1665426 ONTARIO INC

STORMWATER MANAGEMENT REPORT

HILTON HEAD HEIGHTS DEVELOPMENT

MUNICIPALITY OF MEAFORD

JULY 2020

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COBIDE
ENGINEERING INC

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1. INTRODUCTION

Cobide Engineering Inc. was retained by 1665426 Ontario Inc to complete a final stormwater management report in support of Site Plan Approval Application. The application will be to service a portion of the Meaford Golf Course property into a 51 unit vacant land condominium.

A copy of the Overall Plan has been included in Appendix A as Drawing DP1.

1.1 LOCATION

The proposed subdivision development is located Part of Lots 1654 to 1659 and 1695, Registered Plan 309, Former Geographic Town of Meaford, Municipality of Meaford, County of Grey (described herein as the "site"). A Site Location Map is included as Figure 1. The subject property is approximately 41 hectares in area however only 4 ha will be developed in this phase.

1.2 DEVELOPMENT PROPOSAL

This phase of the development will consist of 51 single family residential units along a new private street as well as a stormwater management pond.

The road network will connect to Ridge Road.

1.3 SCOPE OF WORK

The stormwater management report addresses the design and implementation of drainage and stormwater management facilities for the development.

The report includes:

- Details for erosion protection and sedimentation control for short term, construction phase and the long term.
- Quantity Control
- Quality Control
- Establish lot grading requirements for the proposed subdivision
- Provisions for major flows through the development

1.4 BACKGROUND INFORMATION

In support of this application, the following information was prepared:

- A Stormwater Management Report was completed for the easterly portion of the development by GSS Engineering as part of the approval process for the Life Lease development to the north.

Since the development of the Life Lease Development, it was decided to develop both the east and west portions of the Hilton Head Heights Development at the same time and therefore the SWM plan prepared by GSS was no longer valid as the development area had increased considerably.

2. DRAINAGE CHARACTERISTICS

2.1 REGIONAL

Two unnamed Tributaries to Pete's Creek traverse the site from west to east outletting under Ridge Road. The development of Hilton Head Heights will discharge to these Tributaries. Previous work completed on the site identified the limits of the existing floodplain. The stormwater management pond and the various building sites are all located outside the existing floodplain.

2.2 LOCAL

There are a number of swales and water features located throughout the site. All of the existing water features are being avoided with the development of Hilton Head Heights with the exception of some servicing that needs to be installed under the northern unnamed Tributary. The watercourse will be restored to existing condition following installation of the services.

2.3 SOILS

According to the Grey County Soils Survey (January, 1954), the soils on the site are classified as Brighton Sand (Brs). Brighton Sands are described as well sorted sandy outwash soils with imperfect drainage. These soils are typically associated with the Hydrologic Soils Group (HSG) A.

2.4 DISCHARGE POINTS

For the purposes of the report, Discharge Point #1 is any runoff that into Unnamed Tributary A.

Discharge Point #2 is the Unnamed Tributary B.

4. EXISTING CONDITIONS

The site is currently used as a golf course.

The existing catchments areas are delineated in Drawing SWM1 in Appendix A.

Summarized below is a description of each of the drainage catchment areas.

4.1 CATCHMENT AREA 101

- This catchment area encompasses the majority of the Hilton Head Heights Development Area.
- Surface water flows by sheet flow and discharges Unnamed Tributary A.
- Catchment Area 101 is considered to discharge at Discharge Point #1 for the purposes of this report.
- Drainage Area = 4.45 ha.

4.2 CATCHMENT AREA 102

- This catchment area encompasses the southern portion of the development area.
- Surface water flows by sheet flow to Unnamed Tributary B.
- Catchment Area 102 is considered to discharge at Discharge Point #2 for the purposes of this report.
- Drainage Area = 0.73 ha.

6. QUANTITY CONTROL MODELLING

The hydrologic modelling software PCSWMM Version 5.6.1803 Professional 2D was used to determine the pre and post-development peak flows of the 2 yr., 5 yr., 25 yr., 50 yr., and 100 yr. storm events (6 hour duration, SCS Type II, AMC II storm, Owen Sound IDF Parameters). The goal of the development is to try and ensure that all post development flows must match pre-development levels to the respective outlets.

The pre-development and post development parameters and model outputs are contained in Appendix B and C respectively.

6.1 DESIGN REQUIREMENTS

The intent of stormwater quantity control is to limit the flows under proposed conditions to existing levels or less to protect the downstream watercourses, infrastructure and properties.

Minor flows from the majority of the development will be conveyed to the proposed stormwater management facility via a new storm sewer collection system that will be constructed throughout the development. This storm sewer collection system will be designed to accommodate all flows up to and including the 5 year storm event.

Major flows (>5 year), will be conveyed overland within the road allowance of each street.

Due to the increase in impervious area, stormwater quantity control will be required for the site. The design of the stormwater management facility has assumed a free outlet from the pond.

6.2 SWM FACILITY CHARACTERISTICS

The stormwater management facility and outlet structure have been designed to control peak runoff rates as well as conform to MECP best practices.

In order to provide the above required volumes and discharges, the following SWM Facility geometry is being proposed:

Table 6.1 – SWM Facility Geometry

SWM FACILITY	DETAILED DESIGN
Side Slope	3:1
SWM Facility Bottom	195.50
Top Elevation	198.00 m
High Water Elevation	197.44 m

The outlet configuration for the SWM Facility will be as follows:

- A ditch inlet catchbasin with an inlet elevation of 195.50. The outlet will be a 300mm diameter pipe with an invert of 195.10 m with a 50mm orifice installed.;

As seen by the proposed inverts, the proposed stormwater management facility will be constructed as a dry pond.

downstream. The increase is also quite small in comparison to the expected flows from the entire watershed. The flows cannot be controlled any further as the orifice proposed is the smallest recommended diameter as per MECP guidelines.

6.3.2 DISCHARGE POINT #2

The 2 and 5 year design storm event have a slight increase over the pre-development levels but all peak flows during the remaining storm events are equal to or less than pre-development levels. Based on the extremely small increase in flows and the fact that the discharge is to a watercourse rather than a storm sewer, the increase is not expected to cause issues downstream. The increase is also quite small in comparison to the expected flows from the entire watershed.

pool during construction only to help with sediment removal. The OGS will be placed upstream of the pond close to the proposed road for ease of maintenance.

The OGS has been designed in conformance with the MECP design guidelines to achieve an "Enhanced" Level of protection. The OGS will be a FD-6HC from Hydro International as supplied by Armtec or approved equivalent.

9. CONCLUSIONS & RECOMMENDATIONS

The above report presented the Final Stormwater Management Plan in support of the Site Plan Approval Application. Based on the findings of this report, the following conclusions are made:

1. Stormwater quantity control will be provided via a dry pond with an outlet configuration as described previously.
2. Stormwater quantity control for the development will maintain or lower pre-development flows at all discharge points with the exception of slight increases during the minor storm events.
3. Stormwater quality will be provided by a treatment train approach which will include lot level control, conveyance control and 'end-of-pipe' control measures.

   Lot level control will be provided by directing most impervious areas not directly connected to the municipal storm sewer system, over vegetated areas and directing all rear yard drainage to grass swales prior to discharging into the proposed storm sewer system.

   Conveyance control will be provided by and providing a minimum 600 mm sumps in all catchbasins and a minimum 300 mm sumps in all catchbasin manholes.

   End-of-pipe control will be provided by an OGS upstream of the pond.

   All three levels of the treatment train approach will be used for the development to provide an "Enhanced" Level of protection for the development.

Based on the above conclusions of this report, it is recommended that the above Stormwater Management Report for the subdivision be submitted to the GSCA and Municipality of Meaford in support of the Site Plan Approval Application.

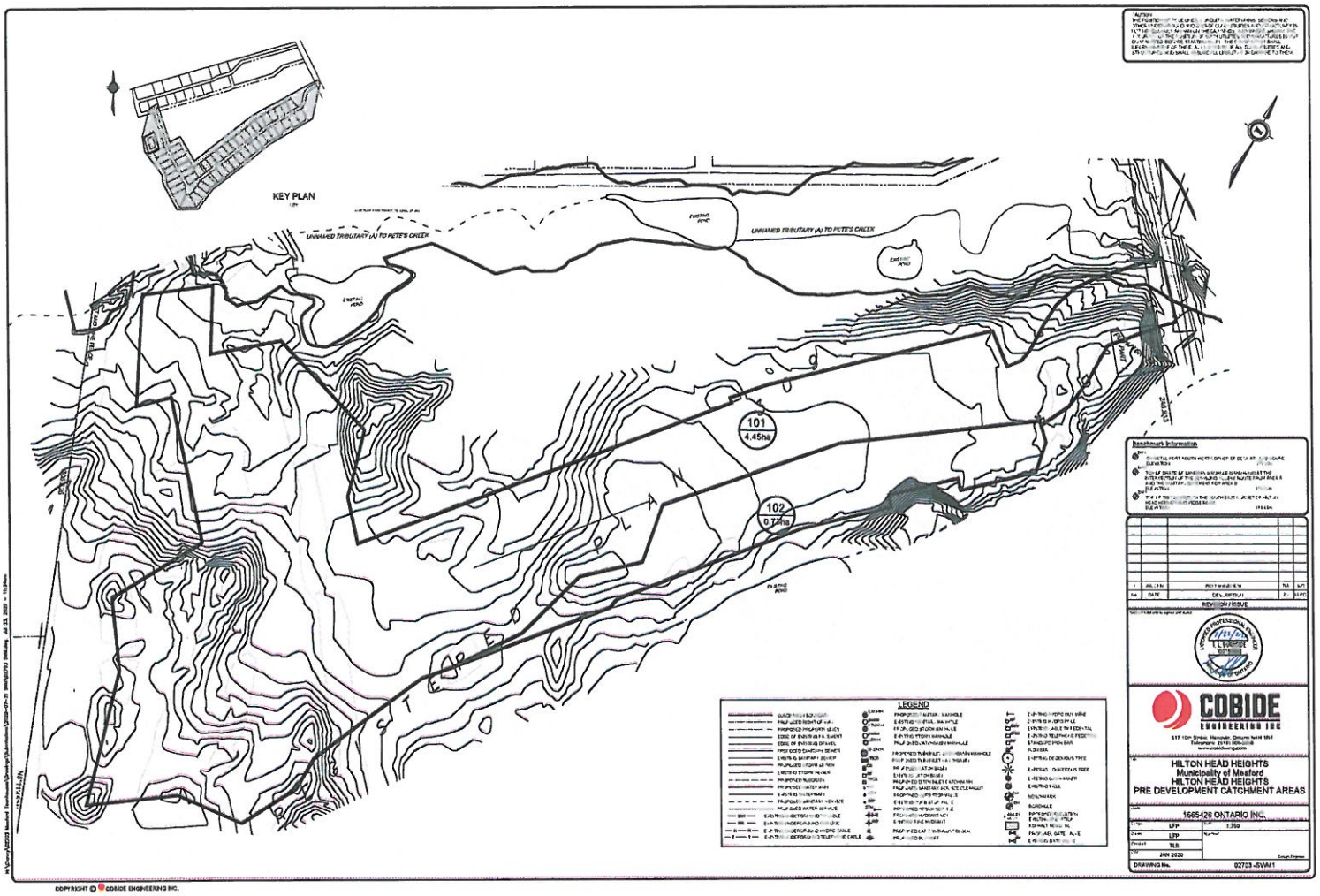
Sincerely,

Cobide Engineering Inc.

Travis Burnside, P. Eng.

LICENSED PROFESSIONAL ENGINEER
7/22/2020
T. L. BURNSIDE
100199868
PROVINCE OF ONTARIO

H:\Clancy\02703 Meaford Townhouses\Reports\SWM Report\2020-07-22 Hilton Head Heights SWM Report.docx



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Appendix B

PRE DEVELOPMENT MODEL PARAMETERS AND OUTPUT

STORMWATER MANAGEMENT REPORT

HILTON HEAD HEIGHTS DEVELOPMENT

MUNICIPALITY OF MEAFORD

Table A.1 Parameter Summary Table

Existing Conditions										
Outlet Location	Model Catchment ID	Description	Area (ha)	Drainage Channel (m)	Flow Length (m)	Gradient (%)	Total Imperv. Connected (%)	Not Connected Imperv. (%)	Manning's 'n' (Perv.)	CN (Perv.)
Tributary A	101	North Side of Development Area	4.45	600	74	3.0	0.0	100%	0.28	58.0
Tributary B	102	South Side of Development Area	0.73	300	24	2.0	0.0	100%	0.28	58.0

Table A.3: Impervious Area Determination for Subcatchment 101 - 102

Existing Conditions

Area of Concern	Total Area (ha)	Impervious Area Connected		Impervious Area Not Connected (Rooftops)		Total (%)
		(ha)	(%)	(ha)	(%)	
101	4.45	0.00	0.0	0.00	0.0	0.0
102	0.73	0.00	0.0	0.00	0.0	0.0

Pre Development Model Schematic

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HILTON HEAD HEIGHTS – PRE DEVELOPMENT – MODEL DETAILS

```
101              0.01       0.28       0.05       0.05       25         OUTLET
S1               0.01       0.28       0.05       0.05       25         OUTLET

[INFILTRATION]
;;Subcatchment   CurveNum   HydCon     DryTime
;;-------------- ---------- ---------- ----------
101              58         0.5        7
S1               58         0.5        7

[OUTFALLS]
;;               Invert     Outfall      Stage/Table      Tide
;;Name           Elev.      Type         Time Series      Gate Route To
;;-------------- ---------- ------------ ---------------- ---- ----------------
Trib_A           189.45     FREE                          NO
Trib_B           192.43     FREE                          NO

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
;SCS_6h_38.4mm design storm, total rainfall = 38.4 mm, rain units = mm/hr.
SCS_6h_38.4mm_2yr

;SCS_6h_50.5mm design storm, total rainfall = 50.5 mm, rain units = mm/hr.
SCS_6h_50.5mm_5yr

;SCS_6h_68.7mm design storm, total rainfall = 68.7 mm, rain units = mm/hr.
SCS_6h_68.7mm_25yr

;SCS_6h_76.3mm design storm, total rainfall = 76.3 mm, rain units = mm/hr.
SCS_6h_76.3mm_50yr

;SCS_6h_83.8mm design storm, total rainfall = 83.8 mm, rain units = mm/hr.
SCS_6h_83.8mm_100yr

[REPORT]
INPUT      YES
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS       530711.488693729 4939507.80999224 531254.163899829 4939986.83489607
UNITS            Meters
```

HILTON HEAD HEIGHTS – PRE DEVELOPMENT – 2 YR STORM EVENT

```
Starting Date ............ 07/22/2020 00:00:00
Ending Date .............. 07/23/2020 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 00:05:00

**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         0.199        38.406
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.167        32.162
Surface Runoff ...........         0.032         6.097
Final Storage ............         0.001         0.147
Continuity Error (%) .....         0.000

**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.032         0.316
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.032         0.316
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....         0.000

***************************
Subcatchment Runoff Summary
***************************

  ---------------------------------------------------------------------------------------------
---------
                            Total      Total      Total      Total      Total       Total
Peak  Runoff
                           Precip     Runon       Evap      Infil     Runoff      Runoff
Runoff   Coeff
  Subcatchment                mm         mm         mm         mm         mm    10^6 ltr
LPS
  ---------------------------------------------------------------------------------------------
---------
  101                      38.41       0.00       0.00      32.23       6.02        0.27
18.01   0.157
  S1                       38.41       0.00       0.00      31.77       6.55        0.05
4.68   0.171

  Analysis begun on:  Thu Jul 23 12:10:46 2020
  Analysis ended on:  Thu Jul 23 12:10:46 2020
  Total elapsed time: < 1 sec
```

HILTON HEAD HEIGHTS – PRE DEVELOPMENT – 5 YR STORM EVENT

```
  Starting Date ........... 07/22/2020 00:00:00
  Ending Date ............. 07/23/2020 00:00:00
  Antecedent Dry Days ...... 0.0
  Report Time Step ......... 00:01:00
  Wet Time Step ........... 00:05:00
  Dry Time Step ........... 00:05:00

  **************************        Volume         Depth
  Runoff Quantity Continuity     hectare-m            mm
  **************************     ---------       -------
  Total Precipitation ......         0.262        50.509
  Evaporation Loss .........         0.000         0.000
  Infiltration Loss ........         0.209        40.316
  Surface Runoff ...........         0.052        10.045
  Final Storage ............         0.001         0.148
  Continuity Error (%) .....         0.000

  **************************        Volume        Volume
  Flow Routing Continuity        hectare-m      10^6 ltr
  **************************     ---------     ---------
  Dry Weather Inflow .......         0.000         0.000
  Wet Weather Inflow .......         0.052         0.521
  Groundwater Inflow .......         0.000         0.000
  RDII Inflow ..............         0.000         0.000
  External Inflow ..........         0.000         0.000
  External Outflow .........         0.052         0.521
  Flooding Loss ............         0.000         0.000
  Evaporation Loss .........         0.000         0.000
  Exfiltration Loss ........         0.000         0.000
  Initial Stored Volume ....         0.000         0.000
  Final Stored Volume ......         0.000         0.000
  Continuity Error (%) .....         0.000

  ***************************
  Subcatchment Runoff Summary
  ***************************

  ---------------------------------------------------------------------------------------------------
---------
                              Total      Total      Total      Total      Total       Total
Peak  Runoff
                             Precip      Runon       Evap      Infil     Runoff      Runoff
Runoff   Coeff
  Subcatchment                  mm         mm         mm         mm         mm    10^6 ltr
LPS
  ---------------------------------------------------------------------------------------------------
---------
  101                        50.51       0.00       0.00      40.42       9.93        0.44
34.97   0.197
  S1                         50.51       0.00       0.00      39.67      10.75        0.08
9.57   0.213

  Analysis begun on:  Thu Jul 23 12:10:11 2020
  Analysis ended on:  Thu Jul 23 12:10:11 2020
  Total elapsed time: < 1 sec
```

HILTON HEAD HEIGHTS – PRE DEVELOPMENT – 25 YR STORM EVENT

```
  Starting Date ............ 07/22/2020 00:00:00
  Ending Date .............. 07/23/2020 00:00:00
  Antecedent Dry Days ...... 0.0
  Report Time Step ......... 00:01:00
  Wet Time Step ............ 00:05:00
  Dry Time Step ............ 00:05:00

  **************************        Volume         Depth
  Runoff Quantity Continuity     hectare-m            mm
  **************************     ---------       -------
  Total Precipitation ......         0.356        68.710
  Evaporation Loss .........         0.000         0.000
  Infiltration Loss ........         0.265        51.120
  Surface Runoff ...........         0.090        17.441
  Final Storage ............         0.001         0.149
  Continuity Error (%) .....         0.000

  **************************        Volume        Volume
  Flow Routing Continuity        hectare-m      10^6 ltr
  **************************     ---------     ---------
  Dry Weather Inflow .......         0.000         0.000
  Wet Weather Inflow .......         0.090         0.904
  Groundwater Inflow .......         0.000         0.000
  RDII Inflow ..............         0.000         0.000
  External Inflow ..........         0.000         0.000
  External Outflow .........         0.090         0.904
  Flooding Loss ............         0.000         0.000
  Evaporation Loss .........         0.000         0.000
  Exfiltration Loss ........         0.000         0.000
  Initial Stored Volume ....         0.000         0.000
  Final Stored Volume ......         0.000         0.000
  Continuity Error (%) .....         0.000

  ***************************
  Subcatchment Runoff Summary
  ***************************

  ---------------------------------------------------------------------------------------------
---------
                              Total      Total      Total      Total      Total       Total
Peak  Runoff
                             Precip      Runon       Evap      Infil     Runoff      Runoff
Runoff   Coeff
  Subcatchment                  mm         mm         mm         mm         mm    10^6 ltr
LPS
  ---------------------------------------------------------------------------------------------
---------
  101                         68.71       0.00       0.00      51.26      17.29        0.77
74.15   0.252
  S1                          68.71       0.00       0.00      50.30      18.33        0.13
20.06   0.267

  Analysis begun on:  Thu Jul 23 12:09:41 2020
  Analysis ended on:  Thu Jul 23 12:09:41 2020
  Total elapsed time: < 1 sec
```

HILTON HEAD HEIGHTS – PRE DEVELOPMENT – 50 YR STORM EVENT

```
Starting Date ............ 07/22/2020 00:00:00
Ending Date .............. 07/23/2020 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 00:05:00

**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         0.396        76.311
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.286        55.168
Surface Runoff ...........         0.109        20.994
Final Storage ............         0.001         0.150
Continuity Error (%) .....         0.000

**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.109         1.088
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.109         1.088
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....         0.000

***************************
Subcatchment Runoff Summary
***************************

  ---------------------------------------------------------------------------------------------------
---------
                            Total      Total      Total      Total      Total       Total
Peak  Runoff
                           Precip      Runon       Evap      Infil     Runoff      Runoff
Runoff   Coeff
  Subcatchment                mm         mm         mm         mm         mm    10^6 ltr
LPS
  ---------------------------------------------------------------------------------------------------
---------
  101                      76.31       0.00       0.00      55.31      20.84        0.93
96.90   0.273
  S1                       76.31       0.00       0.00      54.31      21.92        0.16
25.41   0.287

  Analysis begun on:  Thu Jul 23 12:09:09 2020
  Analysis ended on:  Thu Jul 23 12:09:09 2020
  Total elapsed time: < 1 sec
```

HILTON HEAD HEIGHTS – PRE DEVELOPMENT – 100 YR STORM EVENT

```
Starting Date ............ 07/22/2020 00:00:00
Ending Date .............. 07/23/2020 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 00:05:00

**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         0.434        83.812
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.306        58.942
Surface Runoff ...........         0.128        24.721
Final Storage ............         0.001         0.150
Continuity Error (%) .....        -0.001

**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.128         1.281
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.128         1.281
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....         0.000

***************************
Subcatchment Runoff Summary
***************************

-------------------------------------------------------------------------------------------------
---------
                            Total      Total      Total      Total      Total       Total
Peak  Runoff
                           Precip      Runon       Evap      Infil     Runoff      Runoff
Runoff   Coeff
  Subcatchment                mm         mm         mm         mm         mm    10^6 ltr
LPS
-------------------------------------------------------------------------------------------------
---------
  101                       83.81       0.00       0.00      59.09      24.56        1.09
122.75   0.293
  S1                        83.81       0.00       0.00      58.02      25.71        0.19
31.17   0.307

Analysis begun on:  Wed Jul 22 08:45:26 2020
Analysis ended on:  Wed Jul 22 08:45:26 2020
Total elapsed time: < 1 sec
```

Table B.2 Site Soils: (as per Ontario Soil Survey Report No. 16 for Bruce County)

Soil Type
Brighton Sand

Hydologic Soil Group
A

TABLE OF CURVE NUMBERS (CN's)									
Land Use	Hydrologic Soil Type								
	A	AB	B	BC	C	CD	D	Manning's 'n'	
Meadow	50	54	58	64.5	71	74.5	78	0.4	continuous grass
Woodlot	50	55.3	60.5	67	73.5	76.8	80	0.4	forests
Long Grass	55	60	65	72	79	81.5	84	0.3	natural, not maintained
Lawns	60	65.5	71	77	83	86	89	0.25	maintained
Pasture/Range	58	61.5	65	70.5	76	78.5	81	0.17	farm pasture
Crop	66	70	74	78	82	84	86	0.13	farm land
Fallow (bare)	77	82	86	89	91	93	94	0.05	idle farm land (bare)
Built-up	60	65.5	71	77	83	89	89	0.25	Lawns Proposed
Streets, paved	98	98	98	98	98	98	98	0.01	

HYDROLOGIC SOIL TYPE (%) - Proposed Conditions								
Catchment	Hydrologic Soil Type							
	A	AB	B	BC	C	CD	D	TOTAL
201	100	0	0	0	0	0	0	100
202	100	0	0	0	0	0	0	100
203	100	0	0	0	0	0	0	100

LAND USE (%) - Proposed Conditions										
Catchment	Meadow	Woodlot	Long Grass	Lawns	Pasture Range	Crop	Fallow (Bare)	Imperv. Not Connected (Rooftops)	Imperv. Connected	Total
201	0	7	0	53	0	0	0	24.2	16.2	100
202	0	0	0	59	0	0	0	15.5	25.1	100
203	0	0	0	84	0	0	0	16.3	0.0	100

CURVE NUMBER (CN) - Proposed Conditions											
Catchment	Meadow	Woodlot	Long Grass	Lawns	Pasture Range	Crop	Fallow (Bare)	Built-up	Imperv. Not Connected (Rooftops)	Weighted CN - Pervious	Manning's 'n'
201	50.0	50	55	60	58	66	77	60	90	58.8	0.27
202	50.0	50.0	55	60	58.0	66	77	60	90	60.0	0.25
203	50.0	50	55	60	58	66	77	60	90	60.0	0.25

Table B.3 - Impervious Area Determination for Proposed Catchment 201

Catchment					Imperv. Area	Imperv %
201	490	m of	8	m wide ROW @ 100% imperv.	0.39 ha	9.6 %
	45	driveways @	60	m^2 @ 100% imperv.	0.27 ha	6.6 %
		driveways @	90	m^2 @ 100% imperv.	0.00 ha	0.0 %
	44	single res. homes with roof area of		225 m^2	0.99 ha	24.2 %
		Duplex unit with roof area of		250 m^2	0.00 ha	0.0 %
		Multi-family Blocks with impervious		3250 m^2	0.00 ha	0.0 %
		Apartment Block with impervious ar		4300 m^2	0.00 ha	0.0 %
		Permanent Pool of		4000 m^2	0.00 ha	0.0 %
					1.65 ha	
202	160	m of	8	m wide ROW @ 100% imperv.	0.13 ha	19.6 %
	6	driveways @	60	m^2 @ 100% imperv.	0.04 ha	5.5
	4.5	single res. homes with roof area of		225 m^2	0.10 ha	15.5
		Duplex unit with roof area of		250 m^2	0.00 ha	0.0
		Multi-family Blocks with roof area of		750 m^2	0.00 ha	0.0
					0.13 ha	
203		m of	20	m wide ROW @ 55% imperv.	0.00 ha	0.0 %
		driveways @	1826	m^2 @ 100% imperv.	0.00 ha	0.0 %
	2.5	single res. homes with roof area of		225 m^2	0.06 ha	16.3 %
		Duplex unit with roof area of		200 m^2	0.00 ha	0.0 %
		Multi-family Blocks with roof area of		750 m^2	0.00 ha	0.0 %
					0.06 ha	

HILTON HEAD HEIGHTS – POST DEVELOPMENT – MODEL DETAILS

```
[TITLE]


[OPTIONS]
;;Options             Value
;;------------------- ------------
FLOW_UNITS            LPS
INFILTRATION          CURVE_NUMBER
FLOW_ROUTING          DYNWAVE
START_DATE            7/22/2020
START_TIME            00:00
REPORT_START_DATE     7/22/2020
REPORT_START_TIME     00:00
END_DATE              7/23/2020
END_TIME              00:00
SWEEP_START           1/1
SWEEP_END             12/31
DRY_DAYS              0
REPORT_STEP           00:01:00
WET_STEP              00:05:00
DRY_STEP              00:05:00
ROUTING_STEP          5
ALLOW_PONDING         NO
INERTIAL_DAMPING      PARTIAL
VARIABLE_STEP         0.75
LENGTHENING_STEP      0
MIN_SURFAREA          0
NORMAL_FLOW_LIMITED   BOTH
SKIP_STEADY_STATE     NO
FORCE_MAIN_EQUATION   H-W
LINK_OFFSETS          ELEVATION
MIN_SLOPE             0
MAX_TRIALS            8
HEAD_TOLERANCE        0
SYS_FLOW_TOL          5
LAT_FLOW_TOL          5
MINIMUM_STEP          0.5
THREADS               2

[EVAPORATION]
;;Type           Parameters
;;-------------- ----------
CONSTANT      0.0
DRY_ONLY      NO

[RAINGAGES]
;;                   Rain      Time   Snow   Data
;;Name               Type      Intrvl Catch  Source
;;------------------ --------- ------ ------ ----------
SCS_6h_38.4mm_2yr    INTENSITY 0:05   1.0    TIMESERIES SCS_6h_38.4mm_2yr
SCS_6h_50.5mm_5yr    INTENSITY 0:05   1.0    TIMESERIES SCS_6h_50.5mm_5yr
SCS_6h_68.7mm_25yr   INTENSITY 0:05   1.0    TIMESERIES SCS_6h_68.7mm_25yr
SCS_6h_76.3mm_50yr   INTENSITY 0:05   1.0    TIMESERIES SCS_6h_76.3mm_50yr
SCS_6h_83.8mm_100yr  INTENSITY 0:05   1.0    TIMESERIES SCS_6h_83.8mm_100yr

[SUBCATCHMENTS]
;;                                                Total    Pcnt.              Pcnt.    Curb
Snow
;;Name            Raingage         Outlet          Area     Imperv   Width     Slope    Length
Pack
;;--------------- ---------------- --------------- -------- -------- -------- -------- --------
--------
201               SCS_6h_83.8mm_100yr SU1          4.0915   40.4     900      2        0
S1                SCS_6h_83.8mm_100yr J1           0.6538   40.6     320      2        0
S3                SCS_6h_83.8mm_100yr Trib_B       0.3451   16.3     300      4        0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
```

HILTON HEAD HEIGHTS – POST DEVELOPMENT – MODEL DETAILS

```
[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
;SCS_6h_38.4mm design storm, total rainfall = 38.4 mm, rain units = mm/hr.
SCS_6h_38.4mm_2yr

;SCS_6h_50.5mm design storm, total rainfall = 50.5 mm, rain units = mm/hr.
SCS_6h_50.5mm_5yr

;SCS_6h_68.7mm design storm, total rainfall = 68.7 mm, rain units = mm/hr.
SCS_6h_68.7mm_25yr

;SCS_6h_76.3mm design storm, total rainfall = 76.3 mm, rain units = mm/hr.
SCS_6h_76.3mm_50yr

;SCS_6h_83.8mm design storm, total rainfall = 83.8 mm, rain units = mm/hr.
SCS_6h_83.8mm_100yr

[REPORT]
INPUT      YES
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS       530719.245580512 4939507.73619516 531254.074009732 4939986.83841022
UNITS            Meters
```

HILTON HEAD HEIGHTS – POST DEVELOPMENT – 2 YR STORM EVENT

```
*********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*********************************************************

****************
Analysis Options
****************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Starting Date ............ 07/22/2020 00:00:00
Ending Date .............. 07/23/2020 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 00:05:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001524 m

**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         0.196        38.406
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.098        19.298
Surface Runoff ...........         0.097        19.063
Final Storage ............         0.000         0.063
Continuity Error (%) .....        -0.044

**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.097         0.971
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.069         0.688
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.028         0.282
Continuity Error (%) .....         0.022

***************************
Time-Step Critical Elements
***************************
None
```

HILTON HEAD HEIGHTS – POST DEVELOPMENT – 2 YR STORM EVENT

Node	Type	LPS	LPS	days hr:min	10^6 ltr	10^6 ltr	Percent
J1	JUNCTION	25.27	30.90	0 02:25	0.129	0.647	0.027
Trib_A	OUTFALL	0.00	30.88	0 02:25	0	0.646	0.000
Trib_B	OUTFALL	8.04	8.04	0 02:25	0.042	0.042	0.000
SU1	STORAGE	147.15	147.15	0 02:25	0.799	0.799	0.045

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
SU1	0.441	16	0	0	0.652	24	0 06:07	6.61

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
Trib_A	99.88	7.49	30.88	0.646
Trib_B	33.45	1.45	8.04	0.042
System	66.67	8.94	38.90	0.688

****
Link Flow Summary
****

	Maximum |Flow|	Time of Max Occurrence	Maximum |Veloc|	Max/ Full	Max/ Full

HILTON HEAD HEIGHTS – POST DEVELOPMENT – 5 YR STORM EVENT

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.011)
--------------------------------------------------------------

*************
Element Count
*************
Number of rain gages ...... 5
Number of subcatchments ... 3
Number of nodes ........... 4
Number of links ........... 2
Number of pollutants ...... 0
Number of land uses ....... 0

****************
Raingage Summary
****************
                                                   Data       Recording
Name                 Data Source                   Type       Interval
----------------------------------------------------------------------
SCS_6h_38.4mm_2yr    SCS_6h_38.4mm_2yr             INTENSITY    5 min.
SCS_6h_50.5mm_5yr    SCS_6h_50.5mm_5yr             INTENSITY    5 min.
SCS_6h_68.7mm_25yr   SCS_6h_68.7mm_25yr            INTENSITY    5 min.
SCS_6h_76.3mm_50yr   SCS_6h_76.3mm_50yr            INTENSITY    5 min.
SCS_6h_83.8mm_100yr  SCS_6h_83.8mm_100yr           INTENSITY    5 min.

********************
Subcatchment Summary
********************
Name                       Area     Width   %Imperv    %Slope Rain Gage            Outlet
-----------------------------------------------------------------------------------------------
------------
201                        4.09    900.00     40.40    2.0000 SCS_6h_50.5mm_5yr    SU1
S1                         0.65    320.00     40.60    2.0000 SCS_6h_50.5mm_5yr    J1
S3                         0.35    300.00     16.30    4.0000 SCS_6h_50.5mm_5yr    Trib_B

************
Node Summary
************
                                        Invert      Max.    Ponded    External
Name                 Type                Elev.     Depth      Area    Inflow
-----------------------------------------------------------------------------
J1                   JUNCTION           189.60      1.40       0.0
Trib_A               OUTFALL            189.45      1.00       0.0
Trib_B               OUTFALL            192.43      0.00       0.0
SU1                  STORAGE            195.10      2.90       0.0

************
Link Summary
************
Name             From Node        To Node          Type            Length    %Slope Roughness
-----------------------------------------------------------------------------------------------
C1               J1               Trib_A           CONDUIT           21.8    0.6868    0.0130
OR1              SU1              J1               ORIFICE

*********************
Cross Section Summary
*********************
                                     Full      Full      Hyd.      Max.   No. of      Full
Conduit          Shape              Depth      Area      Rad.     Width  Barrels      Flow
-----------------------------------------------------------------------------------------
C1               TRAPEZOIDAL         1.00      4.50      0.51      8.50        1 18421.07
```

HILTON HEAD HEIGHTS – POST DEVELOPMENT – 5 YR STORM EVENT

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

*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     4.50 sec
Average Time Step           :     5.00 sec
Maximum Time Step           :     5.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.00
Percent Not Converging      :     0.00

****************************
Subcatchment Runoff Summary
****************************

  ---------------------------------------------------------------------------------------------
---------
                              Total      Total      Total      Total      Total       Total
Peak  Runoff
                             Precip      Runon       Evap      Infil     Runoff      Runoff
Runoff   Coeff
  Subcatchment                 mm         mm         mm         mm         mm     10^6 ltr
LPS
  ---------------------------------------------------------------------------------------------
---------
  201                        50.51       0.00       0.00      23.52      26.95        1.10
203.79   0.534
  S1                         50.51       0.00       0.00      23.11      27.36        0.18
35.50   0.542
  S3                         50.51       0.00       0.00      32.56      17.90        0.06
12.32   0.354

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

  ---------------------------------------------------------------------------------
                                Average  Maximum  Maximum  Time of Max    Reported
                                  Depth    Depth      HGL   Occurrence   Max Depth
  Node                  Type      Meters   Meters   Meters  days hr:min      Meters
  ---------------------------------------------------------------------------------
  J1                    JUNCTION    0.03     0.07   189.67     0  02:25        0.07
  Trib_A                OUTFALL     0.03     0.07   189.52     0  02:25        0.06
  Trib_B                OUTFALL     0.00     0.00   192.43     0  00:00        0.00
  SU1                   STORAGE     1.40     1.66   196.76     0  06:09        1.66

*******************
Node Inflow Summary
*******************

  ---------------------------------------------------------------------------------------------
--
                                Maximum  Maximum                    Lateral       Total
Flow
                                Lateral    Total  Time of Max       Inflow      Inflow
Balance
                                 Inflow   Inflow   Occurrence       Volume      Volume
Error
```

HILTON HEAD HEIGHTS – POST DEVELOPMENT – 5 YR STORM EVENT

Link	Type	LPS	days	hr:min	m/sec	Flow	Depth
C1	CONDUIT	41.45	0	02:25	0.84	0.00	0.07
OR1	ORIFICE	7.23	0	06:09			1.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
		---------- Fraction of Time in Flow Class ----------								
C1	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.88	0.00

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Thu Jul 23 12:15:43 2020
Analysis ended on: Thu Jul 23 12:15:43 2020
Total elapsed time: < 1 sec

HILTON HEAD HEIGHTS – POST DEVELOPMENT – 25 YR STORM EVENT

```
*******************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*******************************************************

****************
Analysis Options
****************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Starting Date ............ 07/22/2020 00:00:00
Ending Date .............. 07/23/2020 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 00:05:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001524 m

**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         0.350        68.710
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.155        30.443
Surface Runoff ...........         0.195        38.229
Final Storage ............         0.000         0.063
Continuity Error (%) .....        -0.037

**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.195         1.947
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.099         0.991
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.096         0.956
Continuity Error (%) .....         0.014

***************************
Time-Step Critical Elements
***************************
None
```

HILTON HEAD HEIGHTS – POST DEVELOPMENT – 25 YR STORM EVENT

Node	Type	LPS	LPS	days hr:min	10^6 ltr	10^6 ltr	Percent
J1	JUNCTION	52.62	59.08	0 02:25	0.259	0.895	0.024
Trib_A	OUTFALL	0.00	59.04	0 02:25	0	0.895	0.000
Trib_B	OUTFALL	19.95	19.95	0 02:25	0.0959	0.0959	0.000
SU1	STORAGE	299.59	299.59	0 02:25	1.59	1.59	0.027

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
SU1	1.082	39	0	0	1.419	52	0 06:12	8.02

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
Trib_A	99.92	10.36	59.04	0.895
Trib_B	34.64	3.20	19.95	0.096
System	67.28	13.56	78.96	0.991

****
Link Flow Summary
****

	Maximum |Flow|	Time of Max Occurrence	Maximum |Veloc|	Max/ Full	Max/ Full

HILTON HEAD HEIGHTS – POST DEVELOPMENT – 50 YR STORM EVENT

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.011)
--------------------------------------------------------------


*************
Element Count
*************
Number of rain gages ...... 5
Number of subcatchments ... 3
Number of nodes ........... 4
Number of links ........... 2
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                    Data       Recording
Name                  Data Source                   Type       Interval
----------------------------------------------------------------------
SCS_6h_38.4mm_2yr     SCS_6h_38.4mm_2yr             INTENSITY    5 min.
SCS_6h_50.5mm_5yr     SCS_6h_50.5mm_5yr             INTENSITY    5 min.
SCS_6h_68.7mm_25yr    SCS_6h_68.7mm_25yr            INTENSITY    5 min.
SCS_6h_76.3mm_50yr    SCS_6h_76.3mm_50yr            INTENSITY    5 min.
SCS_6h_83.8mm_100yr   SCS_6h_83.8mm_100yr           INTENSITY    5 min.


********************
Subcatchment Summary
********************
Name                        Area     Width   %Imperv    %Slope Rain Gage            Outlet
-----------------------------------------------------------------------------------------------
------------
201                         4.09    900.00     40.40    2.0000 SCS_6h_76.3mm_50yr   SU1
S1                          0.65    320.00     40.60    2.0000 SCS_6h_76.3mm_50yr   J1
S3                          0.35    300.00     16.30    4.0000 SCS_6h_76.3mm_50yr   Trib_B


************
Node Summary
************
                                          Invert      Max.    Ponded    External
Name                  Type                 Elev.     Depth      Area    Inflow
-----------------------------------------------------------------------
J1                    JUNCTION            189.60      1.40       0.0
Trib_A                OUTFALL             189.45      1.00       0.0
Trib_B                OUTFALL             192.43      0.00       0.0
SU1                   STORAGE             195.10      2.90       0.0


************
Link Summary
************
Name              From Node         To Node           Type             Length    %Slope Roughness
-----------------------------------------------------------------------------------------------
C1                J1                Trib_A            CONDUIT            21.8    0.6868    0.0130
OR1               SU1               J1                ORIFICE


*********************
Cross Section Summary
*********************
                                     Full      Full      Hyd.      Max.   No. of      Full
Conduit           Shape             Depth      Area      Rad.     Width  Barrels      Flow
-----------------------------------------------------------------------------------------
C1                TRAPEZOIDAL        1.00      4.50      0.51      8.50        1 18421.07
```

HILTON HEAD HEIGHTS – POST DEVELOPMENT – 50 YR STORM EVENT

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


  *************************
  Routing Time Step Summary
  *************************
  Minimum Time Step           :     4.50 sec
  Average Time Step           :     5.00 sec
  Maximum Time Step           :     5.00 sec
  Percent in Steady State     :     0.00
  Average Iterations per Step :     2.00
  Percent Not Converging      :     0.01


  ***************************
  Subcatchment Runoff Summary
  ***************************

  ---------------------------------------------------------------------------------------------
---------
                            Total      Total      Total      Total      Total       Total
Peak  Runoff
                           Precip     Runon       Evap      Infil     Runoff      Runoff
Runoff   Coeff
  Subcatchment                mm         mm         mm         mm         mm    10^6 ltr
LPS
  ---------------------------------------------------------------------------------------------
---------
  201                      76.31       0.00       0.00      32.08      44.19        1.81
343.12   0.579
  S1                       76.31       0.00       0.00      31.25      45.03        0.29
60.29   0.590
  S3                       76.31       0.00       0.00      44.03      32.25        0.11
23.49   0.423


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

  ---------------------------------------------------------------------------------
                                Average  Maximum  Maximum  Time of Max    Reported
                                  Depth    Depth      HGL   Occurrence   Max Depth
  Node                 Type       Meters   Meters   Meters  days hr:min      Meters
  ---------------------------------------------------------------------------------
  J1                   JUNCTION     0.03     0.08   189.68     0  02:25        0.08
  Trib_A               OUTFALL      0.03     0.08   189.53     0  02:25        0.08
  Trib_B               OUTFALL      0.00     0.00   192.43     0  00:00        0.00
  SU1                  STORAGE      1.89     2.19   197.29     0  06:13        2.19


  *******************
  Node Inflow Summary
  *******************

  ---------------------------------------------------------------------------------------------
--
                                Maximum  Maximum                   Lateral       Total
Flow
                                Lateral    Total  Time of Max       Inflow      Inflow
Balance
                                 Inflow   Inflow   Occurrence       Volume      Volume
Error
```

HILTON HEAD HEIGHTS – POST DEVELOPMENT – 50 YR STORM EVENT

Link	Type	LPS	days	hr:min	m/sec	Flow	Depth
C1	CONDUIT	66.90	0	02:25	0.96	0.00	0.08
OR1	ORIFICE	8.32	0	06:13			1.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
		---------- Fraction of Time in Flow Class ----------								
C1	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.87	0.00

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Thu Jul 23 12:16:44 2020
Analysis ended on: Thu Jul 23 12:16:44 2020
Total elapsed time: < 1 sec

HILTON HEAD HEIGHTS – POST DEVELOPMENT – 100 YR STORM EVENT

```
-----------------------------------------------------------------------------------------
C1                TRAPEZOIDAL          1.00     4.50     0.51     8.50         1 18421.07


*********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*********************************************************

****************
Analysis Options
****************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Starting Date ............ 07/22/2020 00:00:00
Ending Date .............. 07/23/2020 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 00:05:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001524 m


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         0.427        83.812
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.178        35.033
Surface Runoff ...........         0.248        48.745
Final Storage ............         0.000         0.063
Continuity Error (%) .....        -0.036


**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.248         2.482
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.114         1.141
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.134         1.341
Continuity Error (%) .....         0.012
```

HILTON HEAD HEIGHTS – POST DEVELOPMENT – 100 YR STORM EVENT

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	68.11	74.95	0 02:25	0.33	1.01	0.023
Trib_A	OUTFALL	0.00	74.91	0 02:25	0	1.01	0.000
Trib_B	OUTFALL	27.16	27.16	0 02:25	0.127	0.127	0.000
SU1	STORAGE	387.92	387.92	0 02:25	2.02	2.02	0.024

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
SU1	1.440	52	0	0	1.842	67	0 06:14	8.60

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
Trib_A	99.94	11.74	74.91	1.013
Trib_B	34.95	4.21	27.16	0.127
System	67.44	15.94	102.02	1.141

Appendix D

OGS SIZING

STORMWATER MANAGEMENT REPORT

HILTON HEAD HEIGHTS DEVELOPMENT

MUNICIPALITY OF MEAFORD

Hydro First Defense® - HC

Hydro International

Rev. 9.6

Project Name:	**Hilton Head Heights**	*Report Date:*	Paste
Street:	**Hilton Head Heights**	*City:*	**Meaford**
Province:	**Ontario**	*Country:*	
Designer:		*email:*	

Teatment Parameters:

Structure ID:		
TSS Goal:	80	% Removal
TSS Particle Size:	Fine	
Area:	3.974	ha
Percent Impervious:	45%	
Rational C value:	0.65	Calc. Cn
Rainfall Station:	Owen Sound	MAP
Peak Storm Flow:	479	L/s

RESULTS SUMMARY

Model	TSS	Volume
FD-3HC	73.2%	85.8%
FD-4HC	77.2%	95.0%
FD-5HC	80.9%	98.2%
FD-6HC	**83.3%**	**98.8%**
FD-8HC	87.3%	98.9%

Model Specification:

Model:	**FD-6HC**	
Diameter:	1800	mm
Peak Flow Capacity:	906.00	L/s
Sediment Storage:	1.22	m^3
Oil Storage:	1878.00	L

Installation Configuration:

Placement:	Online		
Outlet Pipe Size:	750	mm	*OK*
Inlet Pipe 1 Size:	750	mm	*OK*
Inlet Pipe 2 Size:		mm	*OK*
Inlet Pipe 3 Size:		mm	*OK*
Rim Level:	198.030	m	Calc Invs.
Outlet Pipe Invert:	195.840	m	*Additional cover may be required*
Invert Pipe 1:	195.860	m	*Check cover*
Invert Pipe 2:		m	
Invert Pipe 3:		m	

Net Annual Removal Model: FD-6HC

Intensity[1] (mm/hr)	Fraction of Rainfall[1] (%)	FD-6HC Removal Efficiency[2] (%)	Weighted Net Annual Efficiency (%)
0.50	10.1%	99.6%	10.1%
1.00	10.7%	93.4%	10.0%
1.50	10.0%	89.9%	9.0%
2.00	8.4%	87.5%	7.4%
2.50	6.6%	85.7%	5.7%
3.00	6.2%	84.3%	5.2%
3.60	4.1%	82.9%	3.4%
4.10	4.2%	81.9%	3.4%
4.60	3.7%	81.0%	3.0%
5.10	3.8%	80.2%	3.0%
6.40	6.4%	78.6%	5.0%
7.60	4.6%	77.3%	3.6%
8.90	3.3%	76.2%	2.5%
10.20	2.4%	75.2%	1.8%
11.40	2.6%	74.5%	1.9%
12.70	1.5%	73.7%	1.1%
15.20	2.1%	72.5%	1.5%
19.10	2.3%	71.0%	1.6%
25.40	3.9%	69.1%	2.7%
38.10	1.4%	66.6%	0.9%
50.80	0.6%	64.8%	0.4%
Total Net Annual Removal Efficiency:			**83.3%**
Total Annual Runoff Volume Treated:			**98.8%**

1. Rainfall data based on 37 years of rainfall data for Canada Station Owen Sound, Owen Sound, Ontario, Canada.

2. Based on third party verified data and appoximating the removal of a PSD similar to the STC Fine distribution

3. Rainfall adjusted to 5 min peak intensity based on hourly average.

Designer Notes: