MINTO / CANDEREL

STORMWATER MANAGEMENT SERVICING REPORT
485 RICHMOND ROAD, OTTAWA

Project: 32385-5.2.2

JULY 2012

IBI GROUP

TABLE OF CONTENTS

List of Figures

List of Tables

List of Appendices

1. INTRODUCTION

Minto and Carederel have proposed a residential building with a height of 17 storeys that includes condominiums and underground parking at 224 Lyon Street. The surrounding area is mostly urban residential buildings. The total site area is 3403 m^2 or 0.3403 ha. The location of the study area is illustrated within **Figure 1**.

This report presents the proposed stormwater management solution to service the development. The stormwater management system has been developed in accordance with the City of Ottawa Sewer Design Guidelines (November 2004) and LEED Canada-NC 1.0 Green Building Rating System.

1.1 Site Servicing

Site servicing for the proposed development was outlined within the report "Conceptual Site Servicing Study, Stormwater Site Management Plan Erosion and Sedimentation Control Plan 485 Richmond Road" by IBI group, July 2012. That report concluded that existing infrastructure adjacent to the site has sufficient available capacity to service the proposed development. Appropriate extensions from an existing sanitary sewer, storm sewer and watermain will adequately service the proposed high rise building. Among other items the Site Survey report recommended that the runoff from the developed site be captured in a new 250 mm diameter storm sewer and conveyed to the existing 250 mm diameter storm sewer located

2. EXISTING CONDITIONS

2.1 Approach

Post-development flows from the site should correspond to the existing conditions release flow rates. The site has been divided into the following three drainage boundaries (Area A, Area B, Area C). Area A consists of 239 m^2 which drains into an existing 675mm diameter sewer to in Richmond Road, Area B consists of 673 m^2 which drains into an existing 500mm diameter sewer located to the west of the site , Area C consist of 2491 m^2 which drains into an existing 250mm diameter sewer to the north of the site. The location of the drainage areas are represented on **Figure 2**

2.2 Existing Conditions Release Rate Area A

The maximum allowable release rate for Area A was determined using the rational method with the following parameters:

- Drainage area = 239 m^2
- Time of concentration = 20 min
- Runoff coefficient = 0.756
- 5 year intensity (City of Ottawa) = i_{5yr} =998.071/(T+6.053)$^{0.814}$ = 70.25 mm/hr
- 100 year intensity (City of Ottawa) = i_{100yr}=1735.688/(T+6.014)$^{0.82}$ = 119.95 mm/hr

The calculations indicate that the maximum permissible release rate (Q_{max}) for Area A is 3.53 l/s for the 5 year storm and 6.03 l/s for the 100 year storm. Detailed calculations are enclosed in **Appendix A**.

2.3 Existing Conditions Release Rate Area B

The maximum allowable release rate for Area B was determined using the rational method with the following parameters:

- Drainage area = 673 m^2
- Time of concentration = 20 min
- Runoff coefficient = 0.795
- 5 year intensity (City of Ottawa) = i_{5yr} =998.071/(T+6.053)$^{0.814}$ = 70.25 mm/hr
- 100 year intensity (City of Ottawa) = i_{100yr}=1735.688/(T+6.014)$^{0.82}$ = 119.95 mm/hr

The calculations indicate that the maximum permissible release rate (Q_{max}) for Area B is 10.45 l/s for the 5 year storm and 17.84 l/s for the 100 year storm. Detailed calculations are enclosed in **Appendix A**.

2.4 Existing Conditions Release Rate Area C

The maximum allowable release rate for Area C was determined using the rational method with the following parameters:

- Drainage area = 2491 m^2
- Time of concentration = 20 min
- Runoff coefficient = 0.7
- 5 year intensity (City of Ottawa) = i_{5yr} =998.071/(T+6.053)$^{0.814}$ = 70.25 mm/hr
- 100 year intensity (City of Ottawa) = i_{100yr}=1735.688/(T+6.014)$^{0.82}$ = 119.95 mm/hr

The calculations indicate that the maximum permissible release rate (Q_{max}) for Area C is 34.05 l/s for the 5 year storm and 58.15 l/s for the 100 year storm. Detailed calculations are enclosed in **Appendix A**.

3. POST DEVELOPMENT

3.1 Approach

The site has been divided into the following three drainage boundaries (Area A, Area B, Area C). Area A consists of 260 m^2 which drains to south of the site, Area B consists of 722 m^2 which drains to west of the site, Area C consist of 2429 m^2 and drains into the north of the site. The locations of the drainage areas are represented on **Figure 3**

3.2 Post Development Release Flow Rate Area A

The flow generated from Area A was determined using the rational method with the following parameters:

- Drainage area = 260 m^2
- Time of concentration = 20 min
- Runoff coefficient = 0.773
- 5 year intensity (City of Ottawa) = i_{5yr} =998.071/(T+6.053)$^{0.814}$ = 70.25 mm/hr
- 100 year intensity (City of Ottawa) = i_{100yr}=1735.688/(T+6.014)$^{0.82}$ = 119.95 mm/hr

The calculations indicate release rate from Area A is 3.93 l/s for the 5 year storm and 6.70 l/s for the 100 year storm. Detailed calculations are enclosed in **Appendix A**.

3.3 Post Development Release Flow Rate Area B

The flow generated from Area A was determined using the rational method with the following parameters:

- Drainage area = 722 m^2
- Time of concentration = 20 min
- Runoff coefficient = 0.815

- 5 year intensity (City of Ottawa) = i_{5yr} =998.071/(T+6.053)$^{0.814}$ = 70.25 mm/hr
- 100 year intensity (City of Ottawa) = i_{100yr}=1735.688/(T+6.014)$^{0.82}$ = 119.95 mm/hr

The calculations indicate release rate from Area A is 11.49 l/s for the 5 year storm and 19.62 l/s for the 100 year storm. Detailed calculations are enclosed in **Appendix A**.

3.4 Post Development Release Flow Rate Area C

The flow generated from Area A was determined using the rational method with the following parameters:

- Drainage area = 2429 m^2
- Time of concentration = 20 min
- Runoff coefficient = 0.707
- 5 year intensity (City of Ottawa) = i_{5yr} =998.071/(T+6.053)$^{0.814}$ = 70.25 mm/hr
- 100 year intensity (City of Ottawa) = i_{100yr}=1735.688/(T+6.014)$^{0.82}$ = 119.95 mm/hr

The calculations indicate release rate from Area A is 33.54 l/s for the 5 year storm and 57.27 l/s for the 100 year storm. Detailed calculations are enclosed in **Appendix A**.

4. SUMMARY OF RESULTS

Table 1: Maximum Allowable Release Flow Rates VS Actual Release Flow Rates

Area ID	**Maximum Allowable Release Flow Rates (Existing Conditions)**		**Release Flow Rates (Post Development)**	
	5 Year (minor flow)	**100 Year (total flow)**	**5 Year (minor flow)**	**100 Year (major flow)**
Area A	3.53 l/s	6.03 l/s	3.93 l/s	6.70 l/s
Area B	10.45 l/s	17.84 l/s	11.49 l/s	19.62 l/s
Area C	34.05 l/s	58.15 l/s	33.54 l/s	57.27 l/s
Total	48.03	82.02	48.96	83.59

The post development release flow rates are close to matching the existing conditions maximum allowable release flow rates. Area A produces a negligible increase of 0.67 l/s for the proposed post development during the 100 year storm. Area B produces a negligible increase of 1.78 l/s for the proposed post development during the 100 year storm. Area C produces a decrease of 1.57 l/s for the proposed post development during the 100 year storm. The post development release flow rate for the entire site will see a marginal increase of 1.57 l/s. Therefore there will be no impact to the existing performance of the stormwater management system.

Major storm from the site was calculated by subtracting the 5 year flow from the 100 year flow. The following table indicates the results.

Table 2: Existing Major Flow Rates VS Post development Flow rates

Area ID	Existing Major Flow Rates	Post Development Major Flow Rates
Area A	2.50 l/s	2.77 l/s
Area B	7.39 l/s	8.13 l/s
Area C	24.10 l/s	23.73 l/s
Total	33.99	34.63

The post development major flow rates are close to matching existing condition major flow rates. Post development major flow routes will be consistent with existing conditions. No storm on site detention will be required.

5. PROPOSED STORM WATER MANAGEMENT PLAN

The proposed development will have a negligible effect on the performance of the existing storm sewer system. It is proposed that the existing drainage patterns remain essentially unchanged. A minor amount of runoff will continue to outlet to the 600mm diameter storm sewer in Richmond Road and some runoff will flow to the west of the subject site to an existing 750mm diameter storm sewer which is located south west of the Amica building. The balance of the site runoff will be directed via a new site storm sewer system to the existing 250mm diameter storm sewer located immediately north of the site. The subject site is the only area connected to that sewer.

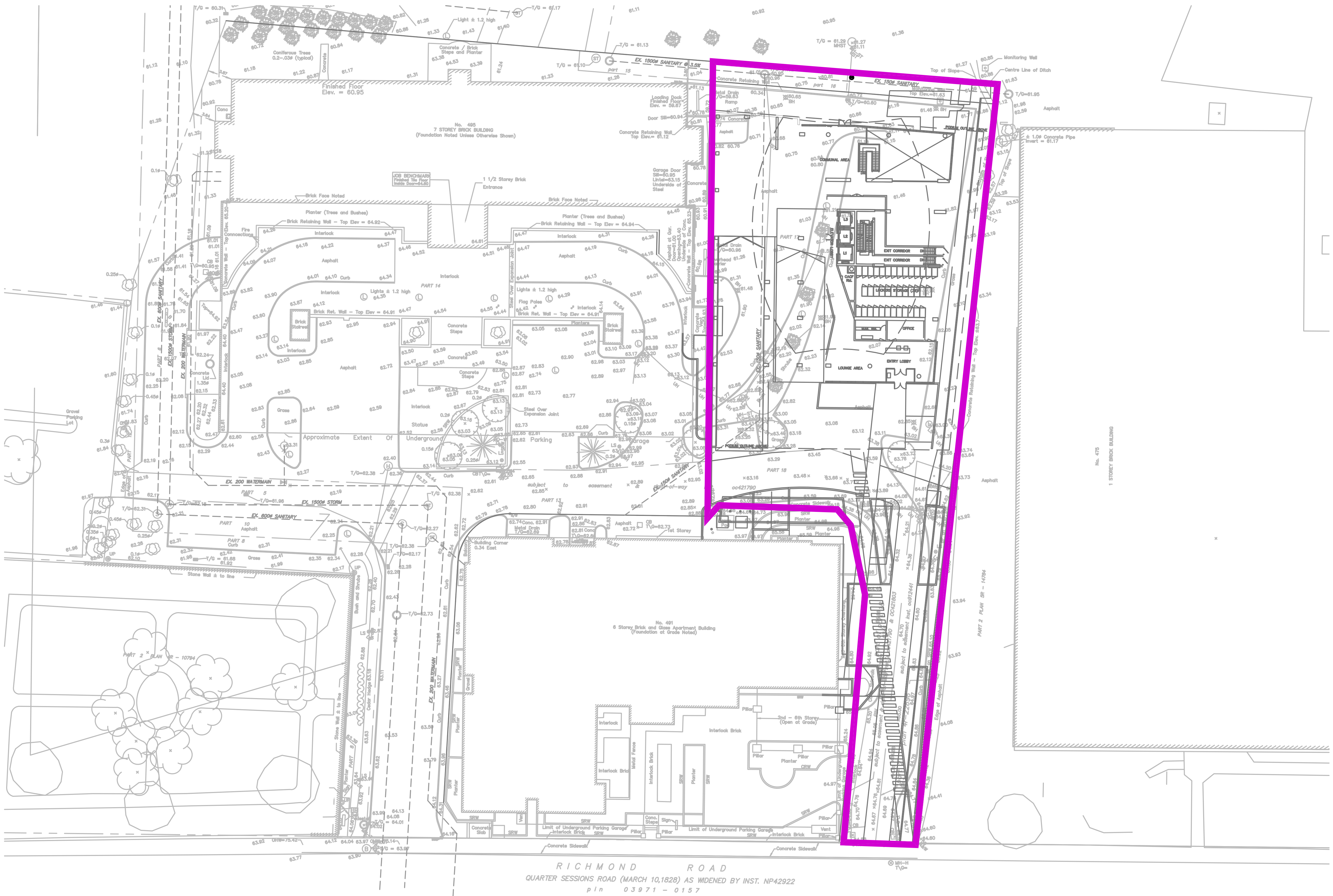
Our analysis indicates that no on site detention or storage is recommended for the proposed development.

Report by:

IBI GROUP

Michel Beauchemin C.E.T.

Peter Spal, P.Eng
Associate - Director



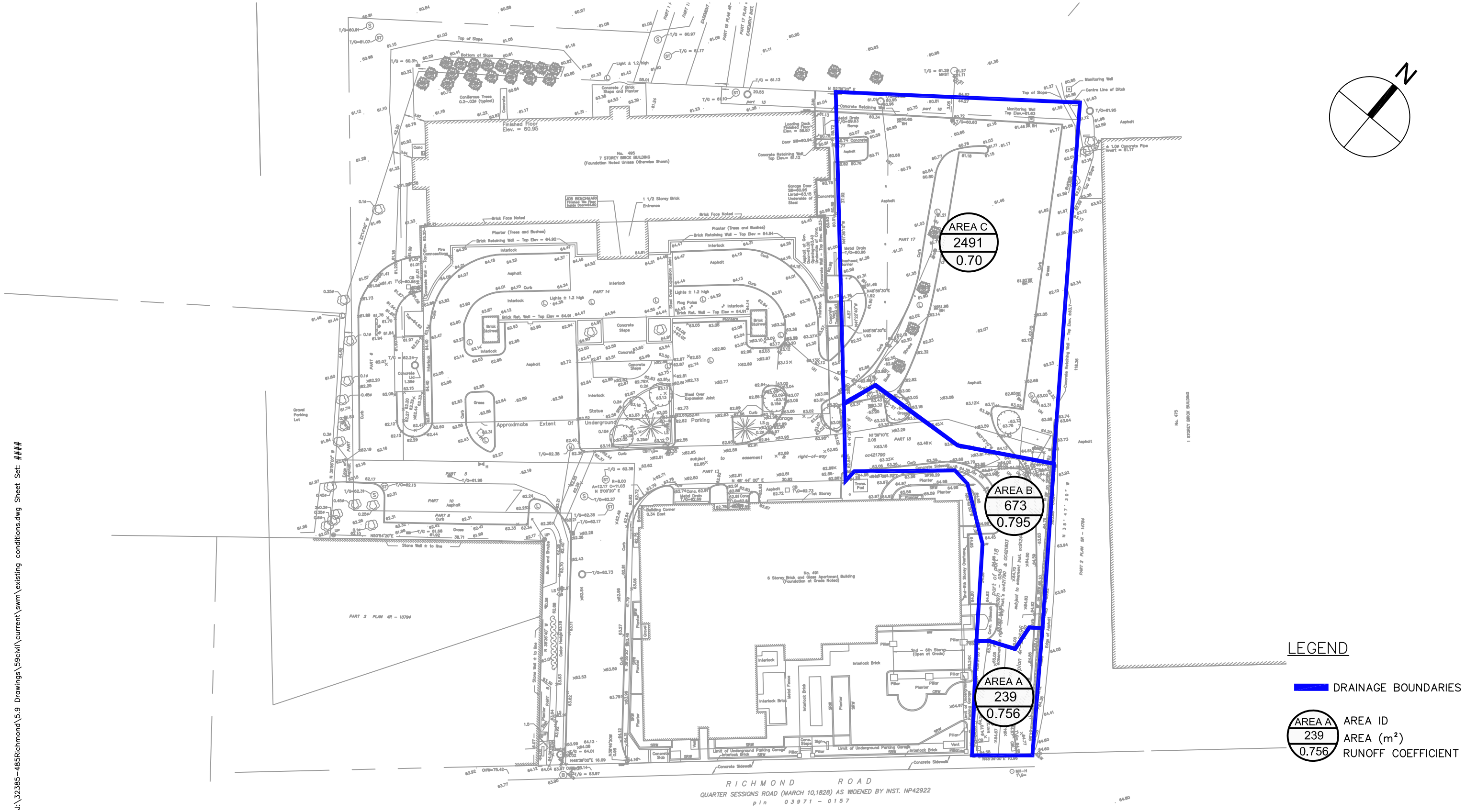
J:\32385-485Richmond\5.9 Drawings\59civil\current\swm\32385-proposed.dwg Sheet Set: ####

Plot Style: ---- Plot Scale: 1:1 Plotted At: Jul. 26, 12 1:01 PM Printed By: MICHEL BEAUCHEMIN Last Saved By: MBEAUCHEMIN Last Saved At: Jul. 26, 12

Scale	Project Title	Drawing Title	Sheet No.
N.T.S.	485 RICHMOND ROAD	STUDY AREA	FIGURE 1

IBI GROUP

minto CANDEREL



J:\32385-485Richmond\5.9 Drawings\59civil\current\swm\existing conditions.dwg Sheet Set: ####

Plot Style: ---- Plot Scale: 1:1 Plotted At: Jul. 26, 12 1:02 PM Printed By: MICHEL BEAUCHEMIN Last Saved By: MBEAUCHEMIN Last Saved At: Jul. 26, 12

IBI GROUP

Scale

N.T.S.

Project Title

minto CANDEREL

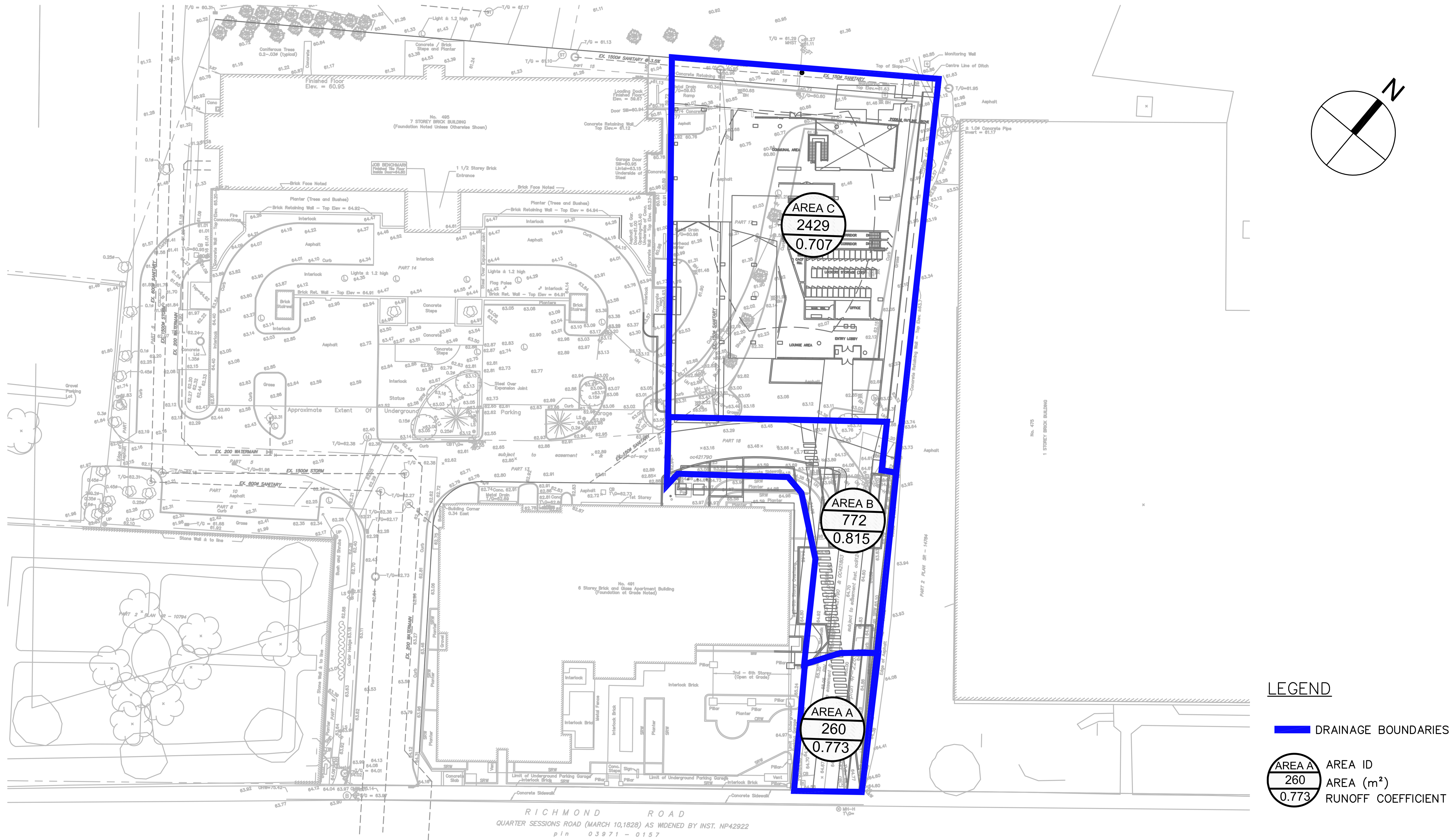
485 RICHMOND ROAD

Drawing Title

EXISTING CONDITIONS
SWM DRAINAGE BOUNDARIES

Sheet No.

FIGURE 2



J:\32385-485Richmond\5.9 Drawings\59civil\current\swm\32385-proposed.dwg Sheet Set: ####

Plot Style: ---- Plot Scale: 1:1 Plotted At: Jul. 26, 12 1:02 PM Printed By: MICHEL BEAUCHEMIN Last Saved By: MBEAUCHEMIN Last Saved At: Jul. 26, 12

IBI GROUP

Scale: N.T.S.

Project Title: minto CANDEREL

485 RICHMOND ROAD

Drawing Title: POST DEVELOPMENT SWM DRAINAGE BOUNDARIES

Sheet No.: FIGURE 3

APPENDIX A

Calculations

Existing Conditions Release Rates and Post development Release Rates

Existing Condition Flow Rates Area A

Time of concentration = 20 minutes

Area = 239 m^2

Runoff Coefficient (C) = Asphalt (190 m^2) 0.9

Grass (49 m^2) 0.2

$$\frac{[(190 \times 0.9) + (49 \times 0.2)]}{239}$$

Runoff Coefficient (C) = 0.756

Intensity - 5 year event storm

20 min Tc $i5_{yr}=998.071/(T+6.053)^{0.814}$ = 70.25 mm/hr

Existing Conditions (Q_{A5yr})

$Q_{max\ allowable\ 5yr}$ = 2.78*A*C*i= **3.53 l/s**

Intensity - 100 year event storm

20 min Tc $i_{100yr}=1735.688/(T+6.014)^{0.82}$ = 119.95 mm/hr

Existing Conditions (Q_{C100yr})

$Q_{max\ allowable\ 100yr}$ = 2.78*A*C*i= **6.03 l/s**

Stormwater Management - Total Site Post Development Uncontrolled 100 Year Flow Area A

Time of concentration = 20 minutes

Area = 260 m^2

Runoff Coefficient (C) = Asphalt (213 m^2) 0.9

Grass (47 m^2) 0.2

Shrubs (0 m2) 0.5

$$\frac{[(213 \times 0.9) + (47 \times 0.2)]}{260}$$

Runoff Coefficient (C) = 0.773

Intensity - 5 Year event storm

20 min Tc $i5_{yr}=998.071/(T+6.053)^{0.814}$ = 70.25 mm/hr

Post Development Flow rate (QA_{5yr})

$Q_{max\ allowable}$ = 2.78*A*C*i= **3.93 l/s**

Intensity - 100 year event storm

20 min Tc $i_{100yr}=1735.688/(T+6.014)^{0.82}$ = 119.95 mm/hr

Post Development Flow Rate(QA_{100yr})

$Q_{max\ allowable\ 100yr}$ = 2.78*A*C*i= **6.70 l/s**

Post development flow increase is negligable. No stormwater management required.

Existing Condition Flow Rates Area B

Time of concentration = 20 minutes

Area = 673 m^2

Runoff Coefficient (C) = Asphalt (572 m^2) 0.9

Grass (101 m^2) 0.2

$$\frac{[(572 \times 0.9) + (101 \times 0.2)]}{673}$$

Runoff Coefficient (C) = 0.795

Intensity - 5 year event storm

20 min Tc $i5_{yr}=998.071/(T+6.053)^{0.814}$ = 70.25 mm/hr

Existing Conditions (Q_{B5yr})

$Q_{max\ allowable\ 5yr}$ = 2.78*A*C*i= **10.45 l/s**

Intensity - 100 year event storm

20 min Tc $i_{100yr}=1735.688/(T+6.014)^{0.82}$ = 119.95 mm/hr

Existing Conditions (Q_{B100yr})

$Q_{max\ allowable\ 100yr}$ = 2.78*A*C*i= **17.84 l/s**

Stormwater Management - Total Site Post Development Uncontrolled 100 Year Flow Area B

Time of concentration = 20 minutes

Area = 722 m^2

Runoff Coefficient (C) = Asphalt (631 m^2) 0.9

Grass (78 m^2) 0.2

Shrubs (13 m2) 0.4

$$\frac{[(631 \times 0.9) + (78 \times 0.2) + (13 \times 0.4)]}{722}$$

Runoff Coefficient (C) = 0.815

Intensity - 5 Year event storm

20 min Tc $i5_{yr}=998.071/(T+6.053)^{0.814}$ = 70.25 mm/hr

Post Development Flow rate (Q_{B5yr})

$Q_{max\ allowable}$ = 2.78*A*C*i= **11.49 l/s**

Intensity - 100 year event storm

20 min Tc $i_{100yr}=1735.688/(T+6.014)^{0.82}$ = 119.95 mm/hr

Post Development Flow Rate(Q_{B100yr})

$Q_{max\ allowable\ 100yr}$ = 2.78*A*C*i= **19.62 l/s**

Post development flow increase is negligable. No stormwater management required.

Existing Condition Flow Rates Area C

Time of concentration = 20 minutes

Area = 2491 m^2

Runoff Coefficient (C) = Asphalt (1788 m^2) 0.9

Grass (703 m^2) 0.2

$$\frac{[(1788 \times 0.9) + (703 \times 0.2)]}{2491}$$

Runoff Coefficient (C) = 0.7

Intensity - 5 year event storm

20 min Tc $i5_{yr}=998.071/(T+6.053)^{0.814}$ = 70.25 mm/hr

Existing Conditions (Q_{C5yr})

$Q_{max\ allowable\ 5yr}$ = 2.78*A*C*i= **34.05 l/s**

Intensity - 100 year event storm

20 min Tc $i_{100yr}=1735.688/(T+6.014)^{0.82}$ = 119.95 mm/hr

Existing Conditions (Q_{C100yr})

$Q_{max\ allowable\ 100yr}$ = 2.78*A*C*i= **58.15 l/s**

Stormwater Management - Total Site Post Development Uncontrolled 100 Year Flow Area A

Time of concentration = 20 minutes

Area = 2429 m^2

Runoff Coefficient (C) = Asphalt (1585 m^2) 0.9

Grass (330 m^2) 0.2

Shrubs (514 m2) 0.4

$$\frac{[(1585 \times 0.9) + (434 \times 0.2) + (514 \times 0.4)]}{2429}$$

Runoff Coefficient (C) = 0.707

Intensity - 5 Year event storm

20 min Tc $i5_{yr}=998.071/(T+6.053)^{0.814}$ = 70.25 mm/hr

Post Development Flow rate (Q_{C5yr})

$Q_{max\ allowable}$ = 2.78*A*C*i= **33.54 l/s**

Intensity - 100 year event storm

20 min Tc $i_{100yr}=1735.688/(T+6.014)^{0.82}$ = 119.95 mm/hr

Post Development Flow Rate(Q_{C100yr})

$Q_{max\ allowable\ 100yr}$ = 2.78*A*C*i= **57.27 l/s**

Post development flow are less then existing conditions. No stormwater management required.