

MAMTA HOMES

FUNCTIONAL SERVICING REPORT

**HARMONY LIVING DEVELOPMENT
TOWN OF COLLINGWOOD**

OCTOBER 2025

COBIDE Engineering Inc
517 10th Street
Hanover, ON N4N 1R4
TEL: 519-506-5959
www.cobideeng.com

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1. INTRODUCTION

Cobide Engineering Inc. was retained by Mamta Homes to provide engineering services in support of a Site Plan Approval Application. The application will be to develop the property into a 4 building - 245-unit residential development.

A copy of the proposed Site Plan has been included in Appendix A as Drawing SP1.

1.1 LOCATION

The proposed development is located on Block 151, Registered Plan 51M-865, Geographic Township of Nottawasaga, Town of Collingwood, County of Simcoe (described herein as the “site”). A Site Location Map is included as Figure 1. The subject property is approximately 2.47 hectares in area.

1.2 DEVELOPMENT PROPOSAL

The proposed development consists of 2.47 hectares of land within the Collingwood settlement area.

The proposed plan is to develop the site into four (4) residential apartment buildings. The development will involve the creation of 2 new streets to access parking for the apartments.

Peel Street will provide two (2) access points to the apartment complex. There will be two linkages to existing sidewalks on Peel Street, and a single pedestrian linkage to the nearby trail network north of the site.

The proposed development is within the Collingwood Settlement Boundary of the current Official Plan and thus is intended for servicing from municipal water and sewage systems.



MAP SOURCE - MTO ROAD MAP



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Figure No.

1

Title

REGIONAL LOCATION MAP

2. WATER DISTRIBUTION SYSTEM

The water distribution system will be sized based on the existing conditions at the connection to the municipal system and the subdivisions demands which are determined by the Ministry of the Environment (MOE) Design Guidelines for Drinking-Water Systems (2008).

2.1 DESIGN CRITERIA

The water distribution system will be design in accordance MOE guidelines which state the system “should be designed to satisfy the greater of the following demands:

- *Maximum day demand plus fire flow; or,*
- *Peak hour demand*

The maximum day demand and peak hour demand are based on the projected water consumption from the development and the fire flow is based on the type of the development.

The system will require modelling during the detailed design stage to ensure the water pressure throughout the system is within the requirements of the MOE.

Based on MOE guidelines, the minimum pressure at ground level at all points in the distribution system under maximum day demand plus fire flow conditions are to be 140 kPa (20 psi). The normal operation pressure should be between 350 kPa (50 psi) to 480 kPa (70 psi). There shall be no point in the distribution system that has a normal operating pressure of less than 275 kPa (40 psi). The maximum pressure in the pipe cannot exceed 700 kPa (100 psi).

2.2 WATER CONSUMPTION

The system will be designed based on a domestic water demand of 260 L/cap/day as per the Town of Collingwood Development Standards. The peaking factors will be derived from the Town of Collingwood Development Standards. The peaking factor for the maximum day demand will be 1.77 and the peaking factor for the peak hour demand will be 2.7. This population estimate is based on 1.9 people per apartment unit as per the Town of Collingwood Development Standards.

Table 1 below summarizes the projected maximum day and peak hour demands for the proposed development.

Table 2.1 - Proposed Water Demands

Demand	Population	Consumption (L/cap/day)	Peaking Factor	Peak Rate (L/day)	Peak Rate (L/s)
Maximum Day	466	260	1.77	214,453	2.48
Peak Hour	466	260	2.7	327,132	3.79

2.3 FIRE FLOW

The AWWA *Manual of Water Supply Practices M31 – Distribution System Requirements for Fire Protection* and the Fire Underwriters Survey document *Water Supply for Public Fire Protection* will determine the required fire flows.

The fire flows are dependent upon many factors including the type of construction materials, building height and density of the development.

The fire flow requirement for each building within the development is expected to 11,000 L/min which would need to be sustained for 2.25 hours.

2.4 DESIGN FLOW RATES

The watermain within the apartment complex will be required to maintain the aforementioned pressure while supplying 185.8 L/s (MDD + Fire Flow). The pipes should be designed with a pipe roughness C-value of 110 which is typically used to represent PVC pipe.

2.5 WATERMAIN CONFIGURATION

The proposed watermain will be connected to the municipal system at the proposed intersections with Peel Street. There is currently a 200mm diameter Ductile Iron watermain on the west side of Peel Street as well as a two (2) 200mm diameter stubs - one at each proposed intersection. The 200mm dia. Ductile Iron will provide service to the proposed development.

A 150mm dia. PVC watermain is proposed within the development. There will be no irrigation systems within the development.

Each building will have two (2) connections to the proposed 150mm dia. PVC watermain. Once service will be the 150mm dia. watermain, the other will be a 50mm dia. service.

3. SANITARY SEWER SYSTEM

The sanitary sewer system will be sized based on the existing conditions at the connection to the municipal system and the subdivisions demands which are determined by the Ministry of the Environment (MOE) Design Guidelines for Sewage Works (2008).

3.1 DESIGN CRITERIA

The sanitary sewer system will be design in accordance MOE guidelines.

The sanitary sewer will be designed to convey the projected peak flow based upon the projected population of the development, flows from future development to the north as well as extraneous flows.

3.2 DESIGN FLOW RATES

The sanitary sewer will be designed based on a peak flow of 260 L/cap/day and a peaking factor derived using the Harmon Formula: $Peak\ Factor = 1 + \frac{14}{4 + \sqrt{\frac{Population}{1000}}}$. Based on a population of 468 the projected residential flow is 5.72 L/s. The development will contribute 1.29 ha of extraneous flows to the sanitary sewer. This will contribute 0.30L/s to the flow. Therefore, the peak flow from the development is 6.02 L/s. The Sanitary Sewer Design Sheet has been included as Appendix C.

The average daily domestic sanitary sewer flows will be designed based on a peak flow of 260 L/cap/day as per the latest Town of Collingwood Development Standards. Based on a population of 468 the projected residential flow is 121,680 L/day. The development will contribute 1.29 ha of extraneous flows to the sanitary sewer. This will contribute 25,635 L/day to the flow. Therefore, the average daily flow from the development is expected to be 147,315 L/day as per the Town of Collingwood's latest Development Standards.

3.3 SANITARY SEWER CONFIGURATION

There will be a sanitary sewer along Street A of the proposed development with two tie-in locations to the existing sanitary sewer on Peel Street. The tie in locations are to be on the east sides of both Ex.SANMH10A and Ex.SANMH15A, Located at the Peel Street and McKean Street intersection and approximately 180m north of the intersection, respectively.

All sanitary sewers are proposed to be 200mm diameter PVC pipe. The minimum slope considered will be 0.40% to maintain a minimum velocity at full flow to prevent sediment deposition and blockages. The services to the proposed apartment buildings will be 200mm dia. with a minimum slope of 2%.

4. STORMWATER MANAGEMENT AND SITE DRAINAGE

The stormwater management and site drainage for the proposed development must comply with the current standards of the Town, Conservation Authority and MECP Design Guidelines. The following provides a summary of the stormwater management and site drainage plan for the development.

4.1 EXISTING DRAINAGE CONDITIONS

The current site topography provides overland drainage from east to west. The site is part of the Riverside Subdivision. The Riverside Subdivision's existing SWM facility provides the required water quantity and water quality control for the entire Riverside development, including Block 151. The SWM pond attenuates up to and including the 100-year post development flow to the pre-development level and also provides the required high level of water quality protection ("Enhanced" level) from stormwater runoff discharge.

The configuration of the existing SWM facility can be found in the "Riverside Development—Hughes Developments—Functional Servicing Report", Greenland Consulting Engineers, August 2004; to be henceforth referred to as FSR (Greenland 2004).

Based on information from the "Stormwater Management Report-Harmony Living", Ainley Group, August 2018 to be henceforth referred to as SWM (Ainley 2004) that was prepared for a previous design of this site, The Town accepted that the final SWM facility provided an as built 100-year storage volume of 12,420 cubic metres, and a permanent pool volume of 4,340 cubic metres. The Riverside Townhomes (August 2016) report accepted by the Town listed the required 100-year storage volume as 10,000 cubic meters and the required permanent pool volume as 3,325 cubic meters. An additional 75 m³ of permanent pool is required based on other recent development in the area.

There are two existing storm sewer stubs from Peel Street to the site. A 375-mm diameter storm sewer stub (at 187.41m) is in place at the site's property line immediately opposite McKean Crescent and a 450-mm diameter storm sewer stub (at 186.50m) approximately 80 m north of McKean Crescent.

4.2 PROPOSED DRAINAGE CONDITIONS

The intent of the stormwater drainage plan for the development is proposed to collect the runoff from the site and convey the runoff away from neighbouring residential lots and to Peel Street and the existing SWM facility.

The storm sewer system will be design in accordance with the Town and conservation authority guidelines including the Ministry of the Environment (MOE) Design Guidelines. The storm sewer system will use the rationale method to size the storm sewer to accommodate the 5 year peak flow from the development. The storm sewer design sheet has been included in Appendix C. The majority of the site will be collected and conveys via internal storm sewers to Peel Street with a small portion sheet flowing to the road allowance. Both outlets will be utilized for the proposed development. As per the storm sewer design sheet, the southerly connection at McKean Crescent has capacity to convey the proposed flows. The northerly connection however does not have adequate capacity. To accommodate this, onsite storage is proposed to provide quantity control to the capacity of the existing storm sewer stub.

4.3 STORMWATER MODELING

The hydrologic modelling software PCSWMM Version 7.7.3920 Professional 2D was used to determine the post-development peak flows of the 5 yr. and 100 yr. storm events (24 hour duration, SCS Type II, AMC II storm, Collingwood IDF Parameters).

4.3.1 POST DEVELOPMENT CONDITIONS

The proposed development of the site will include the construction of four (4) apartment building and paving the associated roadway, sidewalk, and parking areas. Grading of the site and internal storm sewers will direct all post-development run-off from the site into the proposed storm sewer system.

As noted above, the northly catchment area flows exceed with the available capacity and therefore will require quantity control. The underground stormwater chambers will be located on the north side of the site under the site parking and will provide storage for all post-development flows and control the discharge rate of the site's stormwater into the existing municipal storm sewer on Peel Street. The quantity control is provided by the existing storm sewer.

4.3.2 PRIVATE 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, an underground storage system will be implemented. Considering the site characteristics, the StormTech MC-3500 Chamber from ADS was selected.

The layout will consist of 4 rows of 9 chambers each with an inlet and outlet manifold. The base of the stone will be at an elevation of 186.37 m with the base of the chambers at an elevation of 186.60 m.

During major storm events, there will be some ponding in the grassed swales along the eastern side of the site to contain the runoff.

4.3.3 PRIVATE SWM FACILITY PERFORMANCE

Below is a summary of the hydraulic performance of the stormwater SWM Facility during the various storm events.

Table 4.1 – Private SWM Facility Performance

RETURN PERIOD	ELEVATION (m)	STORAGE (m ³)	DISCHARGE (m ³ /s)
5 Year	188.40	237	0.18
100 Year	188.47	247	0.63

The outlet from the north side of the site is a 450mm diameter storm sewer at 0.4%. A 250mm diameter orifice will be used to control flows. The capacity of that pipe is 0.18 m³/s therefore the SWM facility has controlled the flows to match the capacity of the pipe.

4.3.4 RIVERSIDE SWM FACILITY

The existing SWM Facility for the Riverside Subdivision was designed for Block 151 to have an imperviousness of 42% based on the Greenland FSR. As part of the previous design work on the site, Ainley Group reviewed the impacts of increasing a number of blocks including Block 151 by various amounts including an increase of 30% which would put the total imperviousness at 72% impervious which matches the current site configuration. The Table below is an excerpt from the 2018 Ainley Report for the site.

Table 4.2 - Riverside SWM Facility Performance

	2 Year Storm		5 Year Storm		25 Year Storm		100 Year Storm	
	4 hour Chicago	24 hour SCS	4 hour Chicago	24 hour SCS	4 hour Chicago	24 hour SCS	4 hour Chicago	24 hour SCS
Max Elevation SWM Pond	186.3	186.2	186.4	186.3	186.6	186.5	186.7	186.6
Max Inflow (m³/s) SWM Pond	1.99	1.26	2.71	1.66	3.74	2.61	4.31	2.89
Max Storage (m³) SWM Pond	3389	2995	4437	3802	6075	5656	7496	6193
Max Outflow (m³/s) Riverside Development	0.055	0.047	0.075	0.059	0.116	0.105	0.163	0.121
Pre Development Outflow (m³/s) Riverside Development	0.06	0.07	0.13	0.21	0.33	0.30	0.38	0.43

Note: Data Extracted from “Stormwater Management Report-Harmony Living”, Ainley Group, August 2018

As shown in the table above, the post development peak flow with 30% increases to the undeveloped block flow can still be accommodated by the Riverside SWM Facility without exceeding pre-development flows.

4.3.5 STORMTECH CHAMBER MAINTENANCE

The Stormtech Chambers should be inspected every 6 months for the first year and then adjusted to yearly if the build up of sediment has not exceeded 75mm in the isolator rows. As per ADS Stormtech Operation and Maintenance Manual, included in Appendix C, the Isolator Rows are to be cleaned once sediment depth reach 75mm.

4.3.6 STORMWATER QUALITY CONTROL

Quality control for the site is being provided by the Riverside Subdivision SWM Pond. As part of the previous design work on the site, Ainley Group determined that the as built permanent pool for the site is 4,340 m³ and that the existing developments permanent pool requirement per MECP guidelines is 3,400 m³. The MOE's Stormwater Managements Planning and Design Manual (2003) indicates a wet pond volume for block 151 at 42% imperviousness is 117.5 cubic metres per hectare and for an increase of imperviousness to 72% the volume becomes 189 cubic metres per hectare. The pond volume therefore increases by 177 cubic metres with the increase in imperviousness. Therefore the required permanent pool volume is 3,577 m³ which is less than the available permanent pool and the MECP guidelines for enhanced quality control are met.

5. GRADING & EROSION AND SEDIMENT CONTROL

Erosion and sediment controls shall meet the requirements of the most recent version of the MOE *Stormwater Management Planning and Design Manual* at the time of construction.

5.1 CONSTRUCTION STAGE

Prior to the start of construction, appropriate sediment control facilities are to be in place. Following are details regarding erosion and sediment control that are to be implemented:

- Placement of light duty siltation fencing is required along the entire perimeter of the site to intercept sediment that could potentially be transported by sheet flow across the site.
- Placement of temporary straw check dams within swales and any other locations where a concentrated flow of runoff may occur. All proposed drainage swales are to be seeded during construction;
- Installation of filter cloth under all new and existing catchbasin grates until paving of the subdivision streets is completed;
- Mud mats will be placed at construction accesses to keep public roadways free from debris during the construction period.
- Re-vegetate all disturbed areas after underground and surface works have been constructed.

Prior to removal of sediment control facilities, ensure that sediment that may have accumulated has been removed. Once the area has been stabilized, the silt fencing can be removed.

Sincerely,

Cobide Engineering Inc.



Travis Burnside, P. Eng.

Appendix A

DRAWINGS

FUNCTIONAL SERVICING REPORT

**HARMONY LIVING DEVELOPMENT
TOWN OF COLLINGWOOD**

LEGEND

--- PROPERTY BOUNDARY	● SANMH	○ PROPOSED SANITARY MANHOLE	□ CB	○ PROPOSED CATCH BASIN	○ PROPOSED TEE c/w RESTRAINTS
- - - EDGE OF EXISTING PAVEMENT	○ STMMH	○ EXISTING SANITARY MANHOLE	□ DICB	○ EXISTING CATCH BASIN	○ PROPOSED CAP c/w THRUST BLOCK
- - - PROPOSED SANITARY SEWER	○ STMMH	○ EXISTING STORM MANHOLE	○ CB	○ PROPOSED DITCH INLET CATCHBASIN	○ PROPOSED BLOWOFF
- - - EXISTING SANITARY SEWER	○ CBMH	○ EXISTING CATCHBASIN MANHOLE	○ CB	○ PROPOSED HYDRANT SET	○ BENCHMARK
- - - EXISTING STORM SEWER	○ TICBMH	○ PROPOSED TRANSFORMER	○ CB	○ EXISTING FIRE HYDRANT	○ PROPOSED ELEVATION
- - - EXISTING STORM SEWER	○ TICB	○ PROPOSED TWIN INLET CATCHBASIN MANHOLE	○ CB	○ PROPOSED GATE VALVE	○ EXISTING ELEVATION
- - - PROPOSED SUBDRAIN	○ TICB	○ PROPOSED TWIN INLET CATCHBASIN	○ CB	○ EXISTING GATE VALVE	○ EXISTING CONTOUR LINE
- - - PROPOSED WATERMAIN	○ TICB	○ PROPOSED LIGHT POLE	○ CB	○ PROPOSED BEND c/w RESTRAINTS	○ PROPOSED TACTILE PLATES
- - - EXISTING WATERMAIN					

CAUTION:
THE POSITION OF POLE LINES, CONDUITS, WATERMANS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE 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.

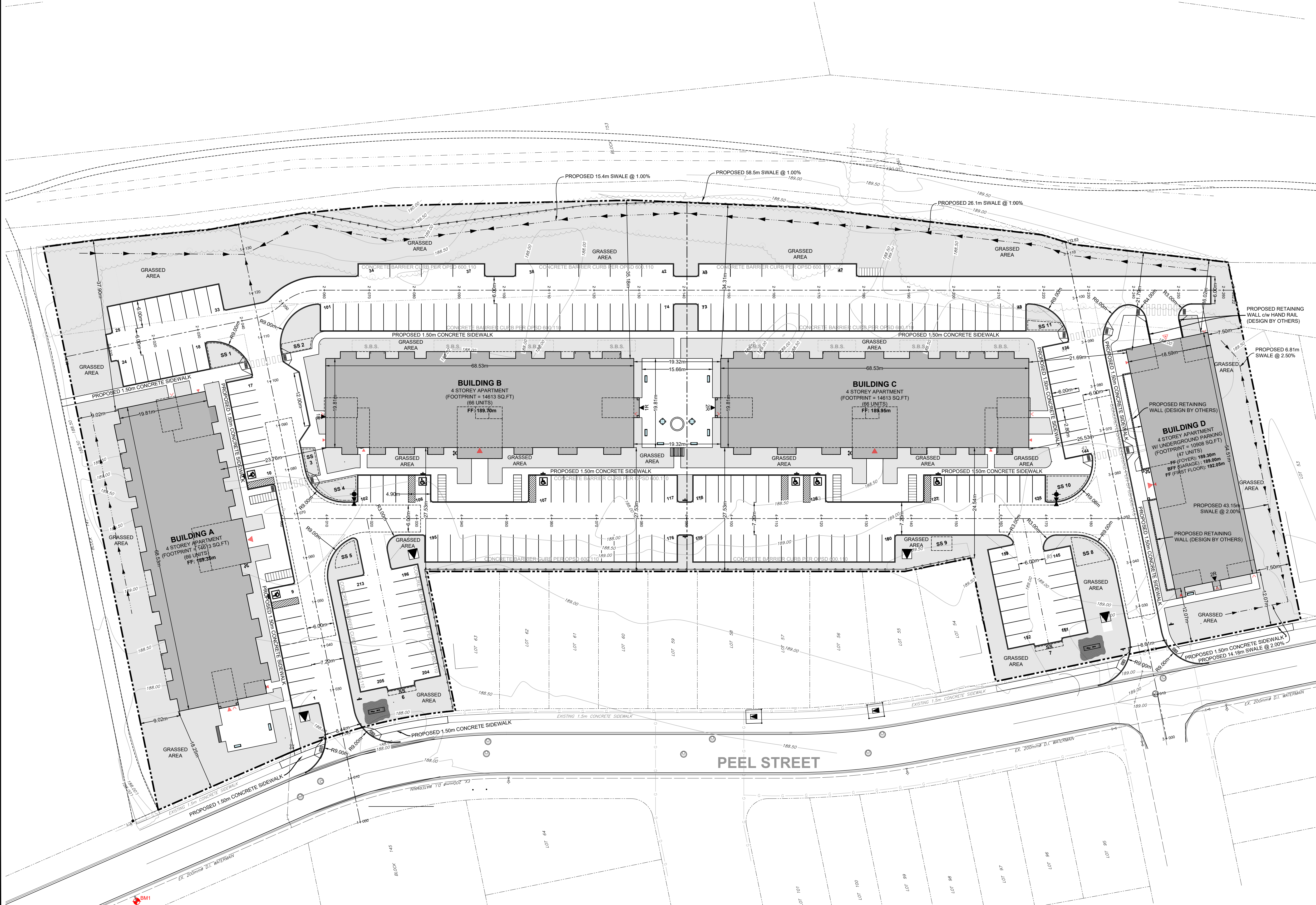
- Notes**
- PROPERTY BOUNDARY DERIVED FROM PLAN OF SURVEY BY ZUBEK, EMO, PATTEN AND THOMSEN LTD.
 - SEE SHEET 03910-C6 FOR TYPICAL CROSS SECTION AND PAVEMENT DESIGN.
 - ALL ORGANIC MATERIAL WITHIN 1.2m OF FINISHED PROFILE GRADE TO BE REMOVED FROM ALL AREAS UNDER THE TRAVELLED PORTION OF THE ROAD.
 - COVER OVER WATERMAIN 1.7m MINIMUM AT ALL POINTS.
 - SANITARY SEWER TO BE PVC SDR35.
 - ALL JOINTS OF SANITARY MANHOLES TO BE CAULKED WITH MIN. 15mm BEAD, INSTALLED ON THE TOP OF JOINT OF EACH SECTION PRIOR TO SECTION ABOVE BEING INSTALLED. CAULKING TO BE SIKAFLEX 1A OR APPROVED EQUIVALENT.
 - ALL HYDRANT SETS REQUIRE TEST POINT AND HYDRANT MARKER.
 - ALL STORM CATCHBASINS TO HAVE A MINIMUM SUMP OF 600mm AND ALL STORM MANHOLES TO HAVE A MINIMUM SUMP OF 300mm.
 - STORM SEWERS TO BE PERFORATED HDPE IN 50mmØ WASHED CLEAR STONE WRAPPED IN NON-WOVEN GEOTEXTILE EXCEPT 3m ENTERING AND EXITING STORM STRUCTURES WHICH IS TO BE SOLID PIPE. SEE DETAIL SHEET 10014-DE1.
 - ALL DITCH INLET CATCHBASINS TO HAVE HORIZONTAL HONEYCOMB GRATE PER O.P.S.D.403.010.
 - ALL CATCHBASIN MANHOLE STRUCTURES TO BE 1200mmØ UNLESS OTHERWISE SHOWN.
 - ALL WATERMANS TO BE DUCTILE IRON WITH 20mmØ COPPER WATER SERVICES.
 - THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION PURPOSES UNTIL STAMPED ISSUED FOR CONSTRUCTION.
 - ALL CONSTRUCTION TO BE COMPLETED TO MUNICIPAL SERVICING STANDARDS FOR THE TOWN OF COLLINGWOOD.

North Arrow

SCALE 1:400

0 5 10 20 30 40 50 60 70 METRES

0 10 20 30 40 50 60 70 FEET



Benchmark Information

BM1	TOP NUT OF FIRE HYDRANT ON THE WEST SIDE OF PEEL STREET, ADJACENT TO THE NORTHWEST CORNER OF THE PROPOSED HARMONY	
	LIVING SITE	188.739m
	ELEVATION	4926726.864
	NORTHING	
	EASTING	563637.181

No.	DATE	DESCRIPTION	BY	APPD
1	OCT 10/25	FIRST SUBMISSION	TLB	SJC
REVISION / ISSUE				

Seal not valid unless signed and dated

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**PROPOSED APARTMENT DEVELOPMENT
TOWN OF COLLINGWOOD
HARMONY LIVING COLLINGWOOD**

SITE DEVELOPMENT PLAN

Client: MAMTA HOMES

Design: TLB	Scale: 1:400
Drawn: ID	Approved:
Checked: TLB	
Date: OCTOBER 2025	Design Engineer

DRAWING No. 03910-C3

H:\Water Documents\CIVIL_3D\Bak Free\A\Sub\1_10246003910 - Harmony Living Collingwood Base Plan 2025-10-10.dwg, Oct 10, 2025 - 8:13am

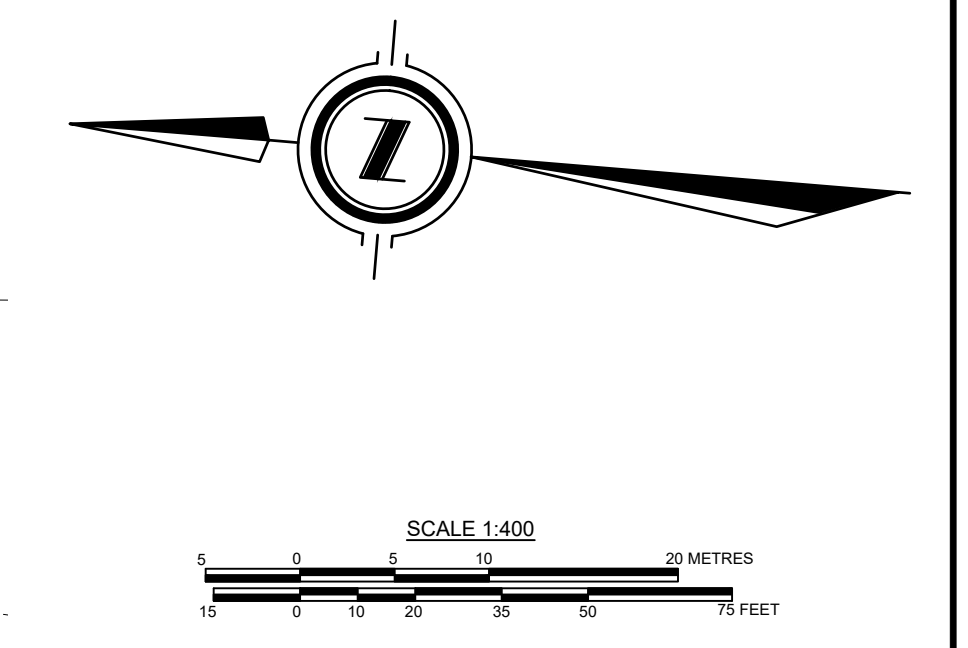
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LEGEND

<ul style="list-style-type: none"> --- PROPERTY BOUNDARY - - - EDGE OF EXISTING PAVEMENT - - - EDGE OF EXISTING GRAVEL --- PROPOSED SANITARY SEWER --- EXISTING SANITARY SEWER --- PROPOSED STORM SEWER --- EXISTING STORM SEWER --- PROPOSED SUBDRAIN --- PROPOSED WATERMAIN --- EXISTING WATERMAIN 	<ul style="list-style-type: none"> ● SANMH ○ SANMH ○ STMMH ○ STMMH ○ CBMH ○ TICBMH ○ TICB ○ TICB ○ L 	<ul style="list-style-type: none"> ○ PROPOSED SANITARY MANHOLE ○ EXISTING SANITARY MANHOLE ○ PROPOSED STORM MANHOLE ○ EXISTING STORM MANHOLE ○ PROPOSED CATCHBASIN MANHOLE ○ PROPOSED TRANSFORMER ○ PROPOSED TWIN INLET CATCHBASIN MANHOLE ○ PROPOSED TWIN INLET CATCHBASIN ○ PROPOSED LIGHT POLE 	<ul style="list-style-type: none"> □ CB □ DICB □ DICB □ DICB □ DICB □ DICB □ DICB □ DICB □ DICB 	<ul style="list-style-type: none"> ○ PROPOSED CATCH BASIN ○ EXISTING CATCH BASIN ○ PROPOSED DITCH INLET CATCHBASIN ○ PROPOSED FIRE HYDRANT SET ○ EXISTING FIRE HYDRANT ○ PROPOSED GATE VALVE ○ EXISTING GATE VALVE ○ PROPOSED BEND c/w RESTRAINTS 	<ul style="list-style-type: none"> ○ PROPOSED TEE c/w RESTRAINTS ○ PROPOSED CAP c/w THRUST BLOCK ○ PROPOSED BLOWOFF ○ BENCHMARK ○ PROPOSED ELEVATION ○ EXISTING ELEVATION ○ EXISTING CONTOUR LINE ○ PROPOSED TACTILE PLATES
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Benchmark Information

<ul style="list-style-type: none"> ● TOP NUT OF FIRE HYDRANT ON THE WEST SIDE OF PEEL STREET, ADJACENT TO THE NORTHWEST CORNER OF THE PROPOSED HARMONY LIVING SITE 	<p>ELEVATION</p> <p>NORTHING 188.739m</p> <p>EASTING 4926726.864</p> <p>56367.181</p>
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No.	DATE	DESCRIPTION	BY	APPD
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REVISION / ISSUE				

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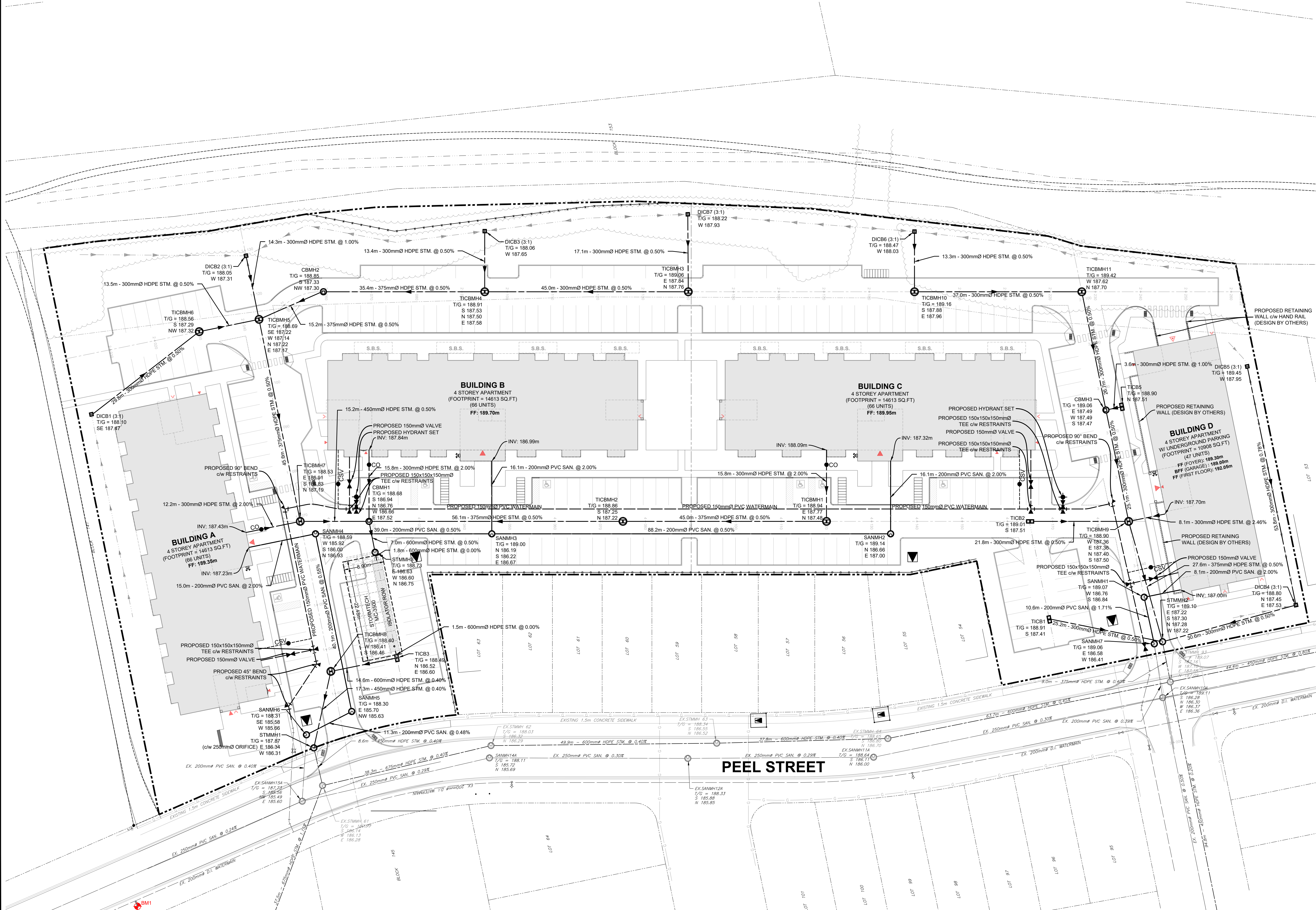
**PROPOSED APARTMENT DEVELOPMENT
TOWN OF COLLINGWOOD
HARMONY LIVING COLLINGWOOD**

SITE SERVICING PLAN

Client: MAMTA HOMES

Design: TLB	Scale: 1:400
Drawn: ID	Approved:
Checked: TLB	
Date: OCTOBER 2025	

DRAWING No. 03910-C5



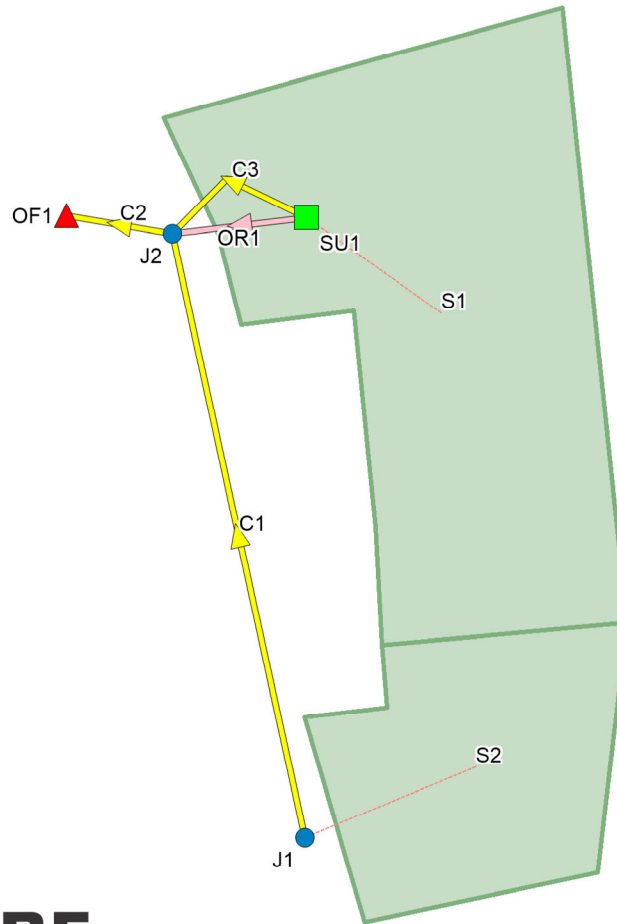
Appendix B

SWM CALCULATIONS

FUNCTIONAL SERVICING REPORT

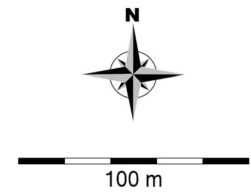
**HARMONY LIVING DEVELOPMENT
TOWN OF COLLINGWOOD**

HARMONY LIVING SWM MODEL SCHEMATIC



Legend

- Junctions
- ▲ Outfalls
- Storages
- Conduits
- Orifices
- Subcatchments



HARMONY LIVING SWM ANALYSIS – SWM MODEL DETAILS

[TITLE]

```
;;Project Title/Notes
```

[OPTIONS]

```
;;Option          Value
FLOW_UNITS        CMS
INFILTRATION      HORTON
FLOW_ROUTING      DYNWAVE
LINK_OFFSETS      ELEVATION
MIN_SLOPE          0
ALLOW_PONDING     NO
SKIP_STEADY_STATE NO

START_DATE        10/2/2025
START_TIME        00:00:00
REPORT_START_DATE 10/2/2025
REPORT_START_TIME 00:00:00
END_DATE          10/3/2025
END_TIME          00:00:00
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
RULE_STEP         00:00:00

INERTIAL_DAMPING  PARTIAL
NORMAL_FLOW_LIMITED BOTH
FORCE_MAIN_EQUATION H-W
VARIABLE_STEP    0.75
LENGTHENING_STEP 0
MIN_SURFAREA     0
MAX_TRIALS       8
HEAD_TOLERANCE   0
SYS_FLOW_TOL     5
LAT_FLOW_TOL     5
MINIMUM_STEP     0.5
THREADS          16
```

[EVAPORATION]

```
;;Data Source    Parameters
;;-----
CONSTANT         0.0
DRY_ONLY         NO
```

[RAINGAGES]

```
;;Name           Format      Interval SCF      Source
;;-----
SCS_Type_II_50.5mm_5yr_OS_MOE INTENSITY 0:06      1.0      TIMESERIES SCS_Type_II_50.5mm_5yr_OS_MOE
SCS_Type_II_60.3mm_Collingwood_5yr INTENSITY 0:06      1.0      TIMESERIES SCS_Type_II_60.3mm_Collingwood_5yr
SCS_Type_II_83.8mm_OS_100yr INTENSITY 0:06      1.0      TIMESERIES SCS_Type_II_83.8mm_OS_100yr
SCS_Type_II_97.1mm_Collingwood_100yr INTENSITY 0:06      1.0      TIMESERIES SCS_Type_II_97.1mm_Collingwood_100yr
```

[SUBCATCHMENTS]

```
;;Name           Rain Gage      Outlet      Area      %Imperv Width      %Slope CurbLen SnowPack
;;-----
S1               SCS_Type_II_60.3mm_Collingwood_5yr SU1 2.022 75      500      2      0
S2               SCS_Type_II_60.3mm_Collingwood_5yr J1 0.86 75      150      2      0
```

[SUBAREAS]

```
;;Subcatchment  N-Imperv  N-Perv      S-Imperv  S-Perv      PctZero  RouteTo  PctRouted
;;-----
```

HARMONY LIVING SWM ANALYSIS – SWM MODEL DETAILS

S1	0.01	0.25	0.05	0.05	25	OUTLET
S2	0.01	0.25	0.05	0.05	25	OUTLET

[INFILTRATION]

```
;;Subcatchment Param1 Param2 Param3 Param4 Param5
;;-----
S1 69 0.5 7 0 0 CURVE_NUMBER
S2 69 0.5 7 0 0 CURVE_NUMBER
```

[JUNCTIONS]

```
;;Name Elevation MaxDepth InitDepth SurDepth Aponded
;;-----
J1 187.1 1.5 0 0 0
J2 186.1 2.2 0 0 0
```

[OUTFALLS]

```
;;Name Elevation Type Stage Data Gated Route To
;;-----
OF1 186.1 FREE NO
```

[STORAGE]

```
;;Name Elev. MaxDepth InitDepth Shape Curve Name/Params SurDepth Fevap Psi
Ksat IMD
;;-----
SU1 186.37 2.27 0 TABULAR Chambers 0 0
```

[CONDUITS]

```
;;Name From Node To Node Length Roughness InOffset OutOffset InitFlow
MaxFlow
;;-----
C1 J1 J2 266.134 0.01 187.1 186.5 0 0
C2 J2 OF1 45.923 0.01 186.5 186.1 0 0
C3 SU1 J2 10 0.01 188.44 188.04 0 0
```

[ORIFICES]

```
;;Name From Node To Node Type Offset Qcoeff Gated CloseTime
;;-----
OR1 SU1 J2 SIDE 186.6 0.65 NO 0
```

[XSECTIONS]

```
;;Link Shape Geom1 Geom2 Geom3 Geom4 Barrels Culvert
;;-----
C1 CIRCULAR 0.45 0 0 0 1
C2 CIRCULAR 0.675 0 0 0 1
C3 RECT_OPEN 0.15 7.5 0 0 1
OR1 CIRCULAR 0.25 0 0 0 0
```

[LOSSES]

```
;;Link Kentry Kexit Kavg Flap Gate Seepage
;;-----
```

[CURVES]

```
;;Name Type X-Value Y-Value
;;-----
Chambers Storage 0 85.16
Chambers 0.05 85.16
Chambers 0.08 85.16
Chambers 0.1 85.16
Chambers 0.13 85.16
Chambers 0.15 85.16
Chambers 0.18 85.16
Chambers 0.2 85.16
```

HARMONY LIVING SWM ANALYSIS – SWM MODEL DETAILS

Chambers	0.23	85.16
Chambers	0.25	85.16
Chambers	0.28	172.75
Chambers	0.3	171.9
Chambers	0.33	171.36
Chambers	0.36	170.83
Chambers	0.38	170.25
Chambers	0.41	169.68
Chambers	0.43	169.07
Chambers	0.46	168.44
Chambers	0.48	167.77
Chambers	0.51	167.05
Chambers	0.53	166.31
Chambers	0.56	165.53
Chambers	0.58	164.72
Chambers	0.61	163.85
Chambers	0.63	162.96
Chambers	0.66	162.03
Chambers	0.69	160.98
Chambers	0.71	159.94
Chambers	0.74	158.86
Chambers	0.76	157.69
Chambers	0.79	156.46
Chambers	0.81	155.17
Chambers	0.84	153.82
Chambers	0.86	152.4
Chambers	0.89	150.91
Chambers	0.91	149.33
Chambers	0.94	147.68
Chambers	0.97	145.95
Chambers	0.99	144.08
Chambers	1.02	142.13
Chambers	1.04	140.06
Chambers	1.07	137.82
Chambers	1.09	135.47
Chambers	1.12	132.89
Chambers	1.14	130.16
Chambers	1.17	127.14
Chambers	1.19	123.81
Chambers	1.22	120.08
Chambers	1.24	115.82
Chambers	1.27	110.39
Chambers	1.3	102.07
Chambers	1.32	95.15
Chambers	1.35	92.44
Chambers	1.37	89.96
Chambers	1.4	86.56
Chambers	1.42	85.16
Chambers	1.45	85.16
Chambers	1.47	85.16
Chambers	1.5	85.16
Chambers	1.52	85.16
Chambers	1.55	85.16
Chambers	1.57	85.16
Chambers	1.6	85.16
Chambers	1.63	85.16
Chambers	1.65	85.16
Chambers	1.68	85.16
Chambers	1.7	85.16
Chambers	1.71	0.5
Chambers	2.07	150
Chambers	2.27	300

[TIMESERIES]

HARMONY LIVING SWM ANALYSIS – SWM MODEL DETAILS

```

;;Name          Date          Time          Value
-----
;SCS_Type II_50.5mm design storm, total rainfall = 50.5 mm, rain interval = 6 minutes, rain units = mm/hr.
SCS_Type_II_50.5mm_5yr_OS_MOE

;SCS_Type II_60.3mm design storm, total rainfall = 60.3 mm, rain interval = 6 minutes, rain units = mm/hr.
SCS_Type_II_60.3mm_Collingwood_5yr

;SCS_Type II_83.8mm design storm, total rainfall = 83.8 mm, rain interval = 6 minutes, rain units = mm/hr.
SCS_Type_II_83.8mm_OS_100yr

;SCS_Type II_97.1mm design storm, total rainfall = 97.1 mm, rain interval = 6 minutes, rain units = mm/hr.
SCS_Type_II_97.1mm_Collingwood_100yr

```

[REPORT]

```

;;Reporting Options
INPUT      YES
CONTROLS   NO
SUBCATCHMENTS ALL
NODES     ALL
LINKS     ALL

```

[TAGS]

[MAP]

```

DIMENSIONS  -8927820.35825  5541386.31735  -8927544.03275  5541819.46765
UNITS       Meters

```

HARMONY LIVING SWM ANALYSIS – 5 YEAR DESIGN STORM EVENT

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.4)

Element Count

Number of rain gages 4
 Number of subcatchments ... 2
 Number of nodes 4
 Number of links 4
 Number of pollutants 0
 Number of land uses 0

Raingage Summary

Name	Data Source	Data Type	Recording Interval
SCS_Type_II_50.5mm_5yr_OS_MOE	SCS_Type_II_50.5mm_5yr_OS_MOE	INTENSITY	6 min.
SCS_Type_II_60.3mm_Collingwood_5yr	SCS_Type_II_60.3mm_Collingwood_5yr	INTENSITY	6 min.
SCS_Type_II_83.8mm_OS_100yr	SCS_Type_II_83.8mm_OS_100yr	INTENSITY	6 min.
SCS_Type_II_97.1mm_Collingwood_100yr	SCS_Type_II_97.1mm_Collingwood_100yr	INTENSITY	6 min.

Subcatchment Summary

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
S1	2.02	500.00	75.00	2.0000	SCS_Type_II_60.3mm_Collingwood_5yr	SU1
S2	0.86	150.00	75.00	2.0000	SCS_Type_II_60.3mm_Collingwood_5yr	J1

Node Summary

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
J1	JUNCTION	187.10	1.50	0.0	
J2	JUNCTION	186.10	2.20	0.0	
OF1	OUTFALL	186.10	0.68	0.0	
SU1	STORAGE	186.37	2.27	0.0	

Link Summary

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	J1	J2	CONDUIT	266.1	0.2255	0.0100
C2	J2	OF1	CONDUIT	45.9	0.8711	0.0100
C3	SU1	J2	CONDUIT	10.0	4.0032	0.0100
OR1	SU1	J2	ORIFICE			

Cross Section Summary

Full Full Hyd. Max. No. of Full

HARMONY LIVING SWM ANALYSIS – 5 YEAR DESIGN STORM EVENT

Conduit	Shape	Depth	Area	Rad.	Width	Barrels	Flow
C1	CIRCULAR	0.45	0.16	0.11	0.45	1	0.18
C2	CIRCULAR	0.68	0.36	0.17	0.68	1	1.02
C3	RECT_OPEN	0.15	1.12	0.14	7.50	1	6.19

Analysis Options

```

Flow Units ..... CMS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Infiltration Method ..... HORTON
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date ..... 10/02/2025 00:00:00
Ending Date ..... 10/03/2025 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 .....      0.174      60.300
Evaporation Loss .....      0.000      0.000
Infiltration Loss .....      0.028      9.863
Surface Runoff .....      0.145      50.314
Final Storage .....      0.001      0.256
Continuity Error (%) .....      -0.220

```

```

*****
                Volume      Volume
Flow Routing Continuity  hectare-m      10^6 ltr
*****
Dry Weather Inflow .....      0.000      0.000
Wet Weather Inflow .....      0.145      1.450
Groundwater Inflow .....      0.000      0.000
RDII Inflow .....      0.000      0.000
External Inflow .....      0.000      0.000
External Outflow .....      0.142      1.424
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 .....      0.003      0.025
Continuity Error (%) .....      0.020

```

HARMONY LIVING SWM ANALYSIS – 5 YEAR DESIGN STORM EVENT

Time-Step Critical Elements

None

Highest Flow Instability Indexes

All links are stable.

Most Frequent Nonconverging Nodes

Node OF1 (0.01%)

Node SU1 (0.01%)

Routing Time Step Summary

```

Minimum Time Step      :      4.50 sec
Average Time Step      :      5.00 sec
Maximum Time Step      :      5.00 sec
% of Time in Steady State :      0.00
Average Iterations per Step :      2.00
% of Steps Not Converging :      0.01
Time Step Frequencies :
  5.000 - 3.155 sec    :    100.00 %
  3.155 - 1.991 sec    :      0.00 %
  1.991 - 1.256 sec    :      0.00 %
  1.256 - 0.792 sec    :      0.00 %
  0.792 - 0.500 sec    :      0.00 %
    
```

Subcatchment Runoff Summary

Peak Runoff	Total	Total	Total	Total	Imperv	Perv	Total	Total
Runoff Coeff	Precip	Runon	Evap	Infil	Runoff	Runoff	Runoff	Runoff
Subcatchment	mm	mm	mm	mm	mm	mm	mm	10 ⁶ ltr
CMS								
S1	60.30	0.00	0.00	9.86	45.21	5.11	50.32	1.02
0.38 0.835								
S2	60.30	0.00	0.00	9.86	45.20	5.09	50.29	0.43
0.16 0.834								

Node Depth Summary

Node	Type	Average	Maximum	Maximum	Time of Max	Reported
		Depth	Depth	HGL	Occurrence	Max Depth
		Meters	Meters	Meters	days hr:min	Meters

HARMONY LIVING SWM ANALYSIS – 5 YEAR DESIGN STORM EVENT

J1	JUNCTION	0.04	0.31	187.41	0	11:56	0.31
J2	JUNCTION	0.44	0.66	186.76	0	11:58	0.65
OF1	OUTFALL	0.05	0.25	186.35	0	11:58	0.25
SU1	STORAGE	0.31	2.03	188.40	0	12:02	2.03

Node Inflow Summary

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	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	0.157	0.157	0 11:54	0.432	0.432	1.942
J2	JUNCTION	0.000	0.309	0 11:58	0	1.42	-0.429
OF1	OUTFALL	0.000	0.309	0 11:58	0	1.42	0.000
SU1	STORAGE	0.375	0.375	0 11:54	1.02	1.02	-0.025

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 CMS
SU1	0.031	10.9	0.0	0.0	0.237	82.5	0 12:02	0.182

Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF1	97.48	0.017	0.309	1.424
System	97.48	0.017	0.309	1.424

Link Flow Summary

HARMONY LIVING SWM ANALYSIS – 5 YEAR DESIGN STORM EVENT

Link	Type	Maximum Flow CMS	Time of Max Occurrence days hr:min	Maximum Veloc m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	0.141	0 11:56	1.31	0.80	0.64
C2	CONDUIT	0.309	0 11:58	2.50	0.30	0.38
C3	CONDUIT	0.000	0 00:00	0.00	0.00	0.00
OR1	ORIFICE	0.182	0 12:02			1.00

Flow Classification Summary

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class								
		Up Dry	Down Dry	Sub Dry	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl	
C1	1.00	0.00	0.00	0.00	0.89	0.00	0.00	0.11	0.87	0.00
C2	1.00	0.03	0.00	0.00	0.00	0.97	0.00	0.00	0.63	0.00
C3	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Conduit Surcharge Summary

No conduits were surcharged.

Analysis begun on: Thu Oct 9 21:22:09 2025
Analysis ended on: Thu Oct 9 21:22:09 2025
Total elapsed time: < 1 sec

HARMONY LIVING SWM ANALYSIS – 100 YEAR DESIGN STORM EVENT

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.4)

Element Count

Number of rain gages 4
 Number of subcatchments ... 2
 Number of nodes 4
 Number of links 4
 Number of pollutants 0
 Number of land uses 0

Raingage Summary

Name	Data Source	Data Type	Recording Interval
SCS_Type_II_50.5mm_5yr_OS_MOE	SCS_Type_II_50.5mm_5yr_OS_MOE	INTENSITY	6 min.
SCS_Type_II_60.3mm_Collingwood_5yr	SCS_Type_II_60.3mm_Collingwood_5yr	INTENSITY	6 min.
SCS_Type_II_83.8mm_OS_100yr	SCS_Type_II_83.8mm_OS_100yr	INTENSITY	6 min.
SCS_Type_II_97.1mm_Collingwood_100yr	SCS_Type_II_97.1mm_Collingwood_100yr	INTENSITY	6 min.

Subcatchment Summary

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
S1	2.02	500.00	75.00	2.0000	SCS_Type_II_97.1mm_Collingwood_100yr	SU1
S2	0.86	150.00	75.00	2.0000	SCS_Type_II_97.1mm_Collingwood_100yr	J1

Node Summary

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
J1	JUNCTION	187.10	1.50	0.0	
J2	JUNCTION	186.10	2.20	0.0	
OF1	OUTFALL	186.10	0.68	0.0	
SU1	STORAGE	186.37	2.27	0.0	

Link Summary

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	J1	J2	CONDUIT	266.1	0.2255	0.0100
C2	J2	OF1	CONDUIT	45.9	0.8711	0.0100
C3	SU1	J2	CONDUIT	10.0	4.0032	0.0100
OR1	SU1	J2	ORIFICE			

Cross Section Summary

Full Full Hyd. Max. No. of Full

HARMONY LIVING SWM ANALYSIS – 100 YEAR DESIGN STORM EVENT

Conduit	Shape	Depth	Area	Rad.	Width	Barrels	Flow
C1	CIRCULAR	0.45	0.16	0.11	0.45	1	0.18
C2	CIRCULAR	0.68	0.36	0.17	0.68	1	1.02
C3	RECT_OPEN	0.15	1.12	0.14	7.50	1	6.19

Analysis Options

```

Flow Units ..... CMS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Infiltration Method ..... HORTON
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date ..... 10/02/2025 00:00:00
Ending Date ..... 10/03/2025 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	0.280	97.100
Evaporation Loss	0.000	0.000
Infiltration Loss	0.038	13.115
Surface Runoff	0.242	83.829
Final Storage	0.001	0.344
Continuity Error (%)	-0.194	

	Volume	Volume
Flow Routing Continuity	hectare-m	10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.241	2.415
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.237	2.365
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	0.003	0.029
Continuity Error (%)	0.830	

HARMONY LIVING SWM ANALYSIS – 100 YEAR DESIGN STORM EVENT

Time-Step Critical Elements

Link C3 (1.05%)

Highest Flow Instability Indexes

All links are stable.

Most Frequent Nonconverging Nodes

Node OF1 (0.02%)

Node J1 (0.01%)

Node J2 (0.01%)

Node SU1 (0.01%)

Routing Time Step Summary

```

Minimum Time Step      :      2.97 sec
Average Time Step      :      4.98 sec
Maximum Time Step      :      5.00 sec
% of Time in Steady State :      0.00
Average Iterations per Step :      2.01
% of Steps Not Converging :      0.02
Time Step Frequencies  :
  5.000 - 3.155 sec    :      99.61 %
  3.155 - 1.991 sec    :      0.39 %
  1.991 - 1.256 sec    :      0.00 %
  1.256 - 0.792 sec    :      0.00 %
  0.792 - 0.500 sec    :      0.00 %
    
```

Subcatchment Runoff Summary

		Total	Total	Total	Total	Imperv	Perv	Total	Total
Peak	Runoff	Precip	Runon	Evap	Infil	Runoff	Runoff	Runoff	Runoff
Runoff	Coeff	mm	mm	mm	mm	mm	mm	mm	10 ⁶ ltr
Subcatchment									
CMS									
S1		97.10	0.00	0.00	13.12	72.81	11.03	83.84	1.70
0.63	0.863								
S2		97.10	0.00	0.00	13.12	72.81	10.99	83.81	0.72
0.27	0.863								

Node Depth Summary

```

-----
Average Maximum Maximum Time of Max Reported
Depth Depth HGL Occurrence Max Depth
    
```

HARMONY LIVING SWM ANALYSIS – 100 YEAR DESIGN STORM EVENT

Node	Type	Meters	Meters	Meters	days hr:min	Meters
J1	JUNCTION	0.06	1.50	188.60	0 11:52	1.50
J2	JUNCTION	0.46	0.94	187.04	0 11:53	0.90
OF1	OUTFALL	0.06	0.52	186.62	0 11:53	0.50
SU1	STORAGE	0.36	2.10	188.47	0 11:54	2.10

Node Inflow Summary

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	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	0.266	0.266	0 11:54	0.72	0.72	1.981
J2	JUNCTION	0.000	0.900	0 11:54	0	2.36	-0.191
OF1	OUTFALL	0.000	0.955	0 11:53	0	2.37	0.000
SU1	STORAGE	0.634	0.634	0 11:54	1.69	1.69	0.763

Node Surcharge Summary

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
J1	JUNCTION	0.13	1.050	0.000

Node Flooding Summary

Flooding refers to all water that overflows a node, whether it ponds or not.

Node	Hours Flooded	Maximum Rate CMS	Time of Max Occurrence days hr:min	Total Flood Volume 10^6 ltr	Maximum Poned Depth Meters
J1	0.01	0.041	0 11:52	0.000	0.000

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 CMS
SU1	0.038	13.2	0.0	0.0	0.247	86.1	0 11:54	0.634

HARMONY LIVING SWM ANALYSIS – 100 YEAR DESIGN STORM EVENT

Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF1	98.11	0.030	0.955	2.365
System	98.11	0.030	0.955	2.365

Link Flow Summary

Link	Type	Maximum Flow CMS	Time of Max Occurrence days hr:min	Maximum Veloc m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	0.266	0 11:54	1.67	1.51	1.00
C2	CONDUIT	0.955	0 11:53	3.24	0.94	0.78
C3	CONDUIT	0.462	0 11:54	1.97	0.07	0.21
OR1	ORIFICE	0.184	0 12:04			1.00

Flow Classification Summary

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class								
		Up Dry	Down Dry	Sub Dry	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl	
C1	1.00	0.00	0.00	0.00	0.92	0.00	0.00	0.08	0.90	0.00
C2	1.00	0.02	0.00	0.00	0.00	0.98	0.00	0.00	0.52	0.00
C3	1.00	0.99	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00

Conduit Surcharge Summary

Conduit	Both Ends	Hours Full			Hours Above Normal Flow	Hours Capacity Limited
		Upstream	Dnstream	Full		
C1	0.06	0.13	0.06	0.17	0.06	

Analysis begun on: Thu Oct 9 21:20:01 2025
 Analysis ended on: Thu Oct 9 21:20:01 2025
 Total elapsed time: < 1 sec

Appendix C

DESIGN SHEETS

FUNCTIONAL SERVICING REPORT

**HARMONY LIVING DEVELOPMENT
TOWN OF COLLINGWOOD**



SUBDIVISION
HARMONY LIVING

**STORM SEWER DESIGN SHEET
5 YEAR STORM**

DESIGN PARAMETERS

$$I = a / ((tc + b)^c)$$

a= 885.197
b= 7.863
c= 0.7830

DATE: October 8, 2025
DESIGNED BY: ID
CHECKED BY: TLB

FILE NUMBER: 03910

LOCATION	DRAINAGE AREA					PIPE SELECTION									
	FROM M.H.	TO M.H.	AREA (ha)	C	A x R (ha)	ACCUM. AREA (ha)	T of C (min)	I (mm/h)	Q (m3/s)	LENGTH (m)	PIPE SIZE (mm)	SLOPE (%)	CAP. (FULL) (m3/s)	VEL. (FULL) (m/S)	TIME OF FLOW (min)
101	DICB6	TICBMH10	0.189	0.200	0.04	0.04	10.00	92.63	0.010	13.3	300	0.50	0.068	0.97	0.23
102	TICBMH10	TICBMH11	0.085	0.770	0.07	0.10	10.23	91.71	0.026	37.0	300	0.50	0.068	0.97	0.64
103	TICBMH11	CBMH3	0.027	0.990	0.03	0.13	10.87	89.26	0.032	26.7	300	0.50	0.068	0.97	0.46
104	CBMH3	TICBMH9	0.072	0.780	0.06	0.19	11.33	87.58	0.045	25.1	300	0.50	0.068	0.97	0.43
						TOTAL	11.76								
105	TICB2	TICBMH9	0.040	0.720	0.03	0.03	10.00	92.63	0.007	21.8	300	0.50	0.068	0.97	0.38
						TOTAL	10.38								
106	BUILDING D	TICBMH9	0.116	0.860	0.10	0.10	10.00	92.63	0.026	8.1	300	2.46	0.152	2.15	0.06
						TOTAL	10.06								
107	TICBMH9	STMMH2	0.086	0.610	0.05	0.37	11.76	86.06	0.088	27.6	375	0.50	0.124	1.12	0.41
						TOTAL	12.17								
108	TICB1	STMMH2	0.051	0.750	0.04	0.04	10.00	92.63	0.010	25.2	300	0.50	0.068	0.97	0.43
						TOTAL	10.43								
109	DICB5	DICB4	0.014	0.200	0.00	0.00	10.00	92.63	0.001	53.8	300	0.78	0.085	1.21	0.74
110	DICB4	STMMH2	0.060	0.200	0.01	0.01	10.74	89.73	0.004	30.6	300	0.50	0.068	0.97	0.53
						TOTAL	11.27								
		STMMH2				0.42	12.17	84.68	0.099	9.0	375	0.40	0.111	1.00	0.15
111	DICB7	TICBMH3	0.144	0.200	0.03	0.03	10.00	92.63	0.007	17.1	300	0.50	0.068	0.97	0.29
112	TICBMH3	TICBMH4	0.113	0.760	0.09	0.11	10.29	91.45	0.029	45.0	300	0.50	0.068	0.97	0.78
						TOTAL	11.07								
113	DICB3	TICBMH4	0.143	0.200	0.03	0.03	10.00	92.63	0.007	13.4	300	0.50	0.068	0.97	0.23
						TOTAL	10.23								
114	TICBMH4	CBMH2	0.089	0.750	0.07	0.21	11.07	88.51	0.052	35.4	375	0.50	0.124	1.12	0.53
115	CBMH2	TICBMH5	0.039	0.740	0.03	0.24	11.60	86.63	0.058	15.2	375	0.50	0.124	1.12	0.23
						TOTAL	11.82								
116	DICB2	TICBMH5	0.285	0.200	0.06	0.06	10.00	92.63	0.015	14.3	300	1.00	0.097	1.37	0.17
						TOTAL	10.17								
117	DICB1	TICBMH6	0.062	0.200	0.01	0.01	10.00	92.63	0.003	29.8	300	0.50	0.068	0.97	0.51



SUBDIVISION
HARMONY LIVING

DATE: October 8, 2025
DESIGNED BY: ID
CHECKED BY: TLB

STORM SEWER DESIGN SHEET 5 YEAR STORM

FILE NUMBER: 03910

DESIGN PARAMETERS

$$I = a / ((tc + b)^c)$$

a= 885.197
b= 7.863
c= 0.7830

LOCATION	DRAINAGE AREA						PIPE SELECTION								
	FROM M.H.	TO M.H.	AREA (ha)	C	A x R (ha)	ACCUM. AREA (ha)	T of C (min)	I (mm/h)	Q (m3/s)	LENGTH (m)	PIPE SIZE (mm)	SLOPE (%)	CAP. (FULL) (m3/s)	VEL. (FULL) (m/S)	TIME OF FLOW (min)
118	TICBMH6	TICBMH5	0.059	0.790	0.05	0.06	10.51	90.60	0.015	13.5	300	0.50	0.068	0.97	0.23
						TOTAL	10.75								
119	TICBMH5	TICBMH7	0.041	0.710	0.03	0.38	11.82	85.85	0.092	45.6	375	0.50	0.124	1.12	0.68
						TOTAL	12.50								
120	BUILDING A	TICBMH7	0.151	0.890	0.13	0.13	10.00	92.63	0.035	12.2	300	2.00	0.137	1.93	0.11
						TOTAL	10.11								
121	TICBMH7	CBMH1	0.125	0.700	0.09	0.61	12.50	83.61	0.141	15.2	450	0.50	0.202	1.27	0.20
						TOTAL	12.70								
122	BUILDING C	TICBMH1	0.151	0.890	0.13	0.13	10.00	92.63	0.035	15.8	300	2.00	0.137	1.93	0.14
123	TICBMH1	TICBMH2	0.118	0.730	0.09	0.22	10.14	92.08	0.057	45.0	375	0.50	0.124	1.12	0.67
124	TICBMH2	CBMH1	0.136	0.770	0.10	0.33	10.80	89.49	0.081	56.1	375	0.50	0.124	1.12	0.83
						TOTAL	11.64								
125	BUILDING B	CBMH1	0.151	0.890	0.13	0.13	10.00	92.63	0.035	15.8	300	2.00	0.137	1.93	0.14
						TOTAL	10.14								
126	CBMH1	STMMH3	0.094	0.800	0.08	1.14	12.70	82.97	0.263	9.2	600	0.50	0.434	1.54	0.10
	STMMH3	TICB3				1.14	12.80	82.66	0.262	2.0	600	0.50	0.434	1.54	0.02
						TOTAL	12.82								
127	TICB3	TICBMH8	0.059	0.800	0.05	1.19	12.82	82.59	0.273	14.6	600	0.40	0.388	1.37	0.18
128	TICBMH8	STMMH1	0.061	0.780	0.05	1.19	13.00	82.04	0.271	17.3	450	0.40	0.180	1.13	0.25
	STMMH1	EX.STMMH61				1.19	13.25	81.26	0.268	8.6	450	0.40	0.180	1.13	0.13



Subdivision: **Harmony Living Collingwood**
 Date: October 8, 2025
 Designed By: ID
 Checked By: TLB
 File Number: 03910

Post Development Runoff Coefficients

"C"

Impervious Area	0.90
Pervious Area	0.20

AREA ID	Total Area (ha)	Building (m ²)	Sidewalk (m ²)	Road (m ²)	Driveways (m ²)	Pervious (ha)	Impervious (ha)	Balanced 'C'
101	0.189	0	0	0	0	0.19	0.00	0.20
102	0.085	0	72.1878	616.4238	0	0.02	0.07	0.77
103	0.027	0	10.7308	249.3568	0	0.00	0.03	0.99
104	0.072	0	153.7561	416.46	0	0.01	0.06	0.78
105	0.040	0	37.7623	270.4955	0	0.01	0.03	0.72
106	0.116	1021.4805	21.1696	64.6281	0	0.01	0.11	0.86
107	0.086	0	109.5684	411.5049	0	0.04	0.05	0.61
108	0.051	0	0	417.8456	0	0.01	0.04	0.75
109	0.014	0	0	0	0	0.01	0.00	0.20
110	0.060	0	36.3718	0	0	0.06	0.00	0.20
111	0.144	0	0	0	0	0.14	0.00	0.20
112	0.113	0	249.5722	632.9659	0	0.02	0.09	0.76
113	0.143	0	0	0	0	0.14	0.00	0.20
114	0.089	0	68.5793	661.0539	0	0.02	0.07	0.75
115	0.039	0	31.7014	291.6879	0	0.01	0.03	0.74
116	0.285	0	0	0	0	0.28	0.00	0.20
117	0.062	0	0	0	0	0.06	0.00	0.20
118	0.059	0	46.3691	480.7904	0	0.01	0.05	0.79
119	0.041	0	61.9461	229.614	0	0.01	0.03	0.71
120	0.151	1479.3106	0	0	0	0.00	0.15	0.89
121	0.125	0	268.0556	674.6502	0	0.03	0.09	0.70
122	0.151	1479.3106	0	0	0	0.00	0.15	0.89
123	0.118	0	183.5313	666.4999	0	0.03	0.09	0.73
124	0.136	0	216.9551	838.4202	0	0.03	0.11	0.77
125	0.151	1479.3106	0	0	0	0.00	0.15	0.89
126	0.094	0	177.5193	593.8157	0	0.01	0.08	0.80
127	0.059	0	0	528.4947	0	0.01	0.05	0.80
128	0.061	0	154.6188	327.0834	0	0.01	0.05	0.78
	2.762	5459.412	1900.395	8371.791	0.000	1.182	1.580	0.60

Notes:

Taken from the Ministry of the Environment - Guidelines for the Design of Storm Sewers
 -Based on 375m² Single Family House, 250m² Semi-Detached unit and 120m² townhouse unit
 - Pervious area has a runoff coefficient equal to 0.2

3657.5754
#REF!

q = average daily per capita flow (260 L/cap.d)
 i = unit of peak extraneous flow (0.23 L/ha.s)
 M = peaking factor
 Q(p) = peak population (L/s)
 Q(i) = peak extraneous flow (L/s)
 Q(d) = peak design flow (L/s)

Residential Density = 1.9 People per Dwelling Unit
 Residential Flow = 0.003 l/s/capita
 260 l/day/ capita

SANITARY SEWER DESIGN SHEET

Q(p) = $\frac{PqM}{86.4}$
 Q(i) = iA where A = area in hectares
 Q(d) = Q(p) + Q(i) (L/s)

LOCATION			COM, IND, INST,			RESIDENTIAL		CUMULATIVE		Peaking Factor M	Pop. Flow Q(p) (L/s)	Peak Extraneous Q(i) (L/s)	Peak Design Flow (L/s)	PROPOSED SEWER					
Street	From	To	Type	Flow (L/s/ha)	Area (hectares)	Pop.	Area (ha)	Pop.	Area (ha)					Length (m)	Pipe Size (mm)	Type of Pipe	Grade %	Capacity (L/s) n=0.013	Full Flow Velocity (m/s)
STREET A	Building C	SANMH2				126	0.27	126	0.27	4.21	1.59	0.06	1.66	16.1	200	PVC	2.00	45.9	1.46
	SANMH2	SANMH3				0	0.16	126	0.43	4.21	1.59	0.10	1.69	88.2	200	PVC	0.50	22.9	0.73
	BUILDING B	SANMH3				126	0.25	126	0.25	4.21	1.59	0.06	1.65	16.1	200	PVC	2	45.9	1.46
	SANMH3	SANMH4				0	0.06	252	0.74	4.11	3.11	0.17	3.28	39.0	200	PVC	0.5	22.9	0.73
	BUILDING A	SANMH4				126	0.21	378	0.21	4.03	4.57	0.05	4.62	15	200	PVC	2	45.9	1.46
	SANMH4	SANMH5				0	0.12	378	1.07	4.03	4.57	0.25	4.82	40.1	200	PVC	0.55	24.1	0.77
	SANMH5	SANMH6				0	0.01	378	1.08	4.03	4.57	0.25	4.82	10.8	200	PVC	0.5	22.9	0.73
	SANMH6	EX.SANMH15A				0	0.02	378	1.10	4.03	4.57	0.25	4.83	17.2	200	PVC	0.5	22.9	0.73
	BUILDING D	SANMH1				90	0.17	90	0.17	4.26	1.15	0.04	1.19	8.1	200	PVC	2	45.9	1.46
	SANMH1	EX.SANMH10A				0	0.02	90	0.19	4.26	1.15	0.04	1.19	22.5	200	PVC	1.6	41.1	1.31

q = average daily per capita flow (260 L/cap.d) i = unit of peak extraneous flow (0.23 L/ha.s) M = peaking factor Q(p) = peak population (L/s) Q(i) = peak extraneous flow (L/s) Q(d) = peak design flow (L/s)									Residential Density = 1.9 People per Dwelling Unit Residential Flow = 0.003 l/s/capita 260 l/day/ capita			SANITARY SEWER DESIGN SHEET				$Q(p) = \frac{PqM}{86.4}$ $Q(i) = iA$ where A = area in hectares $Q(d) = Q(p) + Q(i)$ (L/s)			
LOCATION			COM, IND, INST,			RESIDENTIAL		CUMULATIVE		Peaking Factor M	Pop. Flow Q(p) (L/s)	Peak Extraneous Q(i) (L/s)	Peak Design Flow (L/s)	PROPOSED SEWER					
Street	From	To	Type	Flow (L/s/ha)	Area (hectares)	Pop.	Area (ha)	Pop.	Area (ha)					Length (m)	Pipe Size (mm)	Type of Pipe	Grade %	Capacity (L/s) n=0.013	Full Flow Velocity (m/s)

Appendix D

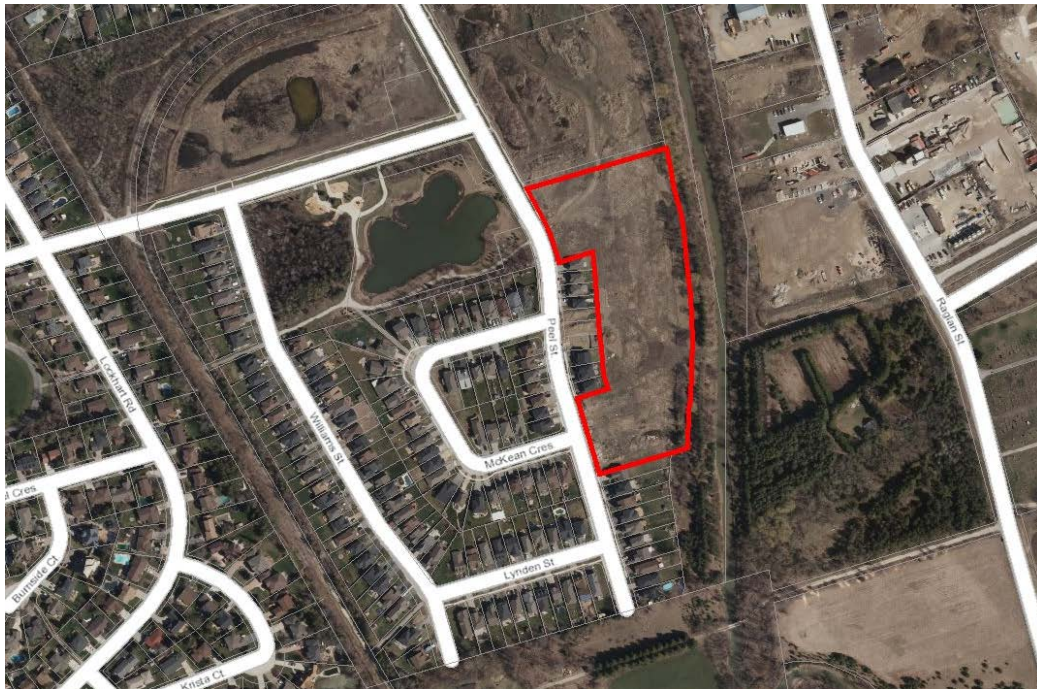
BACKGROUND INFORMATION

FUNCTIONAL SERVICING REPORT

**HARMONY LIVING DEVELOPMENT
TOWN OF COLLINGWOOD**

**HARMONY LIVING
COLLINGWOOD**

**STORMWATER MANAGEMENT
REPORT**



Original report date, October 2016
Revised May 2018
Second revision August 2018

**HARMONY LIVING
COLLINGWOOD
STORMWATER MANAGEMENT
REPORT**

Project No. 115105

Prepared for: Mamta Developments Inc.

Prepared by:

Reviewed by:

**Alireza Zareie, PhD
Intermediate Water Resources Intern**

**Chris Jones, P. Eng.
Project Manager**

**Ainley Group
Consulting Engineers and Planners
280 Pretty River Parkway
Collingwood, Ontario L9Y 4J5
Telephone: 705-445-3451
Facsimile: 705-445-0968
www.ainleygroup.com**

**HARMONY LIVING
COLLINGWOOD
STORMWATER MANAGEMENT
REPORT**

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TABLES

Table 1 - Summary of Peak Flow (m³/s) at Riverside Development Outlet
(Pre-development Condition)

Table 2 - Stage-Storage-Discharge of the Existing SWM Facility¹

Table 3 - Storm Sewer Design Sheet for Block 151- RiversideDevelopment

FIGURES

Figure 1 - Block 151 location relative to surrounding lands and roadways

APPENDICES

Appendix A - Drainage Plan

Appendix B - Analysis Results Tables

HARMONY LIVING COLLINGWOOD

STORMWATER MANAGEMENT REPORT

1.0 Introduction

1.1 General

Ainley Group was retained in 2015 by Mamta Development Inc. to provide engineering and planning services in support of a development proposal in the east end of the Town of Collingwood. Harmony Living Collingwood is a 78 unit medium density townhouse development proposed for Block 151 within the existing, partially developed Riverside Subdivision (Registered Plan 51M-865). The proposal is to develop individually owned POTLs or ‘Parcels of Tied Land’ within a Common Elements Plan of Condominium.

> In October, 2016 Ainley Group prepared a Stormwater Management Report dealing with the subject lands. The report was reviewed by the Town of Collingwood’s engineering department and comments provided. A revised report addressing the Town concerns was prepared and submitted in May 2018. The Town provided further comments on the revised submission. These second review comments are addressed in the second revision of August 2018. This second revision of the SWM report up-dates the May 2018 report by adding clarifying statements and uses the previously accepted volumes for the existing Stormwater management pond. Second revisions are marked for convenience of review with a >

1.2 Site Description and Existing Drainage Conditions

Block 151 within the Riverside Subdivision encompasses approximately 2.47 ha and is bounded by 10 single-detached dwellings and Peel Street to the west, the Pretty River to the east, vacant but soon to be residentially developed land to the north and an existing single detached-dwelling to the south. The property relative to the surrounding lands and roadways is shown in Figure 1.

The storm sewer design is based on 55% imperviousness, a runoff coefficient of 0.7 and a total drainage area of 2.47 ha.

The approved construction drawings for the Riverside Subdivision indicate that municipal storm sewer connections are available at the north and south ends of the property. A 375-mm diameter storm sewer stub (at 187.41m) is in place at the site’s property line immediately opposite McKean Crescent and a 450-mm diameter storm sewer stub (at 186.50m) approximately 80 m north of McKean Crescent.

The Riverside Subdivision’s existing SWM facility provides the required water quantity and water quality control for the entire Riverside development, including Block 151. The SWM pond attenuates up to and including the 100-year post development flow to the pre-development level and also provides the required high level of water quality protection (“Enhanced” level) from stormwater runoff discharge.

The configuration of the existing SWM facility can be found in the “Riverside Development—Hughes Developments—Functional Servicing Report”, Greenland Consulting Engineers, August 2004; to be henceforth referred to as FSR (Greenland 2004). This SWM report for block 151 is to be read in conjunction with FSR (Greenland – 2004).



Figure 1
Block 151 and Surrounding Lands

2.0 Background Data and Data Collection

Relevant documents used for this report included the following:

- Riverside Development - Hughes Developments Collingwood—Functional Servicing Report, Greenland Consulting Engineers, August 2004,
- Riverside Development - Hughes Developments Collingwood—Preliminary Stormwater Management and Pretty River Spill Analysis Report, Greenland Consulting Engineers, August 2004,
- Riverside Developments - Final Engineering Submission, Greenland Consulting Engineers, September 2006,
- Subdivision Agreement - Riverside Developments”, Town of Collingwood, November, 2006.

3.0 Design Criteria

The Riverside Subdivision, which contains the subject lands (i.e., Block 151), is within the Nottawasaga Valley Conservation Authority’s (NVCA) jurisdiction. In August 2004 a Preliminary

Stormwater Management Report was prepared by Greenland International Consulting Ltd. This SWM Report (Greenland 2004), was accepted by the Town of Collingwood and NVCA. It proposed a 1.37 ha stormwater management facility to the south of Collins Street and west of Peel Street. This facility satisfied the requirements of the Town and the policies of the NVCA to maintain and enhance the condition of the ultimate receiving waterbody. The SWM facility consists of an engineered retention wet pond designed to regulate flow to pre-development condition (quantity control) and to provide an enhanced level of water quality protection from stormwater runoff generated from the entire subdivision property.

>The Town accepted that the final SWM facility provided an as built 100-year storage volume of 12,420 cubic metres, and a permanent pool volume of 4,340 cubic metres. The Riverside Townhomes (August 2016) report accepted by the Town listed the required 100-year storage volume as 10,000 cubic meters and the required permanent pool volume as 3,325 cubic meters. The Riverside Townhomes Peel Street project increases the required volumes by 75m³ for the permanent pool and 26 m³ for the extended detention storage This increase occurred when additional land of 1.8ha outside the original Riverside subdivision plans was included in the Riverside Townhomes project as a result of grading and road alignment constraints>.

3.1 Stormwater Quantity

The existing SWM facility was designed to attenuate all post development flow to pre-development levels, up to and including the 100-year storm event. The maximum allowable peak flow from the Riverside Subdivision (SWM Report (Greenland 2004)) is summarized in Table 1.

Table 1
Summary of Peak Flow (m³/s) at Riverside Development Outlet
(Pre-Development Condition)

2- year Storm		5- year Storm		25- year Storm		100- year Storm	
4-hour Chicago	24-hour SCS	4-hour Chicago	24-hour SCS	4-hour Chicago	24-hour SCS	4-hour Chicago	24-hour SCS
0.06	0.07	0.13	0.21	0.33	0.30	0.38	0.43

In a memorandum, dated August 31, 2016, the Town of Collingwood expressed concern regarding the available capacity of the existing SWM pond noting that *“the original design used very conservative drainage coefficient values and the concept plan provided appears to have increased the impervious surface”*. By November 2016 almost 70% of the Riverside Subdivision was developed with only three medium density residential blocks, Blocks 148, 150, and 151 and one commercial block, Block 147 remaining undeveloped.

To address the Town’s concerns, the entire Riverside Subdivision has been simulated using the PCSWMM hydrologic model. The SWM pond performance and the post development discharge from the whole development has been evaluated assuming 10%, 20% and 30% increases in the impervious area of the undeveloped blocks.

The preliminary SWM Report (Greenland 2004) evaluated the performance of the SWM facility assuming the impervious areas of Blocks 147, 148 and 150 to be 35% and Block 151 42%. The report's storm sewer system design also assumed the runoff coefficients for these blocks to be 0.6, 0.6, 0.45 and 0.45 respectively.

Tables 4 through 7 in Appendix B summarize the performance of the SWM pond assuming no change and 10%, 20% and 30 % increases in the impervious area of the undeveloped blocks.

Tables 8 & 9 in Appendix B show that although the SWM pond inflow increases due to the higher impervious areas, the pond and its outlet structure adequately control these additional flows from the Riverside Subdivision. The permanent pool and extended detention for block 151 in the Riverside 2004 FSR were estimated based on imperviousness of 53% for 1.96ha and on imperviousness of 0% for 0.51ha. (average for total 2.74ha area is 42%). The proposal for block 151 is now at an imperviousness of 55%.

The MOE's Stormwater Managements Planning and Design Manual (2003) indicates a wet pond volume for block 151 at 42% imperviousness is 117.5 cubic metres and for an increase of imperviousness to 55% the volume becomes 150 cubic metres. The pond volume therefore increases by 80.3 cubic metres with the increase in imperviousness.

The total increase in permanent pool pond volume require with both the Riverside Townhomes and Harmony Living (block 151) developed is $75+80.3=155.3$ cubic metres.

The as built permanent pool volume is 4,340 cubic metres. Comparing the extra volume now required $3,325+155.3=3,480.3$ cubic metres is required, thus sufficient volume is provided in the as built pond.

Comparing the allowable pre-development peak discharge and post-development peak flow demonstrates that the existing SWM pond meets the Town's stormwater quantity control requirements and hence, that no on-site control on Block 151 will be required.

3.2 Stormwater Quality

>The existing SWM pond designed was checked based on the latest MOE SWMP Manual. The required Permanent Pool Volume to provide Enhanced level water quality protection for the 25.2 ha of land within the Riverside Subdivision is 3150 m³ and the Extended Detention Volume for the 25.2 ha is 1008 m³. The extended detention is not dependent on imperviousness. The required volumes are slightly increased by the Riverside Townhomes project, as noted above in the design criteria section. Using the added land area, the permanent pool volume becomes 3,225 m³ and the extended detention 1034 m³

<The existing as built SWM pond has 4,340 m³ permanent pool storage It is evident that based on the MOE SWMP Manual the pond provides the required Enhanced Level of stormwater protection for both the additional land from the Riverside Townhomes and block 151.

The stage-storage-discharge of the existing SWM facility is presented in Table 2.

Table 2
Stage-Storage-Discharge of the Existing SWM Facility¹

Headwater Elevation (m)	Storage Volume (m³)	Discharge (m³/s)
186.00	0.00	0.0
186.30	2,143	0.019
186.70	5,386	0.070
187.10	9,082	0.087
187.20	10,078	0.277
187.40	12,159	0.354

Note 1: Data extracted from "Riverside Development-Hughes Developments Collingwood-Functional Servicing Report", Greenland Consulting Engineers, August 2004.

Comparing the required pool volume to the available volume demonstrates that the existing SWM pond meets the stormwater quality control requirements and hence, no on-site control on Block 151 will be required.

4.0 Proposed Stormwater Drainage Plan

Given the project's relatively small drainage area the storm drainage system for the subject lands (i.e., Block 151) has been designed in accordance with the Town of Collingwood's Development Standards utilizing the Rational Method.

As per Town standards, the storm sewer pipes have been designed to a 5-year storm.

A runoff coefficient of 0.55 for residential development has been utilized and 0.7 for the townhouse dwellings proposed on Block 151.

Rainfall events were modelled using the IDF values from the Owen Sound Atmospheric Environment Services Weather Station, in this case a minimum ten minutes time of concentration (t_c) having been utilized to design the system.

Storm Sewer Design Sheet goes here

The storm sewer design sheet for the subject site is shown in Table 3.

The storm sewer system proposed for Block 151 will collect the stormwater and discharge it to the existing 450mm and 375mm storm sewer pipes on Peel Street at the north and south ends of the property respectively. These existing storm sewer pipes have enough capacity to convey the stormwater from the property line to the Riverside Subdivision's existing SWM facility.

The overland flow from Block 151 will be discharged on Peel Street and drain northerly to the sag point where it will be captured by twin catch basins and conveyed to the existing SWM facility.

5.0 Sediment and Erosion Control Plan

The upper layer of native soil on the proposed development site (i.e., Block 151) consists mainly of sandy silt to silty fine sand with frequent layers of clayey silt to silty clay. As such, the erosion potential of the site is considered moderate based on the Ministry of Natural Resources (MNR) Guideline on Erosion and Sediment Control for Urban Construction Sites.

The following erosion and sediment control plan details the management measures required to avoid impacts from grading and servicing the development. These measures are to be implemented as development proceeds:

1. Entrances to the site will have a mud mat during the construction period to minimize material (mud) tracked off site,
2. Inlets to catchbasins and manholes will be sealed during the construction period and drainage provided through temporary swales within the ROW. These swales will be equipped with straw bale check dams,
3. A silt fence will be constructed along the northern perimeter of the property to contain silt, originating from the site and being conveyed by sheet flow, within the development area,
4. All areas will be reinstated with topsoil and sod as soon as practically possible following construction,
5. A program will be established and in place to monitor and maintain the erosion and sediment controls. The sediment control will be inspected weekly by the site engineer and contractor.

6.0 Summary & Conclusions

Having analysed the stormwater management requirements for Block 151 as per Town, NVCA and MOE standards, a storm sewer system designed to a 5-year storm is proposed. The collected stormwater is proposed to discharge to existing 450mm and 375mm storm sewer pipes on Peel Street and be conveyed to the Riverside Subdivision's existing SWM facility. In completing this stormwater analysis it was concluded

- That the existing SWM facility/pond can attenuate all post development flows to pre-development levels, up to and including a 100-year storm event and hence, that no on-site control on Block 151 is required. In arriving at this conclusion, the performance of

the SWM facility/pond was evaluated in relation to all pertinent **stormwater quantity** standards/requirements, and the Riverside Subdivision was modelled using the PCSWMM model to consider 10%, 20% and 30 % increases in the impervious area of the subdivision's undeveloped blocks,

- That the existing SWM facility/pond provides enough permanent pool and extended detention volume to support the highest level of **stormwater quality** protection from the stormwater runoff to be generated by Block 151, and
- That the **erosion** potential of the site is “moderate”. To address the potential for erosion, an Erosion and Sediment Control Plan is proposed to limit sediment from leaving the site or entering the storm drainage system during construction,

Appendix A
Drainage Plan

Appendix B
Analysis Results Tables

Table 2: SWM Pond Performance for No Change in Impervious Area at Undeveloped Blocks

	<i>2- year Storm</i>		<i>5- year Storm</i>		<i>25- year Storm</i>		<i>100- year Storm</i>	
	<i>4-hour Chicago</i>	<i>24-hour SCS</i>	<i>4-hour Chicago</i>	<i>24-hour SCS</i>	<i>4-hour Chicago</i>	<i>24-hour SCS</i>	<i>4-hour Chicago</i>	<i>24-hour SCS</i>
<i>Max. Elevation SWM pond</i>	186.2	186.2	186.3	186.3	186.5	186.5	186.7	186.5
<i>Max. Inflow (m³/s) SWM pond</i>	1.83	1.146	2.50	1.50	3.57	2.39	4.18	2.68
<i>Max. Storage (m³) SWM pond</i>	3031	2686	3963	3393	5564	5076	7049	5666
<i>Max. Outflow (m³/s) Riverside Development</i>	0.055	0.047	0.075	0.058	0.115	0.099	0.154	0.116

Table 3: SWM Pond Performance for 10% Increase in Impervious Area at Undeveloped Blocks

	<i>2- year Storm</i>		<i>5- year Storm</i>		<i>25- year Storm</i>		<i>100- year Storm</i>	
	<i>4-hour Chicago</i>	<i>24-hour SCS</i>	<i>4-hour Chicago</i>	<i>24-hour SCS</i>	<i>4-hour Chicago</i>	<i>24-hour SCS</i>	<i>4-hour Chicago</i>	<i>24-hour SCS</i>
<i>Max. Elevation SWM pond</i>	186.2	186.2	186.3	186.3	186.5	186.5	186.7	186.6
<i>Max. Inflow (m³/s) SWM pond</i>	1.89	1.19	2.59	1.56	3.65	2.48	4.231	2.76
<i>Max. Storage (m³) SWM pond</i>	3155	2792	4131	3535	5756	5290	7211	5858
<i>Max. Outflow (m³/s) Riverside Development</i>	0.055	0.047	0.075	0.058	0.115	0.101	0.154	0.118

Table 4: SWM Pond Performance for 20% Increase in Impervious Area at Undeveloped Blocks

	<i>2- year Storm</i>		<i>5- year Storm</i>		<i>25- year Storm</i>		<i>100- year Storm</i>	
	<i>4-hour Chicago</i>	<i>24-hour SCS</i>	<i>4-hour Chicago</i>	<i>24-hour SCS</i>	<i>4-hour Chicago</i>	<i>24-hour SCS</i>	<i>4-hour Chicago</i>	<i>24-hour SCS</i>
<i>Max. Elevation SWM pond</i>	186.2	186.2	186.4	186.3	186.6	186.5	186.7	186.6
<i>Max. Inflow (m³/s) SWM pond</i>	1.94	1.22	2.65	1.61	3.70	2.55	4.27	2.82
<i>Max. Storage (m³) SWM pond</i>	3264	2887	4274	3659	5909	5474	7345	6017
<i>Max. Outflow (m³/s) Riverside Development</i>	0.055	0.047	0.075	0.059	0.116	0.103	0.155	0.120

Table 5: SWM Pond Performance for 30% Increase in Impervious Area at Undeveloped Blocks

	<i>2- year Storm</i>		<i>5- year Storm</i>		<i>25- year Storm</i>		<i>100- year Storm</i>	
	<i>4-hour Chicago</i>	<i>24-hour SCS</i>	<i>4-hour Chicago</i>	<i>24-hour SCS</i>	<i>4-hour Chicago</i>	<i>24-hour SCS</i>	<i>4-hour Chicago</i>	<i>24-hour SCS</i>
<i>Max. Elevation SWM pond</i>	186.3	186.2	186.4	186.3	186.6	186.5	186.7	186.6
<i>Max. Inflow (m³/s) SWM pond</i>	1.99	1.26	2.71	1.66	3.74	2.61	4.31	2.89
<i>Max. Storage (m³) SWM pond</i>	3389	2995	4437	3802	6075	5656	7496	6193
<i>Max. Outflow (m³/s) Riverside Development</i>	0.055	0.047	0.075	0.059	0.116	0.105	0.163	0.121

Table 6: changes in SWM Pond Performance resulted from Impervious Area increase at Undeveloped Blocks (4-Hour Chicago Storm)

<i>Imperviousness increase</i>	<i>2- year</i>			<i>5- year</i>			<i>25- year</i>			<i>100- year</i>		
	<i>10%</i>	<i>20%</i>	<i>30%</i>	<i>10%</i>	<i>20%</i>	<i>30%</i>	<i>10%</i>	<i>20%</i>	<i>30%</i>	<i>10%</i>	<i>20%</i>	<i>30%</i>
<i>SWM pond Max. Ele. Change (m)</i>	0	0	0.1	0	0.1	0.1	0	0.1	0.1	0	0	0
<i>SWM pond Max. Inflow change (%)</i>	3.3	6.0	8.7	3.6	6.0	8.4	2.2	3.64	4.8	1.2	2.2	3.1
<i>SWM pond Max. Storage Change (%)</i>	4.1	7.7	11.8	4.2	7.8	12.0	3.5	6.2	9.2	2.3	4.2	6.3
<i>Development Max. Outflow change (%)</i>	0	0	0	0	0	0	0	0.9	0.9	0	0.6	5.8

Table 7: changes in SWM Pond Performance resulted from Impervious Area increase at Undeveloped Blocks (24-Hour SCS Storm)

<i>Imperviousness increase</i>	<i>2- year</i>			<i>5- year</i>			<i>25- year</i>			<i>100- year</i>		
	<i>10%</i>	<i>20%</i>	<i>30%</i>	<i>10%</i>	<i>20%</i>	<i>30%</i>	<i>10%</i>	<i>20%</i>	<i>30%</i>	<i>10%</i>	<i>20%</i>	<i>30%</i>
<i>SWM pond Max. Ele. Change (m)</i>	0	0	0	0	0	0	0	0	0	0.1	0.1	0.1
<i>SWM pond Max. Inflow change (%)</i>	3.8	6.5	9.9	4.0	7.3	10.7	3.8	6.7	9.2	3.0	5.2	7.8
<i>SWM pond Max. Storage Change (%)</i>	3.9	7.5	11.5	4.2	7.8	12.1	4.2	7.8	11.4	3.4	6.2	9.3
<i>Development Max. Outflow change (%)</i>	0	0	0	0	1.7	1.7	2.0	4.0	6.1	1.7	3.4	4.3