SERVICING & STORMWATER MANAGEMENT IMPLEMENTATION REPORT

BLOCKS 1 & 4
BALMORAL VILLAGE
COLLINGWOOD SENIORS GP LTD & ROYALTON HOMES INC.

TOWN OF COLLINGWOOD

PREPARED BY:

C.F. CROZIER & ASSOCIATES INC.
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L9Y 4R3

JULY 2015

CFCA FILE NO. 362-4007

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1.0 INTRODUCTION

C.F. Crozier & Associates Inc. (Crozier) has been retained by Royalton Homes Inc. [Royalton] and Collingwood Seniors GP Ltd. [CSG] to provide engineering support for the Site Plan Approval of two development blocks (Blocks 1 and 4, respectively) that are contained within the Balmoral Village Subdivision [Balmoral]. Balmoral is a proposed mixed-used adult lifestyle condominium development situated on a 9.5 hectare property and is located south of Harbour Street, northeast of the Georgian Trail, and northwest of Black Ash Creek. The Atoka Golf Course operations yard is located west of the site and an undeveloped parcel of land is located east of the site. Balmoral was previously used as a golf driving range, and the legal description of the property is Part Lot 45, Concession 10, former Town of Nottawasaga, now in the Town of Collingwood. Figure 1 illustrates the site location.

This report has been prepared to provide information concerning the servicing (water, sewer, and utilities) and stormwater management systems to a level of detail to support the respective site plan applications on Blocks 1 and 4. This report has also been prepared to demonstrate that the proposed grading and drainage design for Blocks 1 and 4 meet the grading and drainage intent outlined in the *Balmoral Village Stormwater Management Implementation Report* (February 2015) [Balmoral Master SWM Report], which was prepared by our office.

2.0 BACKGROUND

In April 0215, the Subdivision Agreement for Balmoral Village was executed. Balmoral Village consists of the following blocks, as summarized in Table 1. Refer to Figure 2 for the M-Plan of Balmoral Village.

Table 1: Development Components

Block	Area (ha)	Land Use
1	4.27	46 Semi-Detached Bungalows 50 Townhouse Bungalows
2	0.86	109 Condominium Units
3	0.47	2,800 sq. m. Commercial
4	1.82	127 Retirement Home Units 44 Senior Apartment Units 1,120 sq. m. Clubhouse
5	0.59	Stormwater Management Facility
6	1.38	Environmental Protection
7	0.10	3.0 m Road Widening

To support the execution of the Subdivision Agreement, CFCA completed the following tasks.

1) Detailed design of the reconstruction of Harbour Street West (roadway and drainage system) including the provision of a 3.0m trail for the frontage of the development including the necessary transition zones at either end, an eastbound left turn lane at Highway 26, and enhanced landscaping along the Black Ash Creek corridor;

2) Detailed Master Grading, Servicing & Drainage Plans of the Overall Development;
3) Detailed Design of the Stormwater Management Pond Block (Block 5);
4) Preparation of an Erosion Control Plan; and
5) Preparation of the Balmoral SWM Report.

The Balmoral SWM Report serves as a master plan for the grading and drainage plans for the various development blocks within the Balmoral Village Development as well as acts as the SWM Implementation Report for the proposed end-of-pipe SWM facility. This report should be read in conjunction with the Balmoral SWM Report.

3.0 PROPOSED DEVELOPMENT

MTCO is proposing to develop Block 4 into a retirement complex consisting of two buildings and associated parking areas. The first building (backwards C-shaped) will consist of one hundred and ten (127) retirement home units and a clubhouse, while the second building will consist of forty-four(44) senior apartment units.

Block 1 will be developed by Royalton into a residential development comprised of 46 single family semi-detached bungalow units and 50 townhouse units with associated driveways and parking facilities.

Access to the proposed development will be from Harbour Street through two new private roadways. One entrance is located approximately 100m west of the Harbour Street/Dawson Drive intersection, referred to as Kari Crescent. The second entrance will be a south leg extension of the Harbour Street/Dawson Drive intersection, and will be Kimberly Lane. An additional entrance to Block 4 will also be constructed. Design criteria for the entrances will meet municipal guidelines as well as the applicable sections from the Ontario Building Code (i.e. fire routes).

As required by the Subdivision Agreement, Harbour Street will be reconstructed between the west limits of the subject lands and the Highway 26 intersection. The road will be reconstructed to a rural standard section complete with 7.0m paved surface, 1.2m paved shoulders on both sides as well as a 3.0 m wide sidewalk along the south ROW limits. Harbour Street accepts drainage from approximately 31.8 ha of total external drainage area. Detailed design of the proposed Harbour Street drainage system was completed (Task #1) to support the approval of the Balmoral Plan of Subdivision. This drainage system was also designed to accommodate post-development flows from a portion of Balmoral Village under uncontrolled conditions.

Since this will be a condominium development all internal roadways and associated parking areas will be privately owned and maintained by the respective condominium corporations. The roadways will consist of a minimum 7.2m paved asphalt road surface located within a minimum 14m wide service corridor. The cul-de-sac at the east end of Kari Crescent will be constructed as per OPSD 500.020. All roadways will be constructed as per site specific geotechnical reports and recommendations.

4.0 SITE DESCRIPTION & EXISTING DRAINAGE CONDITIONS

The site is relatively flat and consists primarily of open fields, treed areas, and low lying wet areas. Elevations across the property range from approximately 178 m to 181 m (ASL). Access to the site is provided by a series of existing driveways off of Harbour Street. These driveways are remnants from the former driving range operation.

The site topography is characterized by a ridge that results in runoff generated from the site outleting to three separate outlets; namely, the Black Ash Creek (south), Harbour Street (north), and Highway 26 (east). Refer to Appendix A for a figure illustrating the existing drainage patterns on the site.

Refer to the *Balmoral Master SWM Report* for further discussion.

Terraprobe has produced numerous geotechnical reports to understand the subsurface conditions including soil profiles, bedrock elevations and groundwater conditions. The reader is directed to the Balmoral Master SWM Report for a comprehensive summary of the Terraprobe reports. In June 2015, Terraprobe completed a 7 month long groundwater monitoring program. Overall, the groundwater table is elevated across the site, which has site grading implications (refer to Section 5.2 for further discussion).

5.0 SANITARY SEWAGE SYSTEM

The following section provides an analysis of the servicing strategy for the proposed sanitary sewage system at the Village.

5.1 Existing Infrastructure

The existing sewage infrastructure at or near the site includes the following:

- Black Ash Sewage pump station on Hwy 26;
- 1050mm diameter trunk sanitary sewer on the west side of Hwy 26; and
- 500mm diameter sanitary sewer along the centre line of Harbour Street.

As part of previous planning applications it was confirmed that the existing trunk sanitary sewer within the Harbour Street ROW has sufficient capacity to accommodate all of the peak design flows from Balmoral Village along with existing flows within its catchment area.

5.2 Proposed Servicing Strategy

The proposed routing of the sanitary sewers will follow the alignment of the internal roadway network per municipal standards. It is the intent for the entire development to be serviced by gravity sewers outletting to the existing 500mm sanitary trunk sewer located on Harbour Street. Connections would be made at three locations, and all sewage flows would drain via gravity to the north. These three points were approved as part of the Harbour Street reconstruction drawing set and are as follows:

1. Intersection of Kari Crescent and Harbour Street into a proposed doghouse manhole;
2. Intersection of Kimberly Lane and Harbour Street into an existing manhole; and
3. Service corridor at the east limits of the development into an existing manhole.

For the purposes of this report the sewer obvert was set approximately 3.0 m below the proposed centerline road grade for the internal roadways. This guideline was used to determine the resulting preliminary centerline road grades and finished floor elevations for all of the internal roadways and buildings, respectively, based on providing gravity services for every building. In order to minimize the amount of fill required across the site, possible rock removal, and to accommodate the stormwater

management strategy for the development, a comparison was made between the various grading scenarios to identify the preferred servicing strategy.

All of the mid-rise buildings and the majority of the low-rise units will have basements, and gravity sanitary sewers will service all units. This design will however require imported fill to the development as the units will need to be raised from the existing ground elevations to suit this scenario. Given the relatively deep bedrock along this site and the raised residential units we do not anticipate significant rock excavation works for this sanitary sewer. All of the internal sewers have been sized per Town standards as a minimum 200mm diameter PVC sewer. Refer to Figure 3 for the proposed sanitary servicing drawing and tributary areas. Refer to Appendix B for the sanitary sewer design sheets.

Due to conflicts with the large diameter storm sewer on Kari Crescent there is a block of townhouses to which gravity service laterals cannot be extended beneath the basement floor slab. For Units 64 to 74, it is proposed to install the sanitary building service lateral above the storm sewer and thru the foundation wall. In the event it is required to plumb the basements in these units individual sewage injector pumps will have to be installed. A note has been added to General Servicing Plans confirming these units.

6.0 POTABLE WATER SUPPLY

Potable water for the development will be supplied by the Town of Collingwood municipal water distribution system.

Based on its location within the current service boundary for the municipality, it is our understanding that sufficient pressure and flow are available in the system to service this development.

6.1 Existing Infrastructure

The existing water distribution infrastructure at or near the development includes the following:

- 300 mm diameter trunk watermain on the north side of Harbour Street along the frontage of the site; and
- 300 mm diameter trunk watermain on the east side of Highway 26.

6.2 Proposed Servicing Strategy

Connection to the existing municipal system is straightforward and feasible. The Village will be serviced by connecting to the trunk watermain on Harbour Street in three locations and extending local mains through the development.

1. Intersection of Kari Crescent and Harbour Street via live tap;
2. Intersection of Kimberly Lane and Harbour Street via live tap; and
3. Service corridor at the east limits of the development via live tap.

These three connections to the municipal network will satisfy the Town and Ministry of Environment requirements for a looped water distribution system. Based on the current site plans there are no identified potential dead-end watermains (i.e. cul-de-sac and road stubs to future lands); therefore, there should be no issue with respect to providing adequate water circulation and preventing the potential for stagnant potable water.

Local watermain with individual service connections for each unit will follow the alignment of internal roadways per municipal standards. Based on the size of the development, proposed uses and necessity to provide fire protection systems for mid-rise buildings, the internal watermains are all 200mm diameter main, which exceeds the minimum Town standard diameter of 150mm. This sizing was reviewed and confirmed by the Town and their consultant (Ainley Group) via completion of a distribution analysis and updates to the municipal network model. Refer to the report prepared by Ainley Group dated February 17, 2015 and provided in Appendix C of this report.

Fire hydrant and valve spacing have been set based on the applicable municipal standards. Dedicated and separate potable and fire service lines will be provided for the two buildings in Block 1, and the locations of the fire department connections (siamese) have been shown on the architect's site plan. The piping diameters and layout are shown on the Watermain Distribution Plan (Figure 4).

Based on the current practices in the Town of Collingwood the municipality will assume ownership of the watermain distribution network located within the development. This typically includes all mains, hydrants, valves and services up to and including curb stops. An easement in the name of the municipality along the alignment of the watermain will be provided by both Block Owners.

7.0 UTILITIES

The Village will be serviced with natural gas, telephone, cable TV and hydro. All such utilities have been contacted, and each utility has confirmed that there are existing facilities available along Highway 26 and Harbour Street, but that upgrades may be required.

8.0 PROPOSED STORMWATER MANAGEMENT AND SITE GRADING & DRAINAGE

Per the Block Grading and Master Drainage Plan (Appendix D) presented in the Balmoral Master SWM Report, drainage from the subject development will be conveyed to two separate outlets; namely, the proposed SWM pond (Area #1 – 7.0 ha) and Harbour Street (Area #2 – 1.1 ha). To limit the amount of site runoff that will be tributary to the proposed Harbour Street drainage system, the overall Block Grading and Master Drainage Plan was designed to maximize the drainage area tributary to the SWM pond.

8.1 SWM & Grading Criteria

The applicable SWM and Grading Criteria to be applied to Blocks 1 and 4 from the Balmoral SWM Report including the following:

- Proposed grading and drainage meet the intent of the master grading and drainage plan.
- Regardless of outlet, Blocks 1 and 4 to not exceed the specified maximum impervious level for each development block.
- Site Grading to adhere to the findings of the *Natural Hazards Assessment (2010)* and *Functional Servicing & Stormwater Management Report (2011)*. Specifically:
    - The minimum specified site grade is above 178.95m.
    - Flood hazards remain contained within the EP lands and the existing Regional water surface elevation of 178.65m (Crozier, 2010) is respected upon development of the subject lands.

- Proposed road and parking lot grading to provide suitable cover over the storm sewer to prevent frost heave (typically 1.2 m minimum cover) and provide an overland flow route for major storm runoff.
- All buildings within Block 1 to meet minimum groundwater separation per Town policy unless Town staff support a reduction in the minimum groundwater separation based on Geotechnical recommendations.

SWM Facility – Area #1

- For site drainage directed to the Black Ash Creek via the proposed SWM facility, all site drainage should be directed to the sediment forebay of the proposed SWM facility per the Master Grading & Drainage Plan.

Harbour Street – Area #2

- Post-development peak flow rates for the Regulatory storm event from the total Harbour Street drainage area (including site flows) should be at or below pre-development levels.

The Harbour Street post and pre-development peak flow rates for the Regulatory storm event were established in the Balmoral Master SWM Report via SWMHYMO modeling, to facilitate the design of the drainage system. The post-development SWMHYMO model determined the peak flows from the total drainage area including the 31 ha of external drainage area and approximately 1 ha of the site drainage area. The site drainage area was as per the approved Block Grading and Master Drainage Plan. Refer to Appendix A for the Harbour Street external and internal drainage areas.

8.2 Site Grading - Background

The Block Grading and Master Drainage Plan was completed to support the Subdivision Agreement and is dated March 2015. This plan set the minimum grading to achieve the overall drainage objectives for the development and for each development block. At the site plan approval stage of a given block, the proponent of the block is required to demonstrate that the block grading meets the intent of the minimum site grades provided on the Block Grading and Master Drainage Plan (Appendix D).

The grading design of the subject lands is influenced by the storm drainage system as well as groundwater levels, with the storm sewer system profile governed by the previously designed and approved SWM Facility.

Per Town Policy, it is required that the underside of basement slab for all buildings to be a minimum of 0.5m above the seasonally high groundwater level. Therefore, to establish minimum finished floor elevations, the groundwater characteristics within the site are required to be known and verified by a geotechnical consultant based on the extended monitoring program.

At the time of preparing the Block Grading and Master Drainage Plan (March 2015), the monitoring program to determine the groundwater table across the subject lands had not been completed. Therefore, the groundwater table was not known at that time. To facilitate the setting of minimum finished grades across the site, a conservative assumption was made on the groundwater level. This established the low point along Kari Crescent at the SWM Facility overland flow route to be 180.70 m. It was noted in the Balmoral Master SWM Report that once the established groundwater table elevation had been confirmed

upon completion of the monitoring program, the minimum finished grades would be re-evaluated during the site plan approval stage for each development block.

8.3 Proposed Block Grading & Drainage

8.3.1 Block 1 - Royalton

To convey block flows to the SWM Pond, storm sewers will be installed within the roadways to direct the minor storm events (5 year) towards the SWM facility, while major storm events exceeding the 5 year return period will be conveyed overland by the internal road networks to a low point in Kari Crescent. A 7.5 m wide drainage easement will contain a storm sewer and overland flow route to facilitate the conveyance of minor and major storm flows, respectively. This drainage easement will also contain a 3.0 m wide paved trail. This is consistent with the Block Grading and Master Drainage Plan.

The proposed Kari Crescent road profile extends from the low point at the drainage block towards Harbour Street at 0.5% and to the cul-de-sac at 0.5% to provide a suitable overland flow route. The proposed Kari Crescent entrance road profile from Harbour Street is consistent with the approved Balmoral Subdivision drawings with the high point location and elevation of 182.09 m along Kari Crescent being respected. However, upon review of the results of the groundwater monitoring program, it has been determined that the lowering of the Kari Crescent low point at the drainage block from 180.7 m per the Master Grading Plan to 180.40 m can be supported given that the proposed Block 1 residential units will still meet minimum groundwater separation requirements. Refer to Appendix E for a table that summarizes the groundwater separation from the basement floor elevation of each unit. The reader is also directed to the Geotechnical Report prepared by Soil Engineers Ltd., which provides a geotechnical opinion on the site groundwater levels and the proposed site grading.

The outlet invert of the storm sewer system at the SWM Facility has been set at 177.30 m (0.5 m below permanent pool elevation) in order to provide adequate cover to allow maintenance vehicles to travel along the access trail without compromising the structural integrity of the storm sewer. Within Block 1, the storm sewer system has cover in excess of 1.2 m to pipe obvert.

The overland flow route within the 7.5 m drainage easement has been designed to convey the 100-year peak flows (Regulatory) from Area #1 to the SWM Facility. Refer to flow calculations in Appendix F. The design flow rate is as per the SWMHYMO modeling presented in the Balmoral Master SWM Report.

For the units that back onto the EP lands, the minimum lot grade of 178.95 m has been respected to ensure that the units are adequately dry flood-proofed (0.3 m freeboard).

8.3.2 Block 4- CSG

CMT Engineering Inc. has prepared a Geotechnical Investigation Letter dated July 6, 2015 (submitted under separate cover) in order to determine the bearing capacity of the bedrock. Refer to the said letter for a description of the bedrock and soil encountered during the drilling program.

To maximize the portion of Blocks 2, 3, and 4 that is tributary to the SWM Facility, the following elements have been incorporated into the design:

- Extension of storm sewers from Kari Crescent.

  - Two storm sewers will be extended to the said Blocks from Kari Crescent. The first storm sewer will be extended along Kimberly Lane while the second storm sewer will be extended to Block D via a servicing corridor between the two proposed buildings. The storm sewers will capture runoff generated from the parking areas.
- Detached roof leaders.
  - Building roof leaders are proposed to capture the building roof areas and convey flows to the Kari Crescent storm sewer system.
- Minimize the proposed parking lot elevations.
  - Given the elevation change between Harbour Street and the site elevation (~1.8 m), maintaining the approved vertical curve of the Kimberly Lane access from Harbour Street and providing an acceptable vertical curve for the east access road results in a direct relationship between the parking lot elevations and the size of the drainage area tributary to Harbour Street (i.e. the higher the parking lot elevations, the more block drainage will outlet to Harbour Street). Per the SWM criteria, the site Harbour Street drainage area is to be minimized.

It has been determined that an overland flow route from Blocks 2, 3, and 4 to Kari Crescent cannot be provided without raising the parking lot elevations to the point where runoff from an unacceptably large portion of the said blocks would outlet to Harbour Street. Therefore, an alternative major system design is proposed whereby the storm sewer system within the said blocks will capture and convey the 100-year storm to the Kari Crescent storm sewer system and outlet to the SWM Facility. The parking lot areas have been designed to maximize the catchbasin capture (i.e. waffle grading design) while providing an emergency flow route to Harbour Street in case of catchbasin blockage.

Storm sewer stubs have been provided for Blocks 2 and 3 to allow for the future connection to the storm sewer system.

Major and minor storm flows from Kimberly Lane entrance as well as the East Access will outlet to the Harbour Street drainage system, as consistent with the Block Grading & Master Drainage Plan.

8.4 Hydraulic Grade Line Analysis

A hydraulic grade line (HGL) analysis has been completed to ensure that the storm sewer system will adequately function during the 100-year storm event to convey the 100-year peak flows from Blocks 2, 3, and 4. A 5-year storm sewer design sheet has also been prepared to demonstrate free flow capacity in the minor storm event. Refer to Appendix G for the 5-year and 100-year (HGL) design sheets. Refer to Figure 5 for the Storm Drainage Plan.

A starting water surface elevation at the outlet of the storm sewer system has been set equal to 178.55 m, which corresponds to the design 100-year high water level in the SWM Facility. This elevation also corresponds to the invert of the SWM facility emergency spillway. Typical procedures for HGL analyses were applied including analysis of friction losses, junction losses, manhole losses, per the methodology outlined in Modern Sewer Design (1999).

A catchbasin capture analysis has not been completed. Rather, it has been assumed that the storm sewer system will have 100-year peak flow capture. This assumption results in a conservative HGL given that it is unlikely that the entire major storm flows generated from Block 1 will enter into the storm sewer system.

The HGL analysis results indicate that the HGL within Blocks 2, 3, and 4 will be below the catchbasin/manhole top of grates during the 100-year event. Therefore, the proposed storm sewer system will perform adequately during the 100-year event to convey the 100-year storm flows from the said block.

8.5 Proposed Area #1 (SWM Facility) and Area #2 (Harbour Street) Drainage Area Boundaries

As presented on Figure 5, there is an overall nominal change in the Area#1 and Area#2 drainage areas as compared to the boundaries presented on the approved March 2015 Block Grading and Master Drainage Plan. Furthermore, the land uses within the said areas have also not changed; therefore, there has not been an appreciable change in the level of imperviousness for Area#1 and Area#2. As a result, it is reasonable to assume that the post-development peak flow rates for the Regulatory storm event from the total Harbour Street drainage area (including site flows) will be consistent with the SWMHYMO model output per the Balmoral Master SWM Report.

9.0 EROSION & SEDIMENT CONTROLS

Erosion & sediment controls will be implemented prior to any on-site construction works. An Erosion & Sediment Control Plan has been prepared for works associated with both the internal Blocks 1 and 4 (to be completed for 2nd submission) and the reconstruction of Harbour Street. Refer to the approved March 2015 Sediment & Erosion Control Plan (Drawing 108) for the overall site level plan.

- Silt fencing

Silt fence will be constructed in accordance with NVCA's Typical Detail of Silt/Sediment Fence (BSD-23 Draft). It should be noted that additional silt fence may be added based on field decisions by the Engineer and Developer prior to, during and following the earth works.

- Flow Check Dams

Temporary straw bale and rock check dams will be utilized on-site and within Harbour Street in order to prevent any silt mitigation off site during and after construction activities. These dams will promote settling of suspended solids, and will reduce flow velocities. Sediment accumulation will be monitored and removed as necessary. The temporary rock check dams will be constructed in accordance with NVCA's Typical Rock Check Dam Erosion Control Device (BSD-24 Draft). Locations of the straw bale and rock check dams are also shown on Drawing 108. The need for additional flow check dams will be based on the field condition at the discretion of the Engineer and Owners and implemented as necessary.

- Mud Mat

A mud mad has been proposed at the entrance to the development from Harbour Street. This mud mat will be maintained at the site until base asphalt is placed to limit mud tracking from the site onto Harbour Street and the surrounding municipal roadway network. The Contractor shall ensure mud mat maintenance (cleaning / additional stone) is completed on an as needed basis to ensure proper operation.

- Dust Suppression

During earthwork activities, the Contractor will be responsible for ensuring dust suppression is maintained by the use of water or calcium chloride, or other methods approved by the Engineer.

- Sediment Basin

As per the approved March 2015 ESC Drawing 108, a temporary sediment basin is proposed to be located within the SWM Pond Block. Per the ESC Guidelines, the sediment basin will be sized to provide active storage volume that meets a minimum of 125 m^3 per hectare of contributing drainage area as well as a permanent pool storage volume that meets a minimum of 185 m^3 per hectare of contributing drainage area. Based on a contributing drainage area of 7.0 ha to the sediment basin, 875 m^3 and 1295 m^3 of active and permanent pool storage volumes, respectively, will be provided at a minimum. Therefore, the sediment basin has been sized to handle the portion of Blocks 1 and 4 that is tributary to the SWM facility under post-development conditions.

The basin will outlet to the Black Ash Creek setback line via a hickenbottom outlet structure and the proposed outlet pipe. The design of the temporary sediment basin will be completed as part of the erosion and sediment control plans that will be prepared as part of the 2nd submission.

10.0 CONCLUSIONS & RECOMMENDATIONS

The analysis presented above provides a comprehensive servicing and stormwater management assessment in support of the proposed Block 1 and Block 4 developments.

- Sanitary Services for both blocks will be provided by extension of sewers from Harbour Street. This trunk sewer has adequate capacity for future development lands in Balmoral Village.
- Due to conflicts between the sanitary service and the storm sewer system within Kari Crescent, Units 64 to 74 of Block 1 will require injector pumps to service the basement plumbing.
- An internal watermain system will be looped through Balmoral Village connecting to Harbour Street at three locations. Internal watermain sizing has been confirmed through updates to the Town Water Distribution Model.
- Utilities for site servicing are available along Harbour Street and will be extended to the subject development.
- The proposed grading and drainage system design meets the intent of the approved Block Grading & Master Drainage Plan.
- Minimum groundwater separation per Town policy for the proposed units in Block 1 (Royalton Homes Inc.) has been met with the proposed grading design for Block 1.
- Runoff generated from Blocks 1 and 4 will outlet to the proposed Harbour Street drainage system and SWM Facility, which were previously design and approved as part of the Subdivision Agreement. The proposed Blocks 1 and 4 drainage plans respect the drainage areas and impervious levels assumptions that were incorporated into the design of the said receiving drainage systems. Therefore, SWM criteria per the Balmoral Master SWM Report will be met.

Given the above noted conclusions, we support the development of the Blocks 1 and 4 from the perspective of engineering servicing and stormwater management requirements.

Respectfully submitted,

C.F. CROZIER & ASSOCIATES INC.

Darrin Tone, P.Eng.
Project Engineer

Respectively submitted,

C.F. CROZIER & ASSOCIATES INC.

Kevin Morris, P. Eng.
Partner

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APPENDIX A

Balmoral Master SWM Report Drainage Plans

REFER TO FIGURE 4 FOR EXTERNAL STORM DRAINAGE AREAS

HARBOUR STREET

DAWSON DRIVE

EX. ROADSIDE DITCH

EX. RELIEF CHANNEL

RELIEF CHANNEL OUTLET LOCATION

EX. DUG OUT POND

THE KINGS HIGHWAY No. 26

BLACK ASH CREEK

BLACK ASH CREEK TRAIL

GEORGIAN TRAIL

EX. 450mmø CSP CULVERTS

B1 4.7

B2 2.5

B3 1.8

B4 0.1

B5 1.4

B6 1.5

B7 0.3

Ex1 50.1

1 2 3 4

LEGEND

- SUBJECT PROPERTY
- EXISTING SWALE/DITCH
- BLACK ASH CREEK / DUG-OUT POND CATCHMENT BOUNDARY
- NODE 1 DRAINAGE AREA CATCHMENT
- NODE 2 DRAINAGE AREA CATCHMENT
- NODE 3 DRAINAGE AREA CATCHMENT
- NODE 4 DRAINAGE AREA CATCHMENT
- 2 — FLOW NODE LOCATION
- 3 / 1.8 — CATCHMENT IDENTIFICATION / CATCHMENT AREA (ha)
- EXISTING OVERLAND FLOW ROUTE

TOPOGRAPHIC DATA PER: FIRST BASE SOLUTIONS, MARKHAM, ONTARIO – DATED APRIL 1, 2009

BALMORAL VILLAGE
TOWN OF COLLINGWOOD

EXISTING CONDITIONS
DRAINAGE PLAN

CROZIER & ASSOCIATES Consulting Engineers
110 PINE STREET, COLLINGWOOD, ON L9Y 2N9
705 446-3510 T
705 446-3520 F
WWW.CFCROZIER.CA
INFO@CFCROZIER.CA

Drawn By	Design By	Project
J.O.	C.B.	362-2897
Scale	Date	Check By	Drawing
1:2000	06/30/2011	K.A.M.	FIG. 3

J:\300\362 - Black Ash Creek Village\2897 Black Ash Enterprises Inc\CAD\1C3D\Sheets\2897-705-706.dwg, FIG. 4, 2/23/2015 1:07:19 PM, waters

N

Georgian Bay

EX. CULVERT

14.6
A3

12.67
A4

2.48
A6

EX. STRIP MALL

EX. CULVERTS

EX. CULVERTS

EX. CULVERT

LP

1

2

SPILL

SPILL

2.0
A1

SUBJECT LANDS

LEGEND

- SWALE FLOW DIRECTION
- STORM FLOW DIRECTION
- NODE 1 ADDITIONAL DRAINAGE AREA CATCHMENT
- NODE 2 ADDITIONAL DRAINAGE AREA CATCHMENT
- DRAINAGE AREA DIVIDE
- BALMORAL PROPERTY LINE
- FLOW NODE LOCATION
- 1.32 / A1 — AREA (ha) / AREA ID

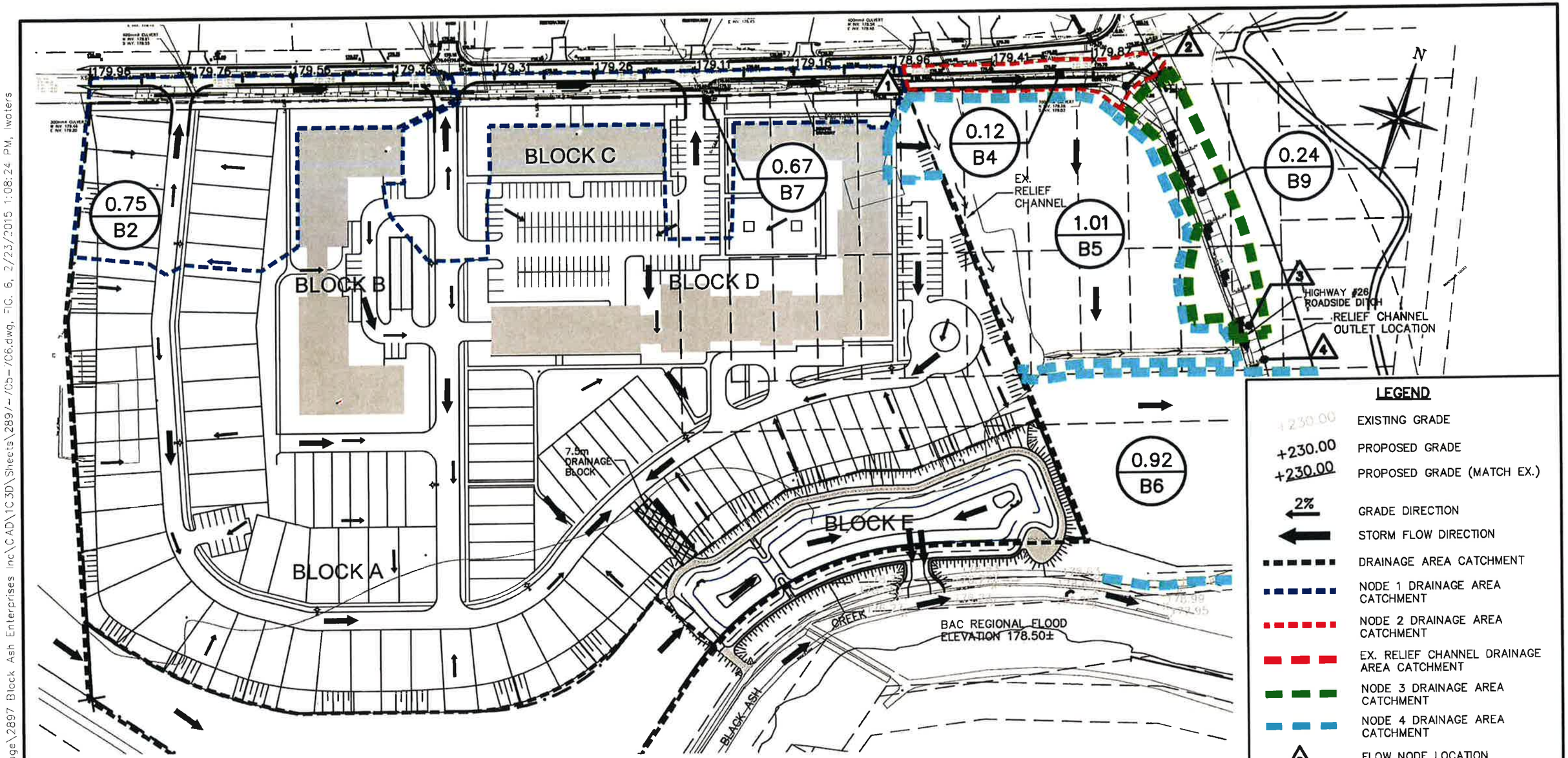
NOTE:
FOR LANDS SOUTH OF HARBOUR STREET:
FOR POST-DEVELOPMENT DRAINAGE AREAS REFER TO FIGURE 6.
FOR EXISTING CONDITIONS DRAINAGE AREAS REFER TO FIGURE 3.

Project: BALMORAL VILLAGE

Drawing: HARBOUR STREET EXTERNAL (NORTH) STORM DRAINAGE AREAS

CROZIER & ASSOCIATES Consulting Engineers
THE HARBOUREDGE BUILDING
40 HURON STREET, SUITE 301,
COLLINGWOOD, ON L9Y 4R3
705 446-3510 T
705 445-3520 F
WWW.CROZIER.CA

Drawn By	L.W.	Design By	D.T.	Project	362-2897
Scale	1:4000	Date	09/10/2014	Check By	D.T.	Drawing	FIG. 4



LEGEND

+230.00	EXISTING GRADE
+230.00	PROPOSED GRADE
+230.00	PROPOSED GRADE (MATCH EX.)
2%	GRADE DIRECTION
	STORM FLOW DIRECTION
	DRAINAGE AREA CATCHMENT
	NODE 1 DRAINAGE AREA CATCHMENT
	NODE 2 DRAINAGE AREA CATCHMENT
	EX. RELIEF CHANNEL DRAINAGE AREA CATCHMENT
	NODE 3 DRAINAGE AREA CATCHMENT
	NODE 4 DRAINAGE AREA CATCHMENT
2	FLOW NODE LOCATION
0.75 / B2	AREA (ha) / AREA ID
	DRAFT PLAN BLOCK LIMIT (DATED DEC. 9, 2014)

IMPERVIOUS ASSUMPTIONS

CATCHMENT B2 – 45%
CATCHMENT B7 – 54%

Project: BALMORAL VILLAGE

Drawing: POST-DEVELOPMENT HARBOUR STREET LOCAL STORM DRAINAGE AREAS

CROZIER & ASSOCIATES Consulting Engineers
THE HARBOUREDGE BUILDING, 40 HURON STREET, SUITE 301, COLLINGWOOD, ON L9Y 4R3
705 445-3510 T
705 445-3520 F
www.crozier.ca
info@crozier.ca

Drawn By	Design By	Project	Scale	Date	Check By	Drawing
L.W.	D.T.	362-2897	1:1500	09/10/2014	D.T.	FIG. 6

APPENDIX B

Sanitary Sewer Design Sheet

CROZIER & ASSOCIATES
Consulting Engineers

Project No. 362-4007
File Name: Sanitary sewer design
Date: July 22, 2015

Balmoral Village at Harbour Street

INTERNAL SANITARY SEWER DESIGN MODEL

DESIGN: A. Spencer
CHECK: S. West

N = 0.013
Population= 3.5 p.p.u.
Avg. Commerical Flow= 28000 L/ha/day

Peak Factor (M) = 1+(14/4+(P/1000)^0.5)
Avg. Daily/Capita Flow = 450 L/cap.d
Q infiltration = 0.23 L/ha.s

Location	FROM MH	TO MH	Length (m)	Area (ha)	Commercial Area (ha)	TOTAL Comm. Area	Residential Units	Pop.	TOTAL trib pop	Peak Factor	Avg. Com. Flow (l/s)	Avg. Res. Flow (l/s)	Max Flow (l/s)	Infilt. (l/s)	TOTAL Infilt.	Combined (l/s)	Pipe Dia. (mm)	Upper Inv. El.	Lower Inv. El.	Slope (%)	Cap. (l/s)	Vel. (m/s)	Ground Upper	Ground Lower	Cover Upper	Cover Lower
Kari Crescent West																										
Kari Crescent West	MH#9	MH#8	58.0	0.44	0.00	0.00	9	31.5	32	4.35	0.00	0.16	0.71	0.10	0.10	**0.82**	200	178.32	178.03	0.50%	**23.19**	0.74	180.88	181.17	2.36	2.94
	MH#8	MH#7	23.9	0.23	0.00	0.00	6	21.0	53	4.31	0.00	0.27	1.18	0.05	0.15	**1.33**	200	177.98	177.88	0.40%	**20.74**	0.66	181.17	181.29	2.99	3.21
	MH#7	MH#6	18.3	0.11	0.00	0.00	2	7.0	60	4.30	0.00	0.31	1.33	0.03	0.18	**1.51**	200	177.83	177.76	0.40%	**20.74**	0.66	181.29	181.38	3.26	3.42
	MH#6	MH#5	20.5	0.14	0.00	0.00	2	7.0	67	4.29	0.00	0.35	1.49	0.03	0.21	**1.70**	200	177.71	177.63	0.40%	**20.74**	0.66	181.38	181.49	3.47	3.66
	MH#5	MH#3	35.3	0.14	0.00	0.00	3	10.5	77	4.27	0.00	0.40	1.71	0.03	0.24	**1.96**	200	177.58	177.44	0.40%	**20.74**	0.66	181.49	181.67	3.71	4.03
Sutton Lane	MH#4	MH#3	37.4	0.16	0.00	0.00	4	14.0	14	4.40	0.00	0.07	0.32	0.04	0.04	**0.36**	200	177.86	177.49	1.00%	**32.80**	1.04	181.29	181.67	3.23	3.98
Kari Crescent West	MH#3	MH#2	51.4	0.37	0.00	0.00	10	35.0	126	4.21	0.00	0.66	2.77	0.09	0.37	**3.13**	200	177.41	177.20	0.40%	**20.74**	0.66	181.67	181.92	4.06	4.52
	MH#2	MH#1	100.4	0.65	0.00	0.00	16	56.0	182	4.16	0.00	0.95	3.95	0.15	0.52	**4.46**	200	177.15	176.75	0.40%	**20.74**	0.66	181.92	179.77	4.57	2.82
Kimberly Lane																										
Sutton Lane	MH#30	MH#29	61.0	0.29	0.00	0.00	7	24.5	25	4.37	0.00	0.13	0.56	0.07	0.07	**0.62**	200	178.08	177.47	1.00%	**32.80**	1.04	181.21	181.03	2.93	3.36
Kimberly Lane	MH#29	MH#26	46.5	0.21	0.00	0.00	4	14.0	39	4.34	0.00	0.20	0.87	0.05	0.12	**0.98**	200	177.39	177.16	0.50%	**23.19**	0.74	181.03	181.26	3.44	3.90
	MH#27	MH#26	6.0	0.44	0.00	0.00	56	196.0	196	4.15	0.00	1.02	4.24	0.10	0.10	**4.34**	200	177.27	177.21	1.00%	**32.80**	1.04	181.26	181.26	3.79	3.85
	MH#28	MH#26	7.5	0.82	0.00	0.00	44	154.0	154	4.19	0.00	0.80	3.36	0.19	0.19	**3.55**	200	177.28	177.21	1.00%	**32.80**	1.04	181.26	181.26	3.78	3.85
	MH#26	MH#23	73.8	0.08	0.00	0.00	0	0.0	389	4.03	0.00	2.02	8.15	0.02	0.42	**8.57**	200	177.13	176.76	0.50%	**23.19**	0.74	181.26	179.37	3.93	2.41
	MH#24	MH#23	10.3	0.42	0.47	0.47	0	0.0	0	4.50	0.15	0.00	0.69	0.10	0.10	**0.78**	200	176.89	176.79	1.00%	**32.80**	1.04	179.37	179.37	2.28	2.38
	MH#25	MH#23	6.1	0.42	0.00	0.00	53	185.5	186	4.16	0.00	0.97	4.02	0.10	0.10	**4.12**	200	176.85	176.79	1.00%	**32.80**	1.04	179.37	179.37	2.32	2.38
	MH#23	MH#22	30.7	0.02	0.00	0.47	0	0.0	574	3.94	0.15	2.99	12.39	0.00	0.62	**13.01**	200	176.71	176.40	1.00%	**32.80**	1.04	179.37	179.25	2.46	2.65
Kari Crescent East																										
Kari Crescent East	MH#21	MH#20	19.6	0.15	0.00	0.00	3	10.5	11	4.41	0.00	0.05	0.24	0.03	0.03	**0.28**	200	178.19	178.02	0.90%	**31.12**	0.99	180.83	180.73	2.44	2.51
	MH#20	MH#19	15.7	0.12	0.00	0.00	2	7.0	18	4.39	0.00	0.09	0.40	0.03	0.06	**0.46**	200	177.97	177.90	0.40%	**20.74**	0.66	180.73	180.65	2.56	2.55
	MH#19	MH#18	36.5	0.27	0.00	0.00	7	24.5	42	4.33	0.00	0.22	0.95	0.06	0.12	**1.07**	200	177.85	177.71	0.40%	**20.74**	0.66	180.65	180.47	2.60	2.56
	MH#18	MH#17	27.0	0.22	0.00	0.00	6	21.0	63	4.29	0.00	0.33	1.41	0.05	0.17	**1.58**	200	177.66	177.55	0.40%	**20.74**	0.66	180.47	180.47	2.61	2.72
	MH#17	MH#16	31.2	0.19	0.00	0.00	5	17.5	81	4.27	0.00	0.42	1.79	0.04	0.22	**2.01**	200	177.50	177.38	0.40%	**20.74**	0.66	180.47	180.63	2.77	3.05
	MH#16	MH#15	37.2	0.13	0.00	0.00	3	10.5	91	4.25	0.00	0.47	2.02	0.03	0.25	**2.26**	200	177.33	177.18	0.40%	**20.74**	0.66	180.63	180.81	3.10	3.43
	MH#15	MH#14	42.2	0.20	0.00	0.00	4	14.0	105	4.24	0.00	0.55	2.32	0.05	0.29	**2.61**	200	177.13	176.96	0.40%	**20.74**	0.66	180.81	180.86	3.48	3.70
	MH#14	MH#13	23.6	0.11	0.00	0.00	2	7.0	112	4.23	0.00	0.58	2.47	0.03	0.32	**2.79**	200	176.91	176.81	0.40%	**20.74**	0.66	180.86	181.11	3.75	4.10
	MH#13	MH#12	75.4	0.21	0.00	0.00	1	3.5	116	4.23	0.00	0.60	2.54	0.05	0.37	**2.91**	200	176.73	176.43	0.40%	**20.74**	0.66	181.11	181.10	4.18	4.47
	MH#12	MH#11	29.0	0.88	0.00	0.00	127	444.5	560	3.95	0.00	2.92	11.52	0.20	0.57	**12.09**	200	176.38	176.27	0.40%	**20.74**	0.66	181.10	179.32	4.52	2.85
	MH#11	MH#10	14.0	0.00	0.00	0.00	0	0.0	560	3.95	0.00	2.92	11.52	0.00	0.57	**12.09**	200	176.22	176.16	0.40%	**20.74**	0.66	179.32	179.32	2.90	2.96

APPENDIX C

Water Distribution Modeling Letter

Ainley GROUP
CONSULTING ENGINEERS PLANNERS

Ainley & Associates Limited
280 Pretty River Parkway, Collingwood, Ontario L9Y 4J5
Tel: (705) 445-3451 • Fax: (705) 445-0968
E-mail: collingwood@ainleygroup.com

February 17, 2015

File No. 115020

Collingwood Utility Services
Box 189
43 Stewart Road
Collingwood, Ontario
L9Y 3Z5

Attn: Peggy Slama, P. Eng.
Manager, Water Services

Ref: Collingwood Utility Services
Balmoral Village Development

Dear Ms. Slama:

We have completed the review of the theoretical pressures and available fire flows at the proposed Balmoral Village Development, as per your January 29, 2015 request. This analysis was undertaken utilizing the CPU's water distribution system WaterCAD computer model, updated to 2012 Existing Conditions. It includes a review of pressures within the area of interest under average day demand (ADD), maximum day demand (MDD), peak hour (PH), maximum day demand plus available fire flow (MDD + FF), and an MDD extended period simulation (EPS).

The conditions for all scenarios are as follows:

- Demands for the proposed Balmoral Village Development are based on the following:
  - 94 residential units and population density of 3 people/unit based on the Collingwood Water Model Update for future residential units, the lot distribution is based on a drawing provided by Crozier & Associates.
  - 109, one and two bedroom condo units with a population density of 1.5 people/unit since it was assumed that the one and two bedroom units would have occupancy of 1 to 2 people. An average of 3 people seemed high
  - 2,800 m^2 of commercial space
  - 126 Retirement home units with 1 bedroom and no kitchen
  - 46 Senior Apartment units with a population density of 1.5 people/unit, it was assumed that the two bedroom units would have occupancy of 1 to 2 people. An average of 3 people seemed high
  - 1,120 m^2 of recreation centre which includes a therapeutic pool and showers to be used by the retirement home residents, it is assumed that there will be no additional water demands from the recreation centre since the people using the pool and shower live at the same location, they would either use the recreational centre showers or their own shower. It was also noted by Crozier & Associates that the pool would be filled by a water truck therefore no water demand to fill the pool would need to be modeled.
- The Average Day Demand (ADD) for residential units the proposed Balmoral Village Development is based on 450 L/cap•day from the Collingwood Town Standards and MOE Guidelines.

- The ADD for the commercial space is $28m^3/(ha•d)$ from the MOE guidelines.
- The ADD for the retirement home units was assumed to be the same as a hotel since each unit contains a bedroom but no kitchen and the MOE guidelines do not have a water demand for retirement units, the ADD used was 225 L/bedspace/day from the MOE design guidelines for a hotel
- A Maximum Day Factor (MDF) of 2.0 and a Peak Hour Factor (PHF) of 4.5 were used. The MDF and PHF are based on the Town of Collingwood Standards.
- The piping diameters and layout are based on the Watermain Distribution Plan Drawing provided by Crozier & Associates (Job number 362-2897, drawing no 107)
- Friction Factors for all proposed piping are based on MOE Design Guidelines.
- The elevations within the Balmoral Village Development are based on Drawing No. 107 (Water Distribution Plan) provided by Crozier & Associates.
- MDD + FF was modelled with a required minimum zone pressure of 140kPa as per the MOE Guidelines. The minimum fire flow required for the development per Crozier's calculations include 150 L/s required as per Ontario Building Code or 233 L/s required by the Fire Underwriters

Our analysis includes a review of existing system conditions and also of intermediate system demand conditions and ultimate build-out demand conditions.

EXISTING SYSTEM CONDITIONS

A review of pressures within the area of interest under ADD, MDD, PH and MDD + FF was completed under existing system conditions (updated to the end of 2012) plus the proposed development.

Under the above noted conditions system pressures in the vicinity of the proposed Balmoral Village development are approximately:

- range from 400 kPa to 420 kPa under ADD conditions
- range from 435 kPa to 455 kPa under MDD conditions
- range from 420 kPa to 440 kPa under PH conditions

The pressure differences that between occur ADD, MDD and PH conditions are due to additional pumps turning on for the different conditions. These pressures are within the range recommended in the MOE Design Guidelines for normal operating conditions (Per the MOE Design Guidelines for Drinking Water Systems 2008, Chapter 10, Section 10.2 Hydraulic Design, 10.2.2.1 Maximum and Minimum Operating Pressures: The normal operating pressure in the distribution system should be approximately 350 to 480 kPa and not less than 275kPa. The maximum pressures in the distribution system should not exceed 700 kPa to avoid damage to household plumbing and unnecessary water and energy consumption).

An MDD extended period simulation was performed under the above conditions. The pressures within the proposed development varied between 360kPa to 450kPa over the 72 hour simulation. These pressures are within the range recommended by the MOE Design Guidelines.

Under the above noted conditions and MDD the available fire flow in the vicinity of the proposed development ranges from approximately 265 L/s to 450 L/s.

INTERMEDIATE GROWTH CONDITION

The conditions for the intermediate system demand analysis included:

- Infilling and draft approved/proposed developments within Collingwood. Draft approved subdivisions/ developments include: Pretty River Estates, Mountain Croft (includes Tepco Holdings), Findlay, The Preserve at Georgian Bay (Consolate), Di Poce Industrial Subdivision, Tanglewood at Cranberry, Mair Mills Villages, Helen Court Homes, Georgian Meadows, 121 High Street (Heights of Collingwood), Eden Oak McNabb, Consolate West Lands, The Victoria Annex.
- Demand of 4,000m^3/day to the Town of The Blue Mountains (Blue Mountains). The Town of Collingwood is currently initiating discussions with the Town of the Blue Mountains to reduce the committed capacity to 1,000m^3/day, with more being allowed when required only if the Town of Collingwood is able to supply it without compromising flows and pressures to Collingwood. A future demand of 4,000m^3/day to the Town of the Blue Mountains was used in the model and based on the potential to decrease the committed capacity to 1,000m^3/day this is considered to be conservative.
- Blue Mountains demand is considered to be constant, ie. Maximum Day and Peak Hour factors have not been applied.

System improvements that have been included in the simulations are:

- Stewart Road Reservoir and Booster Pumping Station on-line
- Carmichael Reservoir modelled as a "flow-through" facility
- A loop of 400mm diameter watermain is required from the west entrance to Georgian Meadows on Sixth Street to the 10th Line and on the 10th Line from Sixth Street to the entrance of Georgian Meadows by Conners Drive

Under the above noted conditions system pressures in the vicinity of the Balmoral Village Development are approximately:

- range from 375 kPa to 395 kPa under ADD conditions
- range from 365 kPa to 385 kPa under MDD conditions
- range from 348 kPa to 368 kPa under PH conditions

The pressure differences that between occur ADD, MDD and PH conditions are due to additional pumps turning on for the different conditions. These pressures are within the range recommended in the MOE Design Guidelines for normal operating conditions (Per the MOE Design Guidelines for Drinking Water Systems 2008, Chapter 10, Section 10.2 Hydraulic Design, 10.2.2.1 Maximum and Minimum Operating Pressures: The normal operating pressure in the distribution system should be approximately 350 to 480 kPa and not less than 275kPa. The maximum pressures in the distribution system should not exceed 700 kPa to avoid damage to household plumbing and unnecessary water and energy consumption).

An MDD extended period simulation was performed under the above conditions. The pressures within the proposed development varied between 325 kPa to 375 kPa over the 72 hour simulation. These pressures are within the range recommended by the MOE Design Guidelines.

Under the above noted conditions and MDD the available fire flow in the vicinity of the proposed Balmoral Village Development ranges from approximately 95L/s to 170L/s. While these fire flows do not meet the minimum 233 L/s fire flow required by the Fire Underwriter, the minimum

fire flow of 150 L/s required by the Ontario Building Code (OBC) is generally met. The fire flows that are less than 150 L/s occur near the residential units where the minimum fire flow set by the OBC is 45L/s and 75 L/s as per the fire flows calculated by Crozier and Associates. The MOE guidelines indicated the minimum fire flow for residential area is 38L/s. Therefore, the fire flows are satisfactory.

ULTIMATE GROWTH CONDITION

Under ultimate-build out conditions system pressures in the vicinity of the proposed Balmoral Village Development are approximately:

- range from 320 kPa to 340 kPa under ADD conditions
- range from 320 Pa to 340 kPa under MDD conditions
- range from 310 kPa to 330 kPa under PH conditions

The pressure differences that between occur ADD, MDD and PH conditions are due to additional pumps turning on for the different conditions. These pressures are below the range recommended in the MOE Design Guidelines for normal operating conditions, however the pressures are greater than 275 kPa minimum (Per the MOE Design Guidelines for Drinking Water Systems 2008, Chapter 10, Section 10.2 Hydraulic Design, 10.2.2.1 Maximum and Minimum Operating Pressures: The normal operating pressure in the distribution system should be approximately 350 to 480 kPa and not less than 275kPa. The maximum pressures in the distribution system should not exceed 700 kPa to avoid damage to household plumbing and unnecessary water and energy consumption).

An MDD extended period simulation was performed under the above conditions. The pressures within the proposed developed varied between 315 kPa to 340 kPa over the 72 hour simulation. These pressures are more than the minimum recommended by the MOE Design Guidelines.

Under ultimate build out MDD-conditions, the available fire flow in the vicinity of the proposed development ranges from approximately 165L/s to 170L/s. While these fire flows do not meet the minimum 233 L/s fire flow required by the Fire Underwriter, the minimum fire flow of 150 L/s required by the Ontario Building Code (OBC) is met. Therefore, the fire flows are satisfactory.

We trust that the above modelling results will assist you in your assessment of the proposed Balmoral Village Development. If you have any questions or require further detail, please do not hesitate to contact this office.

Yours truly

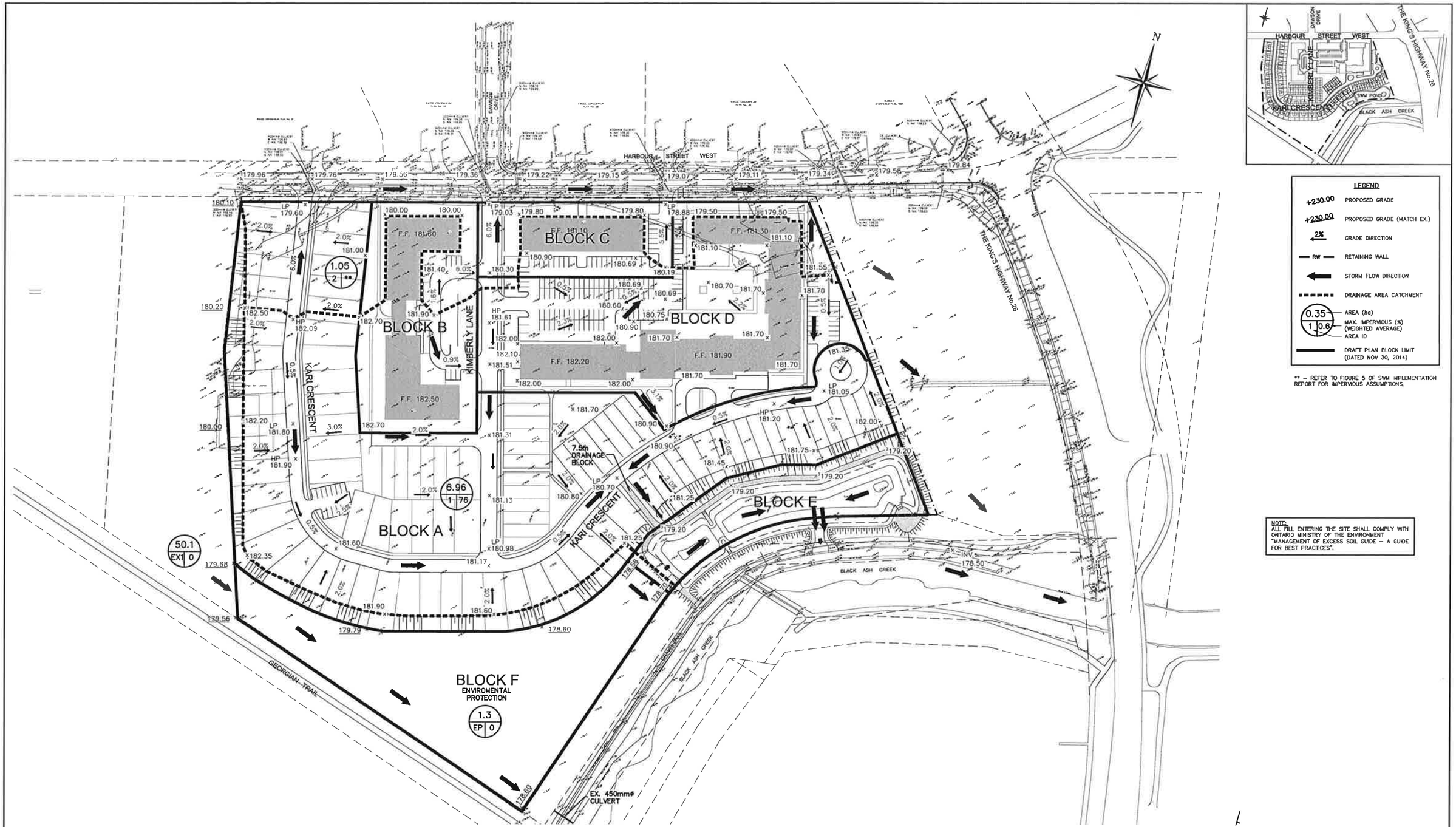
AINLEY & ASSOCIATES LIMITED

Julia Roest E.I.T.

JER/S:\115020\Correspondence\Letter\Balmoral Village Development.docx

APPENDIX D

Approved Block Grading and Master Drainage Plan



LEGEND

- +230.00 — PROPOSED GRADE
- +230.00 — PROPOSED GRADE (MATCH EX.)
- 2% — GRADE DIRECTION
- RW — RETAINING WALL
- STORM FLOW DIRECTION
- DRAINAGE AREA CATCHMENT
- 0.35 / 1 | 0.6 — AREA (ha); MAX. IMPERVIOUS (%) (WEIGHTED AVERAGE); AREA ID
- DRAFT PLAN BLOCK LIMIT (DATED NOV 30, 2014)

** – REFER TO FIGURE 5 OF SWM IMPLEMENTATION REPORT FOR IMPERVIOUS ASSUMPTIONS.

NOTE:
ALL FILL ENTERING THE SITE SHALL COMPLY WITH ONTARIO MINISTRY OF THE ENVIRONMENT "MANAGEMENT OF EXCESS SOIL GUIDE – A GUIDE FOR BEST PRACTICES".

BENCHMARKS

GEODETIC BENCHMARK 72U313 HAVING AN ELEVATION OF 179.63.

TEMPORARY BENCHMARKS

TBM#1–
TBM#2–
TBM#3–

Town

No.	ISSUE / REVISION	DATE: MM/DD/YYYY
0	FIRST SUBMISSION	09/10/2014
1	SECOND SUBMISSION	12/10/2014
2	THIRD SUBMISSION	02/20/2015
3	ISSUED FOR FINAL APPROVAL	03/16/2015

Engineer: LICENSED PROFESSIONAL ENGINEER K. A. MORRIS PROVINCE OF ONTARIO

Engineer: LICENSED PROFESSIONAL ENGINEER D.M. TONE 100115132 PROVINCE OF ONTARIO

Project: BALMORAL VILLAGE
TOWN OF COLLINGWOOD

Drawing: BLOCK GRADING AND MASTER DRAINAGE PLAN

CROZIER & ASSOCIATES Consulting Engineers
THE HARBOUREDGE BUILDING, 40 HURON STREET, SUITE 301, COLLINGWOOD, ON L9Y 4R3
705 446-3510 T
705 446-3520 F
WWW.CFCROZIER.CA
INFO@CFCROZIER.CA

Drawn By	Design By	Project
J.O.	J.O.	362–2897
Scale: 1:1000	Date: 09/10/2014	Check By: D.T.	Drawing: 103A

J:\300\362 - Black Ash Creek Village\2897 Black Ash Enterprises Inc\CAD\C3D\Sheets\2897 - 103-LG.dwg, 103A, 3/19/2015 10:31:12 AM, jonell

APPENDIX E

Block 1 Groundwater Separation Summary Table

CROZIER &ASSOCIATES
Consulting Engineers

PROJECT: 362-4007
DATE: July 22, 2015
NAME: A. Spencer
CHECK: D. Tone

Unit ID	Basement Floor Elevation (BFE) (m)	Ground Water Level (GWL) (m)	Clearance (m)	Minimum Clearance Obtained (≥0.5m)
1	179.76	179.26	0.5	Yes
2	179.76	179.26	0.5	Yes
3	179.76	179.26	0.5	Yes
4	179.76	179.26	0.5	Yes
5	180.49	179.25	1.24	Yes
6	180.49	179.25	1.24	Yes
7	180.49	179.25	1.24	Yes
8	180.49	179.24	1.25	Yes
9	180.49	179.24	1.25	Yes
10	180.49	179.24	1.25	Yes
11	180.16	179.23	0.93	Yes
12	180.16	179.23	0.93	Yes
13	179.93	178.9	1.03	Yes
14	179.93	178.9	1.03	Yes
15	179.93	178.9	1.03	Yes
16	179.93	178.9	1.03	Yes
17	179.76	179.26	0.5	Yes
18	179.76	179.26	0.5	Yes
19	179.76	179.26	0.5	Yes
20	179.76	179.26	0.5	Yes
21	179.86	179.25	0.61	Yes
22	179.86	179.25	0.61	Yes
23	179.95	179.25	0.7	Yes
24	179.95	179.25	0.7	Yes
25	179.95	179.24	0.71	Yes
26	179.95	179.24	0.71	Yes
27	179.83	179.23	0.6	Yes
28	179.83	179.23	0.6	Yes
29	179.66	179.16	0.5	Yes
30	179.66	179.16	0.5	Yes
31	179.66	179.16	0.5	Yes
32	179.66	179.06	0.6	Yes

CROZIER & ASSOCIATES
Consulting Engineers

PROJECT: 362-4007
DATE: July 22, 2015
NAME: A. Spencer
CHECK: D. Tone

Unit ID	Basement Floor Elevation (BFE) (m)	Ground Water Level (GWL) (m)	Clearance (m)	Minimum Clearance Obtained (≥0.5m)
33	179.66	179.06	0.6	Yes
34	179.59	179	0.59	Yes
35	179.59	179	0.59	Yes
36	179.54	178.96	0.58	Yes
37	179.54	178.96	0.58	Yes
38	179.48	178.9	0.58	Yes
39	179.48	178.9	0.58	Yes
40	179.36	178.85	0.51	Yes
41	179.36	178.85	0.51	Yes
42	179.25	178.75	0.5	Yes
43	179.25	178.75	0.5	Yes
44	179.15	178.63	0.52	Yes
45	179.15	178.63	0.52	Yes
46	179.5	178.6	0.9	Yes
47	179.5	178.6	0.9	Yes
48	179.5	178.75	0.75	Yes
49	179.5	178.75	0.75	Yes
50	179.89	178.85	1.04	Yes
51	179.89	178.85	1.04	Yes
52	179.89	178.85	1.04	Yes
53	179.88	178.75	1.13	Yes
54	179.88	178.75	1.13	Yes
55	179.88	178.75	1.13	Yes
56	179.62	178.65	0.97	Yes
57	179.62	178.65	0.97	Yes
58	179.22	178.62	0.6	Yes
59	179.22	178.62	0.6	Yes
60	179.37	178.59	0.78	Yes
61	179.37	178.59	0.78	Yes
62	179.27	178.58	0.69	Yes
63	179.27	178.58	0.69	Yes
64	179.13	178.5	0.63	Yes

CROZIER &ASSOCIATES
Consulting Engineers

PROJECT: 362-4007
DATE: July 22, 2015
NAME: A. Spencer
CHECK: D. Tone

Unit ID	Basement Floor Elevation (BFE) (m)	Ground Water Level (GWL) (m)	Clearance (m)	Minimum Clearance Obtained (≥0.5m)
65	179.13	178.5	0.63	Yes
66	179.13	178.51	0.62	Yes
67	179.13	178.51	0.62	Yes
68	179.13	178.53	0.6	Yes
69	179.13	178.53	0.6	Yes
70	179.13	178.53	0.6	Yes
71	179.23	178.53	0.7	Yes
72	179.23	178.53	0.7	Yes
73	179.13	178.55	0.58	Yes
74	179.13	178.55	0.58	Yes
75	179.03	178.53	0.5	Yes
76	179.03	178.53	0.5	Yes
77	178.99	178.49	0.5	Yes
78	178.99	178.49	0.5	Yes
79	178.95	178.45	0.5	Yes
80	178.95	178.45	0.5	Yes
81	178.95	178.42	0.53	Yes
82	178.95	178.42	0.53	Yes
83	178.85	178.35	0.5	Yes
84	178.85	178.35	0.5	Yes
85	178.85	178.35	0.5	Yes
86	178.85	178.35	0.5	Yes
87	178.85	178.35	0.5	Yes
88	178.85	178.35	0.5	Yes
89	178.93	178.35	0.58	Yes
90	178.93	178.35	0.58	Yes
91	178.93	178.3	0.63	Yes
92	178.93	178.3	0.63	Yes
93	179.04	178.18	0.86	Yes
94	179.04	178.18	0.86	Yes
95	179.04	178.18	0.86	Yes
96	179.04	178.18	0.86	Yes

APPENDIX F

7.5 m Drainage Easement Capacity Calculations

7.5 m Drainage Easement Capacity Calculations

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.03000	m/m
Left Side Slope	3.00	m/m (H:V)
Right Side Slope	3.00	m/m (H:V)
Bottom Width	3.10	m
Discharge	2.00	m^3/s

Results

Normal Depth	0.30	m
Flow Area	1.20	m^2
Wetted Perimeter	4.99	m
Hydraulic Radius	0.24	m
Top Width	4.90	m
Critical Depth	0.31	m
Critical Slope	0.02544	m/m
Velocity	1.67	m/s
Velocity Head	0.14	m
Specific Energy	0.44	m
Froude Number	1.08	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	m
Length	0.00	m
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	m
Profile Description		
Profile Headloss	0.00	m
Downstream Velocity	Infinity	m/s
Upstream Velocity	Infinity	m/s
Normal Depth	0.30	m
Critical Depth	0.31	m
Channel Slope	0.03000	m/m
Critical Slope	0.02544	m/m

APPENDIX G

5-Year and 100-Year (HGL) Storm Sewer Design Sheets

CROZIER & ASSOCIATES
Consulting Engineers

PROJECT: Balmoral Village
PROJECT No.: 362-4007
FILE: Storm Sewer Design

Balmoral Village at Harbour Street

5 YEAR - STORM SEWER DESIGN MODEL

DESIGN: A. Spencer
CHECK: D.Tone
UPDATED: July 22, 2015

FREQUENCY		5 YEARS - Owen Sound IDF			100 YEARS - Owen Sound IDF			
5 YEARS	Coef. A=	28.5	Coef. B=	-0.726	Coef. A=	46.8	Coef. B=	-0.734

TIME OF CONCENTRATION 10.00 MANNINGS "n" 0.013

CATCHMENT AREA I.D.	FR MH NO	TO MH NO	AREA (A) (Ha)	RUN-OFF COEFF (C5)	RUN-OFF COEFF (C100)	A x C	Cummul. A x C	TIME OF CONC. (min.)	I (mm/hr)	Q (l/sec)	SLOPE (%)	PIPE DIA. (mm)	VEL. (m/sec)	LENGTH (m)	TIME OF FLOW (min)	CAPACITY (l/sec)	VEL. ACTUAL (m/s)	PIPE INV ELEV. UPPER END	PIPE INV ELEV. LOWER END	PIPE OBV ELEV. UPPER END	PIPE OBV ELEV. LOWER END	GROUND ELEV. UPPER END	GROUND ELEV. LOWER END	OBV. COVER UPPER END	OBV. COVER LOWER END
1	16	15	0.08	0.71	0.80	0.057	0.057	10.00	104.66	**16.58**	0.50	300	0.97	43.8	0.75	**68.38**	0.80	179.77	179.55	180.07	179.85	181.32	181.85	1.25	2.00
2	15A (CB)	15	0.11	0.42	0.48	0.047	0.047	10.00	104.66	**13.53**	0.50	300	0.97	36.8	0.63	**68.38**	0.75	179.74	179.55	180.04	179.85	180.70	181.85	0.66	2.00
	15	14	0.00	0.71	0.79	0.000	0.104	10.75	99.28	**28.56**	0.35	375	0.94	40.3	0.72	**103.73**	0.81	179.48	179.34	179.85	179.71	181.85	181.63	2.00	1.92
3	14	13	0.27	0.71	0.79	0.191	0.294	11.47	94.74	**77.43**	0.20	450	0.80	45.6	0.95	**127.50**	0.83	179.26	179.17	179.71	179.62	181.63	181.41	1.92	1.79
4	13B (CB)	13A	0.21	0.36	0.42	0.077	0.077	10.00	104.66	**22.26**	0.50	300	0.97	33.0	0.57	**68.38**	0.87	179.57	179.41	179.87	179.71	180.30	181.49	0.43	1.78
	13A	13	0.00	0.36	0.42	0.000	0.077	10.57	100.54	**21.38**	0.50	300	0.97	7.3	0.13	**68.38**	0.85	179.36	179.32	179.66	179.62	181.49	181.41	1.83	1.79
5	13	12	0.17	0.50	0.57	0.086	0.456	12.42	89.43	**113.37**	0.20	525	0.89	16.8	0.32	**192.33**	0.92	179.09	179.06	179.62	179.59	181.41	181.31	1.79	1.72
	12	11	0.00	0.50	0.57	0.000	0.456	12.73	87.82	**111.33**	0.20	525	0.89	16.9	0.32	**192.33**	0.92	179.01	178.98	179.54	179.50	181.31	181.22	1.77	1.72
	11	10	0.00	0.50	0.57	0.000	0.456	13.05	86.27	**109.36**	0.20	525	0.89	22.3	0.42	**192.33**	0.92	178.93	178.88	179.45	179.41	181.22	181.00	1.77	1.59
6	10	9	0.23	0.54	0.61	0.125	0.581	13.47	84.31	**136.07**	0.20	525	0.89	63.8	1.20	**192.33**	0.96	178.83	178.70	179.36	179.23	181.00	180.10	1.64	0.87
13	24	23	0.27	0.90	1.00	0.243	0.243	10.00	104.66	**70.70**	0.30	450	0.98	7.2	0.12	**156.16**	0.95	179.37	179.35	179.82	179.80	180.97	180.97	1.15	1.17
14	23	22	0.02	0.90	1.00	0.018	0.261	10.12	103.74	**75.27**	0.30	450	0.98	9.8	0.17	**156.16**	0.97	179.27	179.24	179.72	179.69	180.97	181.27	1.25	1.58
7	26	25	0.16	0.90	1.00	0.144	0.144	10.00	104.66	**41.90**	0.30	375	0.87	25.4	0.49	**96.03**	0.83	179.52	179.45	179.90	179.82	181.33	180.99	1.43	1.17
9	27A (CB)	27	0.08	0.90	1.00	0.072	0.072	10.00	104.66	**20.95**	0.50	300	0.97	43.0	0.74	**68.38**	0.85	179.79	179.58	180.09	179.88	180.94	180.99	0.85	1.11
10	27R (CB)	27	0.14	0.90	1.00	0.126	0.126	10.00	104.66	**36.66**	0.50	450	1.27	12.5	0.16	**201.60**	0.96	179.49	179.43	179.94	179.88	181.60	180.99	1.66	1.11
11	27	25	0.08	0.90	1.00	0.072	0.270	10.74	99.37	**74.59**	0.30	525	1.09	18.1	0.28	**235.55**	0.97	179.35	179.30	179.88	179.82	180.99	180.99	1.11	1.17
8	25A (CB)	25	0.13	0.90	1.00	0.117	0.117	10.00	104.66	**34.04**	0.50	375	1.12	45.2	0.67	**123.98**	0.97	179.67	179.45	180.05	179.82	180.94	180.99	0.89	1.17
12	25	22	0.15	0.90	1.00	0.135	0.666	11.02	97.55	**180.61**	0.20	750	1.13	26.5	0.39	**497.87**	1.04	179.07	179.02	179.82	179.77	180.99	181.27	1.17	1.50
	22	20	0.00	0.90	1.00	0.000	0.927	11.41	95.10	**245.09**	0.20	750	1.13	48.2	0.71	**497.87**	1.12	178.94	178.84	179.69	179.59	181.27	181.11	1.58	1.52
15	21	20	0.31	0.90	1.00	0.279	0.279	10.00	104.66	**81.18**	0.50	375	1.12	7.2	0.11	**123.98**	1.20	179.22	179.19	179.60	179.56	181.11	181.11	1.51	1.55
16	20	19	0.06	0.53	0.59	0.032	1.238	12.12	91.01	**313.09**	0.20	750	1.13	26.9	0.40	**497.87**	1.19	178.81	178.76	179.56	179.51	181.11	180.97	1.55	1.46
17	19A	19	0.55	0.50	0.57	0.278	0.278	10.00	104.66	**80.74**	0.30	450	0.98	15.3	0.26	**156.16**	0.99	179.10	179.06	179.55	179.51	180.81	180.97	1.26	1.46
18	19	18	0.07	0.58	0.65	0.041	1.556	12.52	88.90	**384.43**	0.20	900	1.27	37.8	0.50	**809.60**	1.25	178.61	178.53	179.51	179.43	180.97	180.78	1.46	1.35
19	18	17	0.20	0.49	0.55	0.098	1.653	13.02	86.43	**397.19**	0.20	900	1.27	24.8	0.32	**809.60**	1.26	178.50	178.45	179.40	179.35	180.78	180.66	1.38	1.31
20	17	9	0.22	0.66	0.74	0.146	1.799	13.34	84.90	**424.49**	0.20	900	1.27	6.5	0.09	**809.60**	1.29	178.42	178.41	179.32	179.31	180.66	180.10	1.34	0.79

CROZIER & ASSOCIATES
Consulting Engineers

PROJECT: Balmoral Village
PROJECT No.: 362-4007
FILE: Storm Sewer Design

Balmoral Village at Harbour Street

5 YEAR - STORM SEWER DESIGN MODEL

DESIGN: A. Spencer
CHECK: D.Tone
UPDATED: July 22, 2015

FREQUENCY	5 YEARS - Owen Sound IDF				100 YEARS - Owen Sound IDF			
5 YEARS	Coef. A=	28.5	Coef. B=	-0.726	Coef. A=	46.5	Coef. B=	-0.734

TIME OF CONCENTRATION 10.00 MANNINGS "n" 0.013

CATCHMENT AREA I.D.	FR MH NO	TO MH NO	AREA (A) (Ha)	RUN-OFF COEFF (C5)	RUN-OFF COEFF (C100)	A x C	Cummul. A x C	TIME OF CONC. (min.)	I (mm/hr)	Q (l/sec)	SLOPE (%)	PIPE DIA. (mm)	VEL. (m/sec)	LENGTH (m)	TIME OF FLOW (min)	CAPACITY (l/sec)	VEL. ACTUAL (m/s)	PIPE INV ELEV. UPPER END	PIPE INV ELEV. LOWER END	PIPE OBV ELEV. UPPER END	PIPE OBV ELEV. LOWER END	GROUND ELEV. UPPER END	GROUND ELEV. LOWER END	OBV. COVER UPPER END	OBV. COVER LOWER END
21	21A (CB)	9	0.12	0.59	0.66	0.071	0.071	10.00	104.66	**20.51**	0.50	300	0.97	6.5	0.11	**68.38**	0.85	178.96	178.93	179.26	179.23	180.78	180.10	1.52	0.87
	9	8	0.00	0.59	0.66	0.000	2.450	14.67	79.26	**539.74**	0.20	900	1.27	8.2	0.11	**809.60**	1.36	178.33	178.31	179.23	179.21	180.10	180.73	0.87	1.52
	8	7	0.00	0.59	0.66	0.000	2.450	14.77	78.84	**536.88**	0.20	900	1.27	13.9	0.18	**809.60**	1.36	178.26	178.24	179.16	179.14	180.73	180.66	1.57	1.52
	7	6	0.00	0.59	0.66	0.000	2.450	14.95	78.14	**532.13**	0.20	900	1.27	14.1	0.18	**809.60**	1.36	178.19	178.16	179.09	179.06	180.66	180.58	1.57	1.52
22	6	5	0.14	0.63	0.71	0.089	2.538	15.14	77.45	**546.47**	0.20	900	1.27	26.9	0.35	**809.60**	1.36	178.11	178.05	179.01	178.95	180.58	180.45	1.57	1.50
23	5	4	0.16	0.57	0.64	0.092	2.630	15.49	76.17	**556.79**	0.20	1050	1.41	23.7	0.28	**1221.22**	1.38	177.90	177.86	178.95	178.91	180.45	180.33	1.50	1.42
24	35	34	0.35	0.90	1.00	0.315	0.315	10.00	104.66	**91.65**	1.00	375	1.59	16.0	0.17	**175.33**	1.60	179.12	178.96	179.50	179.34	181.30	180.72	1.80	1.38
25	34	33	0.24	0.68	0.76	0.164	0.479	10.17	103.40	**137.55**	0.30	525	1.09	33.4	0.51	**235.55**	1.13	178.81	178.71	179.34	179.24	180.72	180.75	1.38	1.51
	33	29	0.00	0.68	0.76	0.000	0.479	10.68	99.78	**132.73**	0.30	525	1.09	32.5	0.50	**235.55**	1.12	178.66	178.57	179.19	179.09	180.75	180.59	1.56	1.50
28	32	30	0.09	0.90	1.00	0.081	0.081	10.00	104.66	**23.57**	0.50	300	0.97	31.0	0.53	**68.38**	0.87	179.19	179.03	179.49	179.33	180.49	180.96	1.00	1.63
26	36	31	0.08	0.90	1.00	0.072	0.072	10.00	104.66	**20.95**	0.50	300	0.97	23.0	0.40	**68.38**	0.85	179.29	179.17	179.59	179.47	180.92	180.92	1.33	1.45
27	31	30	0.09	0.90	1.00	0.081	0.153	10.40	101.75	**43.28**	0.50	375	1.12	28.2	0.42	**123.98**	1.02	179.10	178.96	179.47	179.33	180.92	180.96	1.45	1.63
29	30	29	0.08	0.71	0.80	0.057	0.291	10.81	98.87	**79.99**	0.40	525	1.26	60.0	0.80	**272.00**	1.09	178.81	178.57	179.33	179.09	180.96	180.59	1.63	1.50
30	29	28	0.20	0.41	0.47	0.083	0.852	11.61	93.91	**222.42**	0.40	750	1.59	26.0	0.27	**704.10**	1.42	178.34	178.24	179.09	178.99	180.59	180.46	1.50	1.47
31	28	4	0.27	0.34	0.40	0.093	0.945	11.88	92.34	**242.59**	0.40	750	1.59	28.0	0.29	**704.10**	1.43	178.19	178.08	178.94	178.83	180.46	180.33	1.52	1.50
32	4	3	0.23	0.70	0.79	0.162	3.737	15.77	75.18	**780.97**	0.20	1050	1.41	7.2	0.09	**1221.22**	1.49	177.78	177.76	178.83	178.81	180.33	180.33	1.50	1.52
33	3	2	0.09	0.65	0.73	0.059	3.795	15.86	74.89	**790.10**	1.10	1050	3.31	33.0	0.17	**2864.01**	2.84	177.73	177.37	178.78	178.42	180.33	179.10	1.55	0.68
	2	Inlet#1	0.00	0.65	0.73	0.000	3.795	16.02	74.33	**784.14**	0.20	1050	1.41	9.2	0.11	**1221.22**	1.49	177.32	177.30	178.37	178.35	179.10	178.82	0.73	0.47
			5.65			3.80																			

CROZIER & ASSOCIATES
Consulting Engineers

PROJECT: Balmoral Village
PROJECT No.: 362-4007
FILE: Storm Sewer Design

Balmoral Village at Harbour Street
100 YEAR - STORM SEWER DESIGN MODEL WITH HGL ANALYSIS

DESIGN: A. Spencer
CHECK: D.Tone
UPDATED: July 22, 2015

FREQUENCY	5 YEARS - Owen Sound IDF				100 YEARS - Owen Sound IDF			
5 YEARS	Coef. A=	28.5	Coef. B=	-0.726	Coef. A=	46.6	Coef. B=	-0.734

TIME OF CONCENTRATION 10.00 MANNINGS "n" 0.013

																FLOW CALCULATIONS				FRICTION LOSSES		JUNCTION LOSSES (ONE LATERAL)										
CATCHMENT AREA I.D.	FR MH NO	TO MH NO	AREA (A) (Ha)	RUN-OFF COEFF (C5)	RUN-OFF COEFF (C100)	A x C	Cummul. A x C	TIME OF CONC. (min.)	I (mm/hr)	Q (l/sec)	SLOPE (%)	PIPE DIA. (mm)	VEL. (m/sec)	LENGTH (m)	TIME OF FLOW (min)	CAPACITY (l/sec)	Full Hyd. Radius m	Full Area m^2	Q/A Press m/s	PreseVel. Head m	Sf Press m/m	Head Loss Hf m	Theta1 deg	Theta3 deg	A1 Inflow m^2	A2 Outflow m^2	A3 Lateral m^2	Q1 Inflow m^3/s	Q2 Outflow m^3/s	Q3 Lateral m^3/s	D1 Inflow m	D2 Outflow m	Hj m
1	16	15	0.08	0.71	0.80	0.064	0.064	10.00	173.23	**30.70**	0.50	300	0.97	43.8	0.75	**68.38**	0.08	0.071	0.434	0.010	0.00101												
2	15A (CB)	15	0.11	0.42	0.48	0.053	0.053	10.00	173.23	**25.58**	0.50	300	0.97	36.8	0.63	**68.38**	0.08	0.071	0.362	0.007	0.00070												
	15	14	0.00	0.71	0.79	0.000	0.117	10.75	164.22	**53.36**	0.35	375	0.94	40.3	0.72	**103.73**	0.09	0.110	0.483	0.012	0.00093												
3	14	13	0.27	0.71	0.79	0.213	0.330	11.47	156.64	**143.70**	0.20	450	0.80	45.6	0.95	**127.50**	0.11	0.159	0.904	0.042	0.00254												
4	13B (CB)	13A	0.21	0.36	0.42	0.088	0.088	10.00	173.23	**42.44**	0.50	300	0.97	33.0	0.57	**68.38**	0.08	0.071	0.600	0.018	0.00193												
	13A	13	0.00	0.36	0.42	0.000	0.088	10.57	166.34	**40.75**	0.50	300	0.97	7.3	0.13	**68.38**	0.08	0.071	0.577	0.017	0.00178												
5	13	12	0.17	0.50	0.57	0.097	0.515	12.42	147.77	**211.56**	0.20	525	0.89	16.8	0.32	**192.33**	0.13	0.216	0.977	0.049	0.00242												
	12	11	0.00	0.50	0.57	0.000	0.515	12.73	145.08	**207.71**	0.20	525	0.89	16.9	0.32	**192.33**	0.13	0.216	0.959	0.047	0.00233												
	11	10	0.00	0.50	0.57	0.000	0.515	13.05	142.48	**203.99**	0.20	525	0.89	22.3	0.42	**192.33**	0.13	0.216	0.942	0.045	0.00225												
6	10	9	0.23	0.54	0.61	0.141	0.656	13.47	139.22	**253.75**	0.20	525	0.89	63.8	1.20	**192.33**	0.13	0.216	1.172	0.070	0.00348												
13	24	23	0.27	0.90	1.00	0.270	0.270	10.00	173.23	**130.02**	0.30	450	0.98	7.2	0.12	**156.16**	0.11	0.159	0.818	0.034	0.00208	0.01											
14	23	22	0.02	0.90	1.00	0.020	0.290	10.12	171.69	**138.42**	0.30	450	0.98	9.8	0.17	**156.16**	0.11	0.159	0.870	0.039	0.00236	0.02											
7	26	25	0.16	0.90	1.00	0.160	0.160	10.00	173.23	**77.05**	0.30	375	0.87	25.4	0.49	**96.03**	0.09	0.110	0.698	0.025	0.00193	0.05											
9	27A (CB)	27	0.08	0.90	1.00	0.080	0.080	10.00	173.23	**38.53**	0.50	300	0.97	43.0	0.74	**68.38**	0.08	0.071	0.545	0.015	0.00159	0.07											
10	27R (CB)	27	0.14	0.90	1.00	0.140	0.140	10.00	173.23	**67.42**	0.50	450	1.27	12.5	0.16	**201.60**	0.11	0.159	0.424	0.009	0.00056	0.01											
11	27	25	0.08	0.90	1.00	0.080	0.300	10.74	164.37	**137.09**	0.30	525	1.09	18.1	0.28	**235.55**	0.13	0.216	0.633	0.020	0.00102	0.02	0.00	90.00	0.16	0.22	0.07	0.07	0.14	0.04	0.45	0.53	0.107
8	25A (CB)	25	0.13	0.90	1.00	0.130	0.130	10.00	173.23	**62.60**	0.50	375	1.12	45.2	0.67	**123.98**	0.09	0.110	0.567	0.016	0.00127	0.06											
12	25	22	0.15	0.90	1.00	0.150	0.740	11.02	161.33	**331.88**	0.20	750	1.13	26.5	0.39	**497.87**	0.19	0.442	0.751	0.029	0.00089	0.02											
	22	20	0.00	0.90	1.00	0.000	1.030	11.41	157.24	**450.25**	0.20	750	1.13	48.2	0.71	**497.87**	0.19	0.442	1.019	0.053	0.00164	0.08	90.00	0.00	0.44	0.44	0.16	0.33	0.45	0.14	0.75	0.75	0.078
15	21	20	0.31	0.90	1.00	0.310	0.310	10.00	173.23	**149.29**	0.50	375	1.12	7.2	0.11	**123.98**	0.09	0.110	1.352	0.093	0.00725	0.05											
16	20	19	0.06	0.53	0.59	0.036	1.376	12.12	150.40	**575.17**	0.20	750	1.13	26.9	0.40	**497.87**	0.19	0.442	1.302	0.086	0.00267	0.07	0.00	90.00	0.44	0.44	0.11	0.45	0.58	0.15	0.75	0.75	0.067
17	19A	19	0.55	0.50	0.57	0.314	0.314	10.00	173.23	**151.39**	0.30	450	0.98	15.3	0.26	**156.16**	0.11	0.159	0.952	0.046	0.00282	0.04											
18	19	18	0.07	0.58	0.65	0.046	1.736	12.52	146.88	**708.69**	0.20	900	1.27	37.8	0.50	**809.60**	0.23	0.636	1.114	0.063	0.00153	0.06	0.00	90.00	0.44	0.64	0.16	0.58	0.71	0.15	0.75	0.90	0.158
19	18	17	0.20	0.49	0.55	0.111	1.846	13.02	142.76	**732.71**	0.20	900	1.27	24.8	0.32	**809.60**	0.23	0.636	1.152	0.068	0.00164	0.04											
20	17	9	0.22	0.66	0.74	0.163	2.009	13.34	140.20	**783.15**	0.20	900	1.27	6.5	0.09	**809.60**	0.23	0.636	1.231	0.077	0.00187	0.01											

PROJECT: Balmoral Village
PROJECT No.: 362-4007
FILE: Storm Sewer Design

Balmoral Village at Harbour Street
100 YEAR - STORM SEWER DESIGN MODEL WITH HGL ANALYSIS

			JUNCTION LOSSES (TWO LATERALS)																									
CATCHMENT AREA I.D.	FR MH NO	TO MH NO	Theta1 deg	Theta3 deg	Theta4 deg	A1 Inflow m^2	A2 Outflow m^2	A3 Lateral m^2	A4 Lateral m^2	Q1 Inflow m^3/s	Q2 Outflow m^3/s	Q3 Lateral m^3/s	Q4 Lateral m^3/s	D1 Inflow m	D2 Outflow m	Hj m	Km	Hm m	Theta deg	Kb	Hb m	Total Head Loss m	HGL Upper m	Height Above T/G m	FALL (m)	PIPE INV ELEV. UPPER END	PIPE INV ELEV. LOWER END	PIPE OBV ELEV. UPPER END	PIPE OBV ELEV. LOWER END	GROUND ELEV. UPPER END	GROUND ELEV. LOWER END	OBV. COVER UPPER END	OBV. COVER LOWER END
1	16	15																							0.22	179.77	179.55	180.07	179.85	181.32	181.85	1.25	2.00
2	15A (CB)	15																							0.18	179.74	179.55	180.04	179.85	180.70	181.85	0.66	2.00
	15	14																							0.14	179.48	179.34	179.85	179.71	181.85	181.63	2.00	1.92
3	14	13																							0.09	179.26	179.17	179.71	179.62	181.63	181.41	1.92	1.79
4	13B (CB)	13A																							0.16	179.57	179.41	179.87	179.71	180.30	181.49	0.43	1.78
	13A	13																							0.04	179.36	179.32	179.66	179.62	181.49	181.41	1.83	1.79
5	13	12																							0.03	179.09	179.06	179.62	179.59	181.41	181.31	1.79	1.72
	12	11																							0.03	179.01	178.98	179.54	179.50	181.31	181.22	1.77	1.72
	11	10																							0.04	178.93	178.88	179.45	179.41	181.22	181.00	1.77	1.59
6	10	9																							0.13	178.83	178.70	179.36	179.23	181.00	180.10	1.64	0.87
13	24	23																				0.01	180.46	-0.51	0.02	179.37	179.35	179.82	179.80	180.97	180.97	1.15	1.17
14	23	22																	90.00	1.32	0.05	0.07	180.44	-0.53	0.03	179.27	179.24	179.72	179.69	180.97	181.27	1.25	1.58
7	26	25																				0.05	180.76	-0.57	0.08	179.52	179.45	179.90	179.82	181.33	180.99	1.43	1.17
9	27A (CB)	27																				0.07	180.90	-0.04	0.22	179.79	179.58	180.09	179.88	180.94	180.99	0.85	1.11
10	27R (CB)	27																				0.01	180.84	-0.76	0.06	179.49	179.43	179.94	179.88	181.60	180.99	1.66	1.11
11	27	25																				0.13	180.83	-0.16	0.05	179.35	179.30	179.88	179.82	180.99	180.99	1.11	1.17
8	25A (CB)	25																				0.06	180.77	-0.17	0.23	179.67	179.45	180.05	179.82	180.94	180.99	0.89	1.17
12	25	22	90.00	0.00	50.00	0.22	0.44	0.11	0.11	0.14	0.33	0.06	0.08	0.53	0.75	0.315						0.34	180.71	-0.28	0.05	179.07	179.02	179.82	179.77	180.99	181.27	1.17	1.50
	22	20																				0.16	180.37	-0.90	0.10	178.94	178.84	179.69	179.59	181.27	181.11	1.58	1.52
15	21	20																				0.05	180.26	-0.85	0.04	179.22	179.19	179.60	179.56	181.11	181.11	1.51	1.55
16	20	19																				0.14	180.21	-0.90	0.05	178.81	178.76	179.56	179.51	181.11	180.97	1.55	1.46
17	19A	19																				0.04	180.12	-0.69	0.05	179.10	179.06	179.55	179.51	180.81	180.97	1.26	1.46
18	19	18																				0.22	180.07	-0.90	0.08	178.61	178.53	179.51	179.43	180.97	180.78	1.46	1.35
19	18	17															0.05	0.00				0.04	179.86	-0.92	0.05	178.50	178.45	179.40	179.35	180.78	180.66	1.38	1.31
20	17	9															0.05	0.00				0.02	179.81	-0.85	0.01	178.42	178.41	179.32	179.31	180.66	180.10	1.34	0.79

CROZIER & ASSOCIATES Consulting Engineers

PROJECT: Balmoral Village
PROJECT No.: 362-4007
FILE: Storm Sewer Design

Balmoral Village at Harbour Street
100 YEAR - STORM SEWER DESIGN MODEL WITH HGL ANALYSIS

DESIGN: A. Spencer
CHECK: D.Tone
UPDATED: July 22, 2015

FREQUENCY		5 YEARS - Owen Sound IDF			100 YEARS - Owen Sound IDF		
5 YEARS	Coef. A=	28.5	Coef. B=	-0.726	Coef. A= 46.5	Coef. B=	-0.734

TIME OF CONCENTRATION 10.00 MANNINGS "n" 0.013

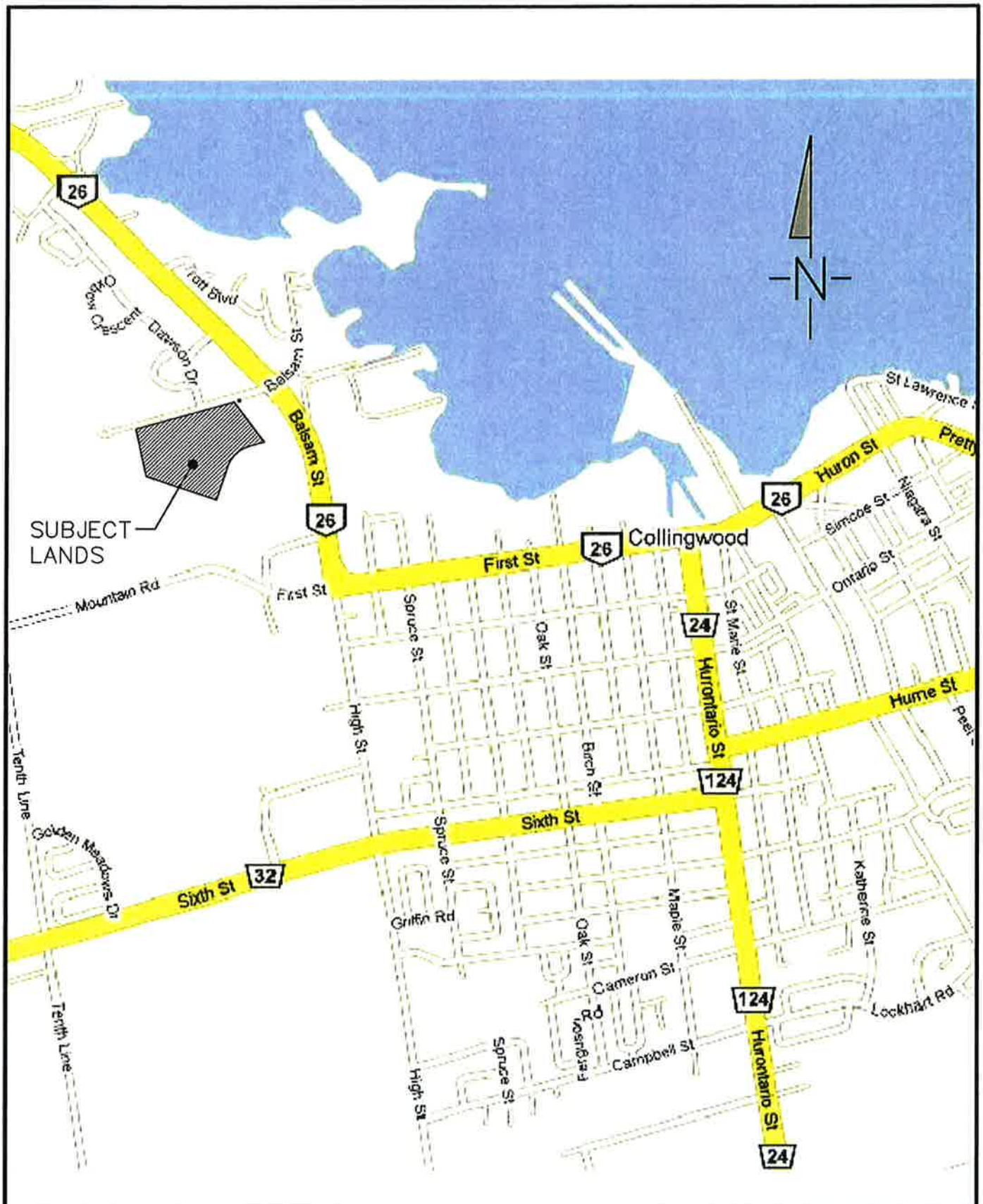
CATCHMENT AREA I.D.	FR MH NO	TO MH NO	AREA (A) (Ha)	RUN-OFF COEFF (C5)	RUN-OFF COEFF (C100)	A x C	Cummul. A x C	TIME OF CONC. (min.)	I (mm/hr)	Q (l/sec)	SLOPE (%)	PIPE DIA. (mm)	VEL. (m/sec)	LENGTH (m)	TIME OF FLOW (min)	CAPACITY (l/sec)	FLOW CALCULATIONS: Full Hyd. Radius m	Full Area m^2	Q/A Press m/s	PressVel. Head m	FRICTION LOSSES: Sf Press m/m	Head Loss Hf m	JUNCTION LOSSES (ONE LATERAL): Theta1 deg	Theta3 deg	A1 Inflow m^2	A2 Outflow m^2	A3 Lateral m^2	Q1 Inflow m^3/s	Q2 Outflow m^3/s	Q3 Lateral m^3/s	D1 Inflow m	D2 Outflow m	Hj m
21	21A (CB)	9	0.12	0.59	0.66	0.079	0.079	10.00	173.23	**38.22**	0.50	300	0.97	6.5	0.11	**68.38**	0.08	0.071	0.541	0.015	0.00156	0.01											
	9	8	0.00	0.59	0.66	0.000	2.744	14.67	130.79	**997.81**	0.20	900	1.27	8.2	0.11	**809.60**	0.23	0.636	1.568	0.125	0.00304	0.02											
	8	7	0.00	0.59	0.66	0.000	2.744	14.77	130.09	**992.49**	0.20	900	1.27	13.9	0.18	**809.60**	0.23	0.636	1.560	0.124	0.00301	0.04											
	7	6	0.00	0.59	0.66	0.000	2.744	14.95	128.92	**983.60**	0.20	900	1.27	14.1	0.18	**809.60**	0.23	0.636	1.546	0.122	0.00295	0.04											
22	6	5	0.14	0.63	0.71	0.099	2.844	15.14	127.77	**1010.08**	0.20	900	1.27	26.9	0.35	**809.60**	0.23	0.636	1.588	0.128	0.00311	0.08											
23	5	4	0.16	0.57	0.64	0.103	2.947	15.49	125.63	**1029.18**	0.20	1050	1.41	23.7	0.28	**1221.22**	0.26	0.866	1.189	0.072	0.00142	0.03											
24	35	34	0.35	0.90	1.00	0.350	0.350	10.00	173.23	**168.55**	1.00	375	1.59	16.0	0.17	**175.33**	0.09	0.110	1.526	0.119	0.00924	0.15											
25	34	33	0.24	0.68	0.76	0.183	0.533	10.17	171.12	**253.62**	0.30	525	1.09	33.4	0.51	**235.55**	0.13	0.216	1.172	0.070	0.00348	0.12											
	33	29	0.00	0.68	0.76	0.000	0.533	10.68	165.07	**244.64**	0.30	525	1.09	32.5	0.50	**235.55**	0.13	0.216	1.130	0.065	0.00324	0.11											
28	32	30	0.09	0.90	1.00	0.090	0.090	10.00	173.23	**43.34**	0.50	300	0.97	31.0	0.53	**68.38**	0.08	0.071	0.613	0.019	0.00201	0.06											
26	36	31	0.08	0.90	1.00	0.080	0.080	10.00	173.23	**38.53**	0.50	300	0.97	23.0	0.40	**68.38**	0.08	0.071	0.545	0.015	0.00159	0.04											
27	31	30	0.09	0.90	1.00	0.090	0.170	10.40	168.36	**79.56**	0.50	375	1.12	28.2	0.42	**123.98**	0.09	0.110	0.720	0.026	0.00206	0.06											
29	30	29	0.08	0.71	0.80	0.064	0.324	10.81	163.55	**147.20**	0.40	525	1.26	60.0	0.80	**272.00**	0.13	0.216	0.680	0.024	0.00117	0.07	0.00	90.00	0.07	0.22	0.11	0.04	0.15	0.08	0.30	0.53	0.277
30	29	28	0.20	0.41	0.47	0.094	0.951	11.61	155.24	**410.53**	0.40	750	1.59	26.0	0.27	**704.10**	0.19	0.442	0.929	0.044	0.00136	0.04	0.00	70.00	0.22	0.44	0.22	0.24	0.41	0.15	0.53	0.75	0.247
31	28	4	0.27	0.34	0.40	0.108	1.059	11.88	152.63	**449.23**	0.40	750	1.59	28.0	0.29	**704.10**	0.19	0.442	1.017	0.053	0.00163	0.05											
32	4	3	0.23	0.70	0.79	0.181	4.187	15.77	123.99	**1443.14**	0.20	1050	1.41	7.2	0.09	**1221.22**	0.26	0.866	1.667	0.142	0.00279	0.02	90.00	90.00	0.87	0.87	0.44	1.03	1.44	0.45	1.05	1.05	0.283
33	3	2	0.09	0.65	0.73	0.066	4.253	15.86	123.50	**1459.99**	1.10	1050	3.31	33.0	0.17	**2864.01**	0.26	0.866	1.686	0.145	0.00286	0.09											
	2	Inlet#1	0.00	0.65	0.73	0.000	4.253	16.02	122.56	**1448.85**	0.20	1050	1.41	9.2	0.11	**1221.22**	0.26	0.866	1.673	0.143	0.00282	0.03											
			5.65			4.25																											

PROJECT: Balmoral Village
PROJECT No.: 382-4007
FILE: Storm Sewer Design

Balmoral Village at Harbour Street
100 YEAR - STORM SEWER DESIGN MODEL WITH HGL ANALYSIS

			JUNCTION LOSSES (TWO LATERALS)																									
CATCHMENT AREA I.D.	FR MH NO	TO MH NO	Theta1 deg	Theta3 deg	Theta4 deg	A1 Inflow m^2	A2 Outflow m^2	A3 Lateral m^2	A4 Lateral m^2	Q1 Inflow m^3/s	Q2 Outflow m^3/s	Q3 Lateral m^3/s	Q4 Lateral m^3/s	D1 Inflow m	D2 Outflow m	HJ m	Km	Hm m	Theta deg	Kb	Hb m	Total Head Loss m	HGL Upper m	Height Above T/G m	FALL (m)	PIPE INV ELEV. UPPER END	PIPE INV ELEV. LOWER END	PIPE OBV ELEV. UPPER END	PIPE OBV ELEV. LOWER END	GROUND ELEV. UPPER END	GROUND ELEV. LOWER END	OBV. COVER UPPER END	OBV. COVER LOWER END
21	21A (CB)	9																				0.01	179.81	-0.97	0.03	178.96	178.93	179.26	179.23	180.78	180.10	1.52	0.87
	9	8	0.00	90.00	90.00	0.22	0.64	0.07	0.64	0.25	1.00	0.04	0.78	0.53	0.90	0.449						0.47	179.80	-0.30	0.02	178.33	178.31	179.23	179.21	180.10	180.73	0.87	1.52
	8	7																	20.00	0.12	0.01	0.06	179.32	-1.41	0.03	178.26	178.24	179.16	179.14	180.73	180.66	1.57	1.52
	7	6																	15.00	0.08	0.01	0.05	179.27	-1.39	0.03	178.19	178.16	179.09	179.06	180.66	180.58	1.57	1.52
22	6	5																	15.00	0.08	0.01	0.09	179.22	-1.36	0.05	178.11	178.05	179.01	178.95	180.58	180.45	1.57	1.50
23	5	4															0.05	0.00				0.04	179.12	-1.33	0.05	177.90	177.86	178.95	178.91	180.45	180.33	1.50	1.42
24	35	34																				0.15	179.88	-1.42	0.16	179.12	178.96	179.50	179.34	181.30	180.72	1.80	1.38
25	34	33																	90.00	1.32	0.09	0.21	179.73	-0.99	0.10	178.81	178.71	179.34	179.24	180.72	180.75	1.38	1.51
	33	29																	10.00	0.08	0.00	0.11	179.52	-1.23	0.10	178.66	178.57	179.19	179.09	180.75	180.59	1.56	1.50
28	32	30																				0.06	179.82	-0.67	0.16	179.19	179.03	179.49	179.33	180.49	180.96	1.00	1.63
26	36	31																				0.04	179.89	-1.03	0.12	179.29	179.17	179.59	179.47	180.92	180.92	1.33	1.45
27	31	30																	90.00	1.32	0.03	0.09	179.86	-1.06	0.14	179.10	178.96	179.47	179.33	180.92	180.96	1.45	1.63
29	30	29																				0.35	179.76	-1.20	0.24	178.81	178.57	179.33	179.09	180.96	180.59	1.63	1.50
30	29	28																				0.28	179.42	-1.17	0.10	178.34	178.24	179.09	178.99	180.59	180.46	1.50	1.47
31	28	4															0.05	0.00				0.05	179.13	-1.33	0.11	178.19	178.08	178.94	178.83	180.46	180.33	1.52	1.50
32	4	3																				0.30	179.08	-1.25	0.01	177.78	177.76	178.83	178.81	180.33	180.33	1.50	1.52
33	3	2															0.05	0.01				0.10	178.78	-1.55	0.36	177.73	177.37	178.78	178.42	180.33	179.10	1.55	0.68
	2	Inlet#1															0.05	0.01				0.03	178.58	-0.52	0.02	177.32	177.30	178.37	178.35	179.10	178.82	0.73	0.47
																						TW=	178.55									

LIST OF FIGURES



Legend

SUBJECT LANDS

Project

BALMORAL VILLAGE
TOWN OF COLLINGWOOD

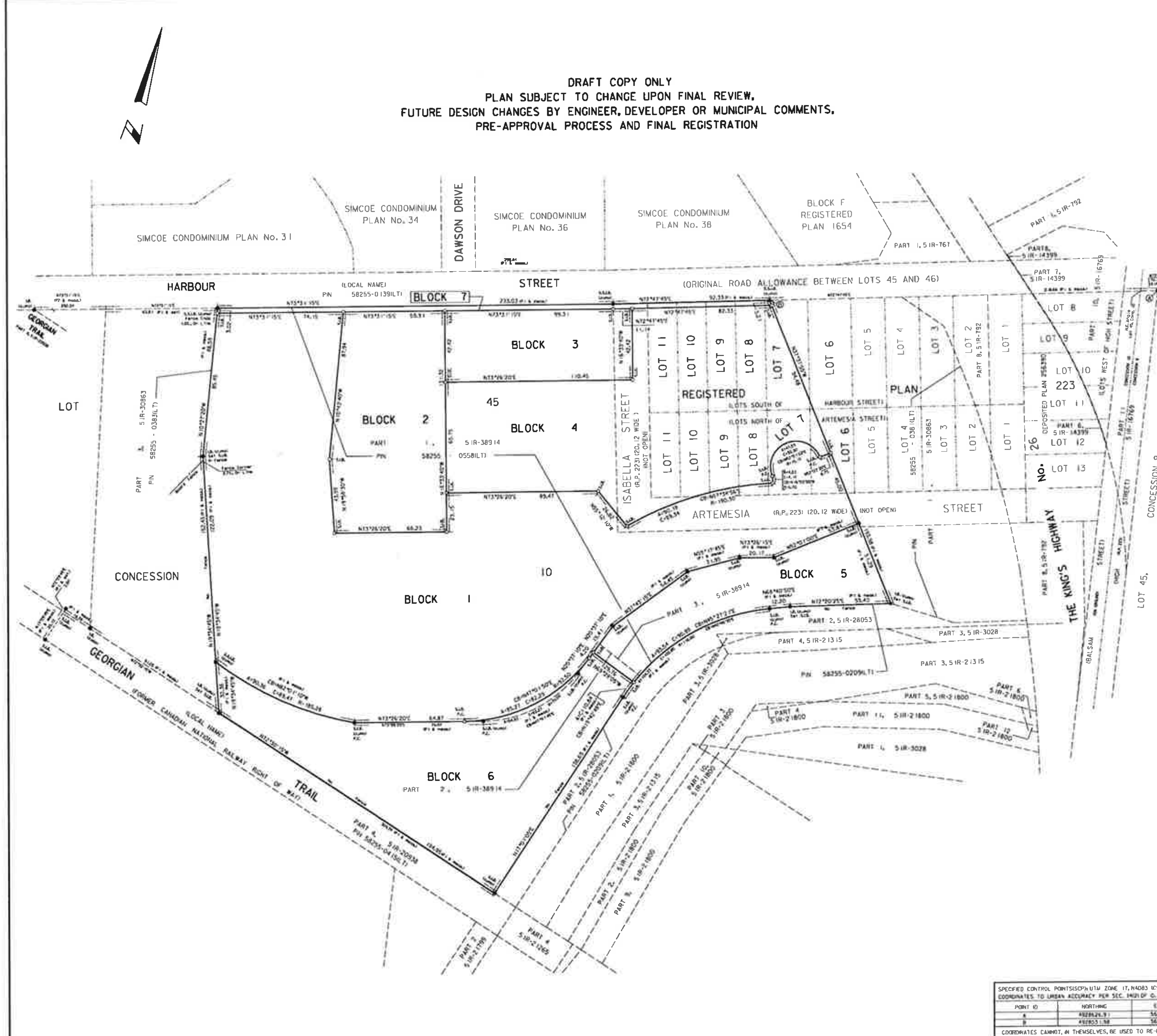
Drawing

SITE LOCATION PLAN

CROZIER & ASSOCIATES ENGINEERS

110 PINE STREET,
COLLINGWOOD, ON L9Y 2N9
705 446-9510 T
705 446-9520 F
WWW.CFCROZIER.CA
INFO@CFCROZIER.CA

Drawn By	L.A.D.	Design By	A.J.F.	Project	362-2897
Scale	N.T.S.	Date	07/24/2008	Check By	A.J.F.	Drawing	Fig. 1



PLAN 51M-

I CERTIFY THAT THIS PLAN IS REGISTERED IN THE LAND REGISTRY OFFICE FOR THE LAND TITLES DIVISION OF SIMCOE (No. 51)
AT ______ O'CLOCK ON THE ______ DAY OF ______________ 2015
AND ENTERED IN THE PARCEL REGISTER FOR PROPERTY IDENTIFIER __________ (LT) AND THE REQUIRED CONSENTS ARE REGISTERED AS PLAN DOCUMENT No. ______________

____
REPRESENTATIVE FOR LAND REGISTRAR

THIS PLAN COMPRISES ALL OF PIN 58255-0558(LT)

APPROVED UNDER SECTION 51 OF THE PLANNING ACT, R.S.O. 1990, C.P. 13, AS AMENDED

THE CORPORATION OF THE TOWN OF COLLINGWOOD

THIS ________ DAY OF ______________ , 2015

____
NAME
I HAVE THE AUTHORITY TO BIND THE CORPORATION

PLAN OF SURVEY OF PART LOT 45, CONCESSION 10
(FORMERLY TOWNSHIP OF NOTTAWASAGA)
AND LOTS 8, 9, 10 AND 11 AND PART OF LOTS 6 AND 7 SOUTH OF HARBOUR STREET AND LOTS 7, 8, 9, 10 AND 11 AND PART LOT 6 NORTH OF ARTEMESIA STREET AND ISABELLA STREET AND PART OF ARTEMESIA STREET REGISTERED PLAN 223 TOWN OF COLLINGWOOD COUNTY OF SIMCOE

SCALE 1:1000

0 5 10 15 20 40 METRES

NOTES:

DISTANCES ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

BEARINGS ARE UTM GRID, DERIVED FROM OBSERVED REFERENCE POINTS A AND B, BY REAL TIME NETWORK OBSERVATIONS, UTM ZONE 17, NAD 83 (CSRS) (1997).

FOR BEARING COMPARISONS, A ROTATION OF 0°30'15" COUNTER-CLOCKWISE WAS APPLIED TO THE BEARINGS ON PLANS 51R-30863, 51R-20938 AND 51R-28053 TO CONVERT TO UTM BEARINGS.

DISTANCES ON THIS PLAN ARE HORIZONTAL GROUND DISTANCES AND CAN BE CONVERTED TO GRID DISTANCES BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.999616.

◇	DENOTES SET
◆	DENOTES FOUND
◇ S.I.B.	DENOTES STANDARD IRON BAR
◇ I.B.	DENOTES IRON BAR
◇ SSIB	DENOTES SHORT STANDARD IRON BAR
◇ C.C.	DENOTES CUT CROSS
◇ C.P.	DENOTES CONCRETE PIN
WIT	DENOTES WITNESS
MEAS	DENOTES MEASURE
R.P.	DENOTES REGISTERED PLAN
N, S, E, W,	DENOTES NORTH, SOUTH, EAST, WEST
P.C.	DENOTES POINT OF CURVATURE
P1	REFERS TO PLAN 51R-38914

OWNER'S CERTIFICATE

THIS IS TO CERTIFY THAT:

1. BLOCKS 1 TO 7, (BOTH INCLUSIVE), HAVE BEEN LAID OUT IN ACCORDANCE WITH MY INSTRUCTIONS.
2. THE STREETS ARE HEREBY DEDICATED TO THE CORPORATION OF THE TOWN OF COLLINGWOOD AS PUBLIC HIGHWAYS.

DATED THIS TH DAY OF MARCH 2015

BLACK ASH ENTERPRISES INC. ______________________
SIGNING OFFICER
I HAVE THE AUTHORITY TO BIND THIS CORPORATION

SURVEYOR'S CERTIFICATE

I CERTIFY THAT:

1. THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT, THE SURVEYORS ACT AND THE LAND TITLES ACT AND THE REGULATIONS MADE UNDER THEM.
2. THE SURVEY WAS COMPLETED ON THE TH DAY OF SEPTEMBER 2015.

MARCH , 2015

______________________ O.L.S.
PAUL R. THOMSEN
ONTARIO LAND SURVEYOR
COLLINGWOOD

SPECIFIED CONTROL POINTS(SCP): UTM ZONE 17, NAD83 (CSRS) (1997)
COORDINATES TO URBAN ACCURACY PER SEC. 14(2) OF O. REG. 216/10.

POINT ID	NORTHING	EASTING
A	4928626.91	560731.75
B	4928531.58	560425.11

COORDINATES CANNOT, IN THEMSELVES, BE USED TO RE-ESTABLISH CORNERS OR BOUNDARIES SHOWN ON THIS PLAN

ZUBEK, EMO PATTEN & THOMSEN LIMITED
ONTARIO LAND SURVEYORS
39 STEWART ROAD
COLLINGWOOD, ONTARIO L9Y 4M7
PHONE: (705) 445-4910 FAX: (705) 445-5866

JOB No. 68-190-14 SURVEY FOR: BLACK ASH ENTERPRISES INC.

HARBOUR STREET WEST

EX. SAN MH#22

EX. SAN MH#10

SAN MH#1

SAN MH#11

DAWSON DRIVE

THE KINGS HIGHWAY No.26

KIMBERLY LANE

KARI CRESCENT

SAN MH#2

SAN MH#3

SAN MH#4

SAN MH#5

SAN MH#6

SAN MH#7

SAN MH#8

SAN MH#9

SAN MH#12

SAN MH#13

SAN MH#14

SAN MH#15

SAN MH#16

SAN MH#17

SAN MH#18

SAN MH#19

SAN MH#20

SAN MH#21

SAN MH#23

SAN MH#24

SAN MH#25

SAN MH#26

SAN MH#27

SAN MH#28

SAN MH#29

SAN MH#30

4 STOREY 127 UNIT RETIREMENT RESIDENCE & CLUBHOUSE

4 STOREY 44 UNIT APARTMENT BUILDING

FUTURE CONDOMINIUM BUILDING

FUTURE 4 STOREY 2800 sq.m COMMERCIAL BUILDING

185.5 / 0.42

COM. / 0.42

0 / 0.08

154 / 0.82

444.5 / 0.88

196 / 0.44

56.0 / 0.65

0 / 0.02

3.5 / 0.21

35.0 / 0.37

14.0 / 0.21

14.0 / 0.16

24.5 / 0.29

10.5 / 0.14

7.0 / 0.14

7.0 / 0.11

21.0 / 0.23

31.5 / 0.44

10.5 / 0.15

7 / 0.12

24.5 / 0.27

21.0 / 0.22

17.5 / 0.19

10.5 / 0.13

14.0 / 0.20

7.0 / 0.11

100.4m–200mm# SAN @ 0.4%

30.7m–200mm# SAN @ 1.0%

6.1m–200mm# SAN @ 1.0%

73.8m–200mm# SAN @ 0.5%

10.3m–200mm# SAN @ 1.0%

6.0m–200mm# SAN @ 1.0%

7.5m–200mm# SAN @ 1.0%

46.5m–200mm# SAN @ 0.5%

14.0m–200mm# SAN @ 0.4%

29.0m–200mm# SAN @ 0.4%

75.4m–200mm# SAN @ 0.4%

42.2m–200mm# SAN @ 0.4%

37.2m–200mm# SAN @ 0.4%

31.2m–200mm# SAN @ 0.4%

27.0m–200mm# SAN @ 0.4%

35.5m–200mm# SAN @ 0.5%

23.6m–200mm# SAN @ 0.4%

15.7m–200mm# SAN @ 0.4%

19.6m–200mm# SAN @ 0.9%

58.0m–200mm# SAN @ 0.5%

23.9m–200mm# SAN @ 0.4%

18.3m–200mm# SAN @ 0.4%

20.5m–200mm# SAN @ 0.4%

35.3m–200mm# SAN @ 0.4%

51.4m–200mm# SAN @ 0.4%

61.0m–200mm# SAN @ 1.0%

37.4m–200mm# SAN @ 1.0%

BLACK ASH CREEK

GRAVEL TRAIL

ENVIROMENTAL PROTECTION

HARBOUR STREET WEST

DAWSON DRIVE

THE KINGS HIGHWAY No.26

SWM POND

BLACK ASH CREEK

LEGEND

- SANITARY DRAINAGE AREA
- 7 / 0.60 — POPULATION (3.5 p.p.u.) / AREA (ha)
- PR. SANITARY SEWER & MANHOLE
- (S) PR. SANITARY SERVICE
- (INJ) PR. SANITARY BASEMENT INJECTOR PUMPS REQUIRED

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BENCHMARKS

GEODETIC BENCHMARK 72U313 HAVING AN ELEVATION OF 179.63.

TEMPORARY BENCHMARKS

TBM#1–
TBM#2–
TBM#3–

Town

No.	ISSUE / REVISION	DATE: MM/DD/YYYY
0	FIRST SUBMISSION	07/22/2015

Engineer

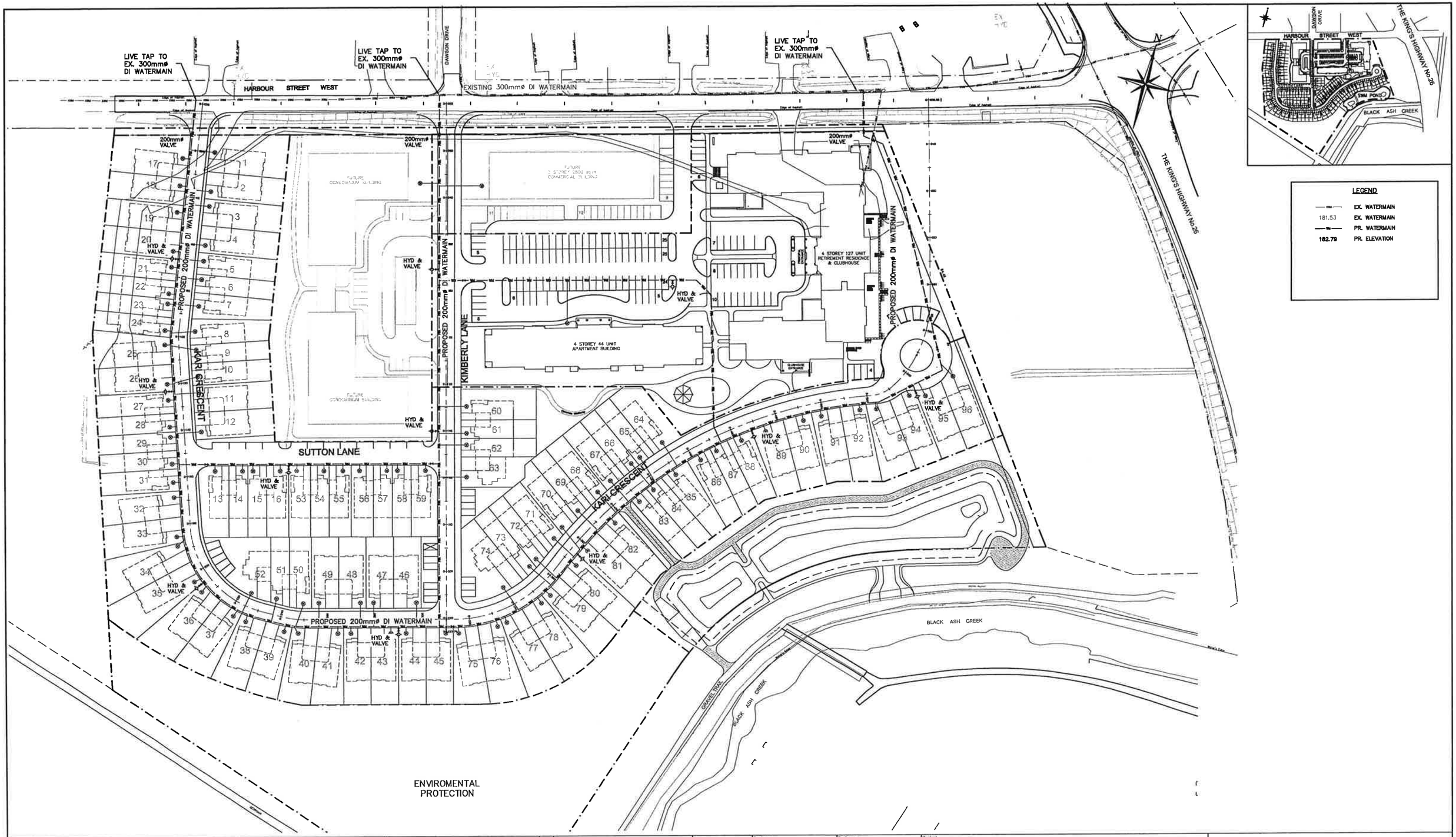
Engineer

Project: BALMORAL VILLAGE – SITE PLAN
TOWN OF COLLINGWOOD

Drawing: SANITARY DRAINAGE AREA PLAN

CROZIER & ASSOCIATES Consulting Engineers
THE HARBOUREDGE BUILDING, 40 HURON STREET, SUITE 301, COLLINGWOOD, ON L9Y 4R3
705 446-3510 T
705 446-3520 F
WWW.CFCROZIER.CA
INFO@CFCROZIER.CA

Drawn By	Design By	Project
J.O.	S.W.	362–4007
Scale: 1:2000	Date: 06/29/2015	Check By: D.T.
		Drawing: Fig 3



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BENCHMARKS

GEODETIC BENCHMARK 72U313 HAVING AN ELEVATION OF 179.63.

TEMPORARY BENCHMARKS

TBM#1–
TBM#2–
TBM#3–

Town

No.	ISSUE / REVISION	DATE: MM/DD/YYYY
0	FIRST SUBMISSION	07/22/2015

Engineer

Engineer

Project: BALMORAL VILLAGE – SITE PLAN
TOWN OF COLLINGWOOD

Drawing: WATER DISTRIBUTION PLAN

CROZIER & ASSOCIATES Consulting Engineers
THE HARBOUREDGE BUILDING,
40 HURON STREET, SUITE 301,
COLLINGWOOD, ON L9Y 4R3
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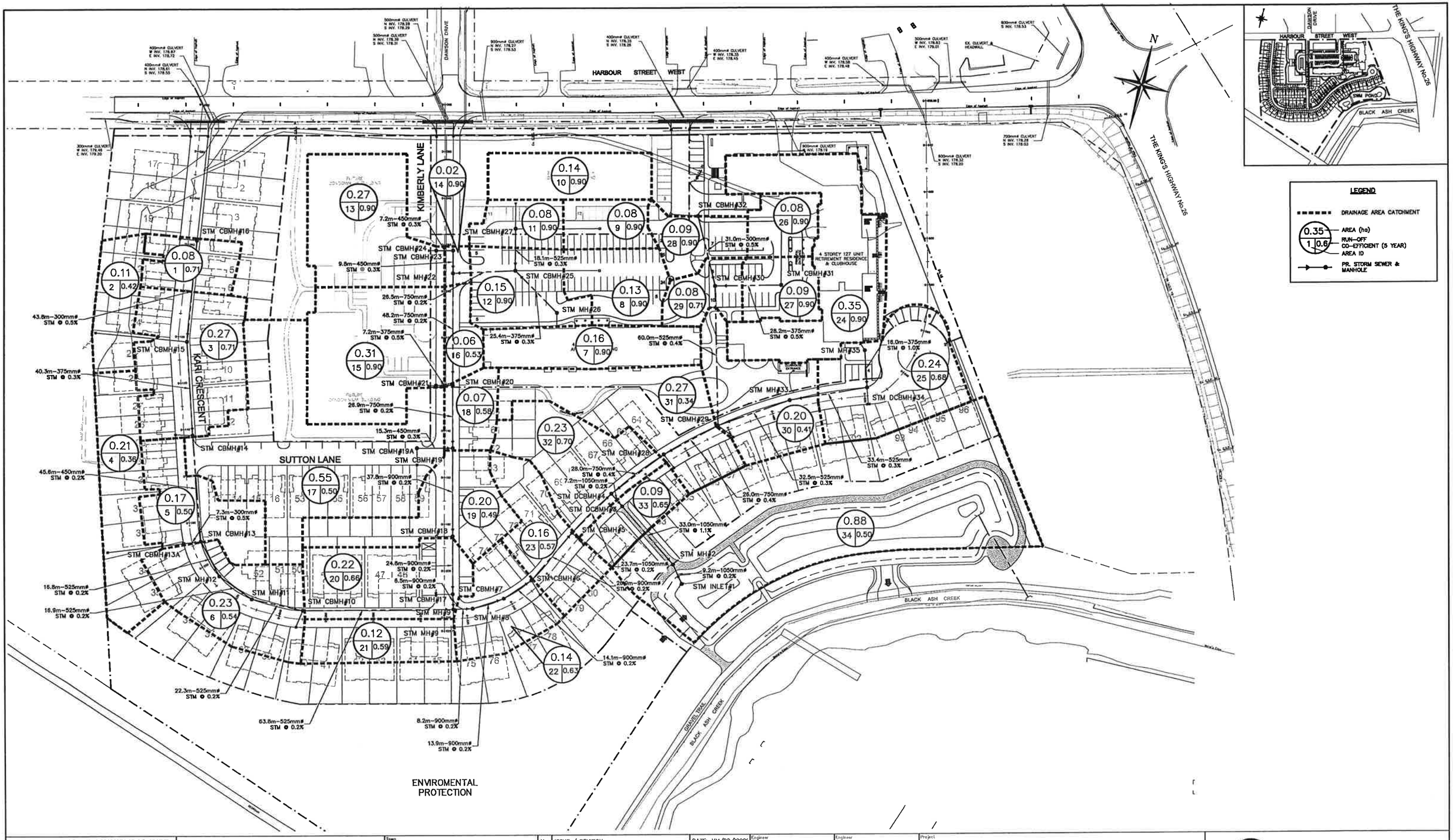
Drawn By	J.O.	Design By	S.W.	Project	362-4007
Scale	1:1500	Date	08/29/2015	Check By	D.T.	Drawing	Fig 4



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3. THIS DRAWING IS TO BE READ AND UNDERSTOOD IN CONJUNCTION WITH ALL OTHER PLANS AND DOCUMENTS APPLICABLE TO THIS PROJECT.
4. DO NOT SCALE THE DRAWINGS.
5. ALL EXISTING UNDERGROUND UTILITIES TO BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION.

BENCHMARKS

GEODETIC BENCHMARK 72U313 HAVING AN ELEVATION OF 179.63.

TEMPORARY BENCHMARKS

TBM#1--
TBM#2--
TBM#3--

No.	ISSUE / REVISION	DATE: MM/DD/YYYY
0	FIRST SUBMISSION	07/22/2015

Project: BALMORAL VILLAGE – SITE PLAN
TOWN OF COLLINGWOOD

Drawing: STORM DRAINAGE AREA PLAN

CROZIER & ASSOCIATES Consulting Engineers
THE HARBOUREDGE BUILDING, 40 HURON STREET, SUITE 301, COLLINGWOOD, ON L9Y 4R3
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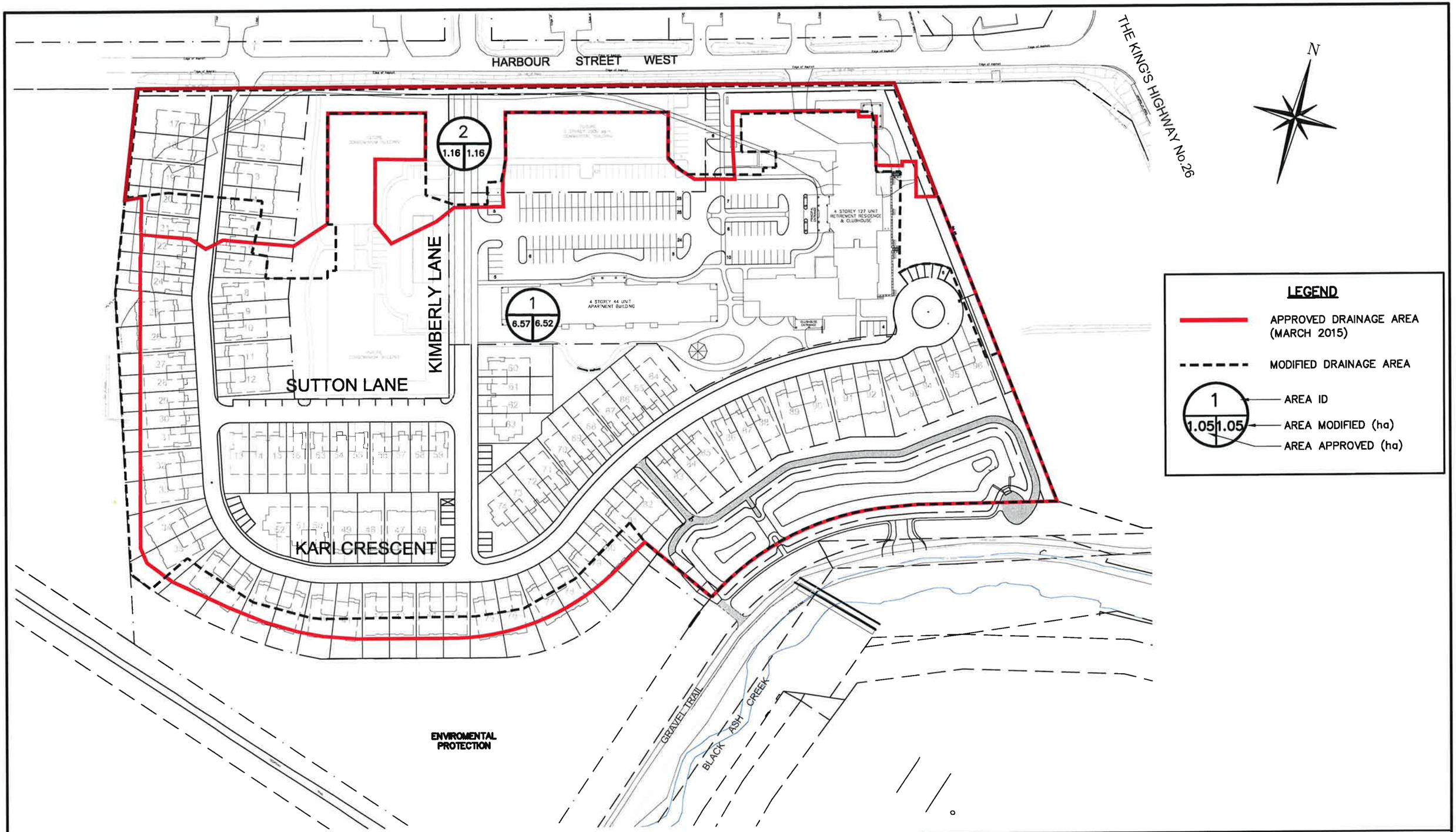
Drawn By	Design By	Project
J.O.	S.W.	362-4007
Scale	Date	Check By	Drawing
1:1500	08/29/2015	D.T.	Fig 5



Project
BALMORAL
TOWN OF COLLINGWOOD

Drawing
STORM AREA COMPARISONS

CROZIER & ASSOCIATES Consulting Engineers
THE HARBOURRIDGE BUILDING, 40 HURON STREET, SUITE 301, COLLINGWOOD, ON L9Y 4R3
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Drawn By	J.O.	Design By	S.W.	Project	362-4007
Scale	1:1500	Date	July 22, 2015	Check By	D.T.
				Drawing	FIG 6