

**FUNCTIONAL SERVICING &  
STORMWATER  
MANAGEMENT REPORT**

**ASHBURY EAST DEVELOPMENT**

**VILLAGE OF THORNBURY  
TOWN OF THE BLUE MOUNTAINS**

**PREPARED FOR:**

**61 ALFRED STREET WEST GP INC.**

**PREPARED BY:**

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**CFCA FILE NO. 1284-4979**

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| Revision Number | Date           | Comments                       |
|-----------------|----------------|--------------------------------|
| Rev.0           | September 2019 | Issued for Draft Plan Approval |
| Rev.1           | October 2019   | Issued for Draft Plan Approval |
| Rev.2           | June 2020      | Revised for New Lot Fabric     |

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## 1.0 Introduction

C.F. Crozier and Associates (Crozier) has been retained by 61 Alfred Street West GP Inc. to prepare a Functional Servicing and Stormwater Management Report to support the Draft Plan Application for the proposed Ashbury East Development located at 61 Alfred Street West in the Town of The Blue Mountains, Grey County. The Site is legally described as All of Lots 1, 2 and Part Of Lot 3, Township of Thornbury, Town of The Blue Mountains, County of Grey. Refer to the Site Location on Figure 1 for the location of the proposed development.

## 2.0 Site Description

Ashbury East covers approximately 1.3 hectares and is bound by Alfred Street West (Grey Road 113) to the north, Victoria Street to the west, and existing residential dwellings to the south and east. The Site currently consists of a two-storey residential dwelling, garage and a driveway which fronts onto Alfred Street West. The rest of the land consists of an open grass field with small trees scattered throughout the Site.

The proposed development consists of a mixed-residential subdivision including 19 units of various types fronting onto a public roadway/cul-de-sac. Refer to the Draft Plan of Subdivision prepared by MHBC, dated May 19, 2020 in Figure 2. Conditional severance approval was received to sever the north-east portion of the property to create two new lots. Refer to the Preliminary Severance Sketch prepared by MHBC, dated July 31, 2019 in Figure 3. One lot will be used for a new single detached dwelling unit (Part C) and the other will feature the existing residence (Part B).

The proposed internal roadway will be consistent with Town standards for a residential cul-de-sac. The cul-de-sac will have a 20m radius road allowance and with a minimum edge of pavement radius of 15m. The longitudinal road grade will be less than 4% from the centre bulb to the intersecting roadway.

External documents/plans were reviewed over the course of completing this engineering report. As such, the servicing and design considerations contained herein are assisted by the following:

- As constructed drawings provided by the Town of The Blue Mountains – 1976 (Orchard Drive), 1982 (Alfred Street West), 2001 (Victoria Street), 2002 (Thorncroft Court), 2017 (Ashbury Court);
- Ashbury Court - Servicing Brief prepared by WSP Canada Inc – April 2015;
- Ashbury Court – Approved for Construction Drawings by WSP Canada Inc – May 2017
- Site Survey by Hewitt and Milne Ltd – October 2018;
- DC Background Study by Hemson Consulting Ltd – February 2019; and
- Geotechnical Report by Peto MacCallum Ltd – August 2019.

### 3.0 Water Servicing

Potable water for the Site will be supplied by the Town of The Blue Mountains water distribution system.

#### 3.1 Existing Water Servicing

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

- An existing 300 mm diameter trunk watermain on Victoria Street South
- An existing 150 mm diameter watermain on Alfred Street West

#### 3.2 Design Water Demand

To estimate the proposed water demands for future development of the Site, the Town of The Blue Mountains Engineering Standards (2009) were consulted to determine the average, maximum day and peak hour water demands.

Water demands for the residential development were determined using the following design figures:

- Average Residential Flow Rate            450 L/cap/day
- Max Day/Peak Hour Factors            2.0/4.5

It is estimated that the maximum water demands for the proposed development are as follows:

- Average Day                                    0.23 L/sec
- Max Day                                        0.46 L/sec
- Peak Hour                                      1.02 L/sec

Fire flows required to service the site were calculated to be 100.00 L/s per the Fire Underwriter's Survey and 45 L/s per the Ontario Building Code. The preliminary design flow (peak hour + fire flow) for the Subject Site is 100.92 L/s, subject to detailed design. Refer to Appendix A for potable water servicing demand and fire flow demand calculations.

#### 3.3 Proposed Water Servicing

The watermain for the Site is proposed to be municipally owned and operated. Watermain will be constructed within the roadway per Town standards for a typical road section and will connect to the existing watermain on Victoria Street. Based on the expected water demand and similar developments in the area the proposed internal watermain is expected to be a 150mm diameter pipe with individual lot services of appropriate size. The water demand in the previous section is being provided to the Town to incorporate into the Town-wide water model to confirm sizing and available pressures. Internal watermain sizing may be subject to change.

Fire protection for the residential units will be provided by fire hydrants spaced as per Town Standards. It is noted that a hydrant flow test has not been completed to verify existing pressures and flow relationships; however, it is expected that adequate fire flows will be available to meet Town requirements. A 50mm diameter watermain loop is proposed at the end of the proposed internal roadway to provide water circulation for water quality purposes.

Refer to Figure 2 for the proposed water distribution strategy.

## 4.0 Sanitary Servicing

Sanitary servicing for the development will be achieved via connection to the Town of The Blue Mountains sanitary sewer system.

### 4.1 Existing Sanitary Servicing

The As-Constructed drawings indicate that the following infrastructure is available to service the Site:

- An existing 200 mm diameter sanitary sewer on Victoria Street South.
- An existing 200 mm diameter sanitary sewer on Alfred Street West.

### 4.2 Design Sanitary Flow

Preliminary sanitary flows for the Site were estimated using the following criteria as specified in the Town of The Blue Mountains Engineering Standards:

- |                                 |               |
|---------------------------------|---------------|
| • Average Residential Flow Rate | 450 L/cap/day |
| • Infiltration                  | 0.23 L/s/ha   |
| • Persons Per Residential Unit  | 2.3           |

Based on these values it is estimated that peak sanitary flow from the site will be 1.28 L/s. Since the Site was designated to be developed by the Town in the Official Plan (2016) and the relatively low flows from the proposed development, it is assumed that there will be sufficient capacity in the existing municipal sanitary system. Refer to Appendix B for sanitary design calculations.

### 4.3 Proposed Sanitary Servicing

The Site will be serviced via a gravity connection to the 200mm diameter sanitary sewer along Victoria Street. The internal sanitary sewer will follow the centre line of the internal roadway network per Town standards for a typical road section. Individual connections to each building that will be sufficiently deep to drain units with basements. Due to the relatively low peak sanitary flows calculated in the previous section it is reasonable to assume that a 200mm diameter internal sanitary sewer will provide adequate capacity to convey the wastewater to the Municipal system.

Sanitary maintenance holes will be installed with spacing consistent with Town standards. The proposed 200mm diameter internal sanitary sewer will be designed with sufficient slope to provide cleansing velocity within the sewer to reduce maintenance issues post construction.

Refer to Figure 2 for the proposed sanitary servicing strategy.

## 5.0 Stormwater Management

The management of stormwater and site drainage for the proposed development must comply with the policies and standards of the various agencies including the Town of The Blue Mountains, Grey Sauble Conservation Authority (GSCA), and Ministry of the Environment, Conservation and Parks (MECP).

The stormwater management criteria that will be met with the development of Ashbury East are as follows:

- Water Quality Control
  - “Enhanced Protection” given that Little Beaver River is the receiver.
- Water Quantity Control
  - The proposed SWM design must control post development flows to the available capacity of the outlet on Victoria Street, which will be determined during detailed design.
- Erosion Control
  - Erosion control for the 25mm storm event.
- Development Standard
  - Urban cross section complete with curb & gutter;
  - Lot grading at 2% optimum; and,
  - Minor and major drainage system to convey frequent and infrequent rainfall/runoff events, respectively.

## **5.1 Existing Drainage**

### **5.1.1 Internal Drainage**

On-site soils are classified as Brighton (BRS) sand with good drainage characteristics (Grey County Soil Mapping, 1979). Based on the topographic survey completed by Hewitt and Milne Ltd. (October 2018) the Site is relatively flat, but gently slopes from south to north conveying overland runoff to the roadside ditches along Alfred Street West and Victoria Street South. However, there are some low-lying areas along the south portion of the site, which are poorly drained.

The Alfred Street West ditch has been graded to convey overland flows to the east, and ultimately collected by the Alfred Street West storm sewer. The stormwater enters the existing Municipal 750mm diameter storm sewer on Alfred Street West, followed by a 1050mm diameter sewer west of Victoria Street South, which eventually outlets to Little Beaver River. A portion of the Site drains towards the Victoria Street South ditch, which is intercepted by a ditch-inlet catchbasin manhole and conveyed by the existing 675mm diameter storm sewer to the 1050mm diameter sewer on Alfred Street West. Refer to Figure 3 for the existing infrastructure and pre-development drainage areas.

Our office has reviewed the Geotechnical Investigation Report, dated August 1, 2019 by Peto MacCallum Ltd. (PML), which will be submitted under separate cover. It is understood that the Site will require topsoil to be stripped to a depth of approximately 0.7 to 1.0 m. PML identified the presence of a perched ground water table 1.3 to 1.5m below existing grade on July 8<sup>th</sup>, 2019. PML will be conducting year-long water table monitoring program to confirm the seasonal high ground water table. Based on the initial results it has been assumed that the Site will need to be raised between 1 to 1.5m above existing grade to provide clearance between the basement slab and the seasonal high groundwater table.



### 5.1.2 External Drainage

#### Thorncroft Court

Based on the Approved for Construction Grading Plan received from the Town, the adjacent lots on Thorncroft Court were designed to be graded with rear-to-front drainage. However, based on a site visit completed by our office, it is noted that grades were raised along the shared property line with a berm in order to provide the rear to front drainage for a portion of the adjacent lots. Therefore, a portion of the Thorncroft Court lots does drain towards the Subject Site.

#### Orchard Drive

Based on the As-Constructed drawings for Orchard Drive, the adjacent lots were also designed to be graded with rear to front drainage. It is noted that the residents on Orchard Drive have experienced drainage issues in the past, which are not expected to be exacerbated by the proposed development.

As noted during the pre-consultation meeting, the adjacent lots on Orchard Drive have a row of mature trees that are located just outside the property limits of the Site. The grading for the proposed development will minimize impacts to the existing tree line where possible.

## **5.2 Proposed Drainage**

Proposed post-development drainage conditions are depicted in Figure 4, which include preliminary grading, swales, existing and proposed storm sewer locations and sizes. Minor storm events up to and including the 5-year storm event will be conveyed via appropriately sized storm sewers. Major storm events (greater than a 5-year storm event) will be conveyed by overland flow routes via roadways and overland channels/swales.

It has been assumed that the majority of the lots in Ashbury East will be graded with split drainage and side yard swales, which will convey stormwater towards either the internal roadway or rear yard swale. Blocks 1, 2 and 3 will be graded with rear to front drainage, similar to the adjacent lots on Thorncroft Court, and convey run-off to the internal storm sewer system via side yard swales. Blocks 4 and 5 will be graded with split drainage to attempt to maintain the existing mature trees along the east property line. The rear yards will drain towards the proposed rear-lot catchbasin located in the backyard of Lot 5 and flow/drain into the proposed internal storm sewer system.

As shown in Figure 4, the Site will be split into two catchments. Proposed Catchment 1 will drain towards the internal roadway, which will convey runoff to Victoria Street South. Runoff from minor storm events will be collected by the internal storm sewer system and major storm events will be conveyed overland via the internal roadway. Proposed Catchment 2 will drain uncontrolled to the existing Alfred Street West roadway and storm sewer system.

As the Site drains into existing storm systems downstream, Crozier has completed a preliminary capacity assessment of the following infrastructure:

1. Victoria Street South Storm Sewer; and
2. Alfred Street West Storm Sewer.

### 5.2.1 Victoria Street South Storm Sewer

Victoria Street West currently consists of a rural roadway cross-section. Stormwater is conveyed via the existing 675mm diameter storm sewer located within the ditch on the east side of the roadway. Our office has reviewed the Ashbury Court - Servicing Brief prepared by WSP (April 2015), and it is understood that the existing 675mm storm sewer on Victoria Street does not have any residual capacity to convey runoff produced from the Site.

The Development Charges Background Study (Hemson, 2019) identified the section of Victoria Street between Alfred Street and Ashbury Court as requiring roadway and storm sewer upgrades in the future, which would provide additional capacity. Further, the Staff Report dated June 2, 2020 indicated that the Town is considering the advancement of the Victoria Street South road reconstruction project, which included the Victoria Street South and Alfred Street West intersection. Improvements should be coordinated with the Town to ensure that the Municipal storm sewer system improvements have capacity and can provide an outlet for the runoff produced from the proposed development.

At this stage we have assumed that the proposed development will provide quantity control to meet the available capacity in the storm sewer provided by any future upgrades. Upon review of the record drawings for Victoria Street South and Alfred Street West there appears to be an adequate amount of elevation difference between the storm sewers to potentially increase the size of the storm sewer on Victoria Street South to a 900mm diameter pipe. The proposed storm sewer would match obverts with the 675mm diameter pipe upstream and the 1050mm diameter pipe downstream.

### 5.2.2 Alfred Street West Storm Sewer

Based on the storm sewer design sheets appended in the Ashbury Court - Servicing Brief prepared by WSP (April 2015), it is understood that the existing 750mm diameter storm sewer on Alfred Street West is at approximately 80% capacity, which is not enough to convey the total amount of runoff produced from the proposed development. The proposed development will ensure that the total runoff being directed to Alfred Street West is less than or equal to the flow rate under pre-development conditions.

The available capacity of the 1050mm diameter storm sewer on Alfred Street West, immediately west of Victoria Street was calculated to be 922 L/s. Per the Ashbury Court Approved For Construction (AFC) Drawings (WSP, May 2017) there was an additional 0.492 ha catchment from Ashbury contributing stormwater to the Alfred Street West storm sewer. Based on the runoff coefficients provided in the AFC Drawings the remaining capacity in the Alfred Street West storm sewer post construction of Ashbury Court is approximately 847 L/s, which can accommodate the increased runoff from the proposed development.

## 5.3 **Stormwater Quantity Control**

To determine the pre and post development flows being directed to the storm sewer on Victoria Street South and Alfred Street West the Modified Rational Method was used to quantify the capacity required for the 2-year to 100-year storm events. Refer to Appendix C for the full Modified Rational Method Calculations. Per the Town of The Blue Mountains Engineering Standards (2009), the Intensity Duration Frequency Curves for the Owen Sound area were used in the calculations. The pre and post-development flows for Victoria Street South and Alfred Street West are shown below in Table 1 and Table 2, respectively.

**Table 1: Modified Rational Method – Victoria Street South**

|  | Pre Development |       |       |        | Post Development |       |       |        |
|--|-----------------|-------|-------|--------|------------------|-------|-------|--------|
|  | 5 yr            | 10 yr | 25 yr | 100 yr | 5 yr             | 10 yr | 25 yr | 100 yr |
| Uncontrolled Peak Flow (m <sup>3</sup> /s) | 0.019           | 0.022 | 0.026 | 0.031  | 0.140            | 0.163 | 0.192 | 0.234  |

**Table 2: Modified Rational Method - Alfred Street West**

|  | Pre Development |       |       |        | Post Development |       |       |        |
|--|-----------------|-------|-------|--------|------------------|-------|-------|--------|
|  | 5 yr            | 10 yr | 25 yr | 100 yr | 5 yr             | 10 yr | 25 yr | 100 yr |
| Uncontrolled Peak Flow (m <sup>3</sup> /s) | 0.070           | 0.081 | 0.095 | 0.116  | 0.044            | 0.051 | 0.060 | 0.073  |

Per the Town Engineering Standards, increases in the post-development runoff rates of any storm event should be controlled to the pre-development rates. Per Table 2, the post-development runoff rate for Alfred Street is reduced compared to the pre-development rates, therefore no quantity control is required for this drainage catchment.

As previously indicated, the storm sewer on Victoria Street South is identified in the DC Background Study (Hemson, 2019) as requiring upgrades. Since this development is the last parcel in the catchment to be developed it is expected that any capacity created by these upgrades would be available to convey the post development flow rates from the Site. Due to the proximity to the outlet via Little Beaver River on Alfred Street West, there may be an opportunity to “beat the peak” by conveying peak flows from the site prior to the peak flows from upstream catchments that would be subject to quantity control.

If quantity control is required, onsite storage could be achieved through a number of methods. At this preliminary stage we have not determined the method of quantity control that would be utilized for the Ashbury East development; however, due to the limited space within the development traditional methods such as end-of-pipe facilities will not be feasible.

Other options to be considered include underground storage tanks and super pipes, which can be installed with the roadway and utilized in conjunction with an orifice plate placed on an outlet structure downstream to provide storage internally. This method is effective in all seasons assuming adequate cover is provided to avoid freezing.

## **5.4 Stormwater Quality Control**

It will be necessary to implement stormwater management practices to address the water quality control requirements of the regulatory agencies. Georgian Bay is the ultimate receiver of drainage from the Site and therefore the development will incorporate measures to provide “enhanced protection” to treat runoff before entering the harbour.

Some of the significant factors involved in selecting the optimum SWM approach in Section 5.3 were the “infill” nature of the development and the relatively flat nature of the site, which make it unsuitable for an end-of-pipe stormwater management facility (i.e. wet pond). Therefore, a treatment train approach will be developed, consisting of lot level control and end of pipe control. The proposed treatment train will provide the Enhanced Quality Control required by the review agencies and is listed below:

### **1. Lot Level Control**

- Reduced lot grading; and
- Grassed swales underlain with permeable material.

### **2. End of Pipe Control**

- Oil/grit separators (Stormceptor or equivalent).

#### **5.4.1 Stormwater Lot Level Controls**

These controls will primarily consist of disconnected roof leaders, reduced lot grading and grass swales. Swales will be underlain with select permeable material and perforated tile (“French Drains”) where deemed necessary. These swales are intended to promote water quality benefits of vegetation and filtering from a nutrient perspective. The majority of the lot level controls will be implemented within the individual lot grading plans.

#### **5.4.2 Stormwater End-Of-Pipe Controls**

Oil/grit separators are recommended to treat runoff from the internal roadway, which are the source of oils and sediment from the vehicles and expected maintenance activities on the site. The type of product will be determined during detailed design, which will likely be a Stormceptor or equivalent unit. These structures are typically pre-manufactured and provide effective removal of oils and total suspended solids. The oil/grit separators have been sized to treat minimum 95% annual runoff and a minimum 80% of annual total suspended solids (TSS) removal.

## **6.0 Utilities**

The proposed development will be serviced with natural gas, telephone, cable TV and hydro. All such utilities are currently available on the boundary roadways. Utilities have not been contacted at the time of this investigation. Circulation and coordination with the utilities will be undertaken to confirm capacity at the appropriate phase of design.

## 7.0 Conclusions and Recommendations

Based on the information offered in this report, we offer the following conclusions:

1. A 20 m ROW and cul-de-sac with a 15 m radius is proposed for the public roadway and will consist of an urban cross section consisting of curb and gutter and storm sewer system.
2. A public watermain will be extended from Victoria Street South and terminate with a 50mm diameter watermain loop. Additional watermain modelling and hydrant testing may be required.
3. Fire flows have been determined based on the short method calculations for grouping of townhome dwellings as per the Fire Underwriter Survey (FUS) and Ontario Building Code (OBC).
4. A public sanitary sewer will be extended from Victoria Street South and service Ashbury East along the internal roadway. The existing sanitary sewer downstream of Ashbury East is assumed to be sufficiently sized to convey the proposed sewage generated.
5. Internal preliminary grading has been completed to maintain, where feasible, existing drainage patterns for Ashbury East. Preliminary grading has proposed some of the lots will drain towards the internal roadway via rear to front drainage, while the majority will have split drainage. The overall master grading will be completed during detailed design.
6. The existing 675mm dia. storm sewer downstream of Ashbury East along Victoria Street South does not have capacity to convey pre or post development flows of the development. The existing 675mm diameter storm sewer will need to be upgraded to a larger diameter storm sewer to accommodate run-off produced from the Site.
7. Water quality controls for the Site will be provided by a treatment train including an oil grit separator.

Based on the above conclusions, we recommend the approval of the Planning Applications for Ashbury East, from the perspective of functional servicing and stormwater management. Thank you.

Respectfully submitted,

**C.F. CROZIER & ASSOCIATES INC.**



Kevin Morris, P. Eng.  
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KM/gc

**C.F. CROZIER & ASSOCIATES INC.**



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# APPENDIX A

## Potable Water Demand and Fire Flow Demand Calculations



File: 1284-4979  
Date: June 2, 2019  
By: GC  
Check By: KM

### **Ashbury East Development - Domestic Water Design Criteria**

|  |                   |
|--|-------------------|
| Developed Site Area  | 1.30 ha           |
| Number of Residential Units (Including Existing)                       | 19 units          |
| Persons Per Unit (Town of The Blue Mountains Engineering Standards)    | 2.3 persons/unit  |
| Residential Population   | 44 persons        |
| <b><u>Water Design Flows</u></b>                                       |                   |
| Residential  | 450 L/C-day       |
| <b><u>Total Domestic Water Design Flows</u></b>                        |                   |
| Average Residential Daily Flow   | 0.23 L/sec        |
| Max Day Peak Factor (Town of The Blue Mountains Engineering Standards) | 2.00              |
| <b>Max Day Demand Flow</b>   | <b>0.46</b> L/sec |
| Peak Hour Factor (Town of The Blue Mountains Engineering Standards)    | 4.50              |
| <b>Peak Hour Flow</b>  | <b>1.02</b> L/sec |

Water Supply for Public Fire Protection - 1999  
Fire Underwriters Survey  
Part II - Guide for Determination of Required Fire Flow

1. An estimate of fire flow required for a given area may be determined by the formula:

$$F = 220 * C * \text{sqrt } A$$

where

- F = the required fire flow in litres per minute
- C = coefficient related to the type of construction
  - = 1.5 for wood frame construction (structure essentially all combustible)
  - = 1.0 for ordinary construction (brick or other masonry walls, combustible floor and interior)
  - = 0.8 for non-combustible construction (unprotected metal structural components)
  - = 0.6 for fire-resistive construction (fully protected frame, floors, roof)
- A = The total floor area in square metres (including all storeys, but excluding basements at least 50 percent below grade) in the building considered.

|                            |                             |
|----------------------------|-----------------------------|
| Proposed Buildings         | Fire resistive construction |
| 390 sq.m. total floor area | 1.0 C                       |

Therefore F= 4,000 L/min (rounded to nearest 1000 L/min)

Fire flow determined above shall not exceed:

- 30,000 L/min for wood frame construction
- 30,000 L/min for ordinary construction
- 25,000 L/min for non-combustible construction
- 25,000 L/min for fire-resistive construction

2. Values obtained in No. 1 may be reduced by as much as 25% for occupancies having low contents fire hazard or may be increased by up to 25% surcharge for occupancies having a high fire hazard.

|                     |           |              |     |
|---------------------|-----------|--------------|-----|
| Non-Combustible     | -25%      | Free Burning | 15% |
| Limited Combustible | -15%      | Rapid Buring | 25% |
| Combustible         | No Charge |              |     |

|   |              |
|---|--------------|
| Low fire Hazard occupancy for dwellings | 0% reduction |
|---|--------------|

0 L/min reduction

Note: Flow determined shall not be less than 2,000 L/min

3. Sprinklers - The value obtained in No. 2 above maybe reduce by up to 50% for complete automatic sprinkler protection.

Buildings will have automatic sprinklers (typical 30% reduction)  
0 L/min reduction



Water Supply for Public Fire Protection - 1999  
Fire Underwriters Survey

Part II - Guide for Determination of Required Fire Flow

4. Exposure - To the value obtained in No. 2, a percentage should be added for structures exposed within 45 metres by the fire area under consideration. The percentage shall depend upon the height, area, and construction of the building(s) being exposed, the separation, openings in the exposed building(s), the length and height of exposure, the provision of automatic sprinklers and/or outside sprinklers in the building(s) exposed, the occupancy of the exposed building(s) and the effect of hillside locations on the possible spread of fire.

| Separation   | Charge | Separation   | Charge |
|--------------|--------|--------------|--------|
| 0 to 3 m     | 25%    | 20.1 to 30 m | 10%    |
| 3.1 to 10 m  | 20%    | 30.1 to 45 m | 5%     |
| 10.1 to 20 m | 15%    |              |        |

Exposed buildings

| Name                  |                   | Distance |     |      |
|-----------------------|-------------------|----------|-----|------|
| North                 | Adjacent Dwelling | 50       | 0%  | 0    |
| East                  | Adjacent Dwelling | 2.4      | 25% | 1000 |
| South                 | Adjacent Dwelling | 40       | 5%  | 200  |
| West                  | Adjacent Dwelling | 6.17     | 20% | 800  |
| 2,000 L/min Surcharge |                   |          |     |      |

Determine Required Fire Flow

|                               |                 |    |                          |
|-------------------------------|-----------------|----|--------------------------|
| No.1                          | 4,000           |    |                          |
| No. 2                         | 0 reduction     |    |                          |
| No. 3                         | 0 reduction     |    |                          |
| No. 4                         | 2,000 surcharge |    |                          |
| Required Flow:                | 6,000 L/min     |    |                          |
| Rounded to nearest 1000l/min: | 6,000 L/min     | or | 100.0 L/s<br>1,585 USGPM |

Determine Required Fire Storage Volume

|                   |   |
|-------------------|---|
| Flow from above   | 6,000 L/min   |
| Required duration | 2.00 hours  |
| Therefore:        | 720,000 Litres or<br>720 cu.m. is the required fire storage volume. |

Required Duration of Fire Flow

| Flow Required<br>L/min | Duration<br>(hours) |
|------------------------|---------------------|
| 2,000 or less          | 1.0                 |
| 3,000                  | 1.25                |
| 4,000                  | 1.5                 |
| 5,000                  | 1.75                |
| 6,000                  | 2.0                 |
| 8,000                  | 2.0                 |
| 10,000                 | 2.0                 |
| 12,000                 | 2.5                 |
| 14,000                 | 3.0                 |
| 16,000                 | 3.5                 |
| 18,000                 | 4.0                 |
| 20,000                 | 4.5                 |
| 22,000                 | 5.0                 |
| 24,000                 | 5.5                 |
| 26,000                 | 6.0                 |
| 28,000                 | 6.5                 |
| 30,000                 | 7.0                 |
| 32,000                 | 7.5                 |
| 34,000                 | 8.0                 |
| 36,000                 | 8.5                 |
| 38,000                 | 9.0                 |
| 40,000 and over        | 9.5                 |

Fire Protection Water Supply Guideline

Part 3 of the Ontario Building Code (2006)

$Q = KVS_{TOT}$

Q =

minimum supply of water in litres (L)

K =

water supply coefficient

V =

total building volume in cubic metres

S<sub>TOT</sub> =

total of spatial coefficient values from property line exposures on all sides

K =

23.0

Group C building with combustible construction (Table 1)

V =

2145

Total building volume in cubic metres

S<sub>TOT</sub> =

2

S<sub>TOT</sub> Need Not Exceed 2.0

Q =

98670

L

Based on ranges listed in Table 2, the required minimum water supply flow rate is

2700

L/min

45

L/s

J:\1200\1284 - Carey Homes\4979-Ashbury East\Design\Civil\_Water\Water and Sanitary\2019.07.23 Fire Flow

6/2/2020 8:08 AM

# APPENDIX B

## Sanitary Servicing Demand Calculations



File: 1284-4979  
Date: June 2, 2019  
By: GC  
Check By: KM

### **Ashbury East Development - Sanitary Design Criteria**

|  |                   |
|--|-------------------|
| Developed Site Area (Roads + Residences) | 1.30 ha           |
| Number of Residential Units              | 19 units          |
| Person Per Residential Unit              | 2.30 persons/unit |
| Residential Population                   | 44 persons        |

#### **Unit Sewage flows**

|                        |             |
|------------------------|-------------|
| Residential            | 450 L/C-day |
| Infiltration (typical) | 0.23 L/s/ha |

#### **Total Design Sewage Flows**

|  |            |
|--|------------|
| Infiltration/Inflow Residential          | 0.30 L/sec |
| Average Daily Residential Flow           | 0.23 L/sec |
| Residential Peak Factor (Harmon Formula) | 4.3        |

|                              |                   |
|------------------------------|-------------------|
| <b>Total Peak Daily Flow</b> | <b>1.28 L/sec</b> |
|------------------------------|-------------------|

# APPENDIX C

## Modified Rational Method



**CROZIER**  
CONSULTING ENGINEERS

PROJECT: Ashbury East  
PROJECT No.: 1284-4979  
FILE: Modified Rational Method  
DATE: 6/2/2020  
DESIGN: GC  
CHECK: KM

| Owen Sound IDF Curve Parameters |      |        |
|---------------------------------|------|--------|
| Storm Event                     | A    | B      |
| 2                               | 22.3 | -0.714 |
| 5                               | 29.1 | -0.724 |
| 10                              | 33.6 | -0.729 |
| 25                              | 39.3 | -0.734 |
| 50                              | 43.5 | -0.736 |
| 100                             | 47.7 | -0.738 |

**Ashbury East - Victoria Street (Catchment #1)**

| Surface    | Pre-development |                    | Post-development |                    |
|------------|-----------------|--------------------|------------------|--------------------|
|            | Area (ha)       | Runoff Coefficient | Area (ha)        | Runoff Coefficient |
| Landscapes | 0.28            | 0.30               | 0.340            | 0.40               |
| Asphalt    | 0.00            | 0.90               | 0.35             | 0.90               |
| Building   | 0.00            | 0.90               | 0.20             | 0.90               |
| Total *    | 0.28            | 0.30               | 0.89             | 0.71               |

### Modified Rational Method Storage Sizing (2-Year Storm)

#### Peak Flow

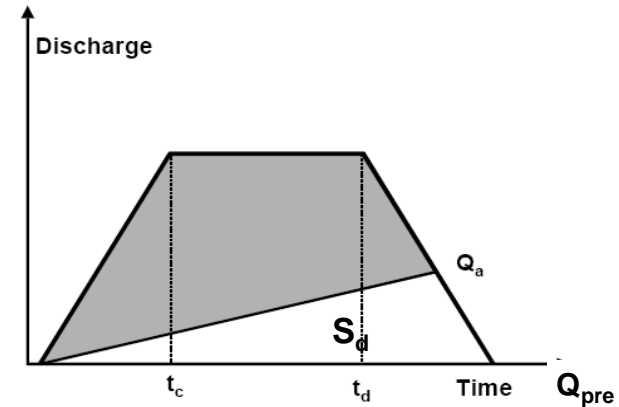
$$Q_{\text{post}} = 0.0028 \cdot C_{\text{post}} \cdot i_{(T_d)} \cdot A$$

#### Intensity

$$i_{(T_d)} = A (T_d)^B$$

#### Storage

$$S_d = Q_{\text{post}} \cdot T_d - Q_{\text{pre}} (T_d + T_c) / 2$$



| Pre-Development Scenario Data |            |                    |       |
|-------------------------------|------------|--------------------|-------|
| Inputs                        |            | Outputs            |       |
| IDF Location                  | Owen Sound | Intensity (mm/hr): | 60.00 |
| Return Period                 | 2 yr       |                    |       |
| Time of Concentration (min)   | 15         |                    |       |
| Coeff A                       | 22.3       |                    |       |
| Coeff B                       | -0.714     |                    |       |
| Runoff Coeff (Unadjusted)     | 0.30       | Flow (m³/s)        | 0.014 |
| Area (ha)                     | 0.28       |                    |       |

| Post-Development Scenario Data |            |                     |       |
|--------------------------------|------------|---------------------|-------|
| Inputs                         |            | Outputs             |       |
| IDF Location                   | Owen Sound | Intensity (mm/hr):  | 60.00 |
| Return Period                  | 2 yr       |                     |       |
| Time of Concentration (min)    | 15         |                     |       |
| Coeff A                        | 22.3       |                     |       |
| Coeff B                        | -0.714     |                     |       |
| Runoff Coeff (unadjusted)      | 0.72       | Uncont. Flow (m³/s) | 0.106 |
| Area (ha)                      | 0.88       |                     |       |

|                    |       |
|--------------------|-------|
| Target Flow (m³/s) | 0.014 |
|--------------------|-------|

|                                 |              |
|---------------------------------|--------------|
| <b>REQUIRED STORAGE VOLUME:</b> | <b>114.8</b> |
|---------------------------------|--------------|

| Storage Volume Determination (Detailed) |       |      |         |       |
|---|-------|------|---------|-------|
| Td                                      | i     | Td   | QUncont | Sd    |
| min                                     | mm/hr | sec  | m³/s    | m³    |
| 15                                      | 60.00 | 900  | 0.106   | 82.7  |
| 20                                      | 48.86 | 1200 | 0.086   | 88.8  |
| 25                                      | 41.67 | 1500 | 0.074   | 93.5  |
| 30                                      | 36.58 | 1800 | 0.065   | 97.3  |
| 35                                      | 32.77 | 2100 | 0.058   | 100.4 |
| 40                                      | 29.79 | 2400 | 0.053   | 103.0 |
| 45                                      | 27.38 | 2700 | 0.048   | 105.2 |
| 50                                      | 25.40 | 3000 | 0.045   | 107.1 |
| 55                                      | 23.73 | 3300 | 0.042   | 108.7 |
| 60                                      | 22.30 | 3600 | 0.039   | 110.1 |
| 65                                      | 21.06 | 3900 | 0.037   | 111.3 |
| 70                                      | 19.98 | 4200 | 0.035   | 112.2 |
| 75                                      | 19.02 | 4500 | 0.034   | 113.1 |
| 80                                      | 18.16 | 4800 | 0.032   | 113.8 |
| 85                                      | 17.39 | 5100 | 0.031   | 114.4 |
| 90                                      | 16.69 | 5400 | 0.029   | 114.8 |

### Modified Rational Method Storage Sizing (5-Year Storm)

#### Peak Flow

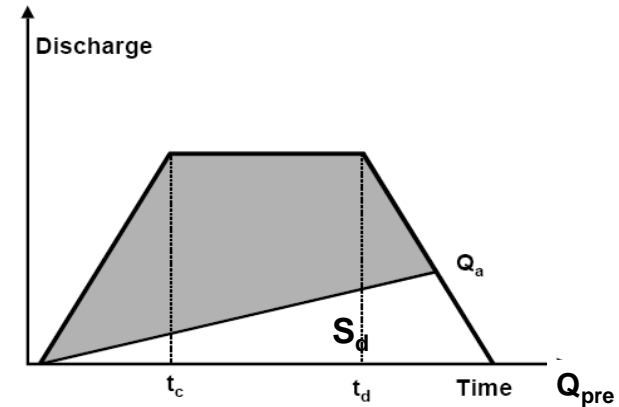
$$Q_{\text{post}} = 0.0028 \cdot C_{\text{post}} \cdot i_{(T_d)} \cdot A$$

#### Intensity

$$i_{(T_d)} = A (T_d)^B$$

#### Storage

$$S_d = Q_{\text{post}} \cdot T_d - Q_{\text{pre}} (T_d + T_c) / 2$$



| Pre-Development Scenario Data |            |                    |       |
|-------------------------------|------------|--------------------|-------|
| Inputs                        |            | Outputs            |       |
| IDF Location                  | Owen Sound | Intensity (mm/hr): | 79.39 |
| Return Period                 | 5 yr       |                    |       |
| Time of Concentration (min)   | 15         |                    |       |
| Coeff A                       | 29.1       |                    |       |
| Coeff B                       | -0.724     |                    |       |
| Runoff Coeff (Unadjusted)     | 0.30       | Flow (m³/s)        | 0.019 |
| Area (ha)                     | 0.28       |                    |       |

| Post-Development Scenario Data |            |                     |       |
|--------------------------------|------------|---------------------|-------|
| Inputs                         |            | Outputs             |       |
| IDF Location                   | Owen Sound | Intensity (mm/hr):  | 79.39 |
| Return Period                  | 5 yr       |                     |       |
| Time of Concentration (min)    | 15         |                     |       |
| Coeff A                        | 29.1       |                     |       |
| Coeff B                        | -0.724     |                     |       |
| Runoff Coeff (unadjusted)      | 0.72       | Uncont. Flow (m³/s) | 0.140 |
| Area (ha)                      | 0.88       |                     |       |

|                    |       |
|--------------------|-------|
| Target Flow (m³/s) | 0.019 |
|--------------------|-------|

|                                 |              |
|---------------------------------|--------------|
| <b>REQUIRED STORAGE VOLUME:</b> | <b>148.2</b> |
|---------------------------------|--------------|

| Storage Volume Determination (Detailed) |       |                |                     |                |
|---|-------|----------------|---------------------|----------------|
| T <sub>d</sub>                          | i     | T <sub>d</sub> | Q <sub>Uncont</sub> | S <sub>d</sub> |
| min                                     | mm/hr | sec            | m³/s                | m³             |
| 15                                      | 79.39 | 900            | 0.140               | 109.4          |
| 20                                      | 64.47 | 1200           | 0.114               | 117.1          |
| 25                                      | 54.85 | 1500           | 0.097               | 123.0          |
| 30                                      | 48.07 | 1800           | 0.085               | 127.7          |
| 35                                      | 42.99 | 2100           | 0.076               | 131.5          |
| 40                                      | 39.03 | 2400           | 0.069               | 134.7          |
| 45                                      | 35.84 | 2700           | 0.063               | 137.4          |
| 50                                      | 33.21 | 3000           | 0.059               | 139.6          |
| 55                                      | 30.99 | 3300           | 0.055               | 141.5          |
| 60                                      | 29.10 | 3600           | 0.051               | 143.1          |
| 65                                      | 27.46 | 3900           | 0.049               | 144.4          |
| 70                                      | 26.03 | 4200           | 0.046               | 145.5          |
| 75                                      | 24.76 | 4500           | 0.044               | 146.4          |
| 80                                      | 23.63 | 4800           | 0.042               | 147.2          |
| 85                                      | 22.61 | 5100           | 0.040               | 147.7          |
| 90                                      | 21.70 | 5400           | 0.038               | 148.2          |



### Modified Rational Method Storage Sizing (10-Year Storm)

#### Peak Flow

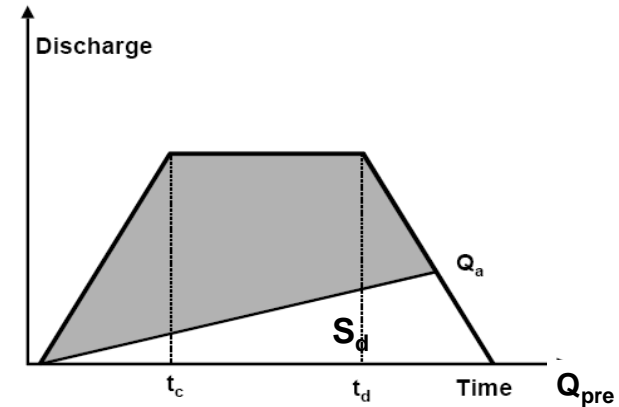
$$Q_{\text{post}} = 0.0028 \cdot C_{\text{post}} \cdot i_{(T_d)} \cdot A$$

#### Intensity

$$i_{(T_d)} = A (T_d)^B$$

#### Storage

$$S_d = Q_{\text{post}} \cdot T_d - Q_{\text{pre}} (T_d + T_c) / 2$$



| Pre-Development Scenario Data |            |                    |       |
|-------------------------------|------------|--------------------|-------|
| Inputs                        |            | Outputs            |       |
| IDF Location                  | Owen Sound | Intensity (mm/hr): | 92.31 |
| Return Period                 | 10 yr      |                    |       |
| Time of Concentration (min)   | 15         |                    |       |
| Coeff A                       | 33.6       |                    |       |
| Coeff B                       | -0.729     |                    |       |
| Runoff Coeff (Unadjusted)     | 0.30       | Flow (m³/s)        | 0.022 |
| Area (ha)                     | 0.28       |                    |       |

| Post-Development Scenario Data |            |                     |       |
|--------------------------------|------------|---------------------|-------|
| Inputs                         |            | Outputs             |       |
| IDF Location                   | Owen Sound | Intensity (mm/hr):  | 92.31 |
| Return Period                  | 10 yr      |                     |       |
| Time of Concentration (min)    | 15         |                     |       |
| Coeff A                        | 33.6       |                     |       |
| Coeff B                        | -0.729     |                     |       |
| Runoff Coeff (unadjusted)      | 0.72       | Uncont. Flow (m³/s) | 0.163 |
| Area (ha)                      | 0.88       |                     |       |

|                    |       |
|--------------------|-------|
| Target Flow (m³/s) | 0.022 |
|--------------------|-------|

|                                 |              |
|---------------------------------|--------------|
| <b>REQUIRED STORAGE VOLUME:</b> | <b>170.1</b> |
|---------------------------------|--------------|

| Storage Volume Determination (Detailed) |       |      |         |       |
|---|-------|------|---------|-------|
| Td                                      | i     | Td   | QUncont | Sd    |
| min                                     | mm/hr | sec  | m³/s    | m³    |
| 15                                      | 92.31 | 900  | 0.163   | 127.2 |
| 20                                      | 74.84 | 1200 | 0.132   | 135.9 |
| 25                                      | 63.61 | 1500 | 0.112   | 142.5 |
| 30                                      | 55.69 | 1800 | 0.098   | 147.8 |
| 35                                      | 49.77 | 2100 | 0.088   | 152.1 |
| 40                                      | 45.16 | 2400 | 0.080   | 155.7 |
| 45                                      | 41.44 | 2700 | 0.073   | 158.6 |
| 50                                      | 38.38 | 3000 | 0.068   | 161.1 |
| 55                                      | 35.80 | 3300 | 0.063   | 163.1 |
| 60                                      | 33.60 | 3600 | 0.059   | 164.9 |
| 65                                      | 31.70 | 3900 | 0.056   | 166.3 |
| 70                                      | 30.03 | 4200 | 0.053   | 167.5 |
| 75                                      | 28.56 | 4500 | 0.050   | 168.4 |
| 80                                      | 27.24 | 4800 | 0.048   | 169.2 |
| 85                                      | 26.07 | 5100 | 0.046   | 169.7 |
| 90                                      | 25.00 | 5400 | 0.044   | 170.1 |

### Modified Rational Method Storage Sizing (25-Year Storm)

#### Peak Flow

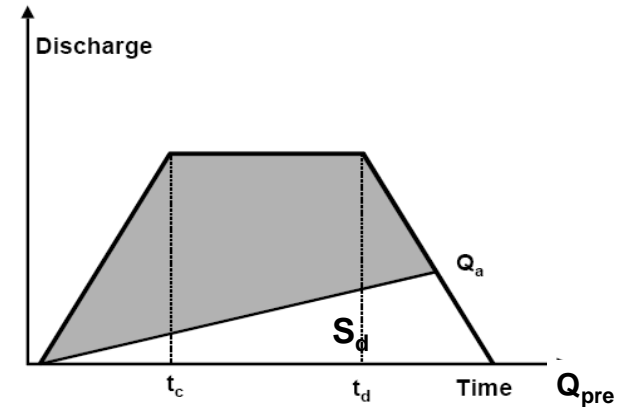
$$Q_{\text{post}} = 0.0028 \cdot C_{\text{post}} \cdot i_{(T_d)} \cdot A$$

#### Intensity

$$i_{(T_d)} = A (T_d)^B$$

#### Storage

$$S_d = Q_{\text{post}} \cdot T_d - Q_{\text{pre}} (T_d + T_c) / 2$$



| Pre-Development Scenario Data |            |                          |        |
|-------------------------------|------------|--------------------------|--------|
| Inputs                        |            | Outputs                  |        |
| IDF Location                  | Owen Sound | Intensity (mm/hr):       | 108.72 |
| Return Period                 | 25 yr      |                          |        |
| Time of Concentration (min)   | 15         |                          |        |
| Coeff A                       | 39.3       |                          |        |
| Coeff B                       | -0.734     |                          |        |
| Runoff Coeff (Unadjusted)     | 0.30       | Flow (m <sup>3</sup> /s) | 0.026  |
| Area (ha)                     | 0.28       |                          |        |

| Post-Development Scenario Data |            |                                  |        |
|--------------------------------|------------|----------------------------------|--------|
| Inputs                         |            | Outputs                          |        |
| IDF Location                   | Owen Sound | Intensity (mm/hr):               | 108.72 |
| Return Period                  | 25 yr      |                                  |        |
| Time of Concentration (min)    | 15         |                                  |        |
| Coeff A                        | 39.3       |                                  |        |
| Coeff B                        | -0.734     |                                  |        |
| Runoff Coeff (unadjusted)      | 0.72       | Uncont. Flow (m <sup>3</sup> /s) | 0.192  |
| Area (ha)                      | 0.88       |                                  |        |

|                                 |       |
|---------------------------------|-------|
| Target Flow (m <sup>3</sup> /s) | 0.026 |
|---------------------------------|-------|

|                                 |              |
|---------------------------------|--------------|
| <b>REQUIRED STORAGE VOLUME:</b> | <b>197.9</b> |
|---------------------------------|--------------|

| Storage Volume Determination (Detailed) |        |                |                     |                |
|---|--------|----------------|---------------------|----------------|
| T <sub>d</sub>                          | i      | T <sub>d</sub> | Q <sub>Uncont</sub> | S <sub>d</sub> |
| min                                     | mm/hr  | sec            | m <sup>3</sup> /s   | m <sup>3</sup> |
| 15                                      | 108.72 | 900            | 0.192               | 149.9          |
| 20                                      | 88.02  | 1200           | 0.156               | 159.8          |
| 25                                      | 74.73  | 1500           | 0.132               | 167.4          |
| 30                                      | 65.37  | 1800           | 0.115               | 173.4          |
| 35                                      | 58.37  | 2100           | 0.103               | 178.2          |
| 40                                      | 52.92  | 2400           | 0.094               | 182.2          |
| 45                                      | 48.54  | 2700           | 0.086               | 185.5          |
| 50                                      | 44.93  | 3000           | 0.079               | 188.3          |
| 55                                      | 41.89  | 3300           | 0.074               | 190.5          |
| 60                                      | 39.30  | 3600           | 0.069               | 192.4          |
| 65                                      | 37.06  | 3900           | 0.065               | 194.0          |
| 70                                      | 35.10  | 4200           | 0.062               | 195.2          |
| 75                                      | 33.36  | 4500           | 0.059               | 196.2          |
| 80                                      | 31.82  | 4800           | 0.056               | 197.0          |
| 85                                      | 30.43  | 5100           | 0.054               | 197.5          |
| 90                                      | 29.18  | 5400           | 0.052               | 197.9          |

### Modified Rational Method Storage Sizing (50-Year Storm)

#### Peak Flow

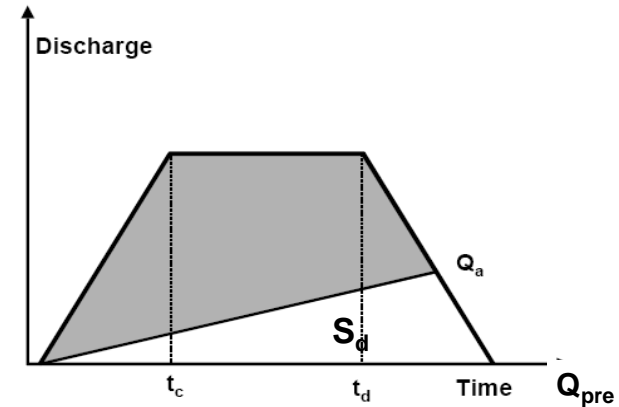
$$Q_{\text{post}} = 0.0028 \cdot C_{\text{post}} \cdot i_{(T_d)} \cdot A$$

#### Intensity

$$i_{(T_d)} = A (T_d)^B$$

#### Storage

$$S_d = Q_{\text{post}} \cdot T_d - Q_{\text{pre}} (T_d + T_c) / 2$$



| Pre-Development Scenario Data |            |                    |        |
|-------------------------------|------------|--------------------|--------|
| Inputs                        |            | Outputs            |        |
| IDF Location                  | Owen Sound | Intensity (mm/hr): | 120.67 |
| Return Period                 | 50 yr      |                    |        |
| Time of Concentration (min)   | 15         |                    |        |
| Coeff A                       | 43.5       |                    |        |
| Coeff B                       | -0.736     |                    |        |
| Runoff Coeff (Unadjusted)     | 0.30       | Flow (m³/s)        | 0.028  |
| Area (ha)                     | 0.28       |                    |        |

| Post-Development Scenario Data |            |                     |        |
|--------------------------------|------------|---------------------|--------|
| Inputs                         |            | Outputs             |        |
| IDF Location                   | Owen Sound | Intensity (mm/hr):  | 120.67 |
| Return Period                  | 50 yr      |                     |        |
| Time of Concentration (min)    | 15         |                     |        |
| Coeff A                        | 43.5       |                     |        |
| Coeff B                        | -0.736     |                     |        |
| Runoff Coeff (unadjusted)      | 0.72       | Uncont. Flow (m³/s) | 0.213  |
| Area (ha)                      | 0.88       |                     |        |

|                    |       |
|--------------------|-------|
| Target Flow (m³/s) | 0.028 |
|--------------------|-------|

|                                 |              |
|---------------------------------|--------------|
| <b>REQUIRED STORAGE VOLUME:</b> | <b>218.5</b> |
|---------------------------------|--------------|

| Storage Volume Determination (Detailed) |        |      |         |       |
|---|--------|------|---------|-------|
| Td                                      | i      | Td   | QUncont | Sd    |
| min                                     | mm/hr  | sec  | m³/s    | m³    |
| 15                                      | 120.67 | 900  | 0.213   | 166.3 |
| 20                                      | 97.65  | 1200 | 0.173   | 177.2 |
| 25                                      | 82.86  | 1500 | 0.146   | 185.5 |
| 30                                      | 72.45  | 1800 | 0.128   | 192.1 |
| 35                                      | 64.68  | 2100 | 0.114   | 197.4 |
| 40                                      | 58.63  | 2400 | 0.104   | 201.8 |
| 45                                      | 53.76  | 2700 | 0.095   | 205.4 |
| 50                                      | 49.75  | 3000 | 0.088   | 208.3 |
| 55                                      | 46.38  | 3300 | 0.082   | 210.8 |
| 60                                      | 43.50  | 3600 | 0.077   | 212.8 |
| 65                                      | 41.01  | 3900 | 0.072   | 214.5 |
| 70                                      | 38.83  | 4200 | 0.069   | 215.8 |
| 75                                      | 36.91  | 4500 | 0.065   | 216.8 |
| 80                                      | 35.20  | 4800 | 0.062   | 217.6 |
| 85                                      | 33.66  | 5100 | 0.059   | 218.2 |
| 90                                      | 32.28  | 5400 | 0.057   | 218.5 |

### Modified Rational Method Storage Sizing (100-Year Storm)

#### Peak Flow

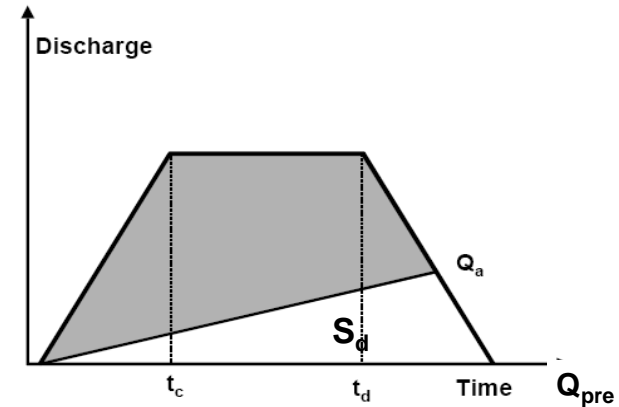
$$Q_{\text{post}} = 0.0028 \cdot C_{\text{post}} \cdot i_{(T_d)} \cdot A$$

#### Intensity

$$i_{(T_d)} = A (T_d)^B$$

#### Storage

$$S_d = Q_{\text{post}} \cdot T_d - Q_{\text{pre}} (T_d + T_c) / 2$$



| Pre-Development Scenario Data |            |                          |        |
|-------------------------------|------------|--------------------------|--------|
| Inputs                        |            | Outputs                  |        |
| IDF Location                  | Owen Sound | Intensity (mm/hr):       | 132.69 |
| Return Period                 | 100 yr     |                          |        |
| Time of Concentration (min)   | 15         |                          |        |
| Coeff A                       | 47.7       |                          |        |
| Coeff B                       | -0.738     |                          |        |
| Runoff Coeff (Unadjusted)     | 0.30       | Flow (m <sup>3</sup> /s) | 0.031  |
| Area (ha)                     | 0.28       |                          |        |

| Post-Development Scenario Data |            |                                  |        |
|--------------------------------|------------|----------------------------------|--------|
| Inputs                         |            | Outputs                          |        |
| IDF Location                   | Owen Sound | Intensity (mm/hr):               | 132.69 |
| Return Period                  | 100 yr     |                                  |        |
| Time of Concentration (min)    | 15         |                                  |        |
| Coeff A                        | 47.7       |                                  |        |
| Coeff B                        | -0.738     |                                  |        |
| Runoff Coeff (unadjusted)      | 0.72       | Uncont. Flow (m <sup>3</sup> /s) | 0.234  |
| Area (ha)                      | 0.88       |                                  |        |

|                                 |       |
|---------------------------------|-------|
| Target Flow (m <sup>3</sup> /s) | 0.031 |
|---------------------------------|-------|

|                                 |              |
|---------------------------------|--------------|
| <b>REQUIRED STORAGE VOLUME:</b> | <b>239.1</b> |
|---------------------------------|--------------|

| Storage Volume Determination (Detailed) |        |                |                     |                |
|---|--------|----------------|---------------------|----------------|
| T <sub>d</sub>                          | i      | T <sub>d</sub> | Q <sub>Uncont</sub> | S <sub>d</sub> |
| min                                     | mm/hr  | sec            | m <sup>3</sup> /s   | m <sup>3</sup> |
| 15                                      | 132.69 | 900            | 0.234               | 182.9          |
| 20                                      | 107.31 | 1200           | 0.190               | 194.7          |
| 25                                      | 91.02  | 1500           | 0.161               | 203.8          |
| 30                                      | 79.56  | 1800           | 0.141               | 210.9          |
| 35                                      | 71.00  | 2100           | 0.125               | 216.6          |
| 40                                      | 64.34  | 2400           | 0.114               | 221.3          |
| 45                                      | 58.98  | 2700           | 0.104               | 225.2          |
| 50                                      | 54.57  | 3000           | 0.096               | 228.4          |
| 55                                      | 50.86  | 3300           | 0.090               | 231.0          |
| 60                                      | 47.70  | 3600           | 0.084               | 233.2          |
| 65                                      | 44.96  | 3900           | 0.079               | 234.9          |
| 70                                      | 42.57  | 4200           | 0.075               | 236.3          |
| 75                                      | 40.46  | 4500           | 0.071               | 237.4          |
| 80                                      | 38.58  | 4800           | 0.068               | 238.2          |
| 85                                      | 36.89  | 5100           | 0.065               | 238.8          |
| 90                                      | 35.36  | 5400           | 0.062               | 239.1          |



**CROZIER**  
CONSULTING ENGINEERS

PROJECT: Ashbury East  
PROJECT No.: 1284-4979  
FILE: Modified Rational Method  
DATE: 6/2/2020  
DESIGN: GC  
CHECK: KM

| Owen Sound IDF Curve Parameters |      |        |
|---------------------------------|------|--------|
| Storm Event                     | A    | B      |
| 2                               | 22.3 | -0.714 |
| 5                               | 29.1 | -0.724 |
| 10                              | 33.6 | -0.729 |
| 25                              | 39.3 | -0.734 |
| 50                              | 43.5 | -0.736 |
| 100                             | 47.7 | -0.738 |

**Ashbury East - Alfred Street (Catchment #2)**

| Surface    | Pre-development |                    | Post-development |                    |
|------------|-----------------|--------------------|------------------|--------------------|
|            | Area (ha)       | Runoff Coefficient | Area (ha)        | Runoff Coefficient |
| Landscapes | 0.90            | 0.30               | 0.220            | 0.40               |
| Asphalt    | 0.03            | 0.90               | 0.04             | 0.90               |
| Building   | 0.02            | 0.90               | 0.08             | 0.90               |
| Total *    | 0.95            | 0.33               | 0.34             | 0.58               |

### Modified Rational Method Storage Sizing (2-Year Storm)

#### Peak Flow

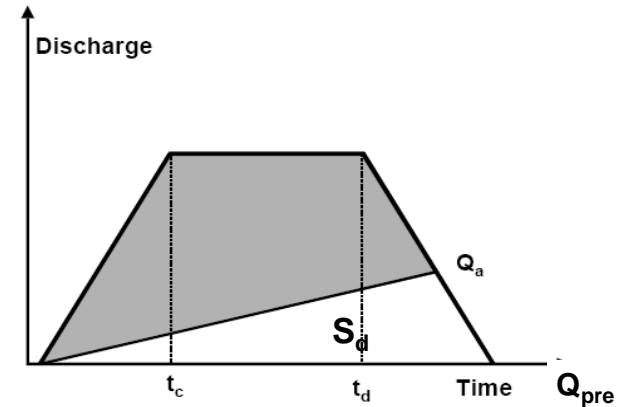
$$Q_{\text{post}} = 0.0028 \cdot C_{\text{post}} \cdot i_{(T_d)} \cdot A$$

#### Intensity

$$i_{(T_d)} = A (T_d)^B$$

#### Storage

$$S_d = Q_{\text{post}} \cdot T_d - Q_{\text{pre}} (T_d + T_c) / 2$$



| Pre-Development Scenario Data |            |                          |       |
|-------------------------------|------------|--------------------------|-------|
| Inputs                        |            | Outputs                  |       |
| IDF Location                  | Owen Sound | Intensity (mm/hr):       | 60.00 |
| Return Period                 | 2 yr       |                          |       |
| Time of Concentration (min)   | 15         |                          |       |
| Coeff A                       | 22.3       |                          |       |
| Coeff B                       | -0.714     |                          |       |
| Runoff Coeff (Unadjusted)     | 0.33       | Flow (m <sup>3</sup> /s) | 0.053 |
| Area (ha)                     | 0.95       |                          |       |

| Post-Development Scenario Data |            |                                  |       |
|--------------------------------|------------|----------------------------------|-------|
| Inputs                         |            | Outputs                          |       |
| IDF Location                   | Owen Sound | Intensity (mm/hr):               | 60.00 |
| Return Period                  | 2 yr       |                                  |       |
| Time of Concentration (min)    | 15         |                                  |       |
| Coeff A                        | 22.3       |                                  |       |
| Coeff B                        | -0.714     |                                  |       |
| Runoff Coeff (unadjusted)      | 0.58       | Uncont. Flow (m <sup>3</sup> /s) | 0.033 |
| Area (ha)                      | 0.34       |                                  |       |

|                                 |       |
|---------------------------------|-------|
| Target Flow (m <sup>3</sup> /s) | 0.053 |
|---------------------------------|-------|

|                                 |              |
|---------------------------------|--------------|
| <b>REQUIRED STORAGE VOLUME:</b> | <b>-17.7</b> |
|---------------------------------|--------------|

| Storage Volume Determination (Detailed) |       |                |                     |                |
|---|-------|----------------|---------------------|----------------|
| T <sub>d</sub>                          | i     | T <sub>d</sub> | Q <sub>Uncont</sub> | S <sub>d</sub> |
| min                                     | mm/hr | sec            | m <sup>3</sup> /s   | m <sup>3</sup> |
| 15                                      | 60.00 | 900            | 0.033               | -17.7          |
| 20                                      | 48.86 | 1200           | 0.027               | -23.1          |
| 25                                      | 41.67 | 1500           | 0.023               | -28.8          |
| 30                                      | 36.58 | 1800           | 0.020               | -34.9          |
| 35                                      | 32.77 | 2100           | 0.018               | -41.2          |
| 40                                      | 29.79 | 2400           | 0.016               | -47.6          |
| 45                                      | 27.38 | 2700           | 0.015               | -54.1          |
| 50                                      | 25.40 | 3000           | 0.014               | -60.8          |
| 55                                      | 23.73 | 3300           | 0.013               | -67.5          |
| 60                                      | 22.30 | 3600           | 0.012               | -74.3          |
| 65                                      | 21.06 | 3900           | 0.012               | -81.2          |
| 70                                      | 19.98 | 4200           | 0.011               | -88.1          |
| 75                                      | 19.02 | 4500           | 0.010               | -95.1          |
| 80                                      | 18.16 | 4800           | 0.010               | -102.1         |
| 85                                      | 17.39 | 5100           | 0.010               | -109.2         |
| 90                                      | 16.69 | 5400           | 0.009               | -116.3         |

### Modified Rational Method Storage Sizing (5-Year Storm)

#### Peak Flow

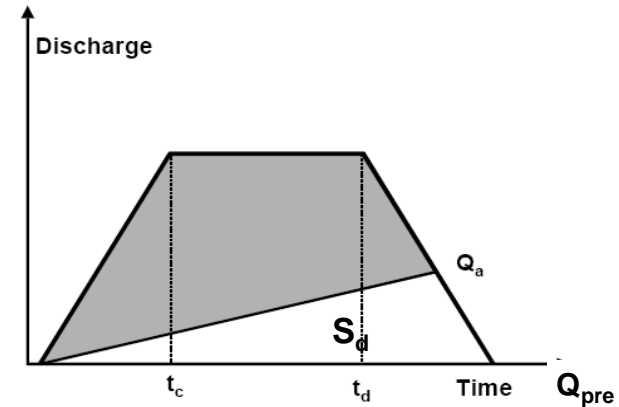
$$Q_{\text{post}} = 0.0028 \cdot C_{\text{post}} \cdot i_{(T_d)} \cdot A$$

#### Intensity

$$i_{(T_d)} = A (T_d)^B$$

#### Storage

$$S_d = Q_{\text{post}} \cdot T_d - Q_{\text{pre}} (T_d + T_c) / 2$$



| Pre-Development Scenario Data |            |                    |       |
|-------------------------------|------------|--------------------|-------|
| Inputs                        |            | Outputs            |       |
| IDF Location                  | Owen Sound | Intensity (mm/hr): | 79.39 |
| Return Period                 | 5 yr       |                    |       |
| Time of Concentration (min)   | 15         |                    |       |
| Coeff A                       | 29.1       |                    |       |
| Coeff B                       | -0.724     |                    |       |
| Runoff Coeff (Unadjusted)     | 0.33       | Flow (m³/s)        | 0.070 |
| Area (ha)                     | 0.95       |                    |       |

| Post-Development Scenario Data |            |                     |       |
|--------------------------------|------------|---------------------|-------|
| Inputs                         |            | Outputs             |       |
| IDF Location                   | Owen Sound | Intensity (mm/hr):  | 79.39 |
| Return Period                  | 5 yr       |                     |       |
| Time of Concentration (min)    | 15         |                     |       |
| Coeff A                        | 29.1       |                     |       |
| Coeff B                        | -0.724     |                     |       |
| Runoff Coeff (unadjusted)      | 0.58       | Uncont. Flow (m³/s) | 0.044 |
| Area (ha)                      | 0.34       |                     |       |

|                    |       |
|--------------------|-------|
| Target Flow (m³/s) | 0.070 |
|--------------------|-------|

|                                 |              |
|---------------------------------|--------------|
| <b>REQUIRED STORAGE VOLUME:</b> | <b>-23.4</b> |
|---------------------------------|--------------|

| Storage Volume Determination (Detailed) |       |      |         |        |
|---|-------|------|---------|--------|
| Td                                      | i     | Td   | QUncont | Sd     |
| min                                     | mm/hr | sec  | m³/s    | m³     |
| 15                                      | 79.39 | 900  | 0.044   | -23.4  |
| 20                                      | 64.47 | 1200 | 0.035   | -30.7  |
| 25                                      | 54.85 | 1500 | 0.030   | -38.4  |
| 30                                      | 48.07 | 1800 | 0.026   | -46.5  |
| 35                                      | 42.99 | 2100 | 0.024   | -54.9  |
| 40                                      | 39.03 | 2400 | 0.021   | -63.5  |
| 45                                      | 35.84 | 2700 | 0.020   | -72.2  |
| 50                                      | 33.21 | 3000 | 0.018   | -81.1  |
| 55                                      | 30.99 | 3300 | 0.017   | -90.1  |
| 60                                      | 29.10 | 3600 | 0.016   | -99.2  |
| 65                                      | 27.46 | 3900 | 0.015   | -108.3 |
| 70                                      | 26.03 | 4200 | 0.014   | -117.6 |
| 75                                      | 24.76 | 4500 | 0.014   | -126.8 |
| 80                                      | 23.63 | 4800 | 0.013   | -136.2 |
| 85                                      | 22.61 | 5100 | 0.012   | -145.6 |
| 90                                      | 21.70 | 5400 | 0.012   | -155.0 |

### Modified Rational Method Storage Sizing (10-Year Storm)

#### Peak Flow

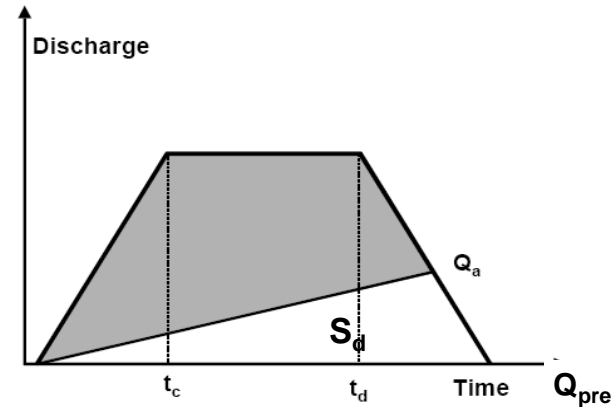
$$Q_{\text{post}} = 0.0028 \cdot C_{\text{post}} \cdot i_{(T_d)} \cdot A$$

#### Intensity

$$i_{(T_d)} = A (T_d)^B$$

#### Storage

$$S_d = Q_{\text{post}} \cdot T_d - Q_{\text{pre}} (T_d + T_c) / 2$$



| Pre-Development Scenario Data |            |                    |       |
|-------------------------------|------------|--------------------|-------|
| Inputs                        |            | Outputs            |       |
| IDF Location                  | Owen Sound | Intensity (mm/hr): | 92.31 |
| Return Period                 | 10 yr      |                    |       |
| Time of Concentration (min)   | 15         |                    |       |
| Coeff A                       | 33.6       |                    |       |
| Coeff B                       | -0.729     |                    |       |
| Runoff Coeff (Unadjusted)     | 0.33       | Flow (m³/s)        | 0.081 |
| Area (ha)                     | 0.95       |                    |       |

| Post-Development Scenario Data |            |                     |       |
|--------------------------------|------------|---------------------|-------|
| Inputs                         |            | Outputs             |       |
| IDF Location                   | Owen Sound | Intensity (mm/hr):  | 92.31 |
| Return Period                  | 10 yr      |                     |       |
| Time of Concentration (min)    | 15         |                     |       |
| Coeff A                        | 33.6       |                     |       |
| Coeff B                        | -0.729     |                     |       |
| Runoff Coeff (unadjusted)      | 0.58       | Uncont. Flow (m³/s) | 0.051 |
| Area (ha)                      | 0.34       |                     |       |

|                    |       |
|--------------------|-------|
| Target Flow (m³/s) | 0.081 |
|--------------------|-------|

|                                 |              |
|---------------------------------|--------------|
| <b>REQUIRED STORAGE VOLUME:</b> | <b>-27.3</b> |
|---------------------------------|--------------|

| Storage Volume Determination (Detailed) |       |      |         |        |
|---|-------|------|---------|--------|
| Td                                      | i     | Td   | QUncont | Sd     |
| min                                     | mm/hr | sec  | m³/s    | m³     |
| 15                                      | 92.31 | 900  | 0.051   | -27.3  |
| 20                                      | 74.84 | 1200 | 0.041   | -35.7  |
| 25                                      | 63.61 | 1500 | 0.035   | -44.8  |
| 30                                      | 55.69 | 1800 | 0.031   | -54.3  |
| 35                                      | 49.77 | 2100 | 0.027   | -64.1  |
| 40                                      | 45.16 | 2400 | 0.025   | -74.1  |
| 45                                      | 41.44 | 2700 | 0.023   | -84.3  |
| 50                                      | 38.38 | 3000 | 0.021   | -94.7  |
| 55                                      | 35.80 | 3300 | 0.020   | -105.2 |
| 60                                      | 33.60 | 3600 | 0.018   | -115.8 |
| 65                                      | 31.70 | 3900 | 0.017   | -126.4 |
| 70                                      | 30.03 | 4200 | 0.016   | -137.2 |
| 75                                      | 28.56 | 4500 | 0.016   | -148.0 |
| 80                                      | 27.24 | 4800 | 0.015   | -158.9 |
| 85                                      | 26.07 | 5100 | 0.014   | -169.9 |
| 90                                      | 25.00 | 5400 | 0.014   | -180.9 |



### Modified Rational Method Storage Sizing (25-Year Storm)

#### Peak Flow

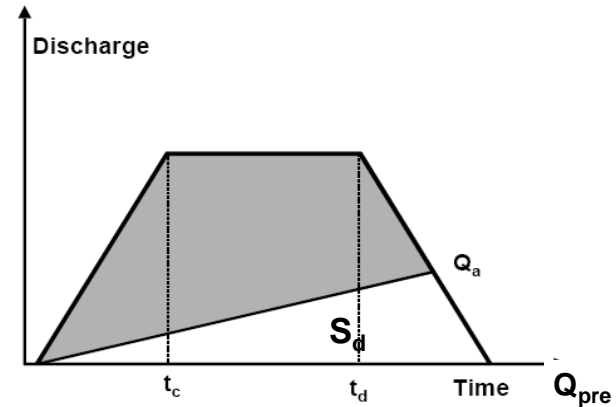
$$Q_{\text{post}} = 0.0028 \cdot C_{\text{post}} \cdot i_{(T_d)} \cdot A$$

#### Intensity

$$i_{(T_d)} = A (T_d)^B$$

#### Storage

$$S_d = Q_{\text{post}} \cdot T_d - Q_{\text{pre}} (T_d + T_c) / 2$$



| Pre-Development Scenario Data |            |                          |        |
|-------------------------------|------------|--------------------------|--------|
| Inputs                        |            | Outputs                  |        |
| IDF Location                  | Owen Sound | Intensity (mm/hr):       | 108.72 |
| Return Period                 | 25 yr      |                          |        |
| Time of Concentration (min)   | 15         |                          |        |
| Coeff A                       | 39.3       |                          |        |
| Coeff B                       | -0.734     |                          |        |
| Runoff Coeff (Unadjusted)     | 0.33       | Flow (m <sup>3</sup> /s) | 0.095  |
| Area (ha)                     | 0.95       |                          |        |

| Post-Development Scenario Data |            |                                  |        |
|--------------------------------|------------|----------------------------------|--------|
| Inputs                         |            | Outputs                          |        |
| IDF Location                   | Owen Sound | Intensity (mm/hr):               | 108.72 |
| Return Period                  | 25 yr      |                                  |        |
| Time of Concentration (min)    | 15         |                                  |        |
| Coeff A                        | 39.3       |                                  |        |
| Coeff B                        | -0.734     |                                  |        |
| Runoff Coeff (unadjusted)      | 0.58       | Uncont. Flow (m <sup>3</sup> /s) | 0.060  |
| Area (ha)                      | 0.34       |                                  |        |

|                                 |       |
|---------------------------------|-------|
| Target Flow (m <sup>3</sup> /s) | 0.095 |
|---------------------------------|-------|

|                                 |              |
|---------------------------------|--------------|
| <b>REQUIRED STORAGE VOLUME:</b> | <b>-32.1</b> |
|---------------------------------|--------------|

| Storage Volume Determination (Detailed) |        |                |                     |                |
|---|--------|----------------|---------------------|----------------|
| T <sub>d</sub>                          | i      | T <sub>d</sub> | Q <sub>Uncont</sub> | S <sub>d</sub> |
| min                                     | mm/hr  | sec            | m <sup>3</sup> /s   | m <sup>3</sup> |
| 15                                      | 108.72 | 900            | 0.060               | -32.1          |
| 20                                      | 88.02  | 1200           | 0.048               | -42.1          |
| 25                                      | 74.73  | 1500           | 0.041               | -52.9          |
| 30                                      | 65.37  | 1800           | 0.036               | -64.1          |
| 35                                      | 58.37  | 2100           | 0.032               | -75.7          |
| 40                                      | 52.92  | 2400           | 0.029               | -87.6          |
| 45                                      | 48.54  | 2700           | 0.027               | -99.7          |
| 50                                      | 44.93  | 3000           | 0.025               | -111.9         |
| 55                                      | 41.89  | 3300           | 0.023               | -124.4         |
| 60                                      | 39.30  | 3600           | 0.022               | -136.9         |
| 65                                      | 37.06  | 3900           | 0.020               | -149.5         |
| 70                                      | 35.10  | 4200           | 0.019               | -162.2         |
| 75                                      | 33.36  | 4500           | 0.018               | -175.0         |
| 80                                      | 31.82  | 4800           | 0.017               | -187.9         |
| 85                                      | 30.43  | 5100           | 0.017               | -200.8         |
| 90                                      | 29.18  | 5400           | 0.016               | -213.8         |

### Modified Rational Method Storage Sizing (50-Year Storm)

#### Peak Flow

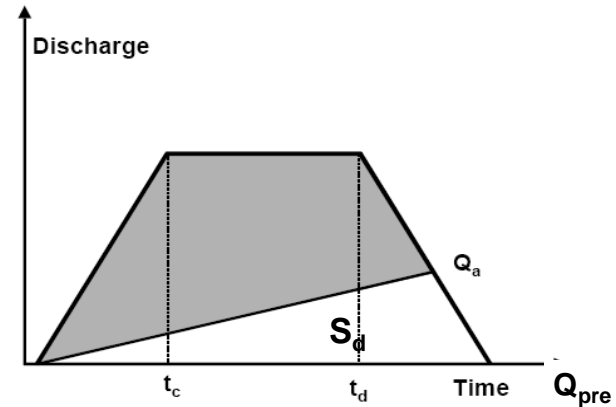
$$Q_{\text{post}} = 0.0028 \cdot C_{\text{post}} \cdot i_{(T_d)} \cdot A$$

#### Intensity

$$i_{(T_d)} = A (T_d)^B$$

#### Storage

$$S_d = Q_{\text{post}} \cdot T_d - Q_{\text{pre}} (T_d + T_c) / 2$$



| Pre-Development Scenario Data |            |                          |        |
|-------------------------------|------------|--------------------------|--------|
| Inputs                        |            | Outputs                  |        |
| IDF Location                  | Owen Sound | Intensity (mm/hr):       | 120.67 |
| Return Period                 | 50 yr      |                          |        |
| Time of Concentration (min)   | 15         |                          |        |
| Coeff A                       | 43.5       |                          |        |
| Coeff B                       | -0.736     |                          |        |
| Runoff Coeff (Unadjusted)     | 0.33       | Flow (m <sup>3</sup> /s) | 0.106  |
| Area (ha)                     | 0.95       |                          |        |

| Post-Development Scenario Data |            |                                  |        |
|--------------------------------|------------|----------------------------------|--------|
| Inputs                         |            | Outputs                          |        |
| IDF Location                   | Owen Sound | Intensity (mm/hr):               | 120.67 |
| Return Period                  | 50 yr      |                                  |        |
| Time of Concentration (min)    | 15         |                                  |        |
| Coeff A                        | 43.5       |                                  |        |
| Coeff B                        | -0.736     |                                  |        |
| Runoff Coeff (unadjusted)      | 0.58       | Uncont. Flow (m <sup>3</sup> /s) | 0.066  |
| Area (ha)                      | 0.34       |                                  |        |

|                                 |       |
|---------------------------------|-------|
| Target Flow (m <sup>3</sup> /s) | 0.106 |
|---------------------------------|-------|

|                                 |              |
|---------------------------------|--------------|
| <b>REQUIRED STORAGE VOLUME:</b> | <b>-35.6</b> |
|---------------------------------|--------------|

| Storage Volume Determination (Detailed) |        |                |                     |                |
|---|--------|----------------|---------------------|----------------|
| T <sub>d</sub>                          | i      | T <sub>d</sub> | Q <sub>Uncont</sub> | S <sub>d</sub> |
| min                                     | mm/hr  | sec            | m <sup>3</sup> /s   | m <sup>3</sup> |
| 15                                      | 120.67 | 900            | 0.066               | -35.6          |
| 20                                      | 97.65  | 1200           | 0.054               | -46.8          |
| 25                                      | 82.86  | 1500           | 0.045               | -58.8          |
| 30                                      | 72.45  | 1800           | 0.040               | -71.3          |
| 35                                      | 64.68  | 2100           | 0.035               | -84.2          |
| 40                                      | 58.63  | 2400           | 0.032               | -97.4          |
| 45                                      | 53.76  | 2700           | 0.030               | -110.8         |
| 50                                      | 49.75  | 3000           | 0.027               | -124.5         |
| 55                                      | 46.38  | 3300           | 0.025               | -138.2         |
| 60                                      | 43.50  | 3600           | 0.024               | -152.2         |
| 65                                      | 41.01  | 3900           | 0.023               | -166.2         |
| 70                                      | 38.83  | 4200           | 0.021               | -180.3         |
| 75                                      | 36.91  | 4500           | 0.020               | -194.6         |
| 80                                      | 35.20  | 4800           | 0.019               | -208.9         |
| 85                                      | 33.66  | 5100           | 0.018               | -223.3         |
| 90                                      | 32.28  | 5400           | 0.018               | -237.7         |

### Modified Rational Method Storage Sizing (100-Year Storm)

#### Peak Flow

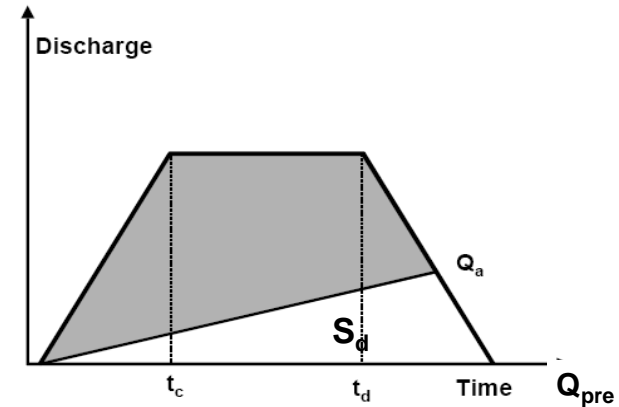
$$Q_{\text{post}} = 0.0028 \cdot C_{\text{post}} \cdot i_{(T_d)} \cdot A$$

#### Intensity

$$i_{(T_d)} = A (T_d)^B$$

#### Storage

$$S_d = Q_{\text{post}} \cdot T_d - Q_{\text{pre}} (T_d + T_c) / 2$$



| Pre-Development Scenario Data |            |                          |        |
|-------------------------------|------------|--------------------------|--------|
| Inputs                        |            | Outputs                  |        |
| IDF Location                  | Owen Sound | Intensity (mm/hr):       | 132.69 |
| Return Period                 | 100 yr     |                          |        |
| Time of Concentration (min)   | 15         |                          |        |
| Coeff A                       | 47.7       |                          |        |
| Coeff B                       | -0.738     |                          |        |
| Runoff Coeff (Unadjusted)     | 0.33       | Flow (m <sup>3</sup> /s) | 0.116  |
| Area (ha)                     | 0.95       |                          |        |

| Post-Development Scenario Data |            |                                  |        |
|--------------------------------|------------|----------------------------------|--------|
| Inputs                         |            | Outputs                          |        |
| IDF Location                   | Owen Sound | Intensity (mm/hr):               | 132.69 |
| Return Period                  | 100 yr     |                                  |        |
| Time of Concentration (min)    | 15         |                                  |        |
| Coeff A                        | 47.7       |                                  |        |
| Coeff B                        | -0.738     |                                  |        |
| Runoff Coeff (unadjusted)      | 0.58       | Uncont. Flow (m <sup>3</sup> /s) | 0.073  |
| Area (ha)                      | 0.34       |                                  |        |

|                                 |       |
|---------------------------------|-------|
| Target Flow (m <sup>3</sup> /s) | 0.116 |
|---------------------------------|-------|

|                                 |              |
|---------------------------------|--------------|
| <b>REQUIRED STORAGE VOLUME:</b> | <b>-39.2</b> |
|---------------------------------|--------------|

| Storage Volume Determination (Detailed) |        |                |                     |                |
|---|--------|----------------|---------------------|----------------|
| T <sub>d</sub>                          | i      | T <sub>d</sub> | Q <sub>Uncont</sub> | S <sub>d</sub> |
| min                                     | mm/hr  | sec            | m <sup>3</sup> /s   | m <sup>3</sup> |
| 15                                      | 132.69 | 900            | 0.073               | -39.2          |
| 20                                      | 107.31 | 1200           | 0.059               | -51.5          |
| 25                                      | 91.02  | 1500           | 0.050               | -64.7          |
| 30                                      | 79.56  | 1800           | 0.044               | -78.5          |
| 35                                      | 71.00  | 2100           | 0.039               | -92.7          |
| 40                                      | 64.34  | 2400           | 0.035               | -107.3         |
| 45                                      | 58.98  | 2700           | 0.032               | -122.1         |
| 50                                      | 54.57  | 3000           | 0.030               | -137.1         |
| 55                                      | 50.86  | 3300           | 0.028               | -152.2         |
| 60                                      | 47.70  | 3600           | 0.026               | -167.6         |
| 65                                      | 44.96  | 3900           | 0.025               | -183.0         |
| 70                                      | 42.57  | 4200           | 0.023               | -198.6         |
| 75                                      | 40.46  | 4500           | 0.022               | -214.3         |
| 80                                      | 38.58  | 4800           | 0.021               | -230.0         |
| 85                                      | 36.89  | 5100           | 0.020               | -245.8         |
| 90                                      | 35.36  | 5400           | 0.019               | -261.7         |

# FIGURES

- Figure 1:** General Site Location
- Figure 2:** Draft Plan of Subdivision (MHBC, 2020)
- Figure 3:** Preliminary Severance Sketch (MHBC, 2019)
- Figure 4:** Preliminary Site Servicing Plan
- Figure 5:** Pre-Development Drainage Area
- Figure 6:** Preliminary Site Grading and Post Development Drainage Plan



[HTTPS://WWW.GOOGLE.COM/MAPS/@44.5587216,-80.4622217,17.25z](https://www.google.com/maps/@44.5587216,-80.4622217,17.25z)

|   |   |   |   |
|---|---|---|---|
| <div>Legend</div> <div><div><div></div></div><div>= SUBJECT LANDS</div></div> | <div>Project</div> <div>ASHBURY EAST<br/>THE TOWN OF THE BLUEMOUNTAINS</div>  | <div><div><div><div></div></div><div>CROZIER</div><div>CONSULTING ENGINEERS</div></div><div><div>THE HARBOUREDGE BUILDING,<br/>40 HURON STREET, SUITE 301,<br/>COLLINGWOOD, ON L9Y 4R3<br/>705 446-3510 T<br/>705 446-3520 F<br/>WWW.CROZIER.CA<br/>INFO@CROZIER.CA</div></div></div> |   |
|   | <div>Drawing</div> <div>GENERAL SITE LOCATION</div>   |   | <div><div><div>Drawn By</div><div>N.L.</div></div><div><div>Design By</div><div>N.L.</div></div><div><div>Project</div><div>1284-4979</div></div></div> |
|   | <div><div><div>Scale</div><div>N.T.S.</div></div><div><div>Date</div><div>07/05/2019</div></div><div><div>Check By</div><div>K.M.</div></div><div><div>Drawing</div><div>FIG. 1</div></div></div> |   |   |





**HEWITT & MILNE LIMITED**  
SCALE - 1 : 250

0 2.50 12.50 25 METRES

SURVEY PREPARED FOR CAREY BUILDERS GROUP

**LEGEND**

|      |   |
|------|---|
| N    | DENOTES SURVEY MONUMENT FOUND                     |
| SE   | DENOTES SURVEY MONUMENT SE                        |
| SW   | DENOTES STANDARD IRON BAR                         |
| SSIB | DENOTES STREET STANDARD IRON BAR                  |
| IB   | DENOTES IRON BAR                                  |
| H&M  | HEWITT AND MILNE LTD., O.L.S.                     |
| 1063 | R. 1063   |
| ZUMO | DENOTES ZUBEK, O.M. PATTEN & THOMSEN LTD., O.L.S. |
| 1331 | MARTIN KINSLEY, O.C.                              |
| P1   | DENOTES MINISTRY OF TRANSPORTATION ONTARIO        |
| P2   | DENOTES REGISTERED PLAN 1129                      |
| P3   | DENOTES MINISTRY OF TRANSPORTATION ONTARIO        |
| P3   | DENOTES ZUMO PLAN DATED AUGUST 13 1998            |
| BM   | DENOTES BENCHMARK                                 |
| BP   | DENOTES B. PEDESTAL                               |
| CB   | DENOTES CHALK BASIN                               |
| FD   | DENOTES FIRE HYDRANT                              |
| OV   | DENOTES OVERHEAD                                  |
| UPH  | DENOTES UTILITY POLE                              |

**ELEVATION NOTES**  
ELEVATIONS ARE GEODETIC, ESTABLISHED BY BENCHMARK 72U299  
LOCATED AT THE HIGHWAY 26 BRIDGE OVER BEAVER RIVER IN THORNBURY  
SAID BENCHMARK HAVING A PUBLISHED ELEVATION OF 187.695

BM#1 - TOP NUT OF FH AT INTERSECTION OF ALFRED STREET WEST  
AND VICTORIA STREET - 198.90

BM#2 - TOP OF SUB AT SOUTHERLY CORNER OF PROPERTY - 198.29

**METRIC NOTE**  
DISTANCES AND COORDINATES SHOWN ON THIS PLAN ARE  
IN METRES AND CAN BE CONVERTED TO FEET BY  
DIVIDING BY 0.3048.

[illegible]

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 13th DAY OF OCTOBER 2018.

OCTOBER 18th 2018

NEIL C. MILNE,  
ONTARIO LAND SURVEYOR

ORCHARD DRIVE

PRELIMINARY  
SEVERANCE SKETCH  
JULY 31 2019

JULY 31 2019

LOT 57

---

*INTEGRATION DATA*

ALL COORDINATES ARE IN METRES, ARE DERIVED FROM GPS  
RTK OBSERVATIONS USING THE CAN-NET NETWORK  
AND ARE REFERRED TO UTM ZONE 17 (81° WEST LONGITUDE,  
NAD83(CSRS)(1997.0)  
COORDINATE VALUES ARE TO A RURAL ACCURACY IN  
ACCORDANCE WITH SECTION 14(2) OF OREG 216/10.

| POINT ID | NORTHING   | EASTING   |
|----------|------------|-----------|
| A        | 4934134.96 | 542682.01 |
| B        | 4934225.57 | 542750.99 |

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

---

*INTEGRATION NOTES*

BEARINGS ARE UNIVERSAL TRANSVERSE MERCATOR (UTM) GRID, DERIVED FROM NETWORK GPS OBSERVATIONS TRANSFERRED TO MONUMENTS 'A' AND 'B' SHOWN HEREON. THE UTM GRID BEARING BETWEEN POINTS 'A' AND 'B' IS N37°16'30"E, NAD83(CSRS)(1997.0), AND IS REFERRED TO THE CENTRAL MERIDIAN OF UTM ZONE 17 (81° WEST LONGITUDE).

DISTANCES SHOWN ON THIS PLAN ARE GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.99956

BEARING COMPARISONS TO REGISTERED INSTRUMENTS AND PLANS SHOWN ON THIS PLAN ARE ASTRONOMIC BEARINGS. A CLOCKWISE ROTATION OF  $359^{\circ}43'35''$  CAN BE APPLIED TO THESE ASTRONOMIC BEARING COMPARISONS TO CONVERT TO UTM GRID BEARINGS

HEWETT AND MILNE LIMITED  
ONTARIO LAND SURVEYORS

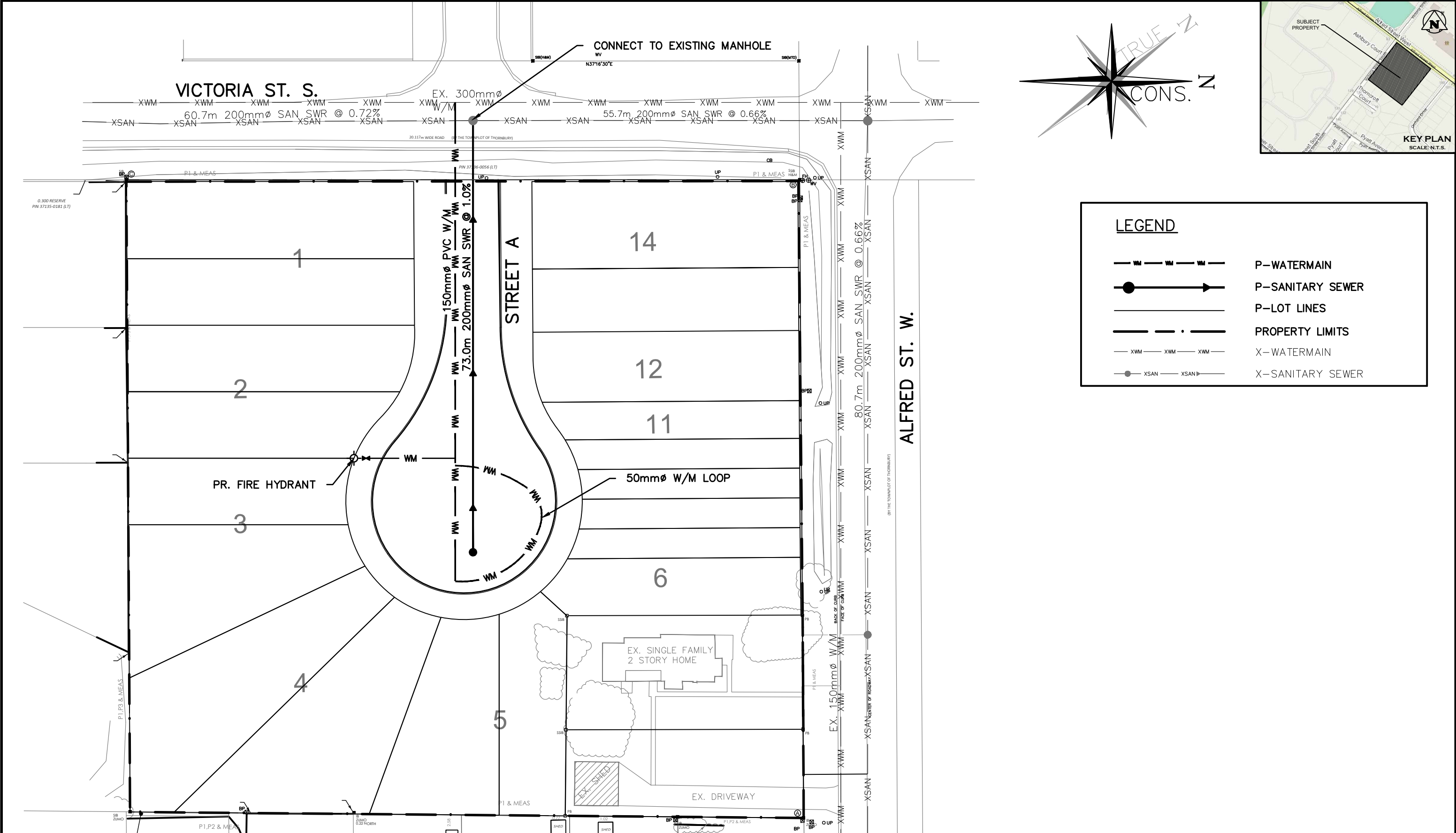
**h** 302, 8th STREET EAST,  
OWEN SOUND, ONTARIO  
P. O. BOX 112, N4K 5P1  
TEL. 519-376-5528  
FAX 519-376-5534  
EMAIL: [hondm@hmts.ca](mailto:hondm@hmts.ca)

| DRAWN BY | FILE # | FILE LOCATION |
|----------|--------|---------------|
| MOH      | 10-043 | 05            |

 PLANNING  
URBAN DESIGN  
& LANDSCAPE  
ARCHITECTURE  
**MHBC PLANNING**

430 COLBORNE STREET,  
SUITE #202  
LONDON, ON. N6B 2V2  
P: 519 858 2797 F: 519 858 2920  
WWW.MHBCPLANNING.COM





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4. DO NOT SCALE THE DRAWINGS.

5. ALL EXISTING UNDERGROUND UTILITIES TO BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION.

| No. | ISSUE                      | DATE: MM/DD/YYYY |
|-----|----------------------------|------------------|
| 0   | DRAFT PLAN APPROVAL        | 09/13/2019       |
| 1   | REVISED FOR NEW LOT FABRIC | 06/2/2020        |
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| Engineer | Engineer |
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| Project | Project |
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**DRAFT**

FOR DISCUSSION PURPOSES ONLY

**ASHBURY EAST**

**THE TOWN OF THE BLUE MOUNTAINS**

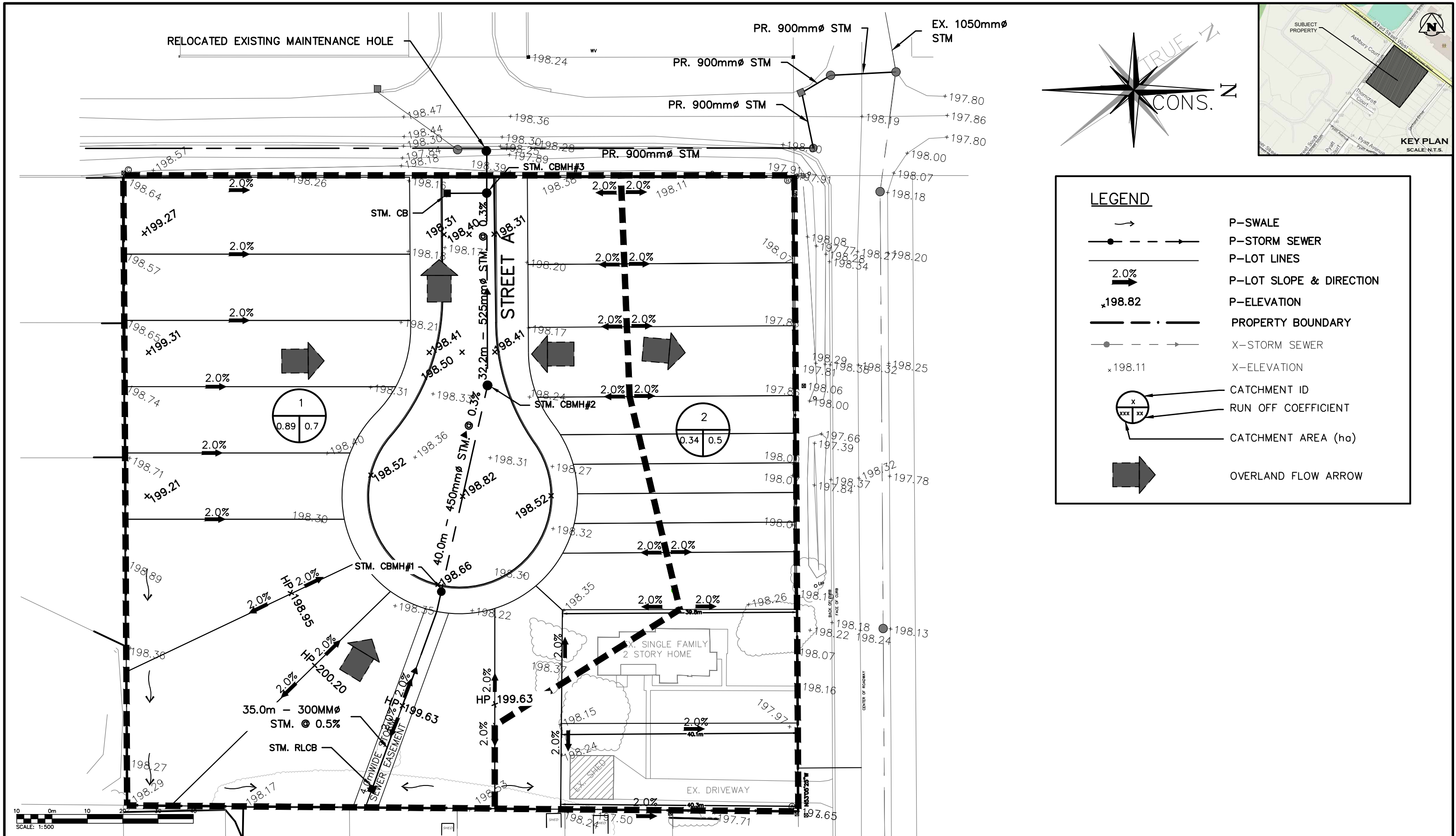
**PRELIMINARY SITE SERVICING PLAN**

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 | N.L. | Design By | N.L. | Project | 1284-4979 |
| Check By | K.M. | Check By  | G.C. | Scale   | 1:600     |
|          |      |           |      | Drawing | FIG. 4    |







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4. DO NOT SCALE THE DRAWINGS.

5. ALL EXISTING UNDERGROUND UTILITIES TO BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION.

**TEMPORARY BENCHMARKS**

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

Town

| No. | ISSUE                      | DATE: MM/DD/YYYY |
|-----|----------------------------|------------------|
| 0   | DRAFT PLAN APPROVAL        | 09/13/2019       |
| 1   | REVISED FOR NEW LOT FABRIC | 06/2/2020        |
|     |                            |                  |
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Engineer

**DRAFT**

FOR DISCUSSION PURPOSES ONLY

Engineer

Project

**ASHBURY EAST**

**THE TOWN OF THE BLUE MOUNTAINS**

Drawing

**PRELIMINARY SITE GRADING AND POST DEVELOPMENT DRAINAGE PLAN**

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 | N.L. | Design By | N.L. | Project | 1284-4979     |
|----------|------|-----------|------|---------|---------------|
| Check By | K.M. | Check By  | G.C. | Scale   | 1:600         |
|          |      |           |      | Drawing | <b>FIG. 6</b> |