| Total Precipitation .....  | 0.416               | 37.024      |
| Surface Runoff .....       | 0.141               | 12.547      |
| Continuity Error (%) ..... | -0.003              |             |

| Flow Routing Continuity    | Volume<br>hectare-m | Volume<br>Mliters |
|----------------------------|---------------------|-------------------|
| *****                      | -----               | -----             |
| External Inflow .....      | 0.000               | 0.000             |
| External Outflow .....     | 0.049               | 0.495             |
| Initial Stored Volume .... | 0.000               | 0.000             |
| Final Stored Volume .....  | 0.000               | 0.001             |
| Continuity Error (%) ..... | -0.004              |                   |

\*\*\*\*\*  
Composite Curve Number Computations Report  
\*\*\*\*\*

-----  
Subbasin Sub-01a  
-----

| Soil/Surface Description     | Area<br>(ha) | Soil<br>Group | CN    |
|------------------------------|--------------|---------------|-------|
| -                            | 5.53         | -             | 78.00 |
| Composite Area & Weighted CN | 5.53         |               | 78.00 |

-----  
Subbasin Sub-01b  
-----

| Soil/Surface Description     | Area<br>(ha) | Soil<br>Group | CN    |
|------------------------------|--------------|---------------|-------|
| -                            | 1.24         | -             | 73.40 |
| Composite Area & Weighted CN | 1.24         |               | 73.40 |

-----  
Subbasin Sub-02  
-----

| Soil/Surface Description     | Area<br>(ha) | Soil<br>Group | CN    |
|------------------------------|--------------|---------------|-------|
| -                            | 4.48         | -             | 75.30 |
| -                            | 0.00         | -             | 0.00  |
| Composite Area & Weighted CN | 4.48         |               | 75.30 |

\*\*\*\*\*  
Subbasin Runoff Summary  
\*\*\*\*\*

| Subbasin<br>ID | Total<br>Precip<br>mm | Total<br>Runoff<br>mm | Peak<br>Runoff<br>LPS | Weighted<br>Curve<br>Number | Time of<br>Concentration<br>days hh:mm:ss |
|----------------|-----------------------|-----------------------|-----------------------|-----------------------------|---|
| Sub-01a        | 37.20                 | 5.54                  | 41.06                 | 78.000                      | 0 00:16:42                                |
| Sub-01b        | 37.20                 | 3.17                  | 3.68                  | 73.400                      | 0 00:08:05                                |
| Sub-02         | 37.20                 | 4.06                  | 17.56                 | 75.300                      | 0 00:21:20                                |

\*\*\*\*\*  
Node Depth Summary  
\*\*\*\*\*

| Node<br>ID | Average<br>Depth<br>Attained<br>m | Maximum<br>Depth<br>Attained<br>m | Maximum<br>HGL<br>Attained<br>m | Time of Max<br>Occurrence<br>days hh:mm | Total<br>Flooded<br>Volume<br>ha-mm | Total<br>Time<br>Flooded<br>minutes | Retention<br>Time<br>hh:mm:ss |
|------------|-----------------------------------|-----------------------------------|---------------------------------|---|-------------------------------------|-------------------------------------|-------------------------------|
| Jun-01     | 0.11                              | 0.20                              | 199.10                          | 0 02:45                                 | 0                                   | 0                                   | 0:00:00                       |
| Jun-02     | 0.10                              | 0.13                              | 199.97                          | 0 02:52                                 | 0                                   | 0                                   | 0:00:00                       |
| Jun-03     | 0.00                              | 0.00                              | 201.60                          | 0 00:00                                 | 0                                   | 0                                   | 0:00:00                       |
| Jun-04     | 0.00                              | 0.00                              | 202.46                          | 0 00:00                                 | 0                                   | 0                                   | 0:00:00                       |
| Jun-05     | 0.00                              | 0.00                              | 202.48                          | 0 00:00                                 | 0                                   | 0                                   | 0:00:00                       |
| Jun-06     | 0.00                              | 0.00                              | 202.72                          | 0 00:00                                 | 0                                   | 0                                   | 0:00:00                       |
| Jun-07     | 0.00                              | 0.00                              | 201.87                          | 0 00:00                                 | 0                                   | 0                                   | 0:00:00                       |
| Out-01     | 0.07                              | 0.11                              | 198.67                          | 0 02:45                                 | 0                                   | 0                                   | 0:00:00                       |
| Out-02     | 0.05                              | 0.08                              | 199.73                          | 0 02:52                                 | 0                                   | 0                                   | 0:00:00                       |

\*\*\*\*\*  
Node Flow Summary  
\*\*\*\*\*

| Node ID | Element Type | Maximum Lateral Inflow LPS | Peak Inflow LPS | Time of Peak Inflow Occurrence days hh:mm | Maximum Flooding Overflow LPS | Time of Peak Flooding Occurrence days hh:mm |
|---------|--------------|----------------------------|-----------------|---|-------------------------------|---|
| Jun-01  | JUNCTION     | 44.03                      | 44.03           | 0 02:45                                   | 0.00                          |   |
| Jun-02  | JUNCTION     | 17.30                      | 17.30           | 0 02:54                                   | 0.00                          |   |
| Jun-03  | JUNCTION     | 0.00                       | 0.00            | 0 00:00                                   | 0.00                          |   |
| Jun-04  | JUNCTION     | 0.00                       | 0.00            | 0 00:00                                   | 0.00                          |   |
| Jun-05  | JUNCTION     | 0.00                       | 0.00            | 0 00:00                                   | 0.00                          |   |
| Jun-06  | JUNCTION     | 0.00                       | 0.00            | 0 00:00                                   | 0.00                          |   |
| Jun-07  | JUNCTION     | 0.00                       | 0.00            | 0 00:00                                   | 0.00                          |   |
| Out-01  | OUTFALL      | 0.00                       | 46.79           | 0 02:45                                   | 0.00                          |   |
| Out-02  | OUTFALL      | 0.00                       | 22.19           | 0 02:52                                   | 0.00                          |   |

\*\*\*\*\*  
Outfall Loading Summary  
\*\*\*\*\*

| Outfall Node ID | Flow Frequency (%) | Average Flow LPS | Peak Inflow LPS |
|-----------------|--------------------|------------------|-----------------|
| Out-01          | 85.24              | 25.95            | 46.79           |
| Out-02          | 84.34              | 13.64            | 22.19           |
| System          | 84.79              | 39.58            | 64.99           |

\*\*\*\*\*  
Link Flow Summary  
\*\*\*\*\*

| Link ID | Ratio of | Total Time | Element Reported Type Condition | Time of Peak Flow Occurrence days hh:mm | Maximum Velocity Attained m/sec | Length Factor | Peak Flow during Analysis LPS | Design Flow Capacity LPS | Ratio of Maximum /Design Flow |
|---------|----------|------------|---------------------------------|---|---------------------------------|---------------|-------------------------------|--------------------------|-------------------------------|
| Link-01 | 0.35     | 0          | Calculated                      | 0 02:45                                 | 1.05                            | 1.00          | 46.79                         | 330.30                   | 0.14                          |
| Link-02 | 0.21     | 0          | Calculated                      | 0 02:52                                 | 0.83                            | 1.00          | 22.19                         | 400.29                   | 0.06                          |
| Link-03 | 0.32     | 0          | Calculated                      | 0 00:00                                 | 0.00                            | 1.00          | 0.00                          | 926.98                   | 0.00                          |
| Link-04 | 0.00     | 0          | Calculated                      | 0 00:00                                 | 0.00                            | 1.00          | 0.00                          | 243.76                   | 0.00                          |
| Link-05 | 0.00     | 0          | Calculated                      | 0 00:00                                 | 0.00                            | 1.00          | 0.00                          | 41.39                    | 0.00                          |
| Link-06 |          |            |                                 | 0 00:00                                 | 0.00                            | 1.00          | 0.00                          | 241.07                   | 0.00                          |



Radbourne Severance

2 Year Pre-Development

|         |   |            |   |       |      |      |      |        |      |
|---------|---|------------|---|-------|------|------|------|--------|------|
| 0.00    | 0 | Calculated |   |       |      |      |      |        |      |
| Link-07 |   | CHANNEL    | 0 | 00:00 | 0.00 | 1.00 | 0.00 | 201.32 | 0.00 |
| 0.00    | 0 | Calculated |   |       |      |      |      |        |      |

\*\*\*\*\*  
Highest Flow Instability Indexes  
\*\*\*\*\*  
Link Link-02 (22)  
Link Link-01 (4)

Analysis began on: Wed Nov 17 10:18:25 2021  
Analysis ended on: Wed Nov 17 10:18:26 2021  
Total elapsed time: 00:00:01

Autodesk® Storm and Sanitary Analysis 2016 - Version 13.4.121 (Build 0)

\*\*\*\*\*

Project Description

\*\*\*\*\*

File Name ..... M20005-PRE-NOV9-21-1.SPF

\*\*\*\*\*

Analysis Options

\*\*\*\*\*

Flow Units ..... LPS  
 Subbasin Hydrograph Method. SCS TR-20  
 Time of Concentration..... User-Defined  
 Link Routing Method ..... Hydrodynamic  
 Storage Node Exfiltration.. None  
 Starting Date ..... NOV-09-2021 00:00:00  
 Ending Date ..... NOV-09-2021 06:00:00  
 Report Time Step ..... 00:05:00

\*\*\*\*\*

Element Count

\*\*\*\*\*

Number of rain gages ..... 1  
 Number of subbasins ..... 3  
 Number of nodes ..... 9  
 Number of links ..... 7

\*\*\*\*\*

Raingage Summary

\*\*\*\*\*

| Gage ID      | Data Source | Data Type  | Recording Interval |
|--------------|-------------|------------|--------------------|
| Rain Gage-01 | 5 Year      | CUMULATIVE | 6.00 min           |

\*\*\*\*\*

Subbasin Summary

\*\*\*\*\*

| Subbasin ID | Total Area<br>hectares | Peak Rate<br>Factor |
|-------------|------------------------|---------------------|
| Sub-01a     | 5.53                   | 484.00              |
| Sub-01b     | 1.24                   | 484.00              |
| Sub-02      | 4.48                   | 484.00              |

\*\*\*\*\*

Node Summary

\*\*\*\*\*

| Node ID | Element Type | Invert Elevation<br>m | Maximum Elev.<br>m | Ponded Area<br>m <sup>2</sup> | External Inflow |
|---------|--------------|-----------------------|--------------------|-------------------------------|-----------------|
| Jun-01  | JUNCTION     | 198.90                | 201.00             | 0.00                          |                 |
| Jun-02  | JUNCTION     | 199.84                | 201.60             | 0.00                          |                 |
| Jun-03  | JUNCTION     | 201.60                | 202.00             | 0.00                          |                 |
| Jun-04  | JUNCTION     | 202.46                | 204.00             | 0.00                          |                 |
| Jun-05  | JUNCTION     | 202.48                | 204.00             | 0.00                          |                 |
| Jun-06  | JUNCTION     | 202.72                | 203.05             | 0.00                          |                 |

|        |          |        |        |      |
|--------|----------|--------|--------|------|
| Jun-07 | JUNCTION | 201.87 | 202.10 | 0.00 |
| Out-01 | OUTFALL  | 198.56 | 199.01 | 0.00 |
| Out-02 | OUTFALL  | 199.65 | 200.15 | 0.00 |

\*\*\*\*\*  
Link Summary  
\*\*\*\*\*

| Link ID | From Node | To Node | Element Type | Length m | Slope % | Manning's Roughness |
|---------|-----------|---------|--------------|----------|---------|---------------------|
| Link-01 | Jun-01    | Out-01  | CONDUIT      | 19.0     | 1.7867  | 0.0150              |
| Link-02 | Jun-02    | Out-02  | CONDUIT      | 12.7     | 1.4961  | 0.0150              |
| Link-03 | Jun-03    | Jun-02  | CHANNEL      | 10.0     | 17.6000 | 0.0320              |
| Link-04 | Jun-04    | Jun-07  | CHANNEL      | 63.2     | 0.9328  | 0.0320              |
| Link-05 | Jun-05    | Jun-04  | CONDUIT      | 8.2      | 0.2439  | 0.0150              |
| Link-06 | Jun-06    | Jun-05  | CHANNEL      | 21.0     | 1.1407  | 0.0320              |
| Link-07 | Jun-07    | Jun-03  | CHANNEL      | 5.0      | 5.4000  | 0.0320              |

\*\*\*\*\*  
Cross Section Summary  
\*\*\*\*\*

| Link Design ID Flow Capacity | Shape | Depth/<br>Diameter<br>m | Width<br>m | No. of<br>Barrels | Cross<br>Sectional<br>Area<br>m <sup>2</sup> | Full Flow<br>Hydraulic<br>Radius<br>m |
|------------------------------|-------|-------------------------|------------|-------------------|--|---------------------------------------|
|------------------------------|-------|-------------------------|------------|-------------------|--|---------------------------------------|

|                   |             |      |      |   |      |      |
|-------------------|-------------|------|------|---|------|------|
| Link-01<br>330.30 | CIRCULAR    | 0.45 | 0.45 | 1 | 0.16 | 0.11 |
| Link-02<br>400.29 | CIRCULAR    | 0.50 | 0.50 | 1 | 0.20 | 0.12 |
| Link-03<br>926.98 | TRAPEZOIDAL | 0.20 | 1.95 | 1 | 0.27 | 0.13 |
| Link-04<br>243.76 | TRAPEZOIDAL | 0.20 | 2.90 | 1 | 0.34 | 0.12 |
| Link-05<br>41.39  | CIRCULAR    | 0.30 | 0.30 | 1 | 0.07 | 0.07 |
| Link-06<br>241.07 | TRAPEZOIDAL | 0.20 | 2.50 | 1 | 0.30 | 0.12 |
| Link-07<br>201.32 | TRAPEZOIDAL | 0.10 | 2.20 | 1 | 0.16 | 0.07 |

| Runoff Quantity Continuity | Volume<br>hectare-m | Depth<br>mm |
|----------------------------|---------------------|-------------|
| *****                      | -----               | -----       |
| Total Precipitation .....  | 0.553               | 49.167      |
| Surface Runoff .....       | 0.310               | 27.599      |
| Continuity Error (%) ..... | -0.004              |             |

| Flow Routing Continuity    | Volume<br>hectare-m | Volume<br>Mliters |
|----------------------------|---------------------|-------------------|
| *****                      | -----               | -----             |
| External Inflow .....      | 0.000               | 0.000             |
| External Outflow .....     | 0.109               | 1.087             |
| Initial Stored Volume .... | 0.000               | 0.000             |
| Final Stored Volume .....  | 0.000               | 0.002             |
| Continuity Error (%) ..... | -0.000              |                   |

\*\*\*\*\*  
Composite Curve Number Computations Report  
\*\*\*\*\*

-----  
Subbasin Sub-01a  
-----

| Soil/Surface Description     | Area<br>(ha) | Soil<br>Group | CN    |
|------------------------------|--------------|---------------|-------|
| -                            | 5.53         | -             | 78.00 |
| Composite Area & Weighted CN | 5.53         |               | 78.00 |

-----  
Subbasin Sub-01b  
-----

| Soil/Surface Description     | Area<br>(ha) | Soil<br>Group | CN    |
|------------------------------|--------------|---------------|-------|
| -                            | 1.24         | -             | 73.40 |
| Composite Area & Weighted CN | 1.24         |               | 73.40 |

-----  
Subbasin Sub-02  
-----

| Soil/Surface Description     | Area<br>(ha) | Soil<br>Group | CN    |
|------------------------------|--------------|---------------|-------|
| -                            | 4.48         | -             | 75.30 |
| -                            | 0.00         | -             | 0.00  |
| Composite Area & Weighted CN | 4.48         |               | 75.30 |

\*\*\*\*\*  
Subbasin Runoff Summary  
\*\*\*\*\*

| Subbasin<br>ID | Total<br>Precip<br>mm | Total<br>Runoff<br>mm | Peak<br>Runoff<br>LPS | Weighted<br>Curve<br>Number | Time of<br>Concentration<br>days hh:mm:ss |
|----------------|-----------------------|-----------------------|-----------------------|-----------------------------|---|
| Sub-01a        | 49.40                 | 11.53                 | 111.00                | 78.000                      | 0 00:16:42                                |
| Sub-01b        | 49.40                 | 7.80                  | 16.42                 | 73.400                      | 0 00:08:05                                |
| Sub-02         | 49.40                 | 9.25                  | 59.18                 | 75.300                      | 0 00:21:20                                |

\*\*\*\*\*  
Node Depth Summary  
\*\*\*\*\*

| Node<br>ID | Average<br>Depth<br>Attained<br>m | Maximum<br>Depth<br>Attained<br>m | Maximum<br>HGL<br>Attained<br>m | Time of Max<br>Occurrence<br>days hh:mm | Total<br>Flooded<br>Volume<br>ha-mm | Total<br>Time<br>Flooded<br>minutes | Retention<br>Time<br>hh:mm:ss |
|------------|-----------------------------------|-----------------------------------|---------------------------------|---|-------------------------------------|-------------------------------------|-------------------------------|
| Jun-01     | 0.20                              | 0.39                              | 199.29                          | 0 02:39                                 | 0                                   | 0                                   | 0:00:00                       |
| Jun-02     | 0.12                              | 0.19                              | 200.03                          | 0 02:45                                 | 0                                   | 0                                   | 0:00:00                       |
| Jun-03     | 0.00                              | 0.00                              | 201.60                          | 0 00:00                                 | 0                                   | 0                                   | 0:00:00                       |
| Jun-04     | 0.00                              | 0.00                              | 202.46                          | 0 00:00                                 | 0                                   | 0                                   | 0:00:00                       |
| Jun-05     | 0.00                              | 0.00                              | 202.48                          | 0 00:00                                 | 0                                   | 0                                   | 0:00:00                       |
| Jun-06     | 0.00                              | 0.00                              | 202.72                          | 0 00:00                                 | 0                                   | 0                                   | 0:00:00                       |
| Jun-07     | 0.00                              | 0.00                              | 201.87                          | 0 00:00                                 | 0                                   | 0                                   | 0:00:00                       |
| Out-01     | 0.11                              | 0.19                              | 198.75                          | 0 02:39                                 | 0                                   | 0                                   | 0:00:00                       |
| Out-02     | 0.08                              | 0.13                              | 199.78                          | 0 02:45                                 | 0                                   | 0                                   | 0:00:00                       |

\*\*\*\*\*  
Node Flow Summary  
\*\*\*\*\*

| Node ID | Element Type | Maximum Lateral Inflow LPS | Peak Inflow LPS | Time of Peak Inflow Occurrence days hh:mm | Maximum Flooding Overflow LPS | Time of Peak Flooding Occurrence days hh:mm |
|---------|--------------|----------------------------|-----------------|---|-------------------------------|---|
| Jun-01  | JUNCTION     | 125.76                     | 125.76          | 0 02:40                                   | 0.00                          |   |
| Jun-02  | JUNCTION     | 59.27                      | 59.27           | 0 02:45                                   | 0.00                          |   |
| Jun-03  | JUNCTION     | 0.00                       | 0.00            | 0 00:00                                   | 0.00                          |   |
| Jun-04  | JUNCTION     | 0.00                       | 0.00            | 0 00:00                                   | 0.00                          |   |
| Jun-05  | JUNCTION     | 0.00                       | 0.00            | 0 00:00                                   | 0.00                          |   |
| Jun-06  | JUNCTION     | 0.00                       | 0.00            | 0 00:00                                   | 0.00                          |   |
| Jun-07  | JUNCTION     | 0.00                       | 0.00            | 0 00:00                                   | 0.00                          |   |
| Out-01  | OUTFALL      | 0.00                       | 125.98          | 0 02:39                                   | 0.00                          |   |
| Out-02  | OUTFALL      | 0.00                       | 59.11           | 0 02:45                                   | 0.00                          |   |

\*\*\*\*\*  
Outfall Loading Summary  
\*\*\*\*\*

| Outfall Node ID | Flow Frequency (%) | Average Flow LPS | Peak Inflow LPS |
|-----------------|--------------------|------------------|-----------------|
| Out-01          | 90.23              | 54.54            | 125.98          |
| Out-02          | 89.70              | 30.51            | 59.11           |
| System          | 89.96              | 85.05            | 179.36          |

\*\*\*\*\*  
Link Flow Summary  
\*\*\*\*\*

| Link ID | Ratio of | Total Time | Element Reported Type Condition | Time of Peak Flow Occurrence days hh:mm | Maximum Velocity Attained m/sec | Length Factor | Peak Flow during Analysis LPS | Design Flow Capacity LPS | Ratio of Maximum Flow /Design Flow |
|---------|----------|------------|---------------------------------|---|---------------------------------|---------------|-------------------------------|--------------------------|------------------------------------|
| Link-01 | 0.65     | 0          | Calculated                      | 0 02:39                                 | 1.15                            | 1.00          | 125.98                        | 330.30                   | 0.38                               |
| Link-02 | 0.32     | 0          | Calculated                      | 0 02:45                                 | 1.11                            | 1.00          | 59.11                         | 400.29                   | 0.15                               |
| Link-03 | 0.46     | 0          | Calculated                      | 0 00:00                                 | 0.00                            | 1.00          | 0.00                          | 926.98                   | 0.00                               |
| Link-04 | 0.00     | 0          | Calculated                      | 0 00:00                                 | 0.00                            | 1.00          | 0.00                          | 243.76                   | 0.00                               |
| Link-05 | 0.00     | 0          | Calculated                      | 0 00:00                                 | 0.00                            | 1.00          | 0.00                          | 41.39                    | 0.00                               |
| Link-06 |          |            |                                 | 0 00:00                                 | 0.00                            | 1.00          | 0.00                          | 241.07                   | 0.00                               |

Radbourne Severance

5 Year Pre-Development

|         |   |            |   |       |      |      |      |        |      |
|---------|---|------------|---|-------|------|------|------|--------|------|
| 0.00    | 0 | Calculated |   |       |      |      |      |        |      |
| Link-07 |   | CHANNEL    | 0 | 00:00 | 0.00 | 1.00 | 0.00 | 201.32 | 0.00 |
| 0.00    | 0 | Calculated |   |       |      |      |      |        |      |

\*\*\*\*\*  
Highest Flow Instability Indexes  
\*\*\*\*\*  
Link Link-02 (58)  
Link Link-01 (14)

Analysis began on: Wed Nov 17 10:20:40 2021  
Analysis ended on: Wed Nov 17 10:20:41 2021  
Total elapsed time: 00:00:01

Autodesk® Storm and Sanitary Analysis 2016 - Version 13.4.121 (Build 0)

\*\*\*\*\*

Project Description

\*\*\*\*\*

File Name ..... M20005-PRE-NOV9-21-1.SPF

\*\*\*\*\*

Analysis Options

\*\*\*\*\*

Flow Units ..... LPS  
 Subbasin Hydrograph Method. SCS TR-20  
 Time of Concentration..... User-Defined  
 Link Routing Method ..... Hydrodynamic  
 Storage Node Exfiltration.. None  
 Starting Date ..... NOV-09-2021 00:00:00  
 Ending Date ..... NOV-09-2021 06:00:00  
 Report Time Step ..... 00:05:00

\*\*\*\*\*

Element Count

\*\*\*\*\*

Number of rain gages ..... 1  
 Number of subbasins ..... 3  
 Number of nodes ..... 9  
 Number of links ..... 7

\*\*\*\*\*

Raingage Summary

\*\*\*\*\*

| Gage ID      | Data Source | Data Type  | Recording Interval |
|--------------|-------------|------------|--------------------|
| Rain Gage-01 | 10 Year     | CUMULATIVE | 6.00 min           |

\*\*\*\*\*

Subbasin Summary

\*\*\*\*\*

| Subbasin ID | Total Area<br>hectares | Peak Rate<br>Factor |
|-------------|------------------------|---------------------|
| Sub-01a     | 5.53                   | 484.00              |
| Sub-01b     | 1.24                   | 484.00              |
| Sub-02      | 4.48                   | 484.00              |

\*\*\*\*\*

Node Summary

\*\*\*\*\*

| Node ID | Element Type | Invert Elevation<br>m | Maximum Elev.<br>m | Ponded Area<br>m <sup>2</sup> | External Inflow |
|---------|--------------|-----------------------|--------------------|-------------------------------|-----------------|
| Jun-01  | JUNCTION     | 198.90                | 201.00             | 0.00                          |                 |
| Jun-02  | JUNCTION     | 199.84                | 201.60             | 0.00                          |                 |
| Jun-03  | JUNCTION     | 201.60                | 202.00             | 0.00                          |                 |
| Jun-04  | JUNCTION     | 202.46                | 204.00             | 0.00                          |                 |
| Jun-05  | JUNCTION     | 202.48                | 204.00             | 0.00                          |                 |
| Jun-06  | JUNCTION     | 202.72                | 203.05             | 0.00                          |                 |

|        |          |        |        |      |
|--------|----------|--------|--------|------|
| Jun-07 | JUNCTION | 201.87 | 202.10 | 0.00 |
| Out-01 | OUTFALL  | 198.56 | 199.01 | 0.00 |
| Out-02 | OUTFALL  | 199.65 | 200.15 | 0.00 |

\*\*\*\*\*  
Link Summary  
\*\*\*\*\*

| Link ID | From Node | To Node | Element Type | Length m | Slope % | Manning's Roughness |
|---------|-----------|---------|--------------|----------|---------|---------------------|
| Link-01 | Jun-01    | Out-01  | CONDUIT      | 19.0     | 1.7867  | 0.0150              |
| Link-02 | Jun-02    | Out-02  | CONDUIT      | 12.7     | 1.4961  | 0.0150              |
| Link-03 | Jun-03    | Jun-02  | CHANNEL      | 10.0     | 17.6000 | 0.0320              |
| Link-04 | Jun-04    | Jun-07  | CHANNEL      | 63.2     | 0.9328  | 0.0320              |
| Link-05 | Jun-05    | Jun-04  | CONDUIT      | 8.2      | 0.2439  | 0.0150              |
| Link-06 | Jun-06    | Jun-05  | CHANNEL      | 21.0     | 1.1407  | 0.0320              |
| Link-07 | Jun-07    | Jun-03  | CHANNEL      | 5.0      | 5.4000  | 0.0320              |

\*\*\*\*\*  
Cross Section Summary  
\*\*\*\*\*

| Link Design ID Flow Capacity | Shape | Depth/<br>Diameter<br>m | Width<br>m | No. of<br>Barrels | Cross<br>Sectional<br>Area<br>m <sup>2</sup> | Full Flow<br>Hydraulic<br>Radius<br>m |
|------------------------------|-------|-------------------------|------------|-------------------|--|---------------------------------------|
|------------------------------|-------|-------------------------|------------|-------------------|--|---------------------------------------|

|                   |             |      |      |   |      |      |
|-------------------|-------------|------|------|---|------|------|
| Link-01<br>330.30 | CIRCULAR    | 0.45 | 0.45 | 1 | 0.16 | 0.11 |
| Link-02<br>400.29 | CIRCULAR    | 0.50 | 0.50 | 1 | 0.20 | 0.12 |
| Link-03<br>926.98 | TRAPEZOIDAL | 0.20 | 1.95 | 1 | 0.27 | 0.13 |
| Link-04<br>243.76 | TRAPEZOIDAL | 0.20 | 2.90 | 1 | 0.34 | 0.12 |
| Link-05<br>41.39  | CIRCULAR    | 0.30 | 0.30 | 1 | 0.07 | 0.07 |
| Link-06<br>241.07 | TRAPEZOIDAL | 0.20 | 2.50 | 1 | 0.30 | 0.12 |
| Link-07<br>201.32 | TRAPEZOIDAL | 0.10 | 2.20 | 1 | 0.16 | 0.07 |

| Runoff Quantity Continuity | Volume<br>hectare-m | Depth<br>mm |
|----------------------------|---------------------|-------------|
| *****                      | -----               | -----       |
| Total Precipitation .....  | 0.643               | 57.129      |
| Surface Runoff .....       | 0.445               | 39.531      |
| Continuity Error (%) ..... | -0.004              |             |

| Flow Routing Continuity    | Volume<br>hectare-m | Volume<br>Mliters |
|----------------------------|---------------------|-------------------|
| *****                      | -----               | -----             |
| External Inflow .....      | 0.000               | 0.000             |
| External Outflow .....     | 0.156               | 1.557             |
| Initial Stored Volume .... | 0.000               | 0.000             |
| Final Stored Volume .....  | 0.000               | 0.002             |
| Continuity Error (%) ..... | 0.001               |                   |



\*\*\*\*\*  
 Composite Curve Number Computations Report  
 \*\*\*\*\*

-----  
 Subbasin Sub-01a  
 -----

| Soil/Surface Description     | Area<br>(ha) | Soil<br>Group | CN    |
|------------------------------|--------------|---------------|-------|
| -                            | 5.53         | -             | 78.00 |
| Composite Area & Weighted CN | 5.53         |               | 78.00 |

-----  
 Subbasin Sub-01b  
 -----

| Soil/Surface Description     | Area<br>(ha) | Soil<br>Group | CN    |
|------------------------------|--------------|---------------|-------|
| -                            | 1.24         | -             | 73.40 |
| Composite Area & Weighted CN | 1.24         |               | 73.40 |

-----  
 Subbasin Sub-02  
 -----

| Soil/Surface Description     | Area<br>(ha) | Soil<br>Group | CN    |
|------------------------------|--------------|---------------|-------|
| -                            | 4.48         | -             | 75.30 |
| -                            | 0.00         | -             | 0.00  |
| Composite Area & Weighted CN | 4.48         |               | 75.30 |

\*\*\*\*\*  
 Subbasin Runoff Summary  
 \*\*\*\*\*

| Subbasin<br>ID | Total<br>Precip<br>mm | Total<br>Runoff<br>mm | Peak<br>Runoff<br>LPS | Weighted<br>Curve<br>Number | Time of<br>Concentration<br>days hh:mm:ss |
|----------------|-----------------------|-----------------------|-----------------------|-----------------------------|---|
| Sub-01a        | 57.40                 | 16.18                 | 167.35                | 78.000                      | 0 00:16:42                                |
| Sub-01b        | 57.40                 | 11.61                 | 27.18                 | 73.400                      | 0 00:08:05                                |
| Sub-02         | 57.40                 | 13.39                 | 96.28                 | 75.300                      | 0 00:21:20                                |

\*\*\*\*\*  
 Node Depth Summary  
 \*\*\*\*\*

| Node<br>ID | Average<br>Depth<br>Attained<br>m | Maximum<br>Depth<br>Attained<br>m | Maximum<br>HGL<br>Attained<br>m | Time of Max<br>Occurrence<br>days hh:mm | Total<br>Flooded<br>Volume<br>ha-mm | Total<br>Time<br>Flooded<br>minutes | Retention<br>Time<br>hh:mm:ss |
|------------|-----------------------------------|-----------------------------------|---------------------------------|---|-------------------------------------|-------------------------------------|-------------------------------|
| Jun-01     | 0.25                              | 0.54                              | 199.44                          | 0 02:39                                 | 0                                   | 0                                   | 0:00:00                       |
| Jun-02     | 0.15                              | 0.29                              | 200.13                          | 0 02:45                                 | 0                                   | 0                                   | 0:00:00                       |
| Jun-03     | 0.00                              | 0.00                              | 201.60                          | 0 00:00                                 | 0                                   | 0                                   | 0:00:00                       |
| Jun-04     | 0.00                              | 0.00                              | 202.46                          | 0 00:00                                 | 0                                   | 0                                   | 0:00:00                       |
| Jun-05     | 0.00                              | 0.00                              | 202.48                          | 0 00:00                                 | 0                                   | 0                                   | 0:00:00                       |
| Jun-06     | 0.00                              | 0.00                              | 202.72                          | 0 00:00                                 | 0                                   | 0                                   | 0:00:00                       |
| Jun-07     | 0.00                              | 0.00                              | 201.87                          | 0 00:00                                 | 0                                   | 0                                   | 0:00:00                       |
| Out-01     | 0.13                              | 0.25                              | 198.81                          | 0 02:40                                 | 0                                   | 0                                   | 0:00:00                       |
| Out-02     | 0.10                              | 0.17                              | 199.82                          | 0 02:45                                 | 0                                   | 0                                   | 0:00:00                       |

\*\*\*\*\*  
Node Flow Summary  
\*\*\*\*\*

| Node ID | Element Type | Maximum Lateral Inflow LPS | Peak Inflow LPS | Time of Peak Inflow Occurrence days hh:mm | Maximum Flooding Overflow LPS | Time of Peak Flooding Occurrence days hh:mm |
|---------|--------------|----------------------------|-----------------|---|-------------------------------|---|
| Jun-01  | JUNCTION     | 191.32                     | 191.32          | 0 02:39                                   | 0.00                          |   |
| Jun-02  | JUNCTION     | 95.60                      | 95.60           | 0 02:44                                   | 0.00                          |   |
| Jun-03  | JUNCTION     | 0.00                       | 0.00            | 0 00:00                                   | 0.00                          |   |
| Jun-04  | JUNCTION     | 0.00                       | 0.00            | 0 00:00                                   | 0.00                          |   |
| Jun-05  | JUNCTION     | 0.00                       | 0.00            | 0 00:00                                   | 0.00                          |   |
| Jun-06  | JUNCTION     | 0.00                       | 0.00            | 0 00:00                                   | 0.00                          |   |
| Jun-07  | JUNCTION     | 0.00                       | 0.00            | 0 00:00                                   | 0.00                          |   |
| Out-01  | OUTFALL      | 0.00                       | 191.27          | 0 02:40                                   | 0.00                          |   |
| Out-02  | OUTFALL      | 0.00                       | 95.40           | 0 02:45                                   | 0.00                          |   |

\*\*\*\*\*  
Outfall Loading Summary  
\*\*\*\*\*

| Outfall Node ID | Flow Frequency (%) | Average Flow LPS | Peak Inflow LPS |
|-----------------|--------------------|------------------|-----------------|
| Out-01          | 91.41              | 76.96            | 191.27          |
| Out-02          | 91.04              | 43.97            | 95.40           |
| System          | 91.22              | 120.93           | 281.79          |

\*\*\*\*\*  
Link Flow Summary  
\*\*\*\*\*

| Link ID | Ratio of | Total Time | Element Reported Type Condition | Time of Peak Flow Occurrence days hh:mm | Maximum Velocity Attained m/sec | Length Factor | Peak Flow during Analysis LPS | Design Flow Capacity LPS | Ratio of Maximum Flow /Design Flow |
|---------|----------|------------|---------------------------------|---|---------------------------------|---------------|-------------------------------|--------------------------|------------------------------------|
| Link-01 | 0.77     | 0          | Calculated                      | 0 02:40                                 | 1.45                            | 1.00          | 191.27                        | 330.30                   | 0.58                               |
| Link-02 | 0.46     | 0          | Calculated                      | 0 02:45                                 | 1.15                            | 1.00          | 95.40                         | 400.29                   | 0.24                               |
| Link-03 | 0.50     | 0          | Calculated                      | 0 00:00                                 | 0.00                            | 1.00          | 0.00                          | 926.98                   | 0.00                               |
| Link-04 | 0.00     | 0          | Calculated                      | 0 00:00                                 | 0.00                            | 1.00          | 0.00                          | 243.76                   | 0.00                               |
| Link-05 | 0.00     | 0          | Calculated                      | 0 00:00                                 | 0.00                            | 1.00          | 0.00                          | 41.39                    | 0.00                               |
| Link-06 |          |            |                                 | 0 00:00                                 | 0.00                            | 1.00          | 0.00                          | 241.07                   | 0.00                               |

Radbourne Severance

10 Year Pre-Development

|         |   |            |   |       |      |      |      |        |      |
|---------|---|------------|---|-------|------|------|------|--------|------|
| 0.00    | 0 | Calculated |   |       |      |      |      |        |      |
| Link-07 |   | CHANNEL    | 0 | 00:00 | 0.00 | 1.00 | 0.00 | 201.32 | 0.00 |
| 0.00    | 0 | Calculated |   |       |      |      |      |        |      |

\*\*\*\*\*  
Highest Flow Instability Indexes  
\*\*\*\*\*  
All links are stable.

Analysis began on: Wed Nov 17 10:21:36 2021  
Analysis ended on: Wed Nov 17 10:21:37 2021  
Total elapsed time: 00:00:01

Autodesk® Storm and Sanitary Analysis 2016 - Version 13.4.121 (Build 0)

\*\*\*\*\*

Project Description

\*\*\*\*\*

File Name ..... M20005-PRE-NOV9-21-1.SPF

\*\*\*\*\*

Analysis Options

\*\*\*\*\*

Flow Units ..... LPS  
 Subbasin Hydrograph Method. SCS TR-20  
 Time of Concentration..... User-Defined  
 Link Routing Method ..... Hydrodynamic  
 Storage Node Exfiltration.. None  
 Starting Date ..... NOV-09-2021 00:00:00  
 Ending Date ..... NOV-09-2021 06:00:00  
 Report Time Step ..... 00:05:00

\*\*\*\*\*

Element Count

\*\*\*\*\*

Number of rain gages ..... 1  
 Number of subbasins ..... 3  
 Number of nodes ..... 9  
 Number of links ..... 7

\*\*\*\*\*

Raingage Summary

\*\*\*\*\*

| Gage ID      | Data Source | Data Type  | Recording Interval |
|--------------|-------------|------------|--------------------|
| Rain Gage-01 | 25 Year     | CUMULATIVE | 6.00 min           |

\*\*\*\*\*

Subbasin Summary

\*\*\*\*\*

| Subbasin ID | Total Area<br>hectares | Peak Rate<br>Factor |
|-------------|------------------------|---------------------|
| Sub-01a     | 5.53                   | 484.00              |
| Sub-01b     | 1.24                   | 484.00              |
| Sub-02      | 4.48                   | 484.00              |

\*\*\*\*\*

Node Summary

\*\*\*\*\*

| Node ID | Element Type | Invert Elevation<br>m | Maximum Elev.<br>m | Ponded Area<br>m <sup>2</sup> | External Inflow |
|---------|--------------|-----------------------|--------------------|-------------------------------|-----------------|
| Jun-01  | JUNCTION     | 198.90                | 201.00             | 0.00                          |                 |
| Jun-02  | JUNCTION     | 199.84                | 201.60             | 0.00                          |                 |
| Jun-03  | JUNCTION     | 201.60                | 202.00             | 0.00                          |                 |
| Jun-04  | JUNCTION     | 202.46                | 204.00             | 0.00                          |                 |
| Jun-05  | JUNCTION     | 202.48                | 204.00             | 0.00                          |                 |
| Jun-06  | JUNCTION     | 202.72                | 203.05             | 0.00                          |                 |

|        |          |        |        |      |
|--------|----------|--------|--------|------|
| Jun-07 | JUNCTION | 201.87 | 202.10 | 0.00 |
| Out-01 | OUTFALL  | 198.56 | 199.01 | 0.00 |
| Out-02 | OUTFALL  | 199.65 | 200.15 | 0.00 |

\*\*\*\*\*  
Link Summary  
\*\*\*\*\*

| Link ID | From Node | To Node | Element Type | Length m | Slope % | Manning's Roughness |
|---------|-----------|---------|--------------|----------|---------|---------------------|
| Link-01 | Jun-01    | Out-01  | CONDUIT      | 19.0     | 1.7867  | 0.0150              |
| Link-02 | Jun-02    | Out-02  | CONDUIT      | 12.7     | 1.4961  | 0.0150              |
| Link-03 | Jun-03    | Jun-02  | CHANNEL      | 10.0     | 17.6000 | 0.0320              |
| Link-04 | Jun-04    | Jun-07  | CHANNEL      | 63.2     | 0.9328  | 0.0320              |
| Link-05 | Jun-05    | Jun-04  | CONDUIT      | 8.2      | 0.2439  | 0.0150              |
| Link-06 | Jun-06    | Jun-05  | CHANNEL      | 21.0     | 1.1407  | 0.0320              |
| Link-07 | Jun-07    | Jun-03  | CHANNEL      | 5.0      | 5.4000  | 0.0320              |

\*\*\*\*\*  
Cross Section Summary  
\*\*\*\*\*

| Link Design ID Flow Capacity | Shape | Depth/<br>Diameter<br>m | Width<br>m | No. of<br>Barrels | Cross<br>Sectional<br>Area<br>m <sup>2</sup> | Full Flow<br>Hydraulic<br>Radius<br>m |
|------------------------------|-------|-------------------------|------------|-------------------|--|---------------------------------------|
|------------------------------|-------|-------------------------|------------|-------------------|--|---------------------------------------|

|                   |             |      |      |   |      |      |
|-------------------|-------------|------|------|---|------|------|
| Link-01<br>330.30 | CIRCULAR    | 0.45 | 0.45 | 1 | 0.16 | 0.11 |
| Link-02<br>400.29 | CIRCULAR    | 0.50 | 0.50 | 1 | 0.20 | 0.12 |
| Link-03<br>926.98 | TRAPEZOIDAL | 0.20 | 1.95 | 1 | 0.27 | 0.13 |
| Link-04<br>243.76 | TRAPEZOIDAL | 0.20 | 2.90 | 1 | 0.34 | 0.12 |
| Link-05<br>41.39  | CIRCULAR    | 0.30 | 0.30 | 1 | 0.07 | 0.07 |
| Link-06<br>241.07 | TRAPEZOIDAL | 0.20 | 2.50 | 1 | 0.30 | 0.12 |
| Link-07<br>201.32 | TRAPEZOIDAL | 0.10 | 2.20 | 1 | 0.16 | 0.07 |

| Runoff Quantity            | Volume<br>hectare-m | Depth<br>mm |
|----------------------------|---------------------|-------------|
| Continuity                 | -----               | -----       |
| Total Precipitation .....  | 0.758               | 67.380      |
| Surface Runoff .....       | 0.638               | 56.738      |
| Continuity Error (%) ..... | -0.004              |             |

| Flow Routing               | Volume<br>hectare-m | Volume<br>Mliters |
|----------------------------|---------------------|-------------------|
| Continuity                 | -----               | -----             |
| External Inflow .....      | 0.000               | 0.000             |
| External Outflow .....     | 0.224               | 2.239             |
| Initial Stored Volume .... | 0.000               | 0.000             |
| Final Stored Volume .....  | 0.000               | 0.002             |
| Continuity Error (%) ..... | -0.000              |                   |

\*\*\*\*\*  
Composite Curve Number Computations Report  
\*\*\*\*\*

-----  
Subbasin Sub-01a  
-----

| Soil/Surface Description     | Area<br>(ha) | Soil<br>Group | CN    |
|------------------------------|--------------|---------------|-------|
| -                            | 5.53         | -             | 78.00 |
| Composite Area & Weighted CN | 5.53         |               | 78.00 |

-----  
Subbasin Sub-01b  
-----

| Soil/Surface Description     | Area<br>(ha) | Soil<br>Group | CN    |
|------------------------------|--------------|---------------|-------|
| -                            | 1.24         | -             | 73.40 |
| Composite Area & Weighted CN | 1.24         |               | 73.40 |

-----  
Subbasin Sub-02  
-----

| Soil/Surface Description     | Area<br>(ha) | Soil<br>Group | CN    |
|------------------------------|--------------|---------------|-------|
| -                            | 4.48         | -             | 75.30 |
| -                            | 0.00         | -             | 0.00  |
| Composite Area & Weighted CN | 4.48         |               | 75.30 |

\*\*\*\*\*  
Subbasin Runoff Summary  
\*\*\*\*\*

| Subbasin<br>ID | Total<br>Precip<br>mm | Total<br>Runoff<br>mm | Peak<br>Runoff<br>LPS | Weighted<br>Curve<br>Number | Time of<br>Concentration<br>days hh:mm:ss |
|----------------|-----------------------|-----------------------|-----------------------|-----------------------------|---|
| Sub-01a        | 67.70                 | 22.78                 | 248.06                | 78.000                      | 0 00:16:42                                |
| Sub-01b        | 67.70                 | 17.20                 | 43.33                 | 73.400                      | 0 00:08:05                                |
| Sub-02         | 67.70                 | 19.38                 | 151.50                | 75.300                      | 0 00:21:20                                |

\*\*\*\*\*  
Node Depth Summary  
\*\*\*\*\*

| Node<br>ID | Average<br>Depth<br>Attained<br>m | Maximum<br>Depth<br>Attained<br>m | Maximum<br>HGL<br>Attained<br>m | Time of Max<br>Occurrence<br>days hh:mm | Total<br>Flooded<br>Volume<br>ha-mm | Total<br>Time<br>Flooded<br>minutes | Retention<br>Time<br>hh:mm:ss |
|------------|-----------------------------------|-----------------------------------|---------------------------------|---|-------------------------------------|-------------------------------------|-------------------------------|
| Jun-01     | 0.33                              | 0.82                              | 199.72                          | 0 02:39                                 | 0                                   | 0                                   | 0:00:00                       |
| Jun-02     | 0.20                              | 0.38                              | 200.22                          | 0 02:44                                 | 0                                   | 0                                   | 0:00:00                       |
| Jun-03     | 0.00                              | 0.00                              | 201.60                          | 0 00:00                                 | 0                                   | 0                                   | 0:00:00                       |
| Jun-04     | 0.00                              | 0.00                              | 202.46                          | 0 00:00                                 | 0                                   | 0                                   | 0:00:00                       |
| Jun-05     | 0.00                              | 0.00                              | 202.48                          | 0 00:00                                 | 0                                   | 0                                   | 0:00:00                       |
| Jun-06     | 0.00                              | 0.00                              | 202.72                          | 0 00:00                                 | 0                                   | 0                                   | 0:00:00                       |
| Jun-07     | 0.00                              | 0.00                              | 201.87                          | 0 00:00                                 | 0                                   | 0                                   | 0:00:00                       |
| Out-01     | 0.16                              | 0.32                              | 198.88                          | 0 02:39                                 | 0                                   | 0                                   | 0:00:00                       |
| Out-02     | 0.12                              | 0.21                              | 199.86                          | 0 02:45                                 | 0                                   | 0                                   | 0:00:00                       |

\*\*\*\*\*  
Node Flow Summary  
\*\*\*\*\*

| Node ID | Element Type | Maximum Lateral Inflow LPS | Peak Inflow LPS | Time of Peak Inflow Occurrence days hh:mm | Maximum Flooding Overflow LPS | Time of Peak Flooding Occurrence days hh:mm |
|---------|--------------|----------------------------|-----------------|---|-------------------------------|---|
| Jun-01  | JUNCTION     | 284.15                     | 284.15          | 0 02:39                                   | 0.00                          |   |
| Jun-02  | JUNCTION     | 148.62                     | 148.62          | 0 02:44                                   | 0.00                          |   |
| Jun-03  | JUNCTION     | 0.00                       | 0.00            | 0 00:00                                   | 0.00                          |   |
| Jun-04  | JUNCTION     | 0.00                       | 0.00            | 0 00:00                                   | 0.00                          |   |
| Jun-05  | JUNCTION     | 0.00                       | 0.00            | 0 00:00                                   | 0.00                          |   |
| Jun-06  | JUNCTION     | 0.00                       | 0.00            | 0 00:00                                   | 0.00                          |   |
| Jun-07  | JUNCTION     | 0.00                       | 0.00            | 0 00:00                                   | 0.00                          |   |
| Out-01  | OUTFALL      | 0.00                       | 284.10          | 0 02:39                                   | 0.00                          |   |
| Out-02  | OUTFALL      | 0.00                       | 148.62          | 0 02:45                                   | 0.00                          |   |

\*\*\*\*\*  
Outfall Loading Summary  
\*\*\*\*\*

| Outfall Node ID | Flow Frequency (%) | Average Flow LPS | Peak Inflow LPS |
|-----------------|--------------------|------------------|-----------------|
| Out-01          | 92.86              | 109.17           | 284.10          |
| Out-02          | 92.34              | 63.85            | 148.62          |
| System          | 92.60              | 173.02           | 431.18          |

\*\*\*\*\*  
Link Flow Summary  
\*\*\*\*\*

| Link ID | Ratio of | Total Time | Element Reported Type Condition | Time of Peak Flow Occurrence days hh:mm | Maximum Velocity Attained m/sec | Length Factor | Peak Flow during Analysis LPS | Design Flow Capacity LPS | Ratio of Maximum Flow /Design Flow |
|---------|----------|------------|---------------------------------|---|---------------------------------|---------------|-------------------------------|--------------------------|------------------------------------|
| Link-01 | 0.86     | 0          | Calculated                      | 0 02:39                                 | 1.96                            | 1.00          | 284.10                        | 330.30                   | 0.86                               |
| Link-02 | 0.59     | 0          | Calculated                      | 0 02:45                                 | 1.23                            | 1.00          | 148.62                        | 400.29                   | 0.37                               |
| Link-03 | 0.50     | 0          | Calculated                      | 0 00:00                                 | 0.00                            | 1.00          | 0.00                          | 926.98                   | 0.00                               |
| Link-04 | 0.00     | 0          | Calculated                      | 0 00:00                                 | 0.00                            | 1.00          | 0.00                          | 243.76                   | 0.00                               |
| Link-05 | 0.00     | 0          | Calculated                      | 0 00:00                                 | 0.00                            | 1.00          | 0.00                          | 41.39                    | 0.00                               |
| Link-06 |          |            |                                 | 0 00:00                                 | 0.00                            | 1.00          | 0.00                          | 241.07                   | 0.00                               |



Radbourne Severance

25 Year Pre-Development

|         |   |            |   |       |      |      |      |        |      |
|---------|---|------------|---|-------|------|------|------|--------|------|
| 0.00    | 0 | Calculated |   |       |      |      |      |        |      |
| Link-07 |   | CHANNEL    | 0 | 00:00 | 0.00 | 1.00 | 0.00 | 201.32 | 0.00 |
| 0.00    | 0 | Calculated |   |       |      |      |      |        |      |

\*\*\*\*\*  
Highest Flow Instability Indexes  
\*\*\*\*\*  
Link Link-02 (7)  
Link Link-01 (5)

Analysis began on: Wed Nov 17 10:23:31 2021  
Analysis ended on: Wed Nov 17 10:23:33 2021  
Total elapsed time: 00:00:02

Autodesk® Storm and Sanitary Analysis 2016 - Version 13.4.121 (Build 0)

\*\*\*\*\*

Project Description

\*\*\*\*\*

File Name ..... M20005-PRE-NOV9-21-1.SPF

\*\*\*\*\*

Analysis Options

\*\*\*\*\*

Flow Units ..... LPS  
 Subbasin Hydrograph Method. SCS TR-20  
 Time of Concentration..... User-Defined  
 Link Routing Method ..... Hydrodynamic  
 Storage Node Exfiltration.. None  
 Starting Date ..... NOV-09-2021 00:00:00  
 Ending Date ..... NOV-09-2021 06:00:00  
 Report Time Step ..... 00:05:00

\*\*\*\*\*

Element Count

\*\*\*\*\*

Number of rain gages ..... 1  
 Number of subbasins ..... 3  
 Number of nodes ..... 9  
 Number of links ..... 7

\*\*\*\*\*

Raingage Summary

\*\*\*\*\*

| Gage ID      | Data Source | Data Type  | Recording Interval | min |
|--------------|-------------|------------|--------------------|-----|
| Rain Gage-01 | 100 Year    | CUMULATIVE | 6.00               |     |

\*\*\*\*\*

Subbasin Summary

\*\*\*\*\*

| Subbasin ID | Total Area<br>hectares | Peak Rate<br>Factor |
|-------------|------------------------|---------------------|
| Sub-01a     | 5.53                   | 484.00              |
| Sub-01b     | 1.24                   | 484.00              |
| Sub-02      | 4.48                   | 484.00              |

\*\*\*\*\*

Node Summary

\*\*\*\*\*

| Node ID | Element Type | Invert Elevation<br>m | Maximum Elev.<br>m | Ponded Area<br>m <sup>2</sup> | External Inflow |
|---------|--------------|-----------------------|--------------------|-------------------------------|-----------------|
| Jun-01  | JUNCTION     | 198.90                | 201.00             | 0.00                          |                 |
| Jun-02  | JUNCTION     | 199.84                | 201.60             | 0.00                          |                 |
| Jun-03  | JUNCTION     | 201.60                | 202.00             | 0.00                          |                 |
| Jun-04  | JUNCTION     | 202.46                | 204.00             | 0.00                          |                 |
| Jun-05  | JUNCTION     | 202.48                | 204.00             | 0.00                          |                 |
| Jun-06  | JUNCTION     | 202.72                | 203.05             | 0.00                          |                 |

|        |          |        |        |      |
|--------|----------|--------|--------|------|
| Jun-07 | JUNCTION | 201.87 | 202.10 | 0.00 |
| Out-01 | OUTFALL  | 198.56 | 199.01 | 0.00 |
| Out-02 | OUTFALL  | 199.65 | 200.15 | 0.00 |

\*\*\*\*\*  
Link Summary  
\*\*\*\*\*

| Link ID | From Node | To Node | Element Type | Length m | Slope % | Manning's Roughness |
|---------|-----------|---------|--------------|----------|---------|---------------------|
| Link-01 | Jun-01    | Out-01  | CONDUIT      | 19.0     | 1.7867  | 0.0150              |
| Link-02 | Jun-02    | Out-02  | CONDUIT      | 12.7     | 1.4961  | 0.0150              |
| Link-03 | Jun-03    | Jun-02  | CHANNEL      | 10.0     | 17.6000 | 0.0320              |
| Link-04 | Jun-04    | Jun-07  | CHANNEL      | 63.2     | 0.9328  | 0.0320              |
| Link-05 | Jun-05    | Jun-04  | CONDUIT      | 8.2      | 0.2439  | 0.0150              |
| Link-06 | Jun-06    | Jun-05  | CHANNEL      | 21.0     | 1.1407  | 0.0320              |
| Link-07 | Jun-07    | Jun-03  | CHANNEL      | 5.0      | 5.4000  | 0.0320              |

\*\*\*\*\*  
Cross Section Summary  
\*\*\*\*\*

| Link Design ID | Shape | Depth/<br>Diameter | Width | No. of<br>Barrels | Cross<br>Sectional<br>Area | Full Flow<br>Hydraulic<br>Radius |
|----------------|-------|--------------------|-------|-------------------|----------------------------|----------------------------------|
| Flow Capacity  |       | m                  | m     |                   | m <sup>2</sup>             | m                                |
| LPS            |       |                    |       |                   |                            |                                  |

|         |             |      |      |   |      |      |
|---------|-------------|------|------|---|------|------|
| Link-01 | CIRCULAR    | 0.45 | 0.45 | 1 | 0.16 | 0.11 |
| 330.30  |             |      |      |   |      |      |
| Link-02 | CIRCULAR    | 0.50 | 0.50 | 1 | 0.20 | 0.12 |
| 400.29  |             |      |      |   |      |      |
| Link-03 | TRAPEZOIDAL | 0.20 | 1.95 | 1 | 0.27 | 0.13 |
| 926.98  |             |      |      |   |      |      |
| Link-04 | TRAPEZOIDAL | 0.20 | 2.90 | 1 | 0.34 | 0.12 |
| 243.76  |             |      |      |   |      |      |
| Link-05 | CIRCULAR    | 0.30 | 0.30 | 1 | 0.07 | 0.07 |
| 41.39   |             |      |      |   |      |      |
| Link-06 | TRAPEZOIDAL | 0.20 | 2.50 | 1 | 0.30 | 0.12 |
| 241.07  |             |      |      |   |      |      |
| Link-07 | TRAPEZOIDAL | 0.10 | 2.20 | 1 | 0.16 | 0.07 |
| 201.32  |             |      |      |   |      |      |

| Runoff Quantity            | Volume<br>hectare-m | Depth<br>mm |
|----------------------------|---------------------|-------------|
| Continuity                 | -----               | -----       |
| Total Precipitation .....  | 0.926               | 82.309      |
| Surface Runoff .....       | 0.952               | 84.675      |
| Continuity Error (%) ..... | -0.003              |             |

| Flow Routing               | Volume<br>hectare-m | Volume<br>Mliters |
|----------------------------|---------------------|-------------------|
| Continuity                 | -----               | -----             |
| External Inflow .....      | 0.000               | 0.000             |
| External Outflow .....     | 0.334               | 3.344             |
| Initial Stored Volume .... | 0.000               | 0.000             |
| Final Stored Volume .....  | 0.000               | 0.003             |
| Continuity Error (%) ..... | -0.000              |                   |

\*\*\*\*\*  
Composite Curve Number Computations Report  
\*\*\*\*\*

-----  
Subbasin Sub-01a  
-----

| Soil/Surface Description     | Area<br>(ha) | Soil<br>Group | CN    |
|------------------------------|--------------|---------------|-------|
| -                            | 5.53         | -             | 78.00 |
| Composite Area & Weighted CN | 5.53         |               | 78.00 |

-----  
Subbasin Sub-01b  
-----

| Soil/Surface Description     | Area<br>(ha) | Soil<br>Group | CN    |
|------------------------------|--------------|---------------|-------|
| -                            | 1.24         | -             | 73.40 |
| Composite Area & Weighted CN | 1.24         |               | 73.40 |

-----  
Subbasin Sub-02  
-----

| Soil/Surface Description     | Area<br>(ha) | Soil<br>Group | CN    |
|------------------------------|--------------|---------------|-------|
| -                            | 4.48         | -             | 75.30 |
| -                            | 0.00         | -             | 0.00  |
| Composite Area & Weighted CN | 4.48         |               | 75.30 |

\*\*\*\*\*  
Subbasin Runoff Summary  
\*\*\*\*\*

| Subbasin<br>ID | Total<br>Precip<br>mm | Total<br>Runoff<br>mm | Peak<br>Runoff<br>LPS | Weighted<br>Curve<br>Number | Time of<br>Concentration<br>days hh:mm:ss |
|----------------|-----------------------|-----------------------|-----------------------|-----------------------------|---|
| Sub-01a        | 82.70                 | 33.38                 | 378.32                | 78.000                      | 0 00:16:42                                |
| Sub-01b        | 82.70                 | 26.44                 | 71.36                 | 73.400                      | 0 00:08:05                                |
| Sub-02         | 82.70                 | 29.21                 | 243.53                | 75.300                      | 0 00:21:20                                |

\*\*\*\*\*  
Node Depth Summary  
\*\*\*\*\*

| Node<br>ID | Average<br>Depth<br>Attained<br>m | Maximum<br>Depth<br>Attained<br>m | Maximum<br>HGL<br>Attained<br>m | Time of Max<br>Occurrence<br>days hh:mm | Total<br>Flooded<br>Volume<br>ha-mm | Total<br>Time<br>Flooded<br>minutes | Retention<br>Time<br>hh:mm:ss |
|------------|-----------------------------------|-----------------------------------|---------------------------------|---|-------------------------------------|-------------------------------------|-------------------------------|
| Jun-01     | 0.45                              | 1.09                              | 199.99                          | 0 02:47                                 | 0                                   | 0                                   | 0:00:00                       |
| Jun-02     | 0.27                              | 0.53                              | 200.37                          | 0 02:40                                 | 0                                   | 0                                   | 0:00:00                       |
| Jun-03     | 0.00                              | 0.00                              | 201.60                          | 0 00:00                                 | 0                                   | 0                                   | 0:00:00                       |
| Jun-04     | 0.00                              | 0.00                              | 202.46                          | 0 00:00                                 | 0                                   | 0                                   | 0:00:00                       |
| Jun-05     | 0.00                              | 0.00                              | 202.48                          | 0 00:00                                 | 0                                   | 0                                   | 0:00:00                       |
| Jun-06     | 0.00                              | 0.00                              | 202.72                          | 0 00:00                                 | 0                                   | 0                                   | 0:00:00                       |
| Jun-07     | 0.00                              | 0.00                              | 201.87                          | 0 00:00                                 | 0                                   | 0                                   | 0:00:00                       |
| Out-01     | 0.21                              | 0.45                              | 199.01                          | 0 02:27                                 | 0                                   | 0                                   | 0:00:00                       |
| Out-02     | 0.15                              | 0.28                              | 199.93                          | 0 02:40                                 | 0                                   | 0                                   | 0:00:00                       |

\*\*\*\*\*  
Node Flow Summary  
\*\*\*\*\*

| Node ID | Element Type | Maximum Lateral Inflow LPS | Peak Inflow LPS | Time of Peak Inflow Occurrence days hh:mm | Maximum Flooding Overflow LPS | Time of Peak Flooding Occurrence days hh:mm |
|---------|--------------|----------------------------|-----------------|---|-------------------------------|---|
| Jun-01  | JUNCTION     | 436.20                     | 436.20          | 0 02:35                                   | 0.00                          |   |
| Jun-02  | JUNCTION     | 241.41                     | 241.41          | 0 02:40                                   | 0.00                          |   |
| Jun-03  | JUNCTION     | 0.00                       | 0.00            | 0 00:00                                   | 0.00                          |   |
| Jun-04  | JUNCTION     | 0.00                       | 0.00            | 0 00:00                                   | 0.00                          |   |
| Jun-05  | JUNCTION     | 0.00                       | 0.00            | 0 00:00                                   | 0.00                          |   |
| Jun-06  | JUNCTION     | 0.00                       | 0.00            | 0 00:00                                   | 0.00                          |   |
| Jun-07  | JUNCTION     | 0.00                       | 0.00            | 0 00:00                                   | 0.00                          |   |
| Out-01  | OUTFALL      | 0.00                       | 436.30          | 0 02:35                                   | 0.00                          |   |
| Out-02  | OUTFALL      | 0.00                       | 241.32          | 0 02:40                                   | 0.00                          |   |

\*\*\*\*\*  
Outfall Loading Summary  
\*\*\*\*\*

| Outfall Node ID | Flow Frequency (%) | Average Flow LPS | Peak Inflow LPS |
|-----------------|--------------------|------------------|-----------------|
| Out-01          | 94.00              | 164.01           | 436.30          |
| Out-02          | 93.67              | 97.71            | 241.32          |
| System          | 93.84              | 261.72           | 674.07          |

\*\*\*\*\*  
Link Flow Summary  
\*\*\*\*\*

| Link ID | Ratio of | Total Time | Element Reported Type Condition | Time of Peak Flow Occurrence days hh:mm | Maximum Velocity Attained m/sec | Length Factor | Peak Flow during Analysis LPS | Design Flow Capacity LPS | Ratio of Maximum Flow /Design Flow |
|---------|----------|------------|---------------------------------|---|---------------------------------|---------------|-------------------------------|--------------------------|------------------------------------|
| Link-01 | 1.00     | 20         | CONDUIT                         | 0 02:35                                 | 2.74                            | 1.00          | 436.30                        | 330.30                   | 1.32                               |
| Link-02 | 0.78     | 0          | SURCHARGED                      |   |                                 |               |                               |                          |                                    |
| Link-03 | 0.50     | 0          | CONDUIT                         | 0 02:40                                 | 1.47                            | 1.00          | 241.32                        | 400.29                   | 0.60                               |
| Link-04 | 0.00     | 0          | Calculated                      | 0 00:00                                 | 0.00                            | 1.00          | 0.00                          | 926.98                   | 0.00                               |
| Link-05 | 0.00     | 0          | CHANNEL                         | 0 00:00                                 | 0.00                            | 1.00          | 0.00                          | 243.76                   | 0.00                               |
| Link-06 | 0.00     | 0          | Calculated                      | 0 00:00                                 | 0.00                            | 1.00          | 0.00                          | 41.39                    | 0.00                               |
| Link-07 | 0.00     | 0          | CONDUIT                         | 0 00:00                                 | 0.00                            | 1.00          | 0.00                          | 241.07                   | 0.00                               |
| Link-08 | 0.00     | 0          | Calculated                      | 0 00:00                                 | 0.00                            | 1.00          | 0.00                          |                          |                                    |

Radbourne Severance

100 Year Pre-Development

|         |   |            |   |       |      |      |      |        |      |
|---------|---|------------|---|-------|------|------|------|--------|------|
| 0.00    | 0 | Calculated |   |       |      |      |      |        |      |
| Link-07 |   | CHANNEL    | 0 | 00:00 | 0.00 | 1.00 | 0.00 | 201.32 | 0.00 |
| 0.00    | 0 | Calculated |   |       |      |      |      |        |      |

\*\*\*\*\*  
Highest Flow Instability Indexes  
\*\*\*\*\*  
Link Link-02 (22)  
Link Link-01 (5)

Analysis began on: Wed Nov 17 10:24:43 2021  
Analysis ended on: Wed Nov 17 10:24:45 2021  
Total elapsed time: 00:00:02

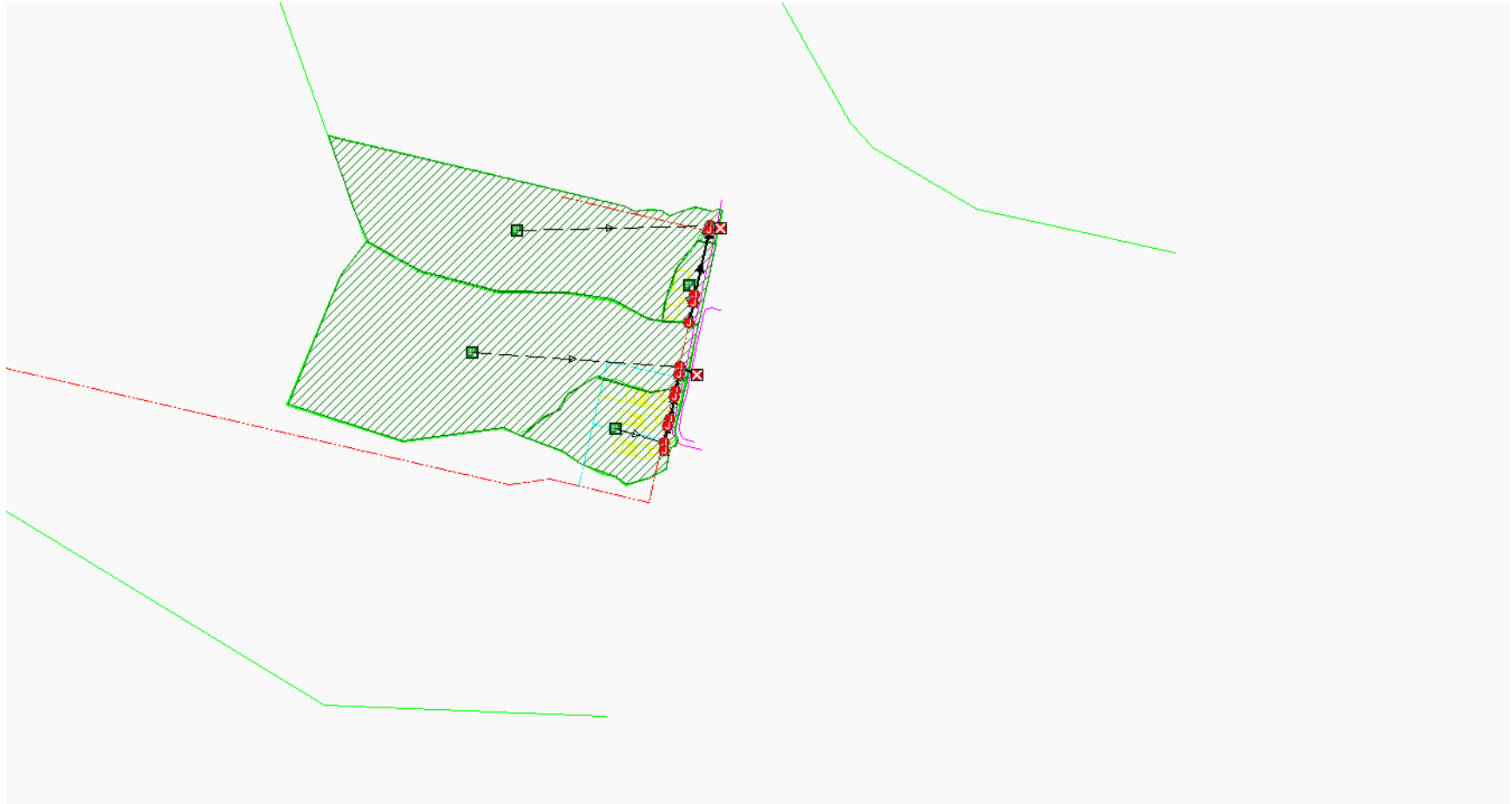
Post Development



Radbourne Severance

Model

Post Development



## CN Calculations

## Post-Development

| Area 1A:                                | CN | Area (m <sup>2</sup> ) | CN*A       |
|---|----|------------------------|------------|
| Impervious Areas (roadways , Buildings) | 98 | 215.21                 | 21090.58   |
| Forest (Fair)                           | 73 | 24752.47               | 1806930.31 |
| Crop - Farm                             | 82 | 30204.94               | 2476805.08 |
| Grass                                   | 74 | 0.00                   | 0.00       |
| Gravel Driveway                         | 89 | 120.26                 | 10703.14   |
| Total                                   |    | 55292.88               | 4315529.11 |
|   | CN |                        | 78.0       |

| Area 1B:                                | CN | Area (m <sup>2</sup> ) | CN*A      |
|---|----|------------------------|-----------|
| Impervious Areas (roadways , Buildings) | 98 | 1672.87                | 163941.36 |
| Forest (Fair)                           | 73 | 8118.34                | 592638.75 |
| Crop - Farm                             | 82 | 0.00                   | 0.00      |
| Grass                                   | 74 | 2591.30                | 191756.20 |
| Gravel Driveway                         | 89 | 0.00                   | 0.00      |
| Total                                   |    | 12382.51               | 948336.31 |
|   | CN |                        | 76.6      |

| Area 2:                     | CN | Area (m <sup>2</sup> ) | CN*A       |
|-----------------------------|----|------------------------|------------|
| Impervious Areas (roadways) | 98 | 132.04                 | 12940.12   |
| Forest (Woods)              | 73 | 22650.16               | 1653461.97 |
| Cultivated                  | 82 | 7402.56                | 607009.92  |
| Grass                       | 74 | 10825.54               | 801089.74  |
| Gravel                      | 89 | 290.59                 | 25862.24   |
| Total                       |    | 41600.56               | 3100363.99 |
|                             | CN |                        | 74.5       |

| Area 2b:                    | CN | Area (m <sup>2</sup> ) | CN*A      |
|-----------------------------|----|------------------------|-----------|
| Impervious Areas (roadways) | 98 | 814.50                 | 79821.00  |
| Forest (Woods)              | 73 | 2447.72                | 178683.56 |
| Cultivated                  | 82 | 0.00                   | 0.00      |
| Grass                       | 74 | 0.00                   | 0.00      |
| Gravel                      | 89 | 98.61                  | 8776.29   |
| Total                       |    | 3205.80                | 267280.85 |
|                             | CN |                        | 83.4      |

## Soil Group C (Osprey Breypan)

Assume new buildings are 300m<sup>2</sup>

**Driveways are 6m wide (asphalt)**

Lot 1 driveway will be 43m long (33m in Dev env) and 2 driveway to be 32m long (25m in dev env)

Lot 3 driveway to be 18.2m long

Lot 4 driveway to consist of 130m<sup>2</sup> asphalt. The remainder to be gravel

| Lot No. | Dev Env | Imp Area in<br>dev env | Grass   |
|---------|---------|------------------------|---------|
| 1       | 1744.0  | 498.00                 | 1246.00 |
| 2       | 1335.5  | 450.00                 | 885.5   |
| 3       | 827.0   | 367.20                 | 459.80  |
|         | Total   | 1315.20                | 2591.30 |

Autodesk® Storm and Sanitary Analysis 2016 - Version 13.4.121 (Build 0)

\*\*\*\*\*

Project Description

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File Name ..... M20005-post-NOV9-21-1.SPF

\*\*\*\*\*

Analysis Options

\*\*\*\*\*

Flow Units ..... LPS  
 Subbasin Hydrograph Method. SCS TR-20  
 Time of Concentration..... User-Defined  
 Link Routing Method ..... Hydrodynamic  
 Storage Node Exfiltration.. None  
 Starting Date ..... NOV-09-2021 00:00:00  
 Ending Date ..... NOV-09-2021 06:00:00  
 Report Time Step ..... 00:05:00

\*\*\*\*\*

Element Count

\*\*\*\*\*

Number of rain gages ..... 1  
 Number of subbasins ..... 4  
 Number of nodes ..... 16  
 Number of links ..... 14

\*\*\*\*\*

Raingage Summary

\*\*\*\*\*

| Gage ID      | Data Source | Data Type  | Recording Interval |
|--------------|-------------|------------|--------------------|
| Rain Gage-01 | 2 Year      | CUMULATIVE | 6.00 min           |

\*\*\*\*\*

Subbasin Summary

\*\*\*\*\*

| Subbasin ID | Total Area<br>hectares | Peak Rate<br>Factor |
|-------------|------------------------|---------------------|
| Sub-01a     | 5.53                   | 484.00              |
| Sub-01b     | 1.24                   | 484.00              |
| Sub-02      | 4.16                   | 484.00              |
| Sub-04      | 0.32                   | 484.00              |

\*\*\*\*\*

Node Summary

\*\*\*\*\*

| Node ID | Element Type | Invert Elevation<br>m | Maximum Elev.<br>m | Ponded Area<br>m <sup>2</sup> | External Inflow |
|---------|--------------|-----------------------|--------------------|-------------------------------|-----------------|
| Jun-01  | JUNCTION     | 198.90                | 202.20             | 0.00                          |                 |
| Jun-02  | JUNCTION     | 201.48                | 202.35             | 0.00                          |                 |
| Jun-03  | JUNCTION     | 201.55                | 202.10             | 0.00                          |                 |
| Jun-04  | JUNCTION     | 201.75                | 202.26             | 0.00                          |                 |
| Jun-05  | JUNCTION     | 202.33                | 204.00             | 0.00                          |                 |

## Radbourne Severance

2 Year Post Development

|        |          |        |        |      |
|--------|----------|--------|--------|------|
| Jun-06 | JUNCTION | 203.00 | 204.00 | 0.00 |
| Jun-07 | JUNCTION | 203.50 | 204.00 | 0.00 |
| Jun-08 | JUNCTION | 201.00 | 202.70 | 0.00 |
| Jun-09 | JUNCTION | 199.84 | 201.64 | 0.00 |
| Jun-10 | JUNCTION | 201.60 | 202.00 | 0.00 |
| Jun-11 | JUNCTION | 202.46 | 204.00 | 0.00 |
| Jun-12 | JUNCTION | 202.48 | 204.00 | 0.00 |
| Jun-13 | JUNCTION | 202.72 | 203.05 | 0.00 |
| Jun-14 | JUNCTION | 201.87 | 202.10 | 0.00 |
| Out-01 | OUTFALL  | 198.56 | 199.01 | 0.00 |
| Out-02 | OUTFALL  | 199.65 | 200.15 | 0.00 |

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## Link Summary

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| Link ID | From Node | To Node | Element Type | Length m | Slope % | Manning's Roughness |
|---------|-----------|---------|--------------|----------|---------|---------------------|
| CSP-1   | Jun-07    | Jun-06  | CONDUIT      | 8.0      | 6.2657  | 0.0240              |
| CSP-2   | Jun-05    | Jun-04  | CONDUIT      | 8.0      | 7.2500  | 0.0240              |
| CSP-3   | Jun-03    | Jun-02  | CONDUIT      | 8.0      | 0.8750  | 0.0240              |
| Link-01 | Jun-01    | Out-01  | CONDUIT      | 19.0     | 1.7867  | 0.0150              |
| Link-02 | Jun-08    | Jun-01  | CHANNEL      | 7.9      | 32.6582 | 0.0300              |
| Link-04 | Jun-04    | Jun-03  | CHANNEL      | 20.0     | 1.0000  | 0.0300              |
| Link-06 | Jun-06    | Jun-05  | CHANNEL      | 15.4     | 4.3620  | 0.0300              |
| Link-08 | Jun-02    | Jun-08  | CHANNEL      | 26.1     | 1.8391  | 0.0300              |
| Link-09 | Jun-09    | Out-02  | CONDUIT      | 11.5     | 1.6565  | 0.0150              |
| Link-10 | Jun-10    | Jun-09  | CHANNEL      | 10.0     | 17.6000 | 0.0320              |
| Link-11 | Jun-11    | Jun-14  | CHANNEL      | 63.2     | 0.9328  | 0.0320              |
| Link-12 | Jun-12    | Jun-11  | CONDUIT      | 8.7      | 0.2309  | 0.0240              |
| Link-13 | Jun-13    | Jun-12  | CHANNEL      | 21.0     | 1.1407  | 0.0320              |
| Link-14 | Jun-14    | Jun-10  | CHANNEL      | 5.5      | 4.9091  | 0.0320              |

\*\*\*\*\*

## Cross Section Summary

\*\*\*\*\*

| Link Design ID Flow Capacity | Shape       | Depth/<br>Diameter<br>m | Width<br>m | No. of<br>Barrels | Cross<br>Sectional<br>Area<br>m <sup>2</sup> | Full Flow<br>Hydraulic<br>Radius<br>m |
|------------------------------|-------------|-------------------------|------------|-------------------|--|---------------------------------------|
| CSP-1                        | CIRCULAR    | 0.45                    | 0.45       | 1                 | 0.16   | 0.11                                  |
| 386.59                       |             |                         |            |                   |  |                                       |
| CSP-2                        | CIRCULAR    | 0.45                    | 0.45       | 1                 | 0.16   | 0.11                                  |
| 415.85                       |             |                         |            |                   |  |                                       |
| CSP-3                        | CIRCULAR    | 0.45                    | 0.45       | 1                 | 0.16   | 0.11                                  |
| 144.47                       |             |                         |            |                   |  |                                       |
| Link-01                      | CIRCULAR    | 0.45                    | 0.45       | 1                 | 0.16   | 0.11                                  |
| 330.30                       |             |                         |            |                   |  |                                       |
| Link-02                      | TRAPEZOIDAL | 1.20                    | 31.80      | 1                 | 20.88  | 0.65                                  |
| 299865.48                    |             |                         |            |                   |  |                                       |
| Link-04                      | TRAPEZOIDAL | 0.45                    | 3.00       | 1                 | 0.84   | 0.27                                  |
| 1163.01                      |             |                         |            |                   |  |                                       |
| Link-06                      | TRAPEZOIDAL | 1.00                    | 2.75       | 1                 | 1.75   | 0.49                                  |
| 7562.79                      |             |                         |            |                   |  |                                       |
| Link-08                      | TRAPEZOIDAL | 0.26                    | 7.24       | 1                 | 1.07   | 0.15                                  |
| 1351.97                      |             |                         |            |                   |  |                                       |
| Link-09                      | CIRCULAR    | 0.50                    | 0.50       | 1                 | 0.20   | 0.12                                  |
| 421.21                       |             |                         |            |                   |  |                                       |

## Radbourne Severance

2 Year Post Development

|         |             |      |      |   |      |      |
|---------|-------------|------|------|---|------|------|
| Link-10 | TRAPEZOIDAL | 0.20 | 1.95 | 1 | 0.27 | 0.13 |
| 926.98  |             |      |      |   |      |      |
| Link-11 | TRAPEZOIDAL | 0.20 | 3.40 | 1 | 0.44 | 0.13 |
| 337.34  |             |      |      |   |      |      |
| Link-12 | CIRCULAR    | 0.30 | 0.30 | 1 | 0.07 | 0.07 |
| 25.17   |             |      |      |   |      |      |
| Link-13 | TRAPEZOIDAL | 0.20 | 3.00 | 1 | 0.40 | 0.13 |
| 345.42  |             |      |      |   |      |      |
| Link-14 | TRAPEZOIDAL | 0.10 | 2.20 | 1 | 0.16 | 0.07 |
| 191.95  |             |      |      |   |      |      |

```

*****
Runoff Quantity Continuity      Volume      Depth
*****      hectare-m      mm
*****      -----      -----
Total Precipitation .....      0.416      37.024
Surface Runoff .....      0.143      12.732
Continuity Error (%) .....      -0.003

```

```

*****
Flow Routing Continuity      Volume      Volume
*****      hectare-m      Mliters
*****      -----      -----
External Inflow .....      0.000      0.000
External Outflow .....      0.047      0.466
Initial Stored Volume ....      0.000      0.000
Final Stored Volume .....      0.002      0.020
Continuity Error (%) .....      0.027

```

\*\*\*\*\*  
Composite Curve Number Computations Report  
\*\*\*\*\*

-----  
Subbasin Sub-01a  
-----

| Soil/Surface Description     | Area<br>(ha) | Soil<br>Group | CN    |
|------------------------------|--------------|---------------|-------|
| -                            | 5.53         | -             | 78.00 |
| Composite Area & Weighted CN | 5.53         |               | 78.00 |

-----  
Subbasin Sub-01b  
-----

| Soil/Surface Description     | Area<br>(ha) | Soil<br>Group | CN    |
|------------------------------|--------------|---------------|-------|
| -                            | 1.24         | -             | 76.60 |
| Composite Area & Weighted CN | 1.24         |               | 76.60 |

-----  
Subbasin Sub-02  
-----

| Soil/Surface Description     | Area<br>(ha) | Soil<br>Group | CN    |
|------------------------------|--------------|---------------|-------|
| -                            | 4.16         | -             | 73.70 |
| Composite Area & Weighted CN | 4.16         |               | 73.70 |

-----  
Subbasin Sub-04  
-----

| Soil/Surface Description | Area<br>(ha) | Soil<br>Group | CN |
|--------------------------|--------------|---------------|----|
|--------------------------|--------------|---------------|----|

|                              |      |   |       |
|------------------------------|------|---|-------|
| -                            | 0.32 | - | 83.40 |
| Composite Area & Weighted CN | 0.32 |   | 83.40 |

\*\*\*\*\*  
 Subbasin Runoff Summary  
 \*\*\*\*\*

| Subbasin ID | Total Precip<br>mm | Total Runoff<br>mm | Peak Runoff<br>LPS | Weighted Curve<br>Number | Time of Concentration<br>days hh:mm:ss |
|-------------|--------------------|--------------------|--------------------|--------------------------|--|
| Sub-01a     | 37.20              | 5.54               | 41.06              | 78.000                   | 0 00:16:42                             |
| Sub-01b     | 37.20              | 4.72               | 8.50               | 76.600                   | 0 00:08:05                             |
| Sub-02      | 37.20              | 3.33               | 12.18              | 73.700                   | 0 00:21:20                             |
| Sub-04      | 37.20              | 9.45               | 7.08               | 83.400                   | 0 00:01:38                             |

\*\*\*\*\*  
 Node Depth Summary  
 \*\*\*\*\*

| Node ID | Average Depth<br>Attained<br>m | Maximum Depth<br>Attained<br>m | Maximum HGL<br>Attained<br>m | Time of Max Occurrence<br>days hh:mm | Total Flooded Volume<br>ha-mm | Total Time Flooded<br>minutes | Retention Time<br>hh:mm:ss |
|---------|--------------------------------|--------------------------------|------------------------------|--------------------------------------|-------------------------------|-------------------------------|----------------------------|
| Jun-01  | 0.10                           | 0.16                           | 199.06                       | 0 02:45                              | 0                             | 0                             | 0:00:00                    |
| Jun-02  | 0.01                           | 0.02                           | 201.50                       | 0 02:42                              | 0                             | 0                             | 0:00:00                    |
| Jun-03  | 0.06                           | 0.09                           | 201.64                       | 0 02:41                              | 0                             | 0                             | 0:00:00                    |
| Jun-04  | 0.02                           | 0.03                           | 201.78                       | 0 02:40                              | 0                             | 0                             | 0:00:00                    |
| Jun-05  | 0.05                           | 0.09                           | 202.42                       | 0 02:40                              | 0                             | 0                             | 0:00:00                    |
| Jun-06  | 0.01                           | 0.02                           | 203.02                       | 0 02:40                              | 0                             | 0                             | 0:00:00                    |
| Jun-07  | 0.00                           | 0.00                           | 203.50                       | 0 00:00                              | 0                             | 0                             | 0:00:00                    |
| Jun-08  | 0.31                           | 0.48                           | 201.48                       | 0 04:07                              | 0                             | 0                             | 0:00:00                    |
| Jun-09  | 0.09                           | 0.12                           | 199.96                       | 0 04:00                              | 0                             | 0                             | 0:00:00                    |
| Jun-10  | 0.01                           | 0.01                           | 201.61                       | 0 02:37                              | 0                             | 0                             | 0:00:00                    |
| Jun-11  | 0.02                           | 0.03                           | 202.49                       | 0 02:33                              | 0                             | 0                             | 0:00:00                    |
| Jun-12  | 0.06                           | 0.10                           | 202.58                       | 0 02:35                              | 0                             | 0                             | 0:00:00                    |
| Jun-13  | 0.01                           | 0.02                           | 202.74                       | 0 02:30                              | 0                             | 0                             | 0:00:00                    |
| Jun-14  | 0.01                           | 0.02                           | 201.89                       | 0 02:37                              | 0                             | 0                             | 0:00:00                    |
| Out-01  | 0.07                           | 0.11                           | 198.67                       | 0 02:45                              | 0                             | 0                             | 0:00:00                    |
| Out-02  | 0.05                           | 0.06                           | 199.71                       | 0 04:00                              | 0                             | 0                             | 0:00:00                    |

\*\*\*\*\*  
 Node Flow Summary  
 \*\*\*\*\*

| Node ID | Element Type | Maximum Lateral Inflow<br>LPS | Peak Inflow<br>LPS | Time of Peak Inflow Occurrence<br>days hh:mm | Maximum Flooding Overflow<br>LPS | Time of Peak Flooding Occurrence<br>days hh:mm |
|---------|--------------|-------------------------------|--------------------|--|----------------------------------|--|
| Jun-01  | JUNCTION     | 40.64                         | 40.64              | 0 02:45                                      | 0.00                             |  |
| Jun-02  | JUNCTION     | 0.00                          | 7.80               | 0 02:41                                      | 0.00                             |  |
| Jun-03  | JUNCTION     | 0.00                          | 7.90               | 0 02:40                                      | 0.00                             |  |
| Jun-04  | JUNCTION     | 0.00                          | 7.91               | 0 02:40                                      | 0.00                             |  |
| Jun-05  | JUNCTION     | 0.00                          | 7.97               | 0 02:40                                      | 0.00                             |  |
| Jun-06  | JUNCTION     | 7.98                          | 7.98               | 0 02:39                                      | 0.00                             |  |
| Jun-07  | JUNCTION     | 0.00                          | 0.00               | 0 00:00                                      | 0.00                             |  |
| Jun-08  | JUNCTION     | 0.00                          | 7.77               | 0 02:42                                      | 0.00                             |  |
| Jun-09  | JUNCTION     | 12.13                         | 14.21              | 0 04:00                                      | 0.00                             |  |
| Jun-10  | JUNCTION     | 0.00                          | 6.46               | 0 02:37                                      | 0.00                             |  |

## Radbourne Severance

2 Year Post Development

|        |          |      |       |   |       |      |
|--------|----------|------|-------|---|-------|------|
| Jun-11 | JUNCTION | 0.00 | 7.31  | 0 | 02:32 | 0.00 |
| Jun-12 | JUNCTION | 0.00 | 6.63  | 0 | 02:30 | 0.00 |
| Jun-13 | JUNCTION | 6.67 | 6.67  | 0 | 02:30 | 0.00 |
| Jun-14 | JUNCTION | 0.00 | 6.56  | 0 | 02:33 | 0.00 |
| Out-01 | OUTFALL  | 0.00 | 40.36 | 0 | 02:45 | 0.00 |
| Out-02 | OUTFALL  | 0.00 | 14.20 | 0 | 04:00 | 0.00 |

\*\*\*\*\*  
 Outfall Loading Summary  
 \*\*\*\*\*

| Outfall Node ID | Flow<br>Frequency<br>(%) | Average<br>Flow<br>LPS | Peak<br>Inflow<br>LPS |
|-----------------|--------------------------|------------------------|-----------------------|
| Out-01          | 85.45                    | 23.87                  | 40.36                 |
| Out-02          | 84.28                    | 11.69                  | 14.20                 |
| System          | 84.86                    | 35.57                  | 52.89                 |

\*\*\*\*\*  
 Link Flow Summary  
 \*\*\*\*\*

| Link ID | Ratio of<br>Total<br>Flow<br>Depth | Element<br>Reported<br>Type<br>Condition | Time of<br>Peak Flow<br>Occurrence<br>days hh:mm | Maximum<br>Velocity<br>Attained<br>m/sec | Length<br>Factor | Peak Flow<br>during<br>Analysis<br>LPS | Design<br>Flow<br>Capacity<br>LPS | Ratio of<br>Maximum<br>/Design<br>Flow |
|---------|------------------------------------|--|--|--|------------------|--|-----------------------------------|--|
| CSP-1   | 0.02                               | 0 Calculated                             | 0 00:00  | 0.00                                     | 1.00             | 0.00                                   | 386.59                            | 0.00                                   |
| CSP-2   | 0.13                               | 0 Calculated                             | 0 02:40  | 0.88                                     | 1.00             | 7.91                                   | 415.85                            | 0.02                                   |
| CSP-3   | 0.13                               | 0 Calculated                             | 0 02:41  | 0.66                                     | 1.00             | 7.80                                   | 144.47                            | 0.05                                   |
| Link-01 | 0.29                               | 0 Calculated                             | 0 02:45  | 1.03                                     | 1.00             | 40.36                                  | 330.30                            | 0.12                                   |
| Link-02 | 0.07                               | 0 Calculated                             | 0 04:07  | 0.02                                     | 1.00             | 4.65                                   | 299865.48                         | 0.00                                   |
| Link-04 | 0.14                               | 0 Calculated                             | 0 02:40  | 0.21                                     | 1.00             | 7.90                                   | 1163.01                           | 0.01                                   |
| Link-06 | 0.05                               | 0 Calculated                             | 0 02:40  | 0.22                                     | 1.00             | 7.97                                   | 7562.79                           | 0.00                                   |
| Link-08 | 0.53                               | 0 Calculated                             | 0 02:42  | 0.22                                     | 1.00             | 7.77                                   | 1351.97                           | 0.01                                   |
| Link-09 | 0.19                               | 0 Calculated                             | 0 04:00  | 0.57                                     | 1.00             | 14.20                                  | 421.21                            | 0.03                                   |
| Link-10 | 0.32                               | 0 Calculated                             | 0 02:37  | 0.21                                     | 1.00             | 6.46                                   | 926.98                            | 0.01                                   |
| Link-11 | 0.12                               | 0 Calculated                             | 0 02:33  | 0.24                                     | 1.00             | 6.56                                   | 337.34                            | 0.02                                   |
| Link-12 | 0.21                               | 0 Calculated                             | 0 02:32  | 0.67                                     | 1.00             | 7.31                                   | 25.17                             | 0.29                                   |
| Link-13 | 0.30                               | 0 Calculated                             | 0 02:30  | 0.11                                     | 1.00             | 6.63                                   | 345.42                            | 0.02                                   |



Radbourne Severance

2 Year Post Development

|         |         |            |       |      |      |      |        |      |
|---------|---------|------------|-------|------|------|------|--------|------|
| Link-14 | CHANNEL | 0          | 02:37 | 0.43 | 1.00 | 6.46 | 191.95 | 0.03 |
| 0.14    | 0       | Calculated |       |      |      |      |        |      |

\*\*\*\*\*  
Highest Flow Instability Indexes  
\*\*\*\*\*  
All links are stable.

Analysis began on: Fri Nov 19 17:10:16 2021  
Analysis ended on: Fri Nov 19 17:10:17 2021  
Total elapsed time: 00:00:01

Autodesk® Storm and Sanitary Analysis 2016 - Version 13.4.121 (Build 0)

\*\*\*\*\*

Project Description

\*\*\*\*\*

File Name ..... M20005-post-NOV9-21-1.SPF

\*\*\*\*\*

Analysis Options

\*\*\*\*\*

Flow Units ..... LPS  
 Subbasin Hydrograph Method. SCS TR-20  
 Time of Concentration..... User-Defined  
 Link Routing Method ..... Hydrodynamic  
 Storage Node Exfiltration.. None  
 Starting Date ..... NOV-09-2021 00:00:00  
 Ending Date ..... NOV-09-2021 06:00:00  
 Report Time Step ..... 00:05:00

\*\*\*\*\*

Element Count

\*\*\*\*\*

Number of rain gages ..... 1  
 Number of subbasins ..... 4  
 Number of nodes ..... 16  
 Number of links ..... 14

\*\*\*\*\*

Raingage Summary

\*\*\*\*\*

| Gage ID      | Data Source | Data Type  | Recording Interval | min |
|--------------|-------------|------------|--------------------|-----|
| Rain Gage-01 | 5 Year      | CUMULATIVE | 6.00               |     |

\*\*\*\*\*

Subbasin Summary

\*\*\*\*\*

| Subbasin ID | Total Area<br>hectares | Peak Rate<br>Factor |
|-------------|------------------------|---------------------|
| Sub-01a     | 5.53                   | 484.00              |
| Sub-01b     | 1.24                   | 484.00              |
| Sub-02      | 4.16                   | 484.00              |
| Sub-04      | 0.32                   | 484.00              |

\*\*\*\*\*

Node Summary

\*\*\*\*\*

| Node ID | Element Type | Invert Elevation<br>m | Maximum Elev.<br>m | Ponded Area<br>m <sup>2</sup> | External Inflow |
|---------|--------------|-----------------------|--------------------|-------------------------------|-----------------|
| Jun-01  | JUNCTION     | 198.90                | 202.20             | 0.00                          |                 |
| Jun-02  | JUNCTION     | 201.48                | 202.35             | 0.00                          |                 |
| Jun-03  | JUNCTION     | 201.55                | 202.10             | 0.00                          |                 |
| Jun-04  | JUNCTION     | 201.75                | 202.26             | 0.00                          |                 |
| Jun-05  | JUNCTION     | 202.33                | 204.00             | 0.00                          |                 |

## Radbourne Severance

## 5 Year Post Development

|        |          |        |        |      |
|--------|----------|--------|--------|------|
| Jun-06 | JUNCTION | 203.00 | 204.00 | 0.00 |
| Jun-07 | JUNCTION | 203.50 | 204.00 | 0.00 |
| Jun-08 | JUNCTION | 201.00 | 202.70 | 0.00 |
| Jun-09 | JUNCTION | 199.84 | 201.64 | 0.00 |
| Jun-10 | JUNCTION | 201.60 | 202.00 | 0.00 |
| Jun-11 | JUNCTION | 202.46 | 204.00 | 0.00 |
| Jun-12 | JUNCTION | 202.48 | 204.00 | 0.00 |
| Jun-13 | JUNCTION | 202.72 | 203.05 | 0.00 |
| Jun-14 | JUNCTION | 201.87 | 202.10 | 0.00 |
| Out-01 | OUTFALL  | 198.56 | 199.01 | 0.00 |
| Out-02 | OUTFALL  | 199.65 | 200.15 | 0.00 |

\*\*\*\*\*

## Link Summary

\*\*\*\*\*

| Link ID | From Node | To Node | Element Type | Length m | Slope % | Manning's Roughness |
|---------|-----------|---------|--------------|----------|---------|---------------------|
| CSP-1   | Jun-07    | Jun-06  | CONDUIT      | 8.0      | 6.2657  | 0.0240              |
| CSP-2   | Jun-05    | Jun-04  | CONDUIT      | 8.0      | 7.2500  | 0.0240              |
| CSP-3   | Jun-03    | Jun-02  | CONDUIT      | 8.0      | 0.8750  | 0.0240              |
| Link-01 | Jun-01    | Out-01  | CONDUIT      | 19.0     | 1.7867  | 0.0150              |
| Link-02 | Jun-08    | Jun-01  | CHANNEL      | 7.9      | 32.6582 | 0.0300              |
| Link-04 | Jun-04    | Jun-03  | CHANNEL      | 20.0     | 1.0000  | 0.0300              |
| Link-06 | Jun-06    | Jun-05  | CHANNEL      | 15.4     | 4.3620  | 0.0300              |
| Link-08 | Jun-02    | Jun-08  | CHANNEL      | 26.1     | 1.8391  | 0.0300              |
| Link-09 | Jun-09    | Out-02  | CONDUIT      | 11.5     | 1.6565  | 0.0150              |
| Link-10 | Jun-10    | Jun-09  | CHANNEL      | 10.0     | 17.6000 | 0.0320              |
| Link-11 | Jun-11    | Jun-14  | CHANNEL      | 63.2     | 0.9328  | 0.0320              |
| Link-12 | Jun-12    | Jun-11  | CONDUIT      | 8.7      | 0.2309  | 0.0240              |
| Link-13 | Jun-13    | Jun-12  | CHANNEL      | 21.0     | 1.1407  | 0.0320              |
| Link-14 | Jun-14    | Jun-10  | CHANNEL      | 5.5      | 4.9091  | 0.0320              |

\*\*\*\*\*

## Cross Section Summary

\*\*\*\*\*

| Link Design ID Flow Capacity | Shape       | Depth/<br>Diameter<br>m | Width<br>m | No. of<br>Barrels | Cross<br>Sectional<br>Area<br>m <sup>2</sup> | Full Flow<br>Hydraulic<br>Radius<br>m |
|------------------------------|-------------|-------------------------|------------|-------------------|--|---------------------------------------|
| CSP-1                        | CIRCULAR    | 0.45                    | 0.45       | 1                 | 0.16   | 0.11                                  |
| 386.59                       |             |                         |            |                   |  |                                       |
| CSP-2                        | CIRCULAR    | 0.45                    | 0.45       | 1                 | 0.16   | 0.11                                  |
| 415.85                       |             |                         |            |                   |  |                                       |
| CSP-3                        | CIRCULAR    | 0.45                    | 0.45       | 1                 | 0.16   | 0.11                                  |
| 144.47                       |             |                         |            |                   |  |                                       |
| Link-01                      | CIRCULAR    | 0.45                    | 0.45       | 1                 | 0.16   | 0.11                                  |
| 330.30                       |             |                         |            |                   |  |                                       |
| Link-02                      | TRAPEZOIDAL | 1.20                    | 31.80      | 1                 | 20.88  | 0.65                                  |
| 299865.48                    |             |                         |            |                   |  |                                       |
| Link-04                      | TRAPEZOIDAL | 0.45                    | 3.00       | 1                 | 0.84   | 0.27                                  |
| 1163.01                      |             |                         |            |                   |  |                                       |
| Link-06                      | TRAPEZOIDAL | 1.00                    | 2.75       | 1                 | 1.75   | 0.49                                  |
| 7562.79                      |             |                         |            |                   |  |                                       |
| Link-08                      | TRAPEZOIDAL | 0.26                    | 7.24       | 1                 | 1.07   | 0.15                                  |
| 1351.97                      |             |                         |            |                   |  |                                       |
| Link-09                      | CIRCULAR    | 0.50                    | 0.50       | 1                 | 0.20   | 0.12                                  |
| 421.21                       |             |                         |            |                   |  |                                       |

## Radbourne Severance

5 Year Post Development

|         |             |      |      |   |      |      |
|---------|-------------|------|------|---|------|------|
| Link-10 | TRAPEZOIDAL | 0.20 | 1.95 | 1 | 0.27 | 0.13 |
| 926.98  |             |      |      |   |      |      |
| Link-11 | TRAPEZOIDAL | 0.20 | 3.40 | 1 | 0.44 | 0.13 |
| 337.34  |             |      |      |   |      |      |
| Link-12 | CIRCULAR    | 0.30 | 0.30 | 1 | 0.07 | 0.07 |
| 25.17   |             |      |      |   |      |      |
| Link-13 | TRAPEZOIDAL | 0.20 | 3.00 | 1 | 0.40 | 0.13 |
| 345.42  |             |      |      |   |      |      |
| Link-14 | TRAPEZOIDAL | 0.10 | 2.20 | 1 | 0.16 | 0.07 |
| 191.95  |             |      |      |   |      |      |

|                            |           |        |
|----------------------------|-----------|--------|
| *****                      | Volume    | Depth  |
| Runoff Quantity Continuity | hectare-m | mm     |
| *****                      | -----     | -----  |
| Total Precipitation .....  | 0.553     | 49.167 |
| Surface Runoff .....       | 0.313     | 27.826 |
| Continuity Error (%) ..... | -0.004    |        |

|                            |           |         |
|----------------------------|-----------|---------|
| *****                      | Volume    | Volume  |
| Flow Routing Continuity    | hectare-m | Mliters |
| *****                      | -----     | -----   |
| External Inflow .....      | 0.000     | 0.000   |
| External Outflow .....     | 0.106     | 1.059   |
| Initial Stored Volume .... | 0.000     | 0.000   |
| Final Stored Volume .....  | 0.002     | 0.023   |
| Continuity Error (%) ..... | 0.012     |         |

\*\*\*\*\*  
Composite Curve Number Computations Report  
\*\*\*\*\*

-----  
Subbasin Sub-01a  
-----

| Soil/Surface Description     | Area<br>(ha) | Soil<br>Group | CN    |
|------------------------------|--------------|---------------|-------|
| -                            | 5.53         | -             | 78.00 |
| Composite Area & Weighted CN | 5.53         |               | 78.00 |

-----  
Subbasin Sub-01b  
-----

| Soil/Surface Description     | Area<br>(ha) | Soil<br>Group | CN    |
|------------------------------|--------------|---------------|-------|
| -                            | 1.24         | -             | 76.60 |
| Composite Area & Weighted CN | 1.24         |               | 76.60 |

-----  
Subbasin Sub-02  
-----

| Soil/Surface Description     | Area<br>(ha) | Soil<br>Group | CN    |
|------------------------------|--------------|---------------|-------|
| -                            | 4.16         | -             | 73.70 |
| Composite Area & Weighted CN | 4.16         |               | 73.70 |

-----  
Subbasin Sub-04  
-----

| Soil/Surface Description | Area<br>(ha) | Soil<br>Group | CN |
|--------------------------|--------------|---------------|----|
| -                        |              |               |    |

|                              |      |   |       |
|------------------------------|------|---|-------|
| -                            | 0.32 | - | 83.40 |
| Composite Area & Weighted CN | 0.32 |   | 83.40 |

\*\*\*\*\*  
 Subbasin Runoff Summary  
 \*\*\*\*\*

| Subbasin ID | Total Precip<br>mm | Total Runoff<br>mm | Peak Runoff<br>LPS | Weighted Curve<br>Number | Time of Concentration<br>days hh:mm:ss |
|-------------|--------------------|--------------------|--------------------|--------------------------|--|
| Sub-01a     | 49.40              | 11.53              | 111.00             | 78.000                   | 0 00:16:42                             |
| Sub-01b     | 49.40              | 10.29              | 24.35              | 76.600                   | 0 00:08:05                             |
| Sub-02      | 49.40              | 8.03               | 43.89              | 73.700                   | 0 00:21:20                             |
| Sub-04      | 49.40              | 17.17              | 13.59              | 83.400                   | 0 00:01:38                             |

\*\*\*\*\*  
 Node Depth Summary  
 \*\*\*\*\*

| Node ID | Average Depth<br>Attained<br>m | Maximum Depth<br>Attained<br>m | Maximum HGL<br>Attained<br>m | Time of Max Occurrence<br>days hh:mm | Total Flooded Volume<br>ha-mm | Total Time Flooded<br>minutes | Retention Time<br>hh:mm:ss |
|---------|--------------------------------|--------------------------------|------------------------------|--------------------------------------|-------------------------------|-------------------------------|----------------------------|
| Jun-01  | 0.20                           | 0.36                           | 199.26                       | 0 02:41                              | 0                             | 0                             | 0:00:00                    |
| Jun-02  | 0.02                           | 0.04                           | 201.52                       | 0 02:37                              | 0                             | 0                             | 0:00:00                    |
| Jun-03  | 0.09                           | 0.13                           | 201.68                       | 0 02:36                              | 0                             | 0                             | 0:00:00                    |
| Jun-04  | 0.03                           | 0.06                           | 201.81                       | 0 02:35                              | 0                             | 0                             | 0:00:00                    |
| Jun-05  | 0.08                           | 0.11                           | 202.44                       | 0 02:40                              | 0                             | 0                             | 0:00:00                    |
| Jun-06  | 0.02                           | 0.04                           | 203.04                       | 0 02:35                              | 0                             | 0                             | 0:00:00                    |
| Jun-07  | 0.00                           | 0.00                           | 203.50                       | 0 00:00                              | 0                             | 0                             | 0:00:00                    |
| Jun-08  | 0.39                           | 0.49                           | 201.49                       | 0 02:53                              | 0                             | 0                             | 0:00:00                    |
| Jun-09  | 0.12                           | 0.17                           | 200.01                       | 0 02:45                              | 0                             | 0                             | 0:00:00                    |
| Jun-10  | 0.01                           | 0.02                           | 201.62                       | 0 02:34                              | 0                             | 0                             | 0:00:00                    |
| Jun-11  | 0.02                           | 0.05                           | 202.51                       | 0 02:33                              | 0                             | 0                             | 0:00:00                    |
| Jun-12  | 0.07                           | 0.12                           | 202.60                       | 0 02:31                              | 0                             | 0                             | 0:00:00                    |
| Jun-13  | 0.02                           | 0.03                           | 202.75                       | 0 02:30                              | 0                             | 0                             | 0:00:00                    |
| Jun-14  | 0.01                           | 0.02                           | 201.89                       | 0 02:34                              | 0                             | 0                             | 0:00:00                    |
| Out-01  | 0.11                           | 0.18                           | 198.74                       | 0 02:41                              | 0                             | 0                             | 0:00:00                    |
| Out-02  | 0.08                           | 0.12                           | 199.77                       | 0 02:45                              | 0                             | 0                             | 0:00:00                    |

\*\*\*\*\*  
 Node Flow Summary  
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| Node ID | Element Type | Maximum Lateral Inflow<br>LPS | Peak Inflow<br>LPS | Time of Peak Inflow Occurrence<br>days hh:mm | Maximum Flooding Overflow<br>LPS | Time of Peak Flooding Occurrence<br>days hh:mm |
|---------|--------------|-------------------------------|--------------------|--|----------------------------------|--|
| Jun-01  | JUNCTION     | 110.99                        | 110.99             | 0 02:40                                      | 0.00                             |  |
| Jun-02  | JUNCTION     | 0.00                          | 23.88              | 0 02:36                                      | 0.00                             |  |
| Jun-03  | JUNCTION     | 0.00                          | 23.99              | 0 02:35                                      | 0.00                             |  |
| Jun-04  | JUNCTION     | 0.00                          | 24.08              | 0 02:40                                      | 0.00                             |  |
| Jun-05  | JUNCTION     | 0.00                          | 24.17              | 0 02:35                                      | 0.00                             |  |
| Jun-06  | JUNCTION     | 24.22                         | 24.22              | 0 02:35                                      | 0.00                             |  |
| Jun-07  | JUNCTION     | 0.00                          | 0.00               | 0 00:00                                      | 0.00                             |  |
| Jun-08  | JUNCTION     | 0.00                          | 23.78              | 0 02:37                                      | 0.00                             |  |
| Jun-09  | JUNCTION     | 43.60                         | 51.04              | 0 02:45                                      | 0.00                             |  |
| Jun-10  | JUNCTION     | 0.00                          | 12.48              | 0 02:34                                      | 0.00                             |  |

## Radbourne Severance

5 Year Post Development

|        |          |       |        |   |       |      |
|--------|----------|-------|--------|---|-------|------|
| Jun-11 | JUNCTION | 0.00  | 12.56  | 0 | 02:31 | 0.00 |
| Jun-12 | JUNCTION | 0.00  | 12.75  | 0 | 02:30 | 0.00 |
| Jun-13 | JUNCTION | 12.80 | 12.80  | 0 | 02:30 | 0.00 |
| Jun-14 | JUNCTION | 0.00  | 12.50  | 0 | 02:33 | 0.00 |
| Out-01 | OUTFALL  | 0.00  | 108.44 | 0 | 02:41 | 0.00 |
| Out-02 | OUTFALL  | 0.00  | 50.90  | 0 | 02:45 | 0.00 |

\*\*\*\*\*  
 Outfall Loading Summary  
 \*\*\*\*\*

| Outfall Node ID | Flow<br>Frequency<br>(%) | Average<br>Flow<br>LPS | Peak<br>Inflow<br>LPS |
|-----------------|--------------------------|------------------------|-----------------------|
| Out-01          | 91.50                    | 53.35                  | 108.44                |
| Out-02          | 90.77                    | 27.88                  | 50.90                 |
| System          | 91.13                    | 81.22                  | 157.61                |

\*\*\*\*\*  
 Link Flow Summary  
 \*\*\*\*\*

| Link ID | Ratio of        | Total   | Element<br>Reported<br>Type<br>Condition | Time of<br>Peak Flow<br>Occurrence | Maximum<br>Velocity<br>Attained | Length<br>Factor | Peak Flow<br>during<br>Analysis | Design<br>Flow<br>Capacity | Ratio of<br>Maximum<br>/Design<br>Flow |
|---------|-----------------|---------|--|------------------------------------|---------------------------------|------------------|---------------------------------|----------------------------|--|
|         | Flow Surcharged | Time    |  | days hh:mm                         | m/sec                           |                  | LPS                             | LPS                        | Flow                                   |
|         | Depth           | minutes |  |                                    |                                 |                  |                                 |                            |  |
| CSP-1   |                 |         | CONDUIT                                  | 0 00:00                            | 0.00                            | 1.00             | 0.00                            | 386.59                     | 0.00                                   |
| 0.04    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| CSP-2   |                 |         | CONDUIT                                  | 0 02:40                            | 1.19                            | 1.00             | 24.08                           | 415.85                     | 0.06                                   |
| 0.19    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| CSP-3   |                 |         | CONDUIT                                  | 0 02:36                            | 1.13                            | 1.00             | 23.88                           | 144.47                     | 0.17                                   |
| 0.19    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| Link-01 |                 |         | CONDUIT                                  | 0 02:41                            | 1.16                            | 1.00             | 108.44                          | 330.30                     | 0.33                                   |
| 0.59    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| Link-02 |                 |         | CHANNEL                                  | 0 02:53                            | 0.02                            | 1.00             | 14.69                           | 299865.48                  | 0.00                                   |
| 0.15    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| Link-04 |                 |         | CHANNEL                                  | 0 02:35                            | 0.25                            | 1.00             | 23.99                           | 1163.01                    | 0.02                                   |
| 0.21    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| Link-06 |                 |         | CHANNEL                                  | 0 02:35                            | 0.38                            | 1.00             | 24.17                           | 7562.79                    | 0.00                                   |
| 0.08    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| Link-08 |                 |         | CHANNEL                                  | 0 02:37                            | 0.23                            | 1.00             | 23.78                           | 1351.97                    | 0.02                                   |
| 0.57    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| Link-09 |                 |         | CONDUIT                                  | 0 02:45                            | 1.08                            | 1.00             | 50.90                           | 421.21                     | 0.12                                   |
| 0.29    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| Link-10 |                 |         | CHANNEL                                  | 0 02:34                            | 0.21                            | 1.00             | 12.48                           | 926.98                     | 0.01                                   |
| 0.46    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| Link-11 |                 |         | CHANNEL                                  | 0 02:33                            | 0.30                            | 1.00             | 12.50                           | 337.34                     | 0.04                                   |
| 0.17    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| Link-12 |                 |         | CONDUIT                                  | 0 02:31                            | 0.78                            | 1.00             | 12.56                           | 25.17                      | 0.50                                   |
| 0.28    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| Link-13 |                 |         | CHANNEL                                  | 0 02:30                            | 0.12                            | 1.00             | 12.75                           | 345.42                     | 0.04                                   |
| 0.39    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |

Radbourne Severance

5 Year Post Development

|         |              |   |       |      |      |       |        |      |
|---------|--------------|---|-------|------|------|-------|--------|------|
| Link-14 | CHANNEL      | 0 | 02:34 | 0.54 | 1.00 | 12.48 | 191.95 | 0.06 |
| 0.20    | 0 Calculated |   |       |      |      |       |        |      |

\*\*\*\*\*  
Highest Flow Instability Indexes  
\*\*\*\*\*  
Link Link-09 (66)  
Link Link-01 (15)  
Link CSP-2 (11)  
Link Link-04 (10)  
Link CSP-3 (7)

Analysis began on: Fri Nov 19 17:11:06 2021  
Analysis ended on: Fri Nov 19 17:11:07 2021  
Total elapsed time: 00:00:01

Autodesk® Storm and Sanitary Analysis 2016 - Version 13.4.121 (Build 0)

\*\*\*\*\*

Project Description

\*\*\*\*\*

File Name ..... M20005-post-NOV9-21-1.SPF

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Analysis Options

\*\*\*\*\*

Flow Units ..... LPS  
 Subbasin Hydrograph Method. SCS TR-20  
 Time of Concentration..... User-Defined  
 Link Routing Method ..... Hydrodynamic  
 Storage Node Exfiltration.. None  
 Starting Date ..... NOV-09-2021 00:00:00  
 Ending Date ..... NOV-09-2021 06:00:00  
 Report Time Step ..... 00:05:00

\*\*\*\*\*

Element Count

\*\*\*\*\*

Number of rain gages ..... 1  
 Number of subbasins ..... 4  
 Number of nodes ..... 16  
 Number of links ..... 14

\*\*\*\*\*

Raingage Summary

\*\*\*\*\*

| Gage ID      | Data Source | Data Type  | Recording Interval | min |
|--------------|-------------|------------|--------------------|-----|
| Rain Gage-01 | 10 Year     | CUMULATIVE | 6.00               |     |

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Subbasin Summary

\*\*\*\*\*

| Subbasin ID | Total Area<br>hectares | Peak Rate<br>Factor |
|-------------|------------------------|---------------------|
| Sub-01a     | 5.53                   | 484.00              |
| Sub-01b     | 1.24                   | 484.00              |
| Sub-02      | 4.16                   | 484.00              |
| Sub-04      | 0.32                   | 484.00              |

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Node Summary

\*\*\*\*\*

| Node ID | Element Type | Invert Elevation<br>m | Maximum Elev.<br>m | Ponded Area<br>m <sup>2</sup> | External Inflow |
|---------|--------------|-----------------------|--------------------|-------------------------------|-----------------|
| Jun-01  | JUNCTION     | 198.90                | 202.20             | 0.00                          |                 |
| Jun-02  | JUNCTION     | 201.48                | 202.35             | 0.00                          |                 |
| Jun-03  | JUNCTION     | 201.55                | 202.10             | 0.00                          |                 |
| Jun-04  | JUNCTION     | 201.75                | 202.26             | 0.00                          |                 |
| Jun-05  | JUNCTION     | 202.33                | 204.00             | 0.00                          |                 |



## Radbourne Severance

## 10 Year Post Development

|        |          |        |        |      |
|--------|----------|--------|--------|------|
| Jun-06 | JUNCTION | 203.00 | 204.00 | 0.00 |
| Jun-07 | JUNCTION | 203.50 | 204.00 | 0.00 |
| Jun-08 | JUNCTION | 201.00 | 202.70 | 0.00 |
| Jun-09 | JUNCTION | 199.84 | 201.64 | 0.00 |
| Jun-10 | JUNCTION | 201.60 | 202.00 | 0.00 |
| Jun-11 | JUNCTION | 202.46 | 204.00 | 0.00 |
| Jun-12 | JUNCTION | 202.48 | 204.00 | 0.00 |
| Jun-13 | JUNCTION | 202.72 | 203.05 | 0.00 |
| Jun-14 | JUNCTION | 201.87 | 202.10 | 0.00 |
| Out-01 | OUTFALL  | 198.56 | 199.01 | 0.00 |
| Out-02 | OUTFALL  | 199.65 | 200.15 | 0.00 |

\*\*\*\*\*

## Link Summary

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| Link ID | From Node | To Node | Element Type | Length m | Slope % | Manning's Roughness |
|---------|-----------|---------|--------------|----------|---------|---------------------|
| CSP-1   | Jun-07    | Jun-06  | CONDUIT      | 8.0      | 6.2657  | 0.0240              |
| CSP-2   | Jun-05    | Jun-04  | CONDUIT      | 8.0      | 7.2500  | 0.0240              |
| CSP-3   | Jun-03    | Jun-02  | CONDUIT      | 8.0      | 0.8750  | 0.0240              |
| Link-01 | Jun-01    | Out-01  | CONDUIT      | 19.0     | 1.7867  | 0.0150              |
| Link-02 | Jun-08    | Jun-01  | CHANNEL      | 7.9      | 32.6582 | 0.0300              |
| Link-04 | Jun-04    | Jun-03  | CHANNEL      | 20.0     | 1.0000  | 0.0300              |
| Link-06 | Jun-06    | Jun-05  | CHANNEL      | 15.4     | 4.3620  | 0.0300              |
| Link-08 | Jun-02    | Jun-08  | CHANNEL      | 26.1     | 1.8391  | 0.0300              |
| Link-09 | Jun-09    | Out-02  | CONDUIT      | 11.5     | 1.6565  | 0.0150              |
| Link-10 | Jun-10    | Jun-09  | CHANNEL      | 10.0     | 17.6000 | 0.0320              |
| Link-11 | Jun-11    | Jun-14  | CHANNEL      | 63.2     | 0.9328  | 0.0320              |
| Link-12 | Jun-12    | Jun-11  | CONDUIT      | 8.7      | 0.2309  | 0.0240              |
| Link-13 | Jun-13    | Jun-12  | CHANNEL      | 21.0     | 1.1407  | 0.0320              |
| Link-14 | Jun-14    | Jun-10  | CHANNEL      | 5.5      | 4.9091  | 0.0320              |

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## Cross Section Summary

\*\*\*\*\*

| Link Design ID Flow Capacity | Shape       | Depth/<br>Diameter<br>m | Width<br>m | No. of<br>Barrels | Cross<br>Sectional<br>Area<br>m <sup>2</sup> | Full Flow<br>Hydraulic<br>Radius<br>m |
|------------------------------|-------------|-------------------------|------------|-------------------|--|---------------------------------------|
| CSP-1                        | CIRCULAR    | 0.45                    | 0.45       | 1                 | 0.16   | 0.11                                  |
| 386.59                       |             |                         |            |                   |  |                                       |
| CSP-2                        | CIRCULAR    | 0.45                    | 0.45       | 1                 | 0.16   | 0.11                                  |
| 415.85                       |             |                         |            |                   |  |                                       |
| CSP-3                        | CIRCULAR    | 0.45                    | 0.45       | 1                 | 0.16   | 0.11                                  |
| 144.47                       |             |                         |            |                   |  |                                       |
| Link-01                      | CIRCULAR    | 0.45                    | 0.45       | 1                 | 0.16   | 0.11                                  |
| 330.30                       |             |                         |            |                   |  |                                       |
| Link-02                      | TRAPEZOIDAL | 1.20                    | 31.80      | 1                 | 20.88  | 0.65                                  |
| 299865.48                    |             |                         |            |                   |  |                                       |
| Link-04                      | TRAPEZOIDAL | 0.45                    | 3.00       | 1                 | 0.84   | 0.27                                  |
| 1163.01                      |             |                         |            |                   |  |                                       |
| Link-06                      | TRAPEZOIDAL | 1.00                    | 2.75       | 1                 | 1.75   | 0.49                                  |
| 7562.79                      |             |                         |            |                   |  |                                       |
| Link-08                      | TRAPEZOIDAL | 0.26                    | 7.24       | 1                 | 1.07   | 0.15                                  |
| 1351.97                      |             |                         |            |                   |  |                                       |
| Link-09                      | CIRCULAR    | 0.50                    | 0.50       | 1                 | 0.20   | 0.12                                  |
| 421.21                       |             |                         |            |                   |  |                                       |

## Radbourne Severance

## 10 Year Post Development

|         |             |      |      |   |      |      |
|---------|-------------|------|------|---|------|------|
| Link-10 | TRAPEZOIDAL | 0.20 | 1.95 | 1 | 0.27 | 0.13 |
| 926.98  |             |      |      |   |      |      |
| Link-11 | TRAPEZOIDAL | 0.20 | 3.40 | 1 | 0.44 | 0.13 |
| 337.34  |             |      |      |   |      |      |
| Link-12 | CIRCULAR    | 0.30 | 0.30 | 1 | 0.07 | 0.07 |
| 25.17   |             |      |      |   |      |      |
| Link-13 | TRAPEZOIDAL | 0.20 | 3.00 | 1 | 0.40 | 0.13 |
| 345.42  |             |      |      |   |      |      |
| Link-14 | TRAPEZOIDAL | 0.10 | 2.20 | 1 | 0.16 | 0.07 |
| 191.95  |             |      |      |   |      |      |

```

*****
Runoff Quantity Continuity      Volume      Depth
*****      hectare-m      mm
*****      -----      -----
Total Precipitation .....      0.643      57.129
Surface Runoff .....      0.447      39.775
Continuity Error (%) .....      -0.004

```

```

*****
Flow Routing Continuity      Volume      Volume
*****      hectare-m      Mliters
*****      -----      -----
External Inflow .....      0.000      0.000
External Outflow .....      0.153      1.529
Initial Stored Volume ....      0.000      0.000
Final Stored Volume .....      0.002      0.025
Continuity Error (%) .....      0.010

```

\*\*\*\*\*  
Composite Curve Number Computations Report  
\*\*\*\*\*

-----  
Subbasin Sub-01a  
-----

| Soil/Surface Description     | Area<br>(ha) | Soil<br>Group | CN    |
|------------------------------|--------------|---------------|-------|
| -                            | 5.53         | -             | 78.00 |
| Composite Area & Weighted CN | 5.53         |               | 78.00 |

-----  
Subbasin Sub-01b  
-----

| Soil/Surface Description     | Area<br>(ha) | Soil<br>Group | CN    |
|------------------------------|--------------|---------------|-------|
| -                            | 1.24         | -             | 76.60 |
| Composite Area & Weighted CN | 1.24         |               | 76.60 |

-----  
Subbasin Sub-02  
-----

| Soil/Surface Description     | Area<br>(ha) | Soil<br>Group | CN    |
|------------------------------|--------------|---------------|-------|
| -                            | 4.16         | -             | 73.70 |
| Composite Area & Weighted CN | 4.16         |               | 73.70 |

-----  
Subbasin Sub-04  
-----

| Soil/Surface Description | Area<br>(ha) | Soil<br>Group | CN |
|--------------------------|--------------|---------------|----|
|--------------------------|--------------|---------------|----|

|                              |      |   |       |
|------------------------------|------|---|-------|
| -                            | 0.32 | - | 83.40 |
| Composite Area & Weighted CN | 0.32 |   | 83.40 |

\*\*\*\*\*  
Subbasin Runoff Summary  
\*\*\*\*\*

| Subbasin ID | Total Precip<br>mm | Total Runoff<br>mm | Peak Runoff<br>LPS | Weighted Curve<br>Number | Time of Concentration<br>days hh:mm:ss |
|-------------|--------------------|--------------------|--------------------|--------------------------|--|
| Sub-01a     | 57.40              | 16.18              | 167.35             | 78.000                   | 0 00:16:42                             |
| Sub-01b     | 57.40              | 14.68              | 37.10              | 76.600                   | 0 00:08:05                             |
| Sub-02      | 57.40              | 11.86              | 74.76              | 73.700                   | 0 00:21:20                             |
| Sub-04      | 57.40              | 22.86              | 18.41              | 83.400                   | 0 00:01:38                             |

\*\*\*\*\*  
Node Depth Summary  
\*\*\*\*\*

| Node ID | Average Depth<br>Attained<br>m | Maximum Depth<br>Attained<br>m | Maximum HGL<br>Attained<br>m | Time of Max Occurrence<br>days hh:mm | Total Flooded Volume<br>ha-mm | Total Time Flooded<br>minutes | Retention Time<br>hh:mm:ss |
|---------|--------------------------------|--------------------------------|------------------------------|--------------------------------------|-------------------------------|-------------------------------|----------------------------|
| Jun-01  | 0.25                           | 0.54                           | 199.44                       | 0 02:42                              | 0                             | 0                             | 0:00:00                    |
| Jun-02  | 0.02                           | 0.05                           | 201.53                       | 0 02:36                              | 0                             | 0                             | 0:00:00                    |
| Jun-03  | 0.10                           | 0.16                           | 201.71                       | 0 02:36                              | 0                             | 0                             | 0:00:00                    |
| Jun-04  | 0.04                           | 0.08                           | 201.83                       | 0 02:35                              | 0                             | 0                             | 0:00:00                    |
| Jun-05  | 0.09                           | 0.14                           | 202.47                       | 0 02:35                              | 0                             | 0                             | 0:00:00                    |
| Jun-06  | 0.03                           | 0.05                           | 203.05                       | 0 02:35                              | 0                             | 0                             | 0:00:00                    |
| Jun-07  | 0.00                           | 0.00                           | 203.50                       | 0 00:00                              | 0                             | 0                             | 0:00:00                    |
| Jun-08  | 0.41                           | 0.49                           | 201.49                       | 0 02:40                              | 0                             | 0                             | 0:00:00                    |
| Jun-09  | 0.15                           | 0.25                           | 200.09                       | 0 02:46                              | 0                             | 0                             | 0:00:00                    |
| Jun-10  | 0.01                           | 0.02                           | 201.62                       | 0 02:33                              | 0                             | 0                             | 0:00:00                    |
| Jun-11  | 0.03                           | 0.05                           | 202.51                       | 0 02:32                              | 0                             | 0                             | 0:00:00                    |
| Jun-12  | 0.08                           | 0.14                           | 202.62                       | 0 02:31                              | 0                             | 0                             | 0:00:00                    |
| Jun-13  | 0.02                           | 0.04                           | 202.76                       | 0 02:30                              | 0                             | 0                             | 0:00:00                    |
| Jun-14  | 0.01                           | 0.03                           | 201.90                       | 0 02:33                              | 0                             | 0                             | 0:00:00                    |
| Out-01  | 0.13                           | 0.25                           | 198.81                       | 0 02:42                              | 0                             | 0                             | 0:00:00                    |
| Out-02  | 0.09                           | 0.15                           | 199.80                       | 0 02:46                              | 0                             | 0                             | 0:00:00                    |

\*\*\*\*\*  
Node Flow Summary  
\*\*\*\*\*

| Node ID | Element Type | Maximum Lateral Inflow<br>LPS | Peak Inflow<br>LPS | Time of Peak Inflow Occurrence<br>days hh:mm | Maximum Flooding Overflow<br>LPS | Time of Peak Flooding Occurrence<br>days hh:mm |
|---------|--------------|-------------------------------|--------------------|--|----------------------------------|--|
| Jun-01  | JUNCTION     | 167.34                        | 201.07             | 0 02:40                                      | 0.00                             |  |
| Jun-02  | JUNCTION     | 0.00                          | 36.70              | 0 02:36                                      | 0.00                             |  |
| Jun-03  | JUNCTION     | 0.00                          | 36.87              | 0 02:35                                      | 0.00                             |  |
| Jun-04  | JUNCTION     | 0.00                          | 36.93              | 0 02:35                                      | 0.00                             |  |
| Jun-05  | JUNCTION     | 0.00                          | 37.06              | 0 02:35                                      | 0.00                             |  |
| Jun-06  | JUNCTION     | 37.11                         | 37.11              | 0 02:35                                      | 0.00                             |  |
| Jun-07  | JUNCTION     | 0.00                          | 0.00               | 0 00:00                                      | 0.00                             |  |
| Jun-08  | JUNCTION     | 0.00                          | 36.60              | 0 02:36                                      | 0.00                             |  |
| Jun-09  | JUNCTION     | 74.63                         | 84.39              | 0 02:40                                      | 0.00                             |  |
| Jun-10  | JUNCTION     | 0.00                          | 16.90              | 0 02:33                                      | 0.00                             |  |

## Radbourne Severance

10 Year Post Development

|        |          |       |        |   |       |      |
|--------|----------|-------|--------|---|-------|------|
| Jun-11 | JUNCTION | 0.00  | 17.00  | 0 | 02:31 | 0.00 |
| Jun-12 | JUNCTION | 0.00  | 17.19  | 0 | 02:30 | 0.00 |
| Jun-13 | JUNCTION | 17.23 | 17.23  | 0 | 02:29 | 0.00 |
| Jun-14 | JUNCTION | 0.00  | 16.93  | 0 | 02:32 | 0.00 |
| Out-01 | OUTFALL  | 0.00  | 190.23 | 0 | 02:42 | 0.00 |
| Out-02 | OUTFALL  | 0.00  | 85.39  | 0 | 02:46 | 0.00 |

\*\*\*\*\*  
 Outfall Loading Summary  
 \*\*\*\*\*

| Outfall Node ID | Flow<br>Frequency<br>(%) | Average<br>Flow<br>LPS | Peak<br>Inflow<br>LPS |
|-----------------|--------------------------|------------------------|-----------------------|
| Out-01          | 92.71                    | 76.13                  | 190.23                |
| Out-02          | 92.14                    | 40.54                  | 85.39                 |
| System          | 92.43                    | 116.67                 | 275.17                |

\*\*\*\*\*  
 Link Flow Summary  
 \*\*\*\*\*

| Link ID | Ratio of        | Total   | Element<br>Reported<br>Type<br>Condition | Time of<br>Peak Flow<br>Occurrence | Maximum<br>Velocity<br>Attained | Length<br>Factor | Peak Flow<br>during<br>Analysis | Design<br>Flow<br>Capacity | Ratio of<br>Maximum<br>/Design<br>Flow |
|---------|-----------------|---------|--|------------------------------------|---------------------------------|------------------|---------------------------------|----------------------------|--|
|         | Flow Surcharged | Time    |  | days hh:mm                         | m/sec                           |                  | LPS                             | LPS                        | Flow                                   |
|         | Depth           | minutes |  |                                    |                                 |                  |                                 |                            |  |
| CSP-1   |                 |         | CONDUIT                                  | 0 00:00                            | 0.00                            | 1.00             | 0.00                            | 386.59                     | 0.00                                   |
| 0.06    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| CSP-2   |                 |         | CONDUIT                                  | 0 02:35                            | 1.23                            | 1.00             | 36.93                           | 415.85                     | 0.09                                   |
| 0.24    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| CSP-3   |                 |         | CONDUIT                                  | 0 02:36                            | 1.28                            | 1.00             | 36.70                           | 144.47                     | 0.25                                   |
| 0.24    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| Link-01 |                 |         | CONDUIT                                  | 0 02:42                            | 1.44                            | 1.00             | 190.23                          | 330.30                     | 0.58                                   |
| 0.77    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| Link-02 |                 |         | CHANNEL                                  | 0 02:40                            | 0.02                            | 1.00             | 33.75                           | 299865.48                  | 0.00                                   |
| 0.23    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| Link-04 |                 |         | CHANNEL                                  | 0 02:35                            | 0.29                            | 1.00             | 36.87                           | 1163.01                    | 0.03                                   |
| 0.27    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| Link-06 |                 |         | CHANNEL                                  | 0 02:35                            | 0.45                            | 1.00             | 37.06                           | 7562.79                    | 0.00                                   |
| 0.10    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| Link-08 |                 |         | CHANNEL                                  | 0 02:36                            | 0.23                            | 1.00             | 36.60                           | 1351.97                    | 0.03                                   |
| 0.59    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| Link-09 |                 |         | CONDUIT                                  | 0 02:46                            | 1.17                            | 1.00             | 85.39                           | 421.21                     | 0.20                                   |
| 0.40    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| Link-10 |                 |         | CHANNEL                                  | 0 02:33                            | 0.20                            | 1.00             | 16.90                           | 926.98                     | 0.02                                   |
| 0.55    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| Link-11 |                 |         | CHANNEL                                  | 0 02:32                            | 0.34                            | 1.00             | 16.93                           | 337.34                     | 0.05                                   |
| 0.20    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| Link-12 |                 |         | CONDUIT                                  | 0 02:31                            | 0.86                            | 1.00             | 17.00                           | 25.17                      | 0.68                                   |
| 0.32    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| Link-13 |                 |         | CHANNEL                                  | 0 02:30                            | 0.13                            | 1.00             | 17.19                           | 345.42                     | 0.05                                   |
| 0.45    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |

Radbourne Severance

10 Year Post Development

|         |              |   |       |      |      |       |        |      |
|---------|--------------|---|-------|------|------|-------|--------|------|
| Link-14 | CHANNEL      | 0 | 02:33 | 0.60 | 1.00 | 16.90 | 191.95 | 0.09 |
| 0.25    | 0 Calculated |   |       |      |      |       |        |      |

\*\*\*\*\*  
Highest Flow Instability Indexes  
\*\*\*\*\*  
Link Link-09 (34)  
Link CSP-3 (20)  
Link CSP-2 (18)  
Link Link-08 (17)  
Link Link-04 (17)

Analysis began on: Sat Nov 20 15:06:47 2021  
Analysis ended on: Sat Nov 20 15:06:48 2021  
Total elapsed time: 00:00:01

Autodesk® Storm and Sanitary Analysis 2016 - Version 13.4.121 (Build 0)

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Project Description

\*\*\*\*\*

File Name ..... M20005-post-NOV9-21-1.SPF

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Analysis Options

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Flow Units ..... LPS  
 Subbasin Hydrograph Method. SCS TR-20  
 Time of Concentration..... User-Defined  
 Link Routing Method ..... Hydrodynamic  
 Storage Node Exfiltration.. None  
 Starting Date ..... NOV-09-2021 00:00:00  
 Ending Date ..... NOV-09-2021 06:00:00  
 Report Time Step ..... 00:05:00

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Element Count

\*\*\*\*\*

Number of rain gages ..... 1  
 Number of subbasins ..... 4  
 Number of nodes ..... 16  
 Number of links ..... 14

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Raingage Summary

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| Gage ID      | Data Source | Data Type  | Recording Interval |
|--------------|-------------|------------|--------------------|
| Rain Gage-01 | 25 Year     | CUMULATIVE | 6.00 min           |

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Subbasin Summary

\*\*\*\*\*

| Subbasin ID | Total Area<br>hectares | Peak Rate<br>Factor |
|-------------|------------------------|---------------------|
| Sub-01a     | 5.53                   | 484.00              |
| Sub-01b     | 1.24                   | 484.00              |
| Sub-02      | 4.16                   | 484.00              |
| Sub-04      | 0.32                   | 484.00              |

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Node Summary

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| Node ID | Element Type | Invert Elevation<br>m | Maximum Elev.<br>m | Ponded Area<br>m <sup>2</sup> | External Inflow |
|---------|--------------|-----------------------|--------------------|-------------------------------|-----------------|
| Jun-01  | JUNCTION     | 198.90                | 202.20             | 0.00                          |                 |
| Jun-02  | JUNCTION     | 201.48                | 202.35             | 0.00                          |                 |
| Jun-03  | JUNCTION     | 201.55                | 202.10             | 0.00                          |                 |
| Jun-04  | JUNCTION     | 201.75                | 202.26             | 0.00                          |                 |
| Jun-05  | JUNCTION     | 202.33                | 204.00             | 0.00                          |                 |

## Radbourne Severance

## 25 Year Post Development

|        |          |        |        |      |
|--------|----------|--------|--------|------|
| Jun-06 | JUNCTION | 203.00 | 204.00 | 0.00 |
| Jun-07 | JUNCTION | 203.50 | 204.00 | 0.00 |
| Jun-08 | JUNCTION | 201.00 | 202.70 | 0.00 |
| Jun-09 | JUNCTION | 199.84 | 201.64 | 0.00 |
| Jun-10 | JUNCTION | 201.60 | 202.00 | 0.00 |
| Jun-11 | JUNCTION | 202.46 | 204.00 | 0.00 |
| Jun-12 | JUNCTION | 202.48 | 204.00 | 0.00 |
| Jun-13 | JUNCTION | 202.72 | 203.05 | 0.00 |
| Jun-14 | JUNCTION | 201.87 | 202.10 | 0.00 |
| Out-01 | OUTFALL  | 198.56 | 199.01 | 0.00 |
| Out-02 | OUTFALL  | 199.65 | 200.15 | 0.00 |

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## Link Summary

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| Link ID | From Node | To Node | Element Type | Length m | Slope % | Manning's Roughness |
|---------|-----------|---------|--------------|----------|---------|---------------------|
| CSP-1   | Jun-07    | Jun-06  | CONDUIT      | 8.0      | 6.2657  | 0.0240              |
| CSP-2   | Jun-05    | Jun-04  | CONDUIT      | 8.0      | 7.2500  | 0.0240              |
| CSP-3   | Jun-03    | Jun-02  | CONDUIT      | 8.0      | 0.8750  | 0.0240              |
| Link-01 | Jun-01    | Out-01  | CONDUIT      | 19.0     | 1.7867  | 0.0150              |
| Link-02 | Jun-08    | Jun-01  | CHANNEL      | 7.9      | 32.6582 | 0.0300              |
| Link-04 | Jun-04    | Jun-03  | CHANNEL      | 20.0     | 1.0000  | 0.0300              |
| Link-06 | Jun-06    | Jun-05  | CHANNEL      | 15.4     | 4.3620  | 0.0300              |
| Link-08 | Jun-02    | Jun-08  | CHANNEL      | 26.1     | 1.8391  | 0.0300              |
| Link-09 | Jun-09    | Out-02  | CONDUIT      | 11.5     | 1.6565  | 0.0150              |
| Link-10 | Jun-10    | Jun-09  | CHANNEL      | 10.0     | 17.6000 | 0.0320              |
| Link-11 | Jun-11    | Jun-14  | CHANNEL      | 63.2     | 0.9328  | 0.0320              |
| Link-12 | Jun-12    | Jun-11  | CONDUIT      | 8.7      | 0.2309  | 0.0240              |
| Link-13 | Jun-13    | Jun-12  | CHANNEL      | 21.0     | 1.1407  | 0.0320              |
| Link-14 | Jun-14    | Jun-10  | CHANNEL      | 5.5      | 4.9091  | 0.0320              |

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## Cross Section Summary

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| Link Design ID Flow Capacity | Shape       | Depth/<br>Diameter<br>m | Width<br>m | No. of<br>Barrels | Cross<br>Sectional<br>Area<br>m <sup>2</sup> | Full Flow<br>Hydraulic<br>Radius<br>m |
|------------------------------|-------------|-------------------------|------------|-------------------|--|---------------------------------------|
| CSP-1                        | CIRCULAR    | 0.45                    | 0.45       | 1                 | 0.16   | 0.11                                  |
| 386.59                       |             |                         |            |                   |  |                                       |
| CSP-2                        | CIRCULAR    | 0.45                    | 0.45       | 1                 | 0.16   | 0.11                                  |
| 415.85                       |             |                         |            |                   |  |                                       |
| CSP-3                        | CIRCULAR    | 0.45                    | 0.45       | 1                 | 0.16   | 0.11                                  |
| 144.47                       |             |                         |            |                   |  |                                       |
| Link-01                      | CIRCULAR    | 0.45                    | 0.45       | 1                 | 0.16   | 0.11                                  |
| 330.30                       |             |                         |            |                   |  |                                       |
| Link-02                      | TRAPEZOIDAL | 1.20                    | 31.80      | 1                 | 20.88  | 0.65                                  |
| 299865.48                    |             |                         |            |                   |  |                                       |
| Link-04                      | TRAPEZOIDAL | 0.45                    | 3.00       | 1                 | 0.84   | 0.27                                  |
| 1163.01                      |             |                         |            |                   |  |                                       |
| Link-06                      | TRAPEZOIDAL | 1.00                    | 2.75       | 1                 | 1.75   | 0.49                                  |
| 7562.79                      |             |                         |            |                   |  |                                       |
| Link-08                      | TRAPEZOIDAL | 0.26                    | 7.24       | 1                 | 1.07   | 0.15                                  |
| 1351.97                      |             |                         |            |                   |  |                                       |
| Link-09                      | CIRCULAR    | 0.50                    | 0.50       | 1                 | 0.20   | 0.12                                  |
| 421.21                       |             |                         |            |                   |  |                                       |

## Radbourne Severance

25 Year Post Development

|         |             |      |      |   |      |      |
|---------|-------------|------|------|---|------|------|
| Link-10 | TRAPEZOIDAL | 0.20 | 1.95 | 1 | 0.27 | 0.13 |
| 926.98  |             |      |      |   |      |      |
| Link-11 | TRAPEZOIDAL | 0.20 | 3.40 | 1 | 0.44 | 0.13 |
| 337.34  |             |      |      |   |      |      |
| Link-12 | CIRCULAR    | 0.30 | 0.30 | 1 | 0.07 | 0.07 |
| 25.17   |             |      |      |   |      |      |
| Link-13 | TRAPEZOIDAL | 0.20 | 3.00 | 1 | 0.40 | 0.13 |
| 345.42  |             |      |      |   |      |      |
| Link-14 | TRAPEZOIDAL | 0.10 | 2.20 | 1 | 0.16 | 0.07 |
| 191.95  |             |      |      |   |      |      |

|                            |           |        |
|----------------------------|-----------|--------|
| *****                      | Volume    | Depth  |
| Runoff Quantity Continuity | hectare-m | mm     |
| *****                      | -----     | -----  |
| Total Precipitation .....  | 0.758     | 67.380 |
| Surface Runoff .....       | 0.641     | 57.000 |
| Continuity Error (%) ..... | -0.004    |        |

|                            |           |         |
|----------------------------|-----------|---------|
| *****                      | Volume    | Volume  |
| Flow Routing Continuity    | hectare-m | Mliters |
| *****                      | -----     | -----   |
| External Inflow .....      | 0.000     | 0.000   |
| External Outflow .....     | 0.221     | 2.209   |
| Initial Stored Volume .... | 0.000     | 0.000   |
| Final Stored Volume .....  | 0.003     | 0.027   |
| Continuity Error (%) ..... | 0.006     |         |

\*\*\*\*\*  
Composite Curve Number Computations Report  
\*\*\*\*\*

-----  
Subbasin Sub-01a  
-----

| Soil/Surface Description     | Area<br>(ha) | Soil<br>Group | CN    |
|------------------------------|--------------|---------------|-------|
| -----                        | -----        | -----         | ----- |
| -                            | 5.53         | -             | 78.00 |
| Composite Area & Weighted CN | 5.53         |               | 78.00 |

-----  
Subbasin Sub-01b  
-----

| Soil/Surface Description     | Area<br>(ha) | Soil<br>Group | CN    |
|------------------------------|--------------|---------------|-------|
| -----                        | -----        | -----         | ----- |
| -                            | 1.24         | -             | 76.60 |
| Composite Area & Weighted CN | 1.24         |               | 76.60 |

-----  
Subbasin Sub-02  
-----

| Soil/Surface Description     | Area<br>(ha) | Soil<br>Group | CN    |
|------------------------------|--------------|---------------|-------|
| -----                        | -----        | -----         | ----- |
| -                            | 4.16         | -             | 73.70 |
| Composite Area & Weighted CN | 4.16         |               | 73.70 |

-----  
Subbasin Sub-04  
-----

| Soil/Surface Description | Area<br>(ha) | Soil<br>Group | CN    |
|--------------------------|--------------|---------------|-------|
| -----                    | -----        | -----         | ----- |



|                              |      |   |       |
|------------------------------|------|---|-------|
| -                            | 0.32 | - | 83.40 |
| Composite Area & Weighted CN | 0.32 |   | 83.40 |

\*\*\*\*\*  
 Subbasin Runoff Summary  
 \*\*\*\*\*

| Subbasin ID | Total Precip<br>mm | Total Runoff<br>mm | Peak Runoff<br>LPS | Weighted Curve<br>Number | Time of Concentration<br>days hh:mm:ss |
|-------------|--------------------|--------------------|--------------------|--------------------------|--|
| Sub-01a     | 67.70              | 22.78              | 248.06             | 78.000                   | 0 00:16:42                             |
| Sub-01b     | 67.70              | 20.98              | 56.07              | 76.600                   | 0 00:08:05                             |
| Sub-02      | 67.70              | 17.53              | 122.33             | 73.700                   | 0 00:21:20                             |
| Sub-04      | 67.70              | 30.66              | 24.92              | 83.400                   | 0 00:01:38                             |

\*\*\*\*\*  
 Node Depth Summary  
 \*\*\*\*\*

| Node ID | Average Depth<br>Attained<br>m | Maximum Depth<br>Attained<br>m | Maximum HGL<br>Attained<br>m | Time of Max Occurrence<br>days hh:mm | Total Flooded Volume<br>ha-mm | Total Time Flooded<br>minutes | Retention Time<br>hh:mm:ss |
|---------|--------------------------------|--------------------------------|------------------------------|--------------------------------------|-------------------------------|-------------------------------|----------------------------|
| Jun-01  | 0.33                           | 0.81                           | 199.71                       | 0 02:42                              | 0                             | 0                             | 0:00:00                    |
| Jun-02  | 0.03                           | 0.06                           | 201.54                       | 0 02:35                              | 0                             | 0                             | 0:00:00                    |
| Jun-03  | 0.12                           | 0.21                           | 201.76                       | 0 02:32                              | 0                             | 0                             | 0:00:00                    |
| Jun-04  | 0.05                           | 0.10                           | 201.85                       | 0 02:35                              | 0                             | 0                             | 0:00:00                    |
| Jun-05  | 0.11                           | 0.19                           | 202.52                       | 0 02:32                              | 0                             | 0                             | 0:00:00                    |
| Jun-06  | 0.03                           | 0.07                           | 203.07                       | 0 02:35                              | 0                             | 0                             | 0:00:00                    |
| Jun-07  | 0.00                           | 0.00                           | 203.50                       | 0 00:00                              | 0                             | 0                             | 0:00:00                    |
| Jun-08  | 0.42                           | 0.50                           | 201.50                       | 0 02:35                              | 0                             | 0                             | 0:00:00                    |
| Jun-09  | 0.19                           | 0.36                           | 200.20                       | 0 02:40                              | 0                             | 0                             | 0:00:00                    |
| Jun-10  | 0.01                           | 0.03                           | 201.63                       | 0 02:32                              | 0                             | 0                             | 0:00:00                    |
| Jun-11  | 0.03                           | 0.06                           | 202.52                       | 0 02:31                              | 0                             | 0                             | 0:00:00                    |
| Jun-12  | 0.09                           | 0.16                           | 202.64                       | 0 02:30                              | 0                             | 0                             | 0:00:00                    |
| Jun-13  | 0.02                           | 0.05                           | 202.77                       | 0 02:30                              | 0                             | 0                             | 0:00:00                    |
| Jun-14  | 0.02                           | 0.03                           | 201.90                       | 0 02:32                              | 0                             | 0                             | 0:00:00                    |
| Out-01  | 0.16                           | 0.32                           | 198.88                       | 0 02:42                              | 0                             | 0                             | 0:00:00                    |
| Out-02  | 0.11                           | 0.20                           | 199.85                       | 0 02:40                              | 0                             | 0                             | 0:00:00                    |

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 Node Flow Summary  
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| Node ID | Element Type | Maximum Lateral Inflow<br>LPS | Peak Inflow<br>LPS | Time of Peak Inflow Occurrence<br>days hh:mm | Maximum Flooding Overflow<br>LPS | Time of Peak Flooding Occurrence<br>days hh:mm |
|---------|--------------|-------------------------------|--------------------|--|----------------------------------|--|
| Jun-01  | JUNCTION     | 247.16                        | 296.03             | 0 02:39                                      | 0.00                             |  |
| Jun-02  | JUNCTION     | 0.00                          | 57.15              | 0 02:35                                      | 0.00                             |  |
| Jun-03  | JUNCTION     | 0.00                          | 55.31              | 0 02:35                                      | 0.00                             |  |
| Jun-04  | JUNCTION     | 0.00                          | 55.59              | 0 02:32                                      | 0.00                             |  |
| Jun-05  | JUNCTION     | 0.00                          | 55.42              | 0 02:35                                      | 0.00                             |  |
| Jun-06  | JUNCTION     | 55.45                         | 55.45              | 0 02:34                                      | 0.00                             |  |
| Jun-07  | JUNCTION     | 0.00                          | 0.00               | 0 00:00                                      | 0.00                             |  |
| Jun-08  | JUNCTION     | 0.00                          | 55.45              | 0 02:35                                      | 0.00                             |  |
| Jun-09  | JUNCTION     | 121.03                        | 137.44             | 0 02:40                                      | 0.00                             |  |
| Jun-10  | JUNCTION     | 0.00                          | 22.95              | 0 02:32                                      | 0.00                             |  |

## Radbourne Severance

25 Year Post Development

|        |          |       |        |   |       |      |
|--------|----------|-------|--------|---|-------|------|
| Jun-11 | JUNCTION | 0.00  | 23.05  | 0 | 02:30 | 0.00 |
| Jun-12 | JUNCTION | 0.00  | 23.20  | 0 | 02:30 | 0.00 |
| Jun-13 | JUNCTION | 23.23 | 23.23  | 0 | 02:29 | 0.00 |
| Jun-14 | JUNCTION | 0.00  | 22.98  | 0 | 02:31 | 0.00 |
| Out-01 | OUTFALL  | 0.00  | 282.86 | 0 | 02:42 | 0.00 |
| Out-02 | OUTFALL  | 0.00  | 137.05 | 0 | 02:40 | 0.00 |

\*\*\*\*\*  
 Outfall Loading Summary  
 \*\*\*\*\*

| Outfall Node ID | Flow<br>Frequency<br>(%) | Average<br>Flow<br>LPS | Peak<br>Inflow<br>LPS |
|-----------------|--------------------------|------------------------|-----------------------|
| Out-01          | 93.75                    | 108.49                 | 282.86                |
| Out-02          | 93.21                    | 59.30                  | 137.05                |
| System          | 93.48                    | 167.79                 | 419.04                |

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 Link Flow Summary  
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| Link ID | Ratio of        | Total   | Element<br>Reported<br>Type<br>Condition | Time of<br>Peak Flow<br>Occurrence | Maximum<br>Velocity<br>Attained | Length<br>Factor | Peak Flow<br>during<br>Analysis | Design<br>Flow<br>Capacity | Ratio of<br>Maximum<br>/Design<br>Flow |
|---------|-----------------|---------|--|------------------------------------|---------------------------------|------------------|---------------------------------|----------------------------|--|
|         | Flow Surcharged | Time    |  | days hh:mm                         | m/sec                           |                  | LPS                             | LPS                        | Flow                                   |
|         | Depth           | minutes |  |                                    |                                 |                  |                                 |                            |  |
| CSP-1   |                 |         | CONDUIT                                  | 0 00:00                            | 0.00                            | 1.00             | 0.00                            | 386.59                     | 0.00                                   |
| 0.07    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| CSP-2   |                 |         | CONDUIT                                  | 0 02:32                            | 1.36                            | 1.00             | 55.59                           | 415.85                     | 0.13                                   |
| 0.32    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| CSP-3   |                 |         | CONDUIT                                  | 0 02:35                            | 1.45                            | 1.00             | 57.15                           | 144.47                     | 0.40                                   |
| 0.30    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| Link-01 |                 |         | CONDUIT                                  | 0 02:42                            | 1.95                            | 1.00             | 282.86                          | 330.30                     | 0.86                                   |
| 0.86    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| Link-02 |                 |         | CHANNEL                                  | 0 02:35                            | 0.03                            | 1.00             | 55.17                           | 299865.48                  | 0.00                                   |
| 0.34    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| Link-04 |                 |         | CHANNEL                                  | 0 02:35                            | 0.33                            | 1.00             | 55.31                           | 1163.01                    | 0.05                                   |
| 0.34    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| Link-06 |                 |         | CHANNEL                                  | 0 02:35                            | 0.51                            | 1.00             | 55.42                           | 7562.79                    | 0.01                                   |
| 0.13    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| Link-08 |                 |         | CHANNEL                                  | 0 02:35                            | 0.22                            | 1.00             | 55.45                           | 1351.97                    | 0.04                                   |
| 0.61    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| Link-09 |                 |         | CONDUIT                                  | 0 02:40                            | 1.22                            | 1.00             | 137.05                          | 421.21                     | 0.33                                   |
| 0.56    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| Link-10 |                 |         | CHANNEL                                  | 0 02:32                            | 0.21                            | 1.00             | 22.95                           | 926.98                     | 0.02                                   |
| 0.56    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| Link-11 |                 |         | CHANNEL                                  | 0 02:31                            | 0.38                            | 1.00             | 22.98                           | 337.34                     | 0.07                                   |
| 0.24    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| Link-12 |                 |         | CONDUIT                                  | 0 02:30                            | 0.95                            | 1.00             | 23.05                           | 25.17                      | 0.92                                   |
| 0.38    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| Link-13 |                 |         | CHANNEL                                  | 0 02:30                            | 0.15                            | 1.00             | 23.20                           | 345.42                     | 0.07                                   |
| 0.53    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |

Radbourne Severance

25 Year Post Development

|         |              |   |       |      |      |       |        |      |
|---------|--------------|---|-------|------|------|-------|--------|------|
| Link-14 | CHANNEL      | 0 | 02:32 | 0.67 | 1.00 | 22.95 | 191.95 | 0.12 |
| 0.29    | 0 Calculated |   |       |      |      |       |        |      |

\*\*\*\*\*  
Highest Flow Instability Indexes  
\*\*\*\*\*  
Link CSP-3 (41)  
Link CSP-2 (39)  
Link Link-04 (36)  
Link Link-08 (31)  
Link Link-09 (15)

Analysis began on: Sat Nov 20 15:07:47 2021  
Analysis ended on: Sat Nov 20 15:07:49 2021  
Total elapsed time: 00:00:02

Autodesk® Storm and Sanitary Analysis 2016 - Version 13.4.121 (Build 0)

\*\*\*\*\*

Project Description

\*\*\*\*\*

File Name ..... M20005-post-NOV9-21-1.SPF

\*\*\*\*\*

Analysis Options

\*\*\*\*\*

Flow Units ..... LPS  
 Subbasin Hydrograph Method. SCS TR-20  
 Time of Concentration..... User-Defined  
 Link Routing Method ..... Hydrodynamic  
 Storage Node Exfiltration.. None  
 Starting Date ..... NOV-09-2021 00:00:00  
 Ending Date ..... NOV-09-2021 06:00:00  
 Report Time Step ..... 00:05:00

\*\*\*\*\*

Element Count

\*\*\*\*\*

Number of rain gages ..... 1  
 Number of subbasins ..... 4  
 Number of nodes ..... 16  
 Number of links ..... 14

\*\*\*\*\*

Raingage Summary

\*\*\*\*\*

| Gage ID      | Data Source | Data Type  | Recording Interval | min |
|--------------|-------------|------------|--------------------|-----|
| Rain Gage-01 | 100 Year    | CUMULATIVE | 6.00               |     |

\*\*\*\*\*

Subbasin Summary

\*\*\*\*\*

| Subbasin ID | Total Area<br>hectares | Peak Rate<br>Factor |
|-------------|------------------------|---------------------|
| Sub-01a     | 5.53                   | 484.00              |
| Sub-01b     | 1.24                   | 484.00              |
| Sub-02      | 4.16                   | 484.00              |
| Sub-04      | 0.32                   | 484.00              |

\*\*\*\*\*

Node Summary

\*\*\*\*\*

| Node ID | Element Type | Invert Elevation<br>m | Maximum Elev.<br>m | Ponded Area<br>m <sup>2</sup> | External Inflow |
|---------|--------------|-----------------------|--------------------|-------------------------------|-----------------|
| Jun-01  | JUNCTION     | 198.90                | 202.20             | 0.00                          |                 |
| Jun-02  | JUNCTION     | 201.48                | 202.35             | 0.00                          |                 |
| Jun-03  | JUNCTION     | 201.55                | 202.10             | 0.00                          |                 |
| Jun-04  | JUNCTION     | 201.75                | 202.26             | 0.00                          |                 |
| Jun-05  | JUNCTION     | 202.33                | 204.00             | 0.00                          |                 |

## Radbourne Severance

## 100 Year Post Development

|        |          |        |        |      |
|--------|----------|--------|--------|------|
| Jun-06 | JUNCTION | 203.00 | 204.00 | 0.00 |
| Jun-07 | JUNCTION | 203.50 | 204.00 | 0.00 |
| Jun-08 | JUNCTION | 201.00 | 202.70 | 0.00 |
| Jun-09 | JUNCTION | 199.84 | 201.64 | 0.00 |
| Jun-10 | JUNCTION | 201.60 | 202.00 | 0.00 |
| Jun-11 | JUNCTION | 202.46 | 204.00 | 0.00 |
| Jun-12 | JUNCTION | 202.48 | 204.00 | 0.00 |
| Jun-13 | JUNCTION | 202.72 | 203.05 | 0.00 |
| Jun-14 | JUNCTION | 201.87 | 202.10 | 0.00 |
| Out-01 | OUTFALL  | 198.56 | 199.01 | 0.00 |
| Out-02 | OUTFALL  | 199.65 | 200.15 | 0.00 |

\*\*\*\*\*

## Link Summary

\*\*\*\*\*

| Link ID | From Node | To Node | Element Type | Length m | Slope % | Manning's Roughness |
|---------|-----------|---------|--------------|----------|---------|---------------------|
| CSP-1   | Jun-07    | Jun-06  | CONDUIT      | 8.0      | 6.2657  | 0.0240              |
| CSP-2   | Jun-05    | Jun-04  | CONDUIT      | 8.0      | 7.2500  | 0.0240              |
| CSP-3   | Jun-03    | Jun-02  | CONDUIT      | 8.0      | 0.8750  | 0.0240              |
| Link-01 | Jun-01    | Out-01  | CONDUIT      | 19.0     | 1.7867  | 0.0150              |
| Link-02 | Jun-08    | Jun-01  | CHANNEL      | 7.9      | 32.6582 | 0.0300              |
| Link-04 | Jun-04    | Jun-03  | CHANNEL      | 20.0     | 1.0000  | 0.0300              |
| Link-06 | Jun-06    | Jun-05  | CHANNEL      | 15.4     | 4.3620  | 0.0300              |
| Link-08 | Jun-02    | Jun-08  | CHANNEL      | 26.1     | 1.8391  | 0.0300              |
| Link-09 | Jun-09    | Out-02  | CONDUIT      | 11.5     | 1.6565  | 0.0150              |
| Link-10 | Jun-10    | Jun-09  | CHANNEL      | 10.0     | 17.6000 | 0.0320              |
| Link-11 | Jun-11    | Jun-14  | CHANNEL      | 63.2     | 0.9328  | 0.0320              |
| Link-12 | Jun-12    | Jun-11  | CONDUIT      | 8.7      | 0.2309  | 0.0240              |
| Link-13 | Jun-13    | Jun-12  | CHANNEL      | 21.0     | 1.1407  | 0.0320              |
| Link-14 | Jun-14    | Jun-10  | CHANNEL      | 5.5      | 4.9091  | 0.0320              |

\*\*\*\*\*

## Cross Section Summary

\*\*\*\*\*

| Link Design ID Flow Capacity | Shape       | Depth/<br>Diameter<br>m | Width<br>m | No. of<br>Barrels | Cross<br>Sectional<br>Area<br>m <sup>2</sup> | Full Flow<br>Hydraulic<br>Radius<br>m |
|------------------------------|-------------|-------------------------|------------|-------------------|--|---------------------------------------|
| CSP-1                        | CIRCULAR    | 0.45                    | 0.45       | 1                 | 0.16   | 0.11                                  |
| 386.59                       |             |                         |            |                   |  |                                       |
| CSP-2                        | CIRCULAR    | 0.45                    | 0.45       | 1                 | 0.16   | 0.11                                  |
| 415.85                       |             |                         |            |                   |  |                                       |
| CSP-3                        | CIRCULAR    | 0.45                    | 0.45       | 1                 | 0.16   | 0.11                                  |
| 144.47                       |             |                         |            |                   |  |                                       |
| Link-01                      | CIRCULAR    | 0.45                    | 0.45       | 1                 | 0.16   | 0.11                                  |
| 330.30                       |             |                         |            |                   |  |                                       |
| Link-02                      | TRAPEZOIDAL | 1.20                    | 31.80      | 1                 | 20.88  | 0.65                                  |
| 299865.48                    |             |                         |            |                   |  |                                       |
| Link-04                      | TRAPEZOIDAL | 0.45                    | 3.00       | 1                 | 0.84   | 0.27                                  |
| 1163.01                      |             |                         |            |                   |  |                                       |
| Link-06                      | TRAPEZOIDAL | 1.00                    | 2.75       | 1                 | 1.75   | 0.49                                  |
| 7562.79                      |             |                         |            |                   |  |                                       |
| Link-08                      | TRAPEZOIDAL | 0.26                    | 7.24       | 1                 | 1.07   | 0.15                                  |
| 1351.97                      |             |                         |            |                   |  |                                       |
| Link-09                      | CIRCULAR    | 0.50                    | 0.50       | 1                 | 0.20   | 0.12                                  |
| 421.21                       |             |                         |            |                   |  |                                       |

## Radbourne Severance

## 100 Year Post Development

|         |             |      |      |   |      |      |
|---------|-------------|------|------|---|------|------|
| Link-10 | TRAPEZOIDAL | 0.20 | 1.95 | 1 | 0.27 | 0.13 |
| 926.98  |             |      |      |   |      |      |
| Link-11 | TRAPEZOIDAL | 0.20 | 3.40 | 1 | 0.44 | 0.13 |
| 337.34  |             |      |      |   |      |      |
| Link-12 | CIRCULAR    | 0.30 | 0.30 | 1 | 0.07 | 0.07 |
| 25.17   |             |      |      |   |      |      |
| Link-13 | TRAPEZOIDAL | 0.20 | 3.00 | 1 | 0.40 | 0.13 |
| 345.42  |             |      |      |   |      |      |
| Link-14 | TRAPEZOIDAL | 0.10 | 2.20 | 1 | 0.16 | 0.07 |
| 191.95  |             |      |      |   |      |      |

```

*****
Runoff Quantity Continuity      Volume      Depth
*****      hectare-m      mm
*****      -----      -----
Total Precipitation .....      0.926      82.309
Surface Runoff .....      0.955      84.947
Continuity Error (%) .....      -0.003

```

```

*****
Flow Routing Continuity      Volume      Volume
*****      hectare-m      Mliters
*****      -----      -----
External Inflow .....      0.000      0.000
External Outflow .....      0.331      3.311
Initial Stored Volume ....      0.000      0.000
Final Stored Volume .....      0.003      0.030
Continuity Error (%) .....      0.004

```

\*\*\*\*\*  
Composite Curve Number Computations Report  
\*\*\*\*\*

-----  
Subbasin Sub-01a  
-----

| Soil/Surface Description     | Area<br>(ha) | Soil<br>Group | CN    |
|------------------------------|--------------|---------------|-------|
| -                            | 5.53         | -             | 78.00 |
| Composite Area & Weighted CN | 5.53         |               | 78.00 |

-----  
Subbasin Sub-01b  
-----

| Soil/Surface Description     | Area<br>(ha) | Soil<br>Group | CN    |
|------------------------------|--------------|---------------|-------|
| -                            | 1.24         | -             | 76.60 |
| Composite Area & Weighted CN | 1.24         |               | 76.60 |

-----  
Subbasin Sub-02  
-----

| Soil/Surface Description     | Area<br>(ha) | Soil<br>Group | CN    |
|------------------------------|--------------|---------------|-------|
| -                            | 4.16         | -             | 73.70 |
| Composite Area & Weighted CN | 4.16         |               | 73.70 |

-----  
Subbasin Sub-04  
-----

| Soil/Surface Description | Area<br>(ha) | Soil<br>Group | CN |
|--------------------------|--------------|---------------|----|
|--------------------------|--------------|---------------|----|

|                              |      |   |       |
|------------------------------|------|---|-------|
| -                            | 0.32 | - | 83.40 |
| Composite Area & Weighted CN | 0.32 |   | 83.40 |

\*\*\*\*\*  
 Subbasin Runoff Summary  
 \*\*\*\*\*

| Subbasin ID | Total Precip<br>mm | Total Runoff<br>mm | Peak Runoff<br>LPS | Weighted Curve<br>Number | Time of Concentration<br>days hh:mm:ss |
|-------------|--------------------|--------------------|--------------------|--------------------------|--|
| Sub-01a     | 82.70              | 33.38              | 378.32             | 78.000                   | 0 00:16:42                             |
| Sub-01b     | 82.70              | 31.17              | 87.22              | 76.600                   | 0 00:08:05                             |
| Sub-02      | 82.70              | 26.87              | 203.32             | 73.700                   | 0 00:21:20                             |
| Sub-04      | 82.70              | 42.80              | 34.83              | 83.400                   | 0 00:01:38                             |

\*\*\*\*\*  
 Node Depth Summary  
 \*\*\*\*\*

| Node ID | Average Depth<br>Attained<br>m | Maximum Depth<br>Attained<br>m | Maximum HGL<br>Attained<br>m | Time of Max Occurrence<br>days hh:mm | Total Flooded Volume<br>ha-mm | Total Time Flooded<br>minutes | Retention Time<br>hh:mm:ss |
|---------|--------------------------------|--------------------------------|------------------------------|--------------------------------------|-------------------------------|-------------------------------|----------------------------|
| Jun-01  | 0.44                           | 1.11                           | 200.01                       | 0 02:40                              | 0                             | 0                             | 0:00:00                    |
| Jun-02  | 0.04                           | 0.07                           | 201.55                       | 0 02:35                              | 0                             | 0                             | 0:00:00                    |
| Jun-03  | 0.14                           | 0.29                           | 201.84                       | 0 02:35                              | 0                             | 0                             | 0:00:00                    |
| Jun-04  | 0.06                           | 0.12                           | 201.87                       | 0 02:35                              | 0                             | 0                             | 0:00:00                    |
| Jun-05  | 0.13                           | 0.26                           | 202.59                       | 0 02:33                              | 0                             | 0                             | 0:00:00                    |
| Jun-06  | 0.04                           | 0.08                           | 203.08                       | 0 02:34                              | 0                             | 0                             | 0:00:00                    |
| Jun-07  | 0.00                           | 0.00                           | 203.50                       | 0 00:00                              | 0                             | 0                             | 0:00:00                    |
| Jun-08  | 0.43                           | 0.50                           | 201.50                       | 0 02:35                              | 0                             | 0                             | 0:00:00                    |
| Jun-09  | 0.25                           | 0.51                           | 200.35                       | 0 02:40                              | 0                             | 0                             | 0:00:00                    |
| Jun-10  | 0.01                           | 0.03                           | 201.63                       | 0 02:32                              | 0                             | 0                             | 0:00:00                    |
| Jun-11  | 0.04                           | 0.07                           | 202.53                       | 0 02:31                              | 0                             | 0                             | 0:00:00                    |
| Jun-12  | 0.11                           | 0.20                           | 202.68                       | 0 02:30                              | 0                             | 0                             | 0:00:00                    |
| Jun-13  | 0.03                           | 0.06                           | 202.78                       | 0 02:30                              | 0                             | 0                             | 0:00:00                    |
| Jun-14  | 0.02                           | 0.04                           | 201.91                       | 0 02:31                              | 0                             | 0                             | 0:00:00                    |
| Out-01  | 0.21                           | 0.45                           | 199.01                       | 0 02:32                              | 0                             | 0                             | 0:00:00                    |
| Out-02  | 0.14                           | 0.26                           | 199.91                       | 0 02:40                              | 0                             | 0                             | 0:00:00                    |

\*\*\*\*\*  
 Node Flow Summary  
 \*\*\*\*\*

| Node ID | Element Type | Maximum Lateral Inflow<br>LPS | Peak Inflow<br>LPS | Time of Peak Inflow Occurrence<br>days hh:mm | Maximum Flooding Overflow<br>LPS | Time of Peak Flooding Occurrence<br>days hh:mm |
|---------|--------------|-------------------------------|--------------------|--|----------------------------------|--|
| Jun-01  | JUNCTION     | 374.94                        | 452.80             | 0 02:36                                      | 0.00                             |  |
| Jun-02  | JUNCTION     | 0.00                          | 84.58              | 0 02:35                                      | 0.00                             |  |
| Jun-03  | JUNCTION     | 0.00                          | 85.11              | 0 02:35                                      | 0.00                             |  |
| Jun-04  | JUNCTION     | 0.00                          | 86.50              | 0 02:33                                      | 0.00                             |  |
| Jun-05  | JUNCTION     | 0.00                          | 84.74              | 0 02:35                                      | 0.00                             |  |
| Jun-06  | JUNCTION     | 84.76                         | 84.76              | 0 02:34                                      | 0.00                             |  |
| Jun-07  | JUNCTION     | 0.00                          | 0.00               | 0 00:00                                      | 0.00                             |  |
| Jun-08  | JUNCTION     | 0.00                          | 84.53              | 0 02:35                                      | 0.00                             |  |
| Jun-09  | JUNCTION     | 200.44                        | 226.04             | 0 02:39                                      | 0.00                             |  |
| Jun-10  | JUNCTION     | 0.00                          | 32.41              | 0 02:31                                      | 0.00                             |  |

## Radbourne Severance

## 100 Year Post Development

|        |          |       |        |   |       |      |
|--------|----------|-------|--------|---|-------|------|
| Jun-11 | JUNCTION | 0.00  | 32.51  | 0 | 02:30 | 0.00 |
| Jun-12 | JUNCTION | 0.00  | 32.69  | 0 | 02:30 | 0.00 |
| Jun-13 | JUNCTION | 32.71 | 32.71  | 0 | 02:30 | 0.00 |
| Jun-14 | JUNCTION | 0.00  | 32.44  | 0 | 02:31 | 0.00 |
| Out-01 | OUTFALL  | 0.00  | 440.62 | 0 | 02:40 | 0.00 |
| Out-02 | OUTFALL  | 0.00  | 225.82 | 0 | 02:40 | 0.00 |

\*\*\*\*\*  
 Outfall Loading Summary  
 \*\*\*\*\*

| Outfall Node ID | Flow<br>Frequency<br>(%) | Average<br>Flow<br>LPS | Peak<br>Inflow<br>LPS |
|-----------------|--------------------------|------------------------|-----------------------|
| Out-01          | 94.99                    | 159.58                 | 440.62                |
| Out-02          | 94.86                    | 89.20                  | 225.82                |
| System          | 94.92                    | 248.78                 | 665.94                |

\*\*\*\*\*  
 Link Flow Summary  
 \*\*\*\*\*

| Link ID | Ratio of        | Total   | Element<br>Reported<br>Type<br>Condition | Time of<br>Peak Flow<br>Occurrence | Maximum<br>Velocity<br>Attained | Length<br>Factor | Peak Flow<br>during<br>Analysis | Design<br>Flow<br>Capacity | Ratio of<br>Maximum<br>/Design<br>Flow |
|---------|-----------------|---------|--|------------------------------------|---------------------------------|------------------|---------------------------------|----------------------------|--|
|         | Flow Surcharged | Time    |  | days hh:mm                         | m/sec                           |                  | LPS                             | LPS                        | Flow                                   |
|         | Depth           | minutes |  |                                    |                                 |                  |                                 |                            |  |
| CSP-1   |                 |         | CONDUIT                                  | 0 00:00                            | 0.00                            | 1.00             | 0.00                            | 386.59                     | 0.00                                   |
| 0.09    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| CSP-2   |                 |         | CONDUIT                                  | 0 02:33                            | 1.37                            | 1.00             | 86.50                           | 415.85                     | 0.21                                   |
| 0.42    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| CSP-3   |                 |         | CONDUIT                                  | 0 02:35                            | 1.51                            | 1.00             | 84.58                           | 144.47                     | 0.59                                   |
| 0.40    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| Link-01 |                 |         | CONDUIT                                  | 0 02:40                            | 2.77                            | 1.00             | 440.62                          | 330.30                     | 1.33                                   |
| 1.00    |                 | 21      | SURCHARGED                               |                                    |                                 |                  |                                 |                            |  |
| Link-02 |                 |         | CHANNEL                                  | 0 02:35                            | 0.03                            | 1.00             | 84.51                           | 299865.48                  | 0.00                                   |
| 0.47    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| Link-04 |                 |         | CHANNEL                                  | 0 02:35                            | 0.35                            | 1.00             | 85.11                           | 1163.01                    | 0.07                                   |
| 0.45    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| Link-06 |                 |         | CHANNEL                                  | 0 02:35                            | 0.54                            | 1.00             | 84.74                           | 7562.79                    | 0.01                                   |
| 0.17    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| Link-08 |                 |         | CHANNEL                                  | 0 02:35                            | 0.22                            | 1.00             | 84.53                           | 1351.97                    | 0.06                                   |
| 0.64    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| Link-09 |                 |         | CONDUIT                                  | 0 02:40                            | 1.41                            | 1.00             | 225.82                          | 421.21                     | 0.54                                   |
| 0.76    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| Link-10 |                 |         | CHANNEL                                  | 0 02:32                            | 0.25                            | 1.00             | 32.41                           | 926.98                     | 0.03                                   |
| 0.58    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| Link-11 |                 |         | CHANNEL                                  | 0 02:31                            | 0.43                            | 1.00             | 32.44                           | 337.34                     | 0.10                                   |
| 0.28    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |
| Link-12 |                 |         | CONDUIT                                  | 0 02:30                            | 1.05                            | 1.00             | 32.51                           | 25.17                      | 1.29                                   |
| 0.45    |                 | 0       | > CAPACITY                               |                                    |                                 |                  |                                 |                            |  |
| Link-13 |                 |         | CHANNEL                                  | 0 02:30                            | 0.16                            | 1.00             | 32.69                           | 345.42                     | 0.09                                   |
| 0.64    |                 | 0       | Calculated                               |                                    |                                 |                  |                                 |                            |  |



Radbourne Severance

100 Year Post Development

|         |              |   |       |      |      |       |        |      |
|---------|--------------|---|-------|------|------|-------|--------|------|
| Link-14 | CHANNEL      | 0 | 02:31 | 0.74 | 1.00 | 32.41 | 191.95 | 0.17 |
| 0.36    | 0 Calculated |   |       |      |      |       |        |      |

\*\*\*\*\*  
Highest Flow Instability Indexes  
\*\*\*\*\*  
Link CSP-2 (40)  
Link Link-04 (38)  
Link CSP-3 (38)  
Link Link-08 (24)  
Link Link-09 (20)

Analysis began on: Fri Nov 19 17:07:11 2021  
Analysis ended on: Fri Nov 19 17:07:12 2021  
Total elapsed time: 00:00:01

Drawings





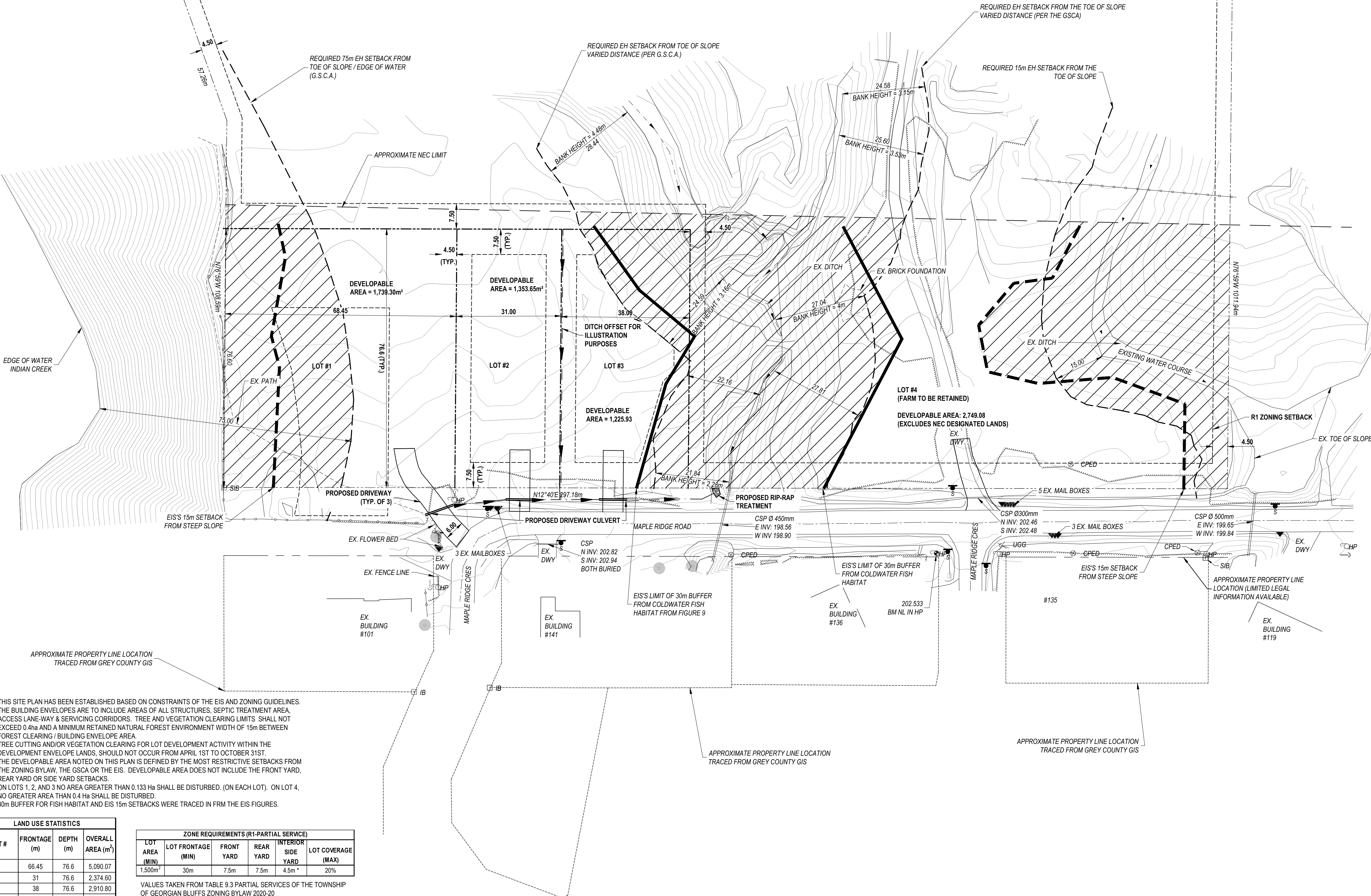








THE CLIENT'S PROPERTY EXTENDS FURTHER TO THE WEST THAN WHAT IS SHOWN ON THIS PLAN



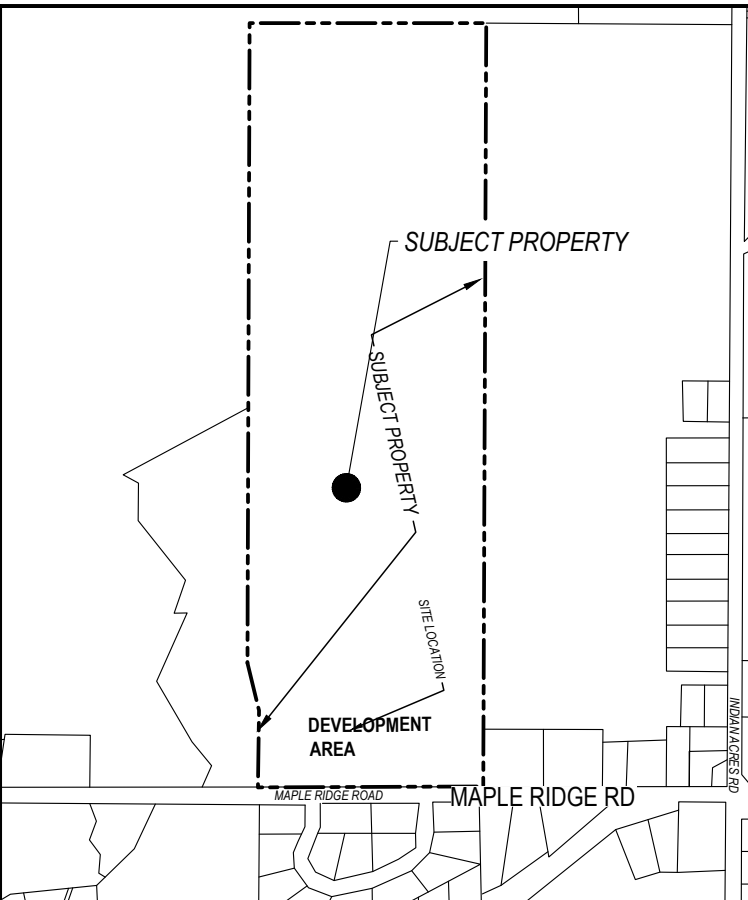
- NOTES:
- THIS SITE PLAN HAS BEEN ESTABLISHED BASED ON CONSTRAINTS OF THE EIS AND ZONING GUIDELINES. THE BUILDING ENVELOPES ARE TO INCLUDE AREAS OF ALL STRUCTURES, SEPTIC TREATMENT AREA, ACCESS LANE-WAY & SERVICING CORRIDORS. TREE AND VEGETATION CLEARING LIMITS SHALL NOT EXCEED 0.4ha AND A MINIMUM RETAINED NATURAL FOREST ENVIRONMENT WIDTH OF 15m BETWEEN FOREST CLEARING / BUILDING ENVELOPE AREA.
  - TREE CUTTING AND/OR VEGETATION CLEARING FOR LOT DEVELOPMENT ACTIVITY WITHIN THE DEVELOPMENT ENVELOPE LANDS, SHOULD NOT OCCUR FROM APRIL 1ST TO OCTOBER 31ST.
  - THE DEVELOPABLE AREA NOTED ON THIS PLAN IS DEFINED BY THE MOST RESTRICTIVE SETBACKS FROM THE ZONING BYLAW, THE GSCA OR THE EIS. DEVELOPABLE AREA DOES NOT INCLUDE THE FRONT YARD, REAR YARD OR SIDE YARD SETBACKS.
  - ON LOTS 1, 2, AND 3 NO AREA GREATER THAN 0.133 Ha SHALL BE DISTURBED. (ON EACH LOT). ON LOT 4, NO GREATER AREA THAN 0.4 Ha SHALL BE DISTURBED.
  - 30m BUFFER FOR FISH HABITAT AND EIS 15m SETBACKS WERE TRACED IN FRM THE EIS FIGURES.

| LAND USE STATISTICS |              |           |                   |
|---------------------|--------------|-----------|-------------------|
| LOT #               | FRONTAGE (m) | DEPTH (m) | OVERALL AREA (m²) |
| 1                   | 66.45        | 76.6      | 5,090.07          |
| 2                   | 31           | 76.6      | 2,374.80          |
| 3                   | 38           | 76.6      | 2,910.80          |
| 4                   | 159.13       | 1,011.94  | 303,643.71        |

| ZONE REQUIREMENTS (R1-PARTIAL SERVICE) |                    |            |           |                    |                    |
|--|--------------------|------------|-----------|--------------------|--------------------|
| LOT AREA (MIN)                         | LOT FRONTAGE (MIN) | FRONT YARD | REAR YARD | INTERIOR SIDE YARD | LOT COVERAGE (MAX) |
| 1,500m²                                | 30m                | 7.5m       | 7.5m      | 4.5m *             | 20%                |

VALUES TAKEN FROM TABLE 9.3 PARTIAL SERVICES OF THE TOWNSHIP OF GEORGIAN BLUFFS ZONING BYLAW 2020-20

\*THE SIDE YARD SETBACK CAN BE REDUCED TO 2m ON ONE SIDE FOR AN ATTACHED GARAGE OR CARPORT .



- KEY PLAN SCALE 1:15000
- LEGEND
- EX. PROPERTY BOUNDARY
  - BUILDING ENVELOPE (R1 PARTIAL SORCES)
  - ROAD CENTRE LINE
  - EDGE OF STREET / DRIVEWAY
  - ZONING BOUNDARY
  - EH SETBACK (GSCA)
  - EX. FENCE
  - EX. CONTOUR LINE
  - EX. TREE LINE
  - EIS 30m BUFFER FOR HABITAT
  - EIS 15m SETBACK FOR SLOPES
  - HP EXISTING HYDRO POLE
  - SIB STANDARD IRON BAR FOUND
  - IB IRON BAR FOUND
  - MAIL BOX
  - ANCHOR
  - NO - DEVELOPMENT AREA

PROPERTY LINE LOCATION TAKEN FROM SKETCH PROVIDED BY MICHAEL D HILLYER (DATED APRIL 21, 2020) LIMITED INFORMATION WAS AVAILABLE TO CONFIRM PROPERTY LIMITS. IT IS HIGHLY RECOMMENDED THAT AN OLS IS EMPLOYED TO CONFIRM PROPERTY LIMITS.

SIDE AND REAR LOT LINES FOR LOTS ON THE SOUTH SIDE OF MAPLE RIDGE CRES. ARE BASED ON GREY COUNTY GIS

REQUIRED EH SETBACKS ARE ESTABLISHED BY THE GREY SAUBLE CONSERVATION AUTHORITY (GSCA) AND VARY DEPENDING ON HEIGHT OF BANK. SEE LETTER DATED NOV. 22, 2019 FOR DETAILS ON REQUIRED SETBACKS. REQUIRED SLOPE IS 3H:1V FROM THE TOE OF SLOPE PLUS 15m OR AS NOTED BY THE GSCA.

TOPOGRAPHIC SURVEY COMPLETED BY SMC GEOMATICS MAY 4-5, 2020.

EIS DETAILS OBTAINED FROM FIGURE 9 PROVIDED VIA EMAILED ON NOV. 23, 2020. EIS LIMITS OVERLAYED WITH PROPERTY LINES. EIS COMPLETED BY AWS

NEC ZONING LIMIT BASED ON GREY COUNTY GIS

CAUTION:  
THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND ABOVEGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND, WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES, AND SHALL ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

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| NOV/2021 | FOR APPROVAL     |
| DATE     | REVISION / ISSUE |

SEAL NOT VALID UNLESS SIGNED AND DATED



**DARRYL M. ROBINS**  
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**SITE PLAN**  
**130 MAPLE RIDGE DR.**  
**GEORGIAN BLUFFS, ON**

|                                    |               |                        |                         |
|------------------------------------|---------------|------------------------|-------------------------|
| CLIENT: CHERILYN & BLAIR RADBOURNE |               |                        |                         |
| APPROVED:                          | DESIGN: L A S | CHECK: L A S           | DATE: mm/dd/yy 05/27/20 |
|                                    | DRAWN: W K    | SCALE: 1:600           | PROJECT NO.: 20005      |
| DESIGN ENGINEER                    |               | DRAWING NO.: M20005-SP |                         |