STORMWATER MANAGEMENT REPORT

BLACKMOOR GATE

STRAW HAT RESTORATION

PROJECT NO.: 171-16446-00
DATE: MAY 09, 2018

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1 INTRODUCTION

1.1 SCOPE

WSP was retained by Straw Hat Restoration to prepare a Stormwater Management (SWM) Report for the proposed Blackmoor Gate infill development project in Collingwood, Ontario. This SWM report examines the potential water quality, quantity and water balance impacts of the proposed residential development and summarizes how each will be address in accordance with the Town of Collingwood Development Standards, the Ministry of the Environment (MOE) Stormwater Management Practices, and the Nottawasaga Valley Conservation Authority (NVCA) Stormwater Technical Guide.

1.2 SITE LOCATION

The site of the proposed residential subdivision is located south of Campbell Drive and west of Hurontario Street in the Town of Collingwood. The location of the site is illustrated in **Figure 1**.

1.3 STORMWATER MANAGEMENT PLAN OBJECTIVES

The objectives of the stormwater management plan are as follows:

- → Determine the site specific stormwater management requirements to ensure that the proposals are in conformance with the applicable Provincial, Municipal and Conservation Authority stormwater management and development guidelines.
- → Evaluate various stormwater management practices that meet the applicable SWM and development requirements and recommend a preferred strategy.
- → Prepare a stormwater management report documenting the strategy along with the technical information necessary for the justification and sizing of the proposed stormwater management facilities.

1.4 DESIGN CRITERIA

The anticipated SWM design criteria for the project, from each of the applicable sources, are detailed below.

TOWN OF COLLINGWOOD DESIGN STANDARDS (2002)

- → **Water Quality-** controls are to be implemented on applications in accordance with the applicable Master Drainage or Sub watershed Plan or site specific plan. A sub watershed plan for Black Ask Creek has been prepared by the NVCA in association with the Town of Collingwood et al. In the absence of an established plan the MOE- SWM Practices, Planning and Design Manual should be used.

During consultation discussions with Town staff it is also understood that capacity of the receiving storm drainage system is a concern, and therefore control of peak flow rates will be necessary to ensure post-development conditions to not exacerbate downstream issues. On this basis it is proposed that post-development peak runoff rates for all events up to the 100-year storm are controlled down to the pre-development 2-year capacity of the receiving system.

NOTTAWASAGA VALLEY CONSERVATION AUTHORITY STORMWATER TECHNICAL GUIDE (2013)

- → **Stormwater Quantity-** control post-development flows to pre-development levels for the 2- to 100-year storm events and safe conveyance of the Regulatory flow through the site.
- → **Stormwater Quality-** enhanced level of protection as per the latest MOE SWMPDM is required (80% TSS Removal).

→ **Water Balance-** for significant groundwater recharge areas and highly vulnerable aquifers, site-specific water balance analyses are required.

CLIENT

STRAWHAT RESTORATION

TITLE

BLACKMOOR GATE, COLLINGWOOD

SITE LOCATION

Checked B.W.	Drawn AutoCAD/J.W.	
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Scale N.T.S.	Figure No. 1	Gr.No.

180220_Figure 1.dwg Figure 1 Site Location \\Caoft100dat01\Water Resources\Projects\2018\171-16446-00_Blackmoor Gate\Drawings\ Mar 16, 2018 - 1:27pm

2 PRE-DEVELOPMENT CONDITIONS

2.1 EXISTING LAND-USE AND DRAINAGE

The subject property is a 1.61 ha parcel of land comprised of two residential lots at 774 Hurontario Street, and 750 Hurontario Street. Under pre-development conditions the subject site consists of 97% pervious surfaces, and a runoff coefficient of 0.32 is estimated for existing conditions.

Existing drainage patterns for the site were determined based on topographic survey information. The pre-development catchment areas are as illustrated in **Figure 2**.

2.2 RAINFALL INFORMATION

The rainfall intensity for the site was calculated using the following equation:

$$I = \left[\frac{A}{(T_d + C)^B}\right]$$

Where:

- I = rainfall intensity (mm/hr)
- T_d = storm duration (minutes)
- A, B, C = IDF parameters for each return period (see below)

The parameters (A, B and C) recommended for use by the Town of Collingwood Development Standards (Standard 110, 2003) are summarized below in **Table 1**.

Table 1: Town of Collingwood Rainfall Parameters

RETURN PERIOD (YEARS)	2	5	10	25	50	100
A	807.4	1135.4	1387.0	1676.2	1973.1	2193.1
B	0.828	0.841	0.852	0.858	0.868	0.871
C	6.750	7.500	7.970	8.300	9.000	9.040

2.3 ALLOWABLE FLOW RATES

As noted in section 1.4, relevant policies from the NVCA require the post-development discharge rate from the site match pre-development levels for the 2- to 100-year storm events and safe conveyance of the Regulatory Flow through the site. However, a conservative approach has been taken to control the 100-year flow down to the 2-year pre-development flow as runoff from the site will be discharging to a municipal storm sewer.

Rational method was used to calculate the peak flow rates for the site in the pre-development conditions summarized in **Table 2**. Detailed calculations are provided in **Appendix A**.

LEGEND

- PROJECT AREA BOUNDARY
- SUB-CATCHMENT BOUNDARIES
- OVERLAND FLOW ROUTE

ID — SUB-CATCHMENT ID.
AREA — DRAINAGE AREA (ha)
C — RUNOFF COEFFICIENT

Topographic survey prepared by SMC Geomatics (December 2017)

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EXISTING CONDITIONS

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Table 2: Pre-Development Peak Flow Rate Calculations (Based on T_d= 10 minutes and C=0.32)

RETURN PERIOD (Years)	RAINFALL INTENSITY, I (mm/hour)	PEAK FLOW RATE (L/sec)
2	**78.3**	**113**
5	102.3	147
10	118.4	170
25	138.4	199
50	153.2	221
100	168.4	243

3 POST-DEVELOPMENT CONDITIONS

3.1 GENERAL

The proposed Blackmoor Gate project is a residential infill development within the Town of Collingwood. Post-development condition details are shown in **Figure 3** including land uses and estimated stormwater sub-catchments.

The development proposal includes the following new units (current residences at 774 and 750 Hurontario Street will also remain):

- → Detached units - 29 units (including two freehold units)
- → Semi-detached units with rear garage- 4 units

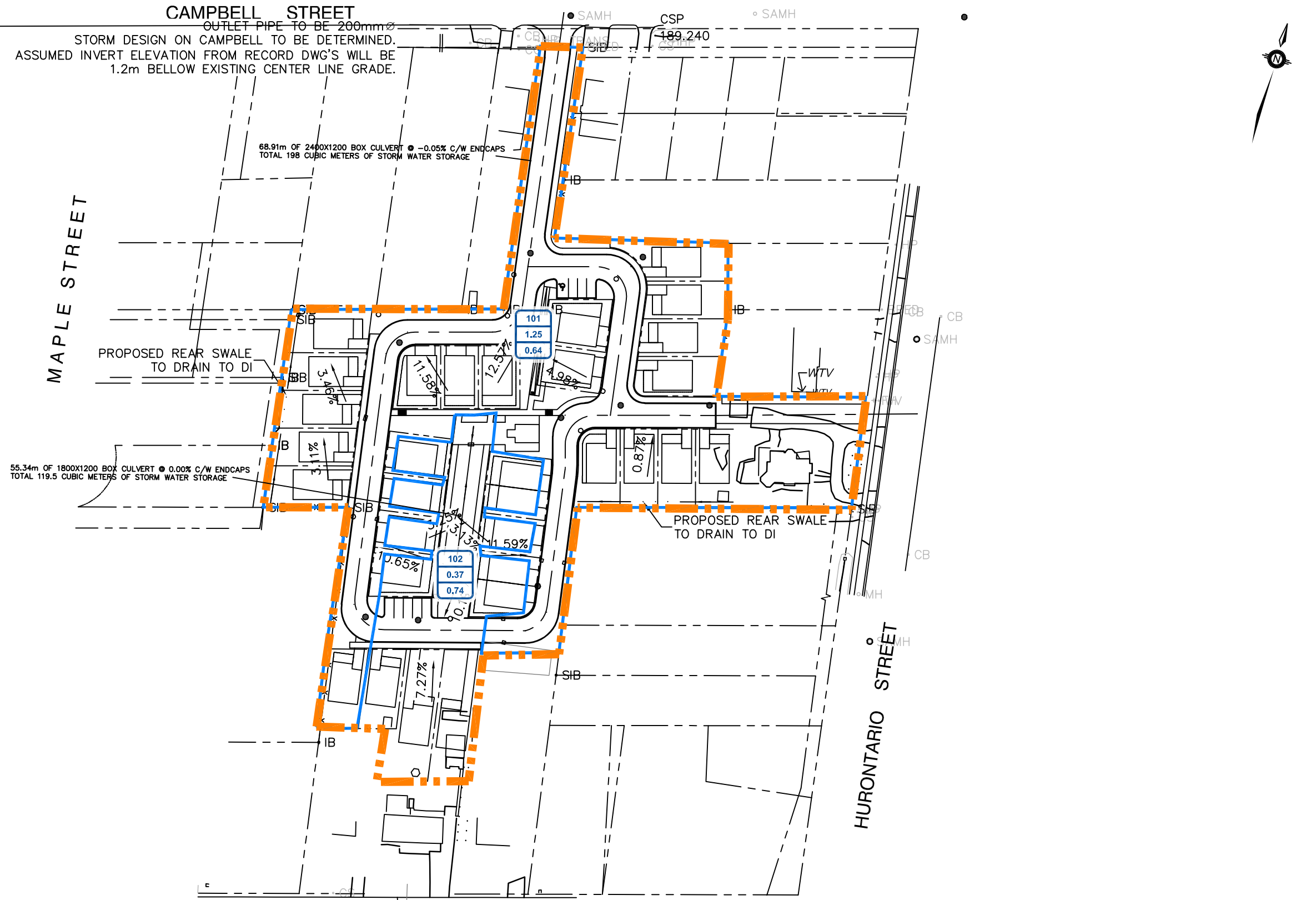
Vehicular access to the site will be provided by private roads from Campbell Street and Hurontario Street. A single discharge point is proposed at Campbell Street. It is understood that the existing Campbell Street storm sewer will be extended to accommodate discharge from the site.

An estimated area breakdown for the new site layout (concept plan) is provided in **Table 3** below.

Table 3: Proposed Land-Use Area Breakdown

LAND-USE	AREA (m^2)	% COVERAGE	RUNOFF COEFFICIENT
Controlled Drainage Areas (Catchment Area: 101)			
Impervious Roof	2532	16%	0.9
Walkways and Driveways (Permeable Pavers)	951	6%	0.6*
Asphalt	3986	25%	0.9
Soft-landscaping	5015	31%	0.3
Controlled Drainage Areas (Catchment Area: 102)			
Impervious Roof	1606	10%	0.9
Walkways and Driveways (Permeable Pavers)	1177	7%	0.6*
Asphalt	503	3%	0.9
Soft-landscaping	414	3%	0.3
TOTALS	16,183	100%	

**Runoff coefficient is reduced due to expected use of permeable pavers (Unilock Ecolock product or similar)*



LEGEND

- PROJECT AREA BOUNDARY
- SUB-CATCHMENT BOUNDARIES
- ID — SUB-CATCHMENT ID.
- AREA — DRAINAGE AREA (ha)
- C — RUNOFF COEFFICIENT

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PROPOSED CONDITIONS

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In addition, the weighted runoff coefficients for each subcatchment have been tabulated below (**Table 4**).

Table 4: Subcatchment Runoff Coefficients

CATCHMENT ID		AREA (m^2)	WEIGHTED RUNOFF COEFFICIENT
101	**Controlled**	12,483	0.64
102		3,700	0.74

To meet stormwater management objectives, as defined by the design criteria outlined in section 1.4, the following components have been proposed:

- → Permeable pavement for walkways and driveways
- → Raised planter beds – from pre-consultation document
- → Superpipe storage
- → OGS unit

The application and sizing of these proposed stormwater management facilities is outlined in the following sections.

3.2 WATER QUALITY

As noted previously, a single outlet location at Campbell Street is proposed for this site and runoff will be released through orifice control of an oversized pipe. A suitably sized oil and grit separator (OGS) unit is proposed to achieve minimum 80% TSS removal ("Enhanced" level, per development criteria) for runoff from the at-grade parking and asphalt areas.

It is assumed that runoff from the proposed rooftop areas, walkways and pervious areas will be free of typical sediment-generating activities and therefore runoff will leave them effectively unchanged, and can be considered clean for the purposes of water quality assessment.

3.3 WATER QUANTITY

As noted in section 2.3, the target discharge rate to the municipal sewer system from the site is 113 l/sec. This is equivalent to the peak runoff rate under pre-development conditions during a 2-year design storm event.

In post-development conditions it is proposed that water quantity control for the site will be provided by two box culverts with orifice control on the outlets. The proposed design features are indicated below:

MAIN STORAGE- CAMPBELL STREET OUTLET

- → 2400 mm x 1200 mm Box Culvert (69 m length)
- → 6 Manholes Assumed
- → 0.1% slope assumed
- → Orifice control plate- 225 mm diameter- to be installed at the invert of the downstream end

COMMON AREA STORAGE

- → 1800 mm x 1200 mm Box Culvert (55 m length)
- → 0.1% slope assumed
- → Orifice control plate- 90 mm diameter- to be installed at the invert of the downstream end

HydroCAD software has been used to model the behaviour of the proposed SWM system and determine its response under various storm events. The software uses Modified Rational Method to calculate flow rates and related storage

values. In addition, the software helps identify the critical duration for different components of the system. The critical storm duration (100-year) for peak discharge from the main storage pipe and from the site occurs at 32 minutes but the maximum storage utilized in the common area culvert occurs at a duration of 54 minutes.

A summary of the modelling results is provided in **Table 5** (for all storm events up to the 100-year event) and detailed output from the modelling is included in **Appendix B**. It is demonstrated that the post-development peak flow rates (including flow from uncontrolled areas) for all events up to the 100-year storm event are lower than the established target release rate.

Table 5: Summary of HydroCAD Modelling Results

RETURN PERIOD (YEARS)	OVERALL SITE PEAK DISCHARGE RATE (L/SEC)	TARGET SITE RELEASE RATE (L/SEC)	MAX STORAGE UTILIZED (m^3)	
			Common Area Storage	Main Storage
2	64.8	**113**	42	91
5	78.4		58	117
10	86.7		69	149
25	96.3		83	179
50	103.5		94	204
100	110.0		105	228

It should be noted that the modelling described above did not account for the retention/ abstraction effect of the permeable pavement areas and therefore the actual attenuated flow rates are expected to be lower than the modelling results presented in Table 5. In addition, the analysis only accounts for the storage provided within the box culverts, not for the storage that will be provided within the remaining pipe network.

3.4 WATER BALANCE

Based on review of NVCA online mapping, it has been determined that the proposed site is not within a significant groundwater recharge area or highly vulnerable aquifer and therefore a site-specific water balance analysis is not required (see map in **Appendix C**).

4 CONCLUSIONS

A stormwater management report has been prepared to support the feasibility study for the proposed Blackmoor Gate development project in the Town of Collingwood. The key points are summarized below.

WATER QUALITY

An OGS unit (suitably sized Stormceptor unit, or equivalent) is proposed downstream of the orifice control for the Campbell Street outlet to meet MOE Enhanced treatment standards (80% TSS removal).

WATER QUANTITY

Controlled runoff on site will be directed to a storm sewer network with two box culverts with a minimum combined storage volume of 359 m^3. Outflow from the common area box culvert will be controlled by a 90 mm orifice and outflow to the Campbell Street storm sewer will be controlled by a 225 mm orifice plate in order to satisfy equivalent maximum pre-development release rate of 113 l/sec for all events up to the 100-year return period.

This report has demonstrated the proposed SWM strategy will address stormwater management related impacts from this project and meet the applicable design requirements.

APPENDIX

A STORMWATER MANAGEMENT CALCULATIONS

APPENDIX

B HYDROCAD MODELLING OUTPUT

APPENDIX

C SUPPORTING DOCUMENTS