1 Columbia Street West

Functional Servicing and Stormwater Management Report

Project Location:
1 Columbia Street West, Waterloo, ON

Prepared for:
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December 5, 2023

MTE File No.: 40459-101

Engineers, Scientists, Surveyors.

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Erosion Sediment Control and Conceptual Workspace Management Plan
MTE Drawing No. ES1.1 .....Appended Separately

Functional Site Grading Plan
MTE Drawing No. C2.1 .....Appended Separately

Functional Site Servicing Plan
MTE Drawing No. C2.2 .....Appended Separately

1.0 INTRODUCTION

MTE Consultants Inc. was retained by Studio Lumina Inc. to complete a Functional Servicing and Stormwater Management Report for a proposed 7-storey residential building addition to be constructed at 1 Columbia Street West in the City of Waterloo in support of the Official Plan Amendment and Zoning By-Law Amendment Applications. The proposed building will be connected to the existing residential building at 1 Columbia Street West through the underground parking structure.

The site is located at the intersection of King Street North and Columbia Street West. The site is bounded to the north by Columbia Street West, to the east by King Street North, and to the south and west by existing residential developments. For the exact location of the site refer to the key plan located on the separately appended engineering drawings.

The purpose of this study is to support the Official Plan Amendment and Zoning By-Law Amendment Applications. This will be accomplished by reviewing the opportunities and constraints for the subject property with respect to servicing, grading, and stormwater management; reviewing the requirements of the reviewing agencies; describing the development concept; and demonstrating the functional serviceability of the property. Pending approval of the Amendment applications, detailed design of the site will commence and be submitted to the City in support of Site Plan Approval.

2.0 EXISTING CONDITIONS

2.1 Existing Topography

The overall site consists of an existing high-rise apartment building municipally known as 1 Columbia Street West and two existing 2-storey residential dwellings known as 351-355 King Street North, each with its own driveway entrance. The total site area is 0.395ha, with the developable area of the site being 0.120ha. In the existing condition, surface runoff from the developable area of the site drains from north to south. There is an elevation difference of approximately 2.5m across the developable area, with the lowest elevation at approximately 334.75m in the southeast corner and the highest elevation at approximately 337.25m to the north. The developable area is approximately 46.3% impervious in the existing condition.

2.2 Existing Servicing

2.2.1 Water

There is an existing 200mm diameter municipal watermain along Columbia Street West. There is also an existing 150mm diameter municipal watermain and a 400mm diameter regional transmission watermain along King Street North. The closest municipal fire hydrant is located at the north corner of the site. The existing apartment building is currently serviced by a 150mm diameter water service off the Columbia Street West municipal watermain. The existing residential dwellings facing King Street North are each serviced with their own water service, all connected to the existing 150mm diameter municipal watermain on King Street North. The existing water services to the residential dwellings will be decommissioned and capped at the municipal watermain as part of the redevelopment.

2.2.2 Sanitary

There is an existing 200mm diameter municipal sanitary sewer along Columbia Street West draining west. There is also an existing 225mm diameter municipal sanitary sewer along King Street North draining south. The existing apartment building is currently serviced by a 200mm diameter sanitary sewer service off the municipal sanitary sewer along Columbia Street West. The existing residential dwellings fronting King Street North are individually serviced with their own 100mm diameter sanitary service connections off of the municipal sanitary sewer along King Street North. The existing sanitary services to the residential dwellings will be removed and capped at municipal sewer as part of the redevelopment of the site.

2.2.3 Storm

There is an existing 300mm diameter municipal storm sewer along Columbia Street West draining west. There is also an existing 300mm diameter municipal storm sewer along King Street North draining south into a 400mm diameter sewer. The existing apartment building is currently serviced by a 300mm diameter storm service off of the municipal storm sewer along Spruce Street. The majority of surface runoff from the developable area is currently conveyed overland to the southeast corner of the site and on to the King Street North right-of-way.

2.3 Existing Soils Information

Geotechnical information for the property is currently not available. A geotechnical investigation may be required during detailed building design to determine the condition of the native soils and recommend appropriate construction methods for the site development.

2.4 Reviewing Agencies

Grading, servicing and stormwater management designs as well as this Functional Servicing and Stormwater Report will be required for submission to the City of Waterloo in support of the Official Plan Amendment, the Zoning By-Law Amendment and the Site Plan Approval Applications. The City will also be responsible for the review and approval of site plans, detailed site grading, servicing, stormwater management, lighting and landscape designs and ultimately issuing building permits.

3.0 PROPOSED CONDITIONS

Functional grading and servicing strategies for the proposed development have been developed based on the topographic survey, plan and profile information, and Conceptual Site Plan prepared by Studio Limina Ltd., dated November 3, 2023.

3.1 Proposed Grading

The proposed development consists of a 7-storey building addition, connected to the existing apartment building through the underground parking structure. The building addition will be complete with commercial unit and amenity areas on the main floor, with a driveway entrance off King Street North. The proposed grading strategy will respect the existing grades along all property lines and match into the municipal sidewalk along King Street North. Regrading will involve raising the developable area in general to better align with the existing apartment building and directing runoff to the on-site area drains. The proposed addition will have a finished floor elevation of 335.80m with the commercial unit finished floor elevation being 335.30m.

3.2 Proposed Servicing

3.2.1 Water

The new building addition will be serviced through the existing apartment building for water, which is currently serviced by an existing 150mm diameter water service off the municipal watermain on Columbia Street West. The new building addition will be equipped with sprinklers. The following table summarizes the preliminary domestic and fire flow demands for the building addition.

Table 3.1 – Water Demand Summary

Building	Max Day Domestic Demand* (L/s)	OBC Fire Demand (L/s)	FUS Fire Demand (L/s)
Proposed Building Addition	3.37	105	200

* Max Day Domestic demand is calculated for the existing apartment building and the new building addition.

Refer to Appendix A for the water demand design sheet. The proposed development was analyzed using both the OBC and FUS fire flow requirements. The required fire flow was determined to be 105L/s and 200L/s based on OBC and FUS fire flow requirements, respectively.

Many municipalities in Ontario use both the OBC and the FUS fire flow requirements for assessing firefighting water supply requirements. Ideally, fire flow demands for new developments are calculated based on the FUS criteria; however, it is not reasonable to expect that the existing municipal watermain infrastructure always has the operational capacity to supply water at the rates prescribed in the FUS guidelines. As a result, at no time shall the available fire flow be less than that required by the Ontario Building Code. The minimum allowable pressure permitted under firefighting conditions is 140.0kPa per OBC 2012.

The existing municipal fire hydrant located at the north corner of the overall site is positioned within 45.0m of the fire department connection on the proposed building addition. A hydrant flow test will be conducted on this hydrant at detailed design to confirm it can provide the required fire flows as calculated above for the proposed building addition.

3.2.2 Sanitary

A sanitary flow design sheet has been prepared to determine the flows anticipated to be generated by the proposed building addition. The proposed 7-storey residential building has a total of six two-bedroom units, six three-bedroom units, and 24-bedroom units, for a total of 24 units and 78 bedrooms. The existing building is proposed to be revised with 12 new units, with a total of 21 new bedrooms. An anticipated peak sanitary demand of 6.0L/s was calculated based on a total of 470 existing and proposed bedrooms with a conservative density of 1.0 person per bedroom, an approximate existing commercial/amenity area of 593m^3, and a proposed commercial area of 144m^3. The combined total demand including infiltration allowance of 0.25L/s/ha for the site is 6.2L/s.

The proposed building addition will be serviced through the existing apartment building. The existing building is currently serviced by an existing 200mm diameter sanitary service installed at a 1.0% slope, connected to the municipal sanitary sewer along Columbia Street West. This

existing sanitary service connection will be replaced with a 200mm diameter sanitary sewer at a 3.0% slope to accommodate the increased sanitary flows. The total demand of 6.2L/s represents only 10.9% of the full flow capacity of the revised sanitary service. The revised service is proposed to connect to the 200mm diameter municipal sanitary sewer within the King Street North right-of-way, at an existing manhole located north of the Site. Refer to the separately submitted Drawings C1.1 and C2.2 for more details, as well as Appendix B for the sanitary sewer design sheet. The service sizes and inverts will be confirmed at detailed design.

3.2.3 Storm

In the existing condition, the existing apartment building is currently serviced by an existing storm service connected to the municipal storm sewer along Spruce Street. For the proposed building addition, runoff will be directed to on-site area drains that will be connected internally through the existing building.

Note that the proposed building addition takes up most of the site area, and stormwater from the perimeter of the building will flow uncontrolled to the surrounding right-of-ways. Refer to the separately submitted Drawings C1.1 and C.2.2 for more details.

4.0 PRELIMINARY STORMWATER MANAGEMENT DESIGN

4.1 SWM Criteria

The stormwater management design criteria for the developable area, as established by the City of Waterloo, are as follows:

i) Attenuation of the post-development peak flows for the 2-, 5-, and 100-year storm event to the pre-development (existing) peak flow; and,

ii) Implementation of Normal (Level 2) water quality controls.

4.2 Water Quantity Control

In order to successfully complete the preliminary stormwater management design for the developable area, the following specific tasks were undertaken:

i) Calculate the allowable runoff rates using MIDUSS NET;

ii) Determine the percent impervious of the site and catchment parameters for inclusion in MIDUSSS modeling; and,

iii) Calculate post-development runoff hydrographs using MIDUSS NET.

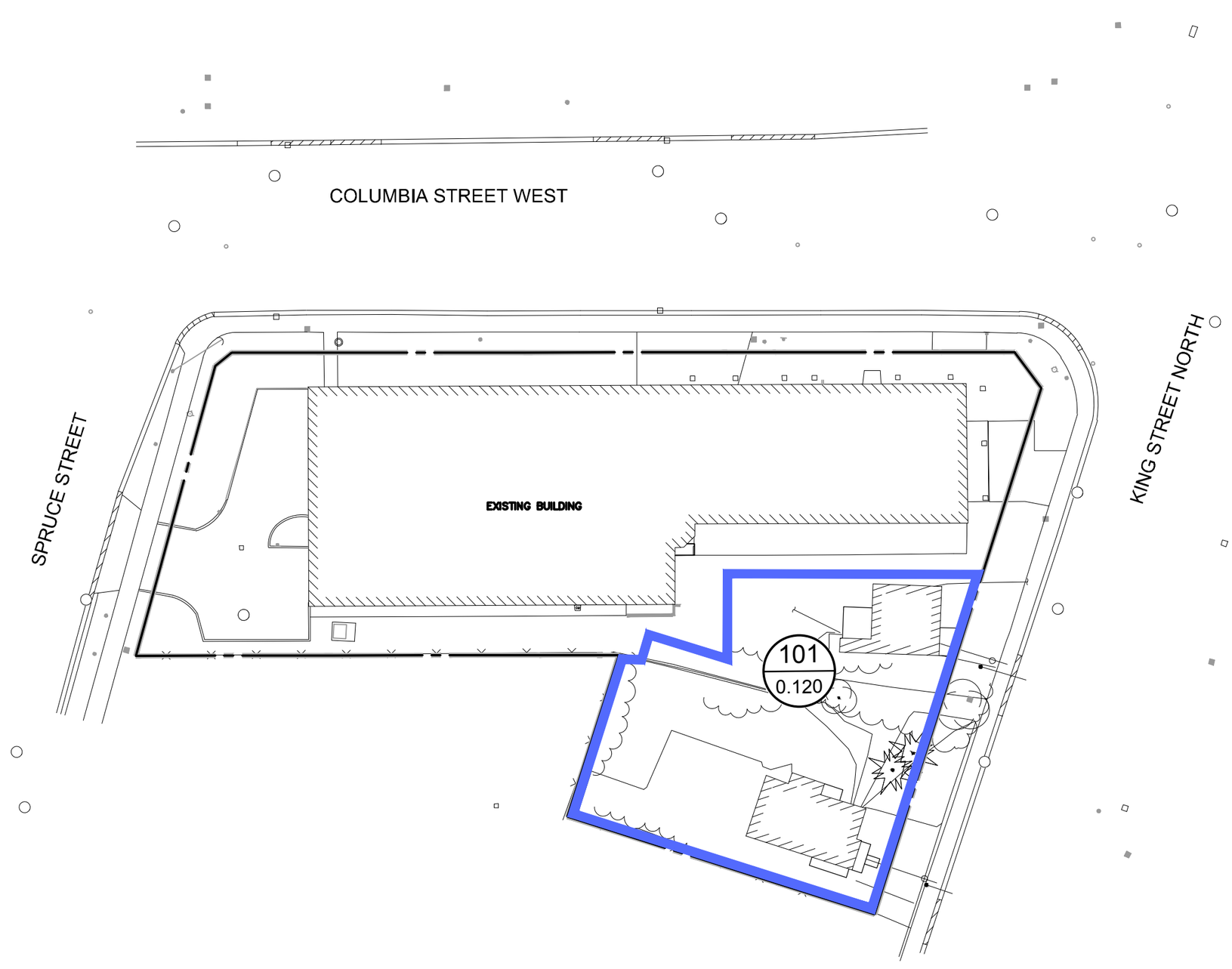
The following table summarizes the catchments used in modeling of the developable area. The post-development condition was separated into two catchment areas: the controlled rooftop and the uncontrolled area. Figure 1.0 illustrates the limits of the pre-development catchment area. Figure 2.0 illustrates the limits of the post-development catchment areas.

Table 4.1 – Catchment Parameters

#	Catchment	Area (m)	% Impervious	Pervious CN	Impervious CN	Slope (%)	Flow Length (m)
Pre-Development Catchment Area							
101	Developable Area	0.120	37.5	75	98	5.0	15.0
Post-Development Catchment Area							
201	Controlled Rooftop	0.056	100	75	98	1.5	10.0
202	Uncontrolled Area	0.064	70.2	75	98	2.5	5.0

A geotechnical investigation was not available for this development at the time this report was published. Therefore, a conservative value of 75 was used for the pervious CN.

CAD: P:\P\40459\101\40459-101-F1.DWG



LEGEND

CATCHMENT 101

101 — SUB-CATCHMENT NUMBER

0.120 — AREA (ha.)

0 5 10 15 20 25m

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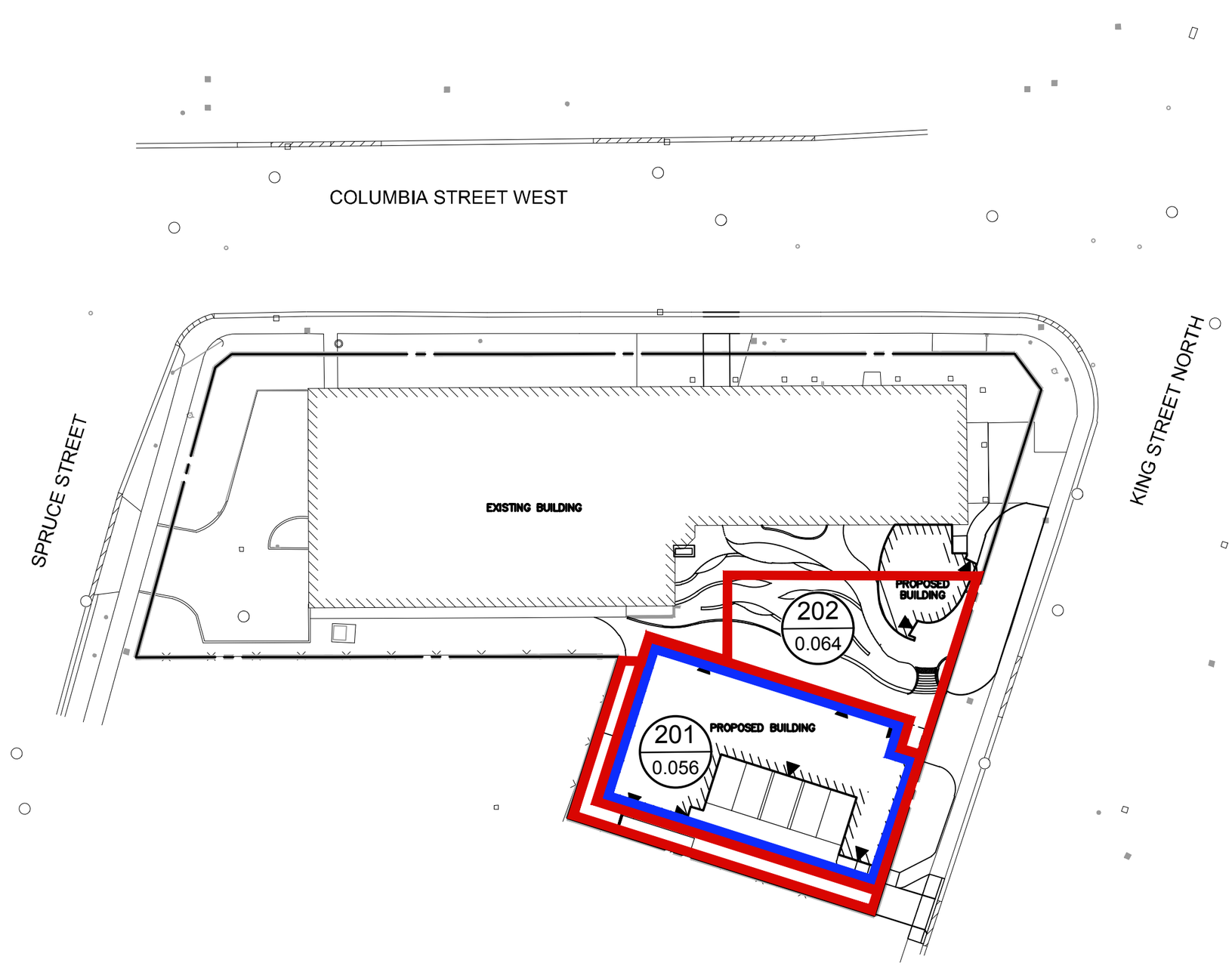
PROJECT
1 COLUMBIA
7-STOREY EXTENSION

TITLE
PRE-DEVELOPMENT CATCHMENT AREAS

Drawn	Scale	Figure
DAC	1:500	**1.0**
Checked: JHN	Project No.: 40459-101	
Date: 2023-12-06	Rev No.: 0	

Plot Date: December 8, 2023 - 11:34 AM

CAD: P:\P\40459\101\40459-101-F1.DWG



LEGEND

CATCHMENT 201

CATCHMENT 202

201 — SUB-CATCHMENT NUMBER

0.056 — AREA (ha.)

0 5 10 15 20 25m

MTE
Engineers, Scientists, Surveyors

PROJECT
1 COLUMBIA
7-STOREY EXTENSION

TITLE
POST-DEVELOPMENT CATCHMENT AREAS

Drawn: DAC	Scale: 1:500	Figure: **2.0**
Checked: JHN	Project No.: 40459-101	
Date: 2023-12-06	Rev No.: 0	

Plot Date: December 8, 2023 - 11:34 AM

In order to achieve the stormwater management requirements for the developable area, runoff generated from the building rooftop will be controlled using two flow control roof drains. A maximum of 0.15m of ponding is permitted on the rooftop. The runoff generated from the rooftop and the area drains proposed above the underground parking garage extension will be connected internally to the existing storm connection of the existing apartment building. The flow will then be conveyed to the municipal storm sewer on Spruce Street. Refer to the Stormwater Management Report for prepared by Meritech, dated September 2012 for details of the existing stormwater management design of the existing apartment building.

The site's impervious percentage under the existing condition is approximately 46.3% and will increase to approximately 77.3% under proposed development conditions. Runoff from the increased impervious area will be attenuated to reduce post-development peak flows to pre-development rates. Major overland flow generated from the impacted area will be directed to the King Street North right-of-way.

The following table summarizes the expected flows that will be generated by the developable area. Please note that these flows are subject to change at the detailed design stage.

Table 4.2 – Summary of Flows

Modelling Condition	2-Year Storm Event (m^3/s)	5-Year Storm Event (m^3/s)	100-Year Storm Event (m^3/s)
Pre-Development	0.013	0.018	0.039
Post-Development	0.013	0.017	0.032

With the installation of the flow control roof drains, the post-development runoff from the controlled portion of the developable area for the 2- and 5-storm event is controlled to $0.003m^3/s$, and for the 100-year storm event to $0.004m^3/s$. Note, these flow rates are subject to change at detailed design. Refer to Appendix C for the MIDUSS output.

4.3 Water Quality Control

There are currently no on-site stormwater quality controls in place for the developable area. The additional impervious area resulting from the proposed building addition will be captured internally through the existing apartment building and will generate mainly clean runoff on the rooftop and landscaped areas. Minimal impervious area from the proposed driveway entrance off of King Street North will flow untreated off-site. Therefore, the proposed development will not negatively impact stormwater quality, and no additional quality control for the developable area is proposed.

4.4 Erosion and Sediment Control

Precautions will need to be taken during construction to limit erosion and sedimentation. Typically, the following measures are recommended during construction for erosion and sedimentation control:

i. Erosion and sedimentation facilities are to be installed prior to any site preparation or demolition;

ii. All erosion control measures are to be inspected and monitored by the contractor and repairs are to be completed as required; and,

iii. All materials and equipment used for the purpose of site preparation and project completion should be operated and stored in a manner that prevents any deleterious substance from leaving the site.

5.0 CONCLUSIONS

Based on the foregoing analysis, it is concluded that:

i) The proposed grading design will respect the natural topography of the site to match into the existing surrounding elevations.

ii) Existing municipal infrastructure for water, sanitary and storm is available along King Street North and Columbia Street West.

iii) Service connections for sanitary, storm, and water are proposed to be connected internally to the existing apartment building services.

iv) The existing sanitary service is proposed to be revised to accommodate the additional sanitary flows from the new building addition.

v) The anticipated max day domestic water demand is 3.37L/s and the max fire flow demand is 150L/s based on OBC calculations. Based on the existing Functional Servicing Brief prepared by Meritech, dated June 2012, it is anticipated that the minimum residual pressure of 140kPa can be achieved.

vi) The SWM criteria can be satisfied with the implementation of onsite controls for water quantity. No additional water quality control is required.

vii) Additional grading, servicing and stormwater management details will be provided during detailed design.

All of which is respectfully submitted,

MTE Consultants Inc.



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Appendix A

Domestic and Fire Flow Demand

1 Columbia Street West

FIRE FLOW DEMANDS

Waterloo, Ontario

Project #: 40459-101

Date: December 5, 2023

Date Printed: 12/8/2023

By: JHN

Development Information[1]							Fire Flow[2]														Domestic Flow[3,4]					
							Ontario Building Code						Fire Underwriters Survey													
Node ID / Area ID / Building #	F.F.E. (m.a.s.l.)	Description	# of Bedrooms	Population	Total Bldg Area	Building Volume	K	V	S_{tot}	Q	F	F	C	A	F	(2) Occupancy Reduction	(3) Sprinkler Protection	(4) Building Exposure	F	F	Fire Flow (Max OBC/FUS)	MOE Guidelines	Average Day	Max Day	Peak Hour	Minimum Hour	Max Day + OBC Fire Flow
				# of people	m^2	m^3		m^3		*L*	*L/min*	*L/s*		m^2	*L/min*				*L/min*	*L/s*	*L/s*	*L/s*	*L/s*	*L/s*	*L/s*	*L/s*	*L/s*
A	337.80	Modified Ex. Apartment Bldg	392	392																		1.021	1.021	2.807	4.216	0.408	3
B	335.80	Proposed Addition	78	78	4,640	12,992	10	12,992	2.00	259,840	6,300	105	0.80	4,640	11,989	-15%	-30%	50%	12,000	200	200	0.203	0.203	0.559	0.839	0.081	203
TOTALS FOR SITE			**470**	**470**	**4640**	**12992**				**Max Fire Flow =**		**105**						**Max Fire Flow =**		**200**	**200**	**1.22**	**1.22**	**3.37**	**5.05**	**0.49**	**203**

Sum of Maximum Day Flows + Largest Fire Flow (L/s) = 203

Assumptions:

1 All building areas and populations are based on the Site Plan by Studio Limina Inc. Assumed a conservative 1 persons per bedrooms for domestic flow calculations.

2 All buildings are classified as occupancy group C (Residential Occupancy)

3 Average Daily Demands for each building are based on "*Tri City Water Distribution Master Plan Final Report" by AECOM, Dated May 2009* :

Residential = 225 L/cap/day

4 Peaking Factors based on "*Design Guidelines for Drinking-Water Systems*" (MOE, 2008):

Average Day =	1
Maximum Day =	2.75
Peak Hour =	4.13
Minimum Hour =	0.4

Appendix B

Sanitary Sewer Design Sheet

1 Columbia Street West
CITY OF WATERLOO

SANITARY SEWER DESIGN SHEET

ENGINEERING AND PUBLIC WORKS

Project Number: 40459-100
Date: December 8, 2023
Design By: JHN
Checked By: CAD
File: Q:\40459\101\Dec 2023 submission\Sanitary Sewer Design Sheet Waterloo_1 Columbia_v2.xls

Drainage Area Plan No: n/a

Design Parameters

Average Daily Flow

Residential	0.00318	L/s/c
Commercial	0.95	L/s/ha
Industrial	0.40	L/s/ha
Inst. / School	0.25	L/s/ha

Mannings "*n*"	0.013	
Min. Velocity	0.6	m/sec
Max. Velocity	3.0	m/sec

Residential Harmon Peaking Factor (F) $F = 1 + 14/(4 + P^{0.5})$
Commercial Peaking Factor = 2.5
Residential Areas Infiltration 0.25 L/s/ha

LOCATION				RESIDENTIAL AREAS AND POPULATION							SCHOOL, INSTITUTIONAL			COMMERCIAL			INDUSTRIAL				INFILTRATION			DESIGN						
											HECTARES AND FLOW OF EACH ZONING																			
											0.25 *L/s/ha*			0.95 *L/s/ha*			0.40 *L/s/ha*												
STREET	AREA NO.	MANHOLE LOCATION FROM MH	MANHOLE LOCATION TO MH	AREA	No. BEDROOM @ 1.00 people	No. UNITS @ 2.18 PPU	POPUL.	CUMUL POPUL.	PEAK FACTOR "F"	PEAK RES. FLOW	AREA	CUMUL AREA	PEAK FLOW	AREA	CUMUL AREA	PEAK FLOW	AREA	CUMUL AREA	PEAK FLOW	TOTALS-C-I FLOW	AREA	CUMUL AREA	INFIL FLOW	TOTAL VOLUME FLOW	LENGTH	SLOPE	PIPE SIZE	CAPACITY	FULL FLOW VELOCITY
				ha			*1000s*	*1000s*		*L/sec*	*ha*	*ha*	*L/sec*	*ha*	*ha*	*L/sec*	*ha*	*ha*	*L/sec*	*L/sec*	*ha*	*ha*	*L/sec*	*L/sec*	*m*	*%*	*mm*	*L/sec.*	*m/s*
Exisiting		Ex. Bdg	MHS1		370.00	0.00	0.370	0.370	4.038012	4.7554				0.06	0.06	0.1421				0.1421	0.40	0.40	0.0988	4.9962	17.4	3.00	200	56.7797	1.808
Proposed Additional Units to Existing Building		Ex. Bdg	MHS1		**22.00**		0.022	0.392	4.026308	5.0236				0.00	0.06	0.1421				0.1421		0.40	0.0988	5.2644	17.4	3.00	200	56.7797	1.808
Proposed Building Addition		Ex. Bdg	MHS1		**78.00**		0.078	0.470	3.9879	5.9657				0.01	0.07	0.1753				0.1753		0.40	0.0988	6.2398	17.4	3.00	200	56.7797	1.808

Appendix C

MIDUSS OUTPUT

Pre-Development

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                            Version 2.25  rev. 473"
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"                Output filename:                                  2 Year Pre.out"
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"                Company                                                        "
"                Date & Time last used:               12/8/2023 at 10:20:28 AM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     1101.000   Coefficient A"
"        9.258   Constant B"
"        0.882   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity          105.659    mm/hr"
"             Total depth                 32.400    mm"
"            6   002hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   Pre development"
"       46.300   % Impervious"
"        0.120   Total Area"
"       15.000   Flow length"
"        5.000   Overland Slope"
"        0.064   Pervious Area"
"       15.000   Pervious length"
"        5.000   Pervious slope"
"        0.056   Impervious Area"
"       15.000   Impervious length"
"        5.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.163   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
```

```
"       98.000   Impervious SCS Curve No."
"        0.825   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.013     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           0.064      0.056      0.120      hectare"
"             Time of concentration  14.038     1.126      3.529      minutes"
"             Time to Centroid       116.542    88.052     93.355     minutes"
"             Rainfall depth         32.400     32.400     32.400     mm"
"             Rainfall volume        20.88      18.00      38.88      c.m"
"             Rainfall losses        27.132     5.684      17.202     mm"
"             Runoff depth           5.268      26.716     15.199     mm"
"             Runoff volume          3.39       14.84      18.24      c.m"
"             Runoff coefficient     0.163      0.825      0.469      "
"             Maximum flow           0.001      0.013      0.013      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.013     0.013     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.013     0.013     0.013     0.000"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total Site"
"             Maximum flow                  0.013    c.m/sec"
"             Hydrograph volume            18.238    c.m"
"                     0.013     0.013     0.013     0.013"
" 38          START/RE-START TOTALS 101"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      0.120    hectare"
"             Total Impervious area                     0.056    hectare"
"             Total % impervious                       46.300"
" 19          EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                            ie METRIC"
"                Job folder:          Q:\40459\101\Dec 2023 submission\Miduss\"
"                                           With impacted area only\2023-12-08"
"                Output filename:                                  5 Year Pre.out"
"                Licensee name:                                                A"
"                Company                                                        "
"                Date & Time last used:                12/8/2023 at 10:22:20 AM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
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"       12.347   Constant B"
"        0.895   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity          136.512    mm/hr"
"             Total depth                 47.549    mm"
"            6   005hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   Pre development"
"       46.300   % Impervious"
"        0.120   Total Area"
"       15.000   Flow length"
"        5.000   Overland Slope"
"        0.064   Pervious Area"
"       15.000   Pervious length"
"        5.000   Pervious slope"
"        0.056   Impervious Area"
"       15.000   Impervious length"
"        5.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.258   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.862   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                  0.018     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           0.064      0.056      0.120      hectare"
"             Time of concentration  9.639      1.000      3.228      minutes"
"             Time to Centroid       109.672    87.235     93.020     minutes"
"             Rainfall depth         47.549     47.549     47.549     mm"
"             Rainfall volume        30.64      26.42      57.06      c.m"
"             Rainfall losses        35.278     6.582      21.992     mm"
"             Runoff depth           12.271     40.967     25.557     mm"
"             Runoff volume          7.91       22.76      30.67      c.m"
"             Runoff coefficient     0.258      0.862      0.537      "
"             Maximum flow           0.004      0.018      0.018      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.018     0.018     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                  0.018     0.018     0.018     0.000"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total Site"
"             Maximum flow                 0.018    c.m/sec"
"             Hydrograph volume           30.669    c.m"
"                  0.018     0.018     0.018     0.018"
" 38          START/RE-START TOTALS 101"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                    0.120    hectare"
"             Total Impervious area                   0.056    hectare"
"             Total % impervious                     46.300"
" 19          EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                              ie METRIC"
"                Job folder:          Q:\40459\101\Dec 2023 submission\Miduss\"
"                                           With impacted area only\2023-12-08"
"                Output filename:                                 100 Year Pre.out"
"                Licensee name:                                                 A"
"                Company                                                         "
"                Date & Time last used:                12/8/2023 at 10:23:42 AM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     4692.000   Coefficient A"
"       17.437   Constant B"
"        0.956   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           239.793    mm/hr"
"             Total depth                  89.960    mm"
"            6   100hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   Pre development"
"       46.300   % Impervious"
"        0.120   Total Area"
"       15.000   Flow length"
"        5.000   Overland Slope"
"        0.064   Pervious Area"
"       15.000   Pervious length"
"        5.000   Pervious slope"
"        0.056   Impervious Area"
"       15.000   Impervious length"
"        5.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.440   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.889   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                  0.039     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           0.064      0.056      0.120      hectare"
"             Time of concentration  5.855      0.789      2.637      minutes"
"             Time to Centroid       100.567    85.236     90.829     minutes"
"             Rainfall depth         89.960     89.960     89.960     mm"
"             Rainfall volume        57.97      49.98      107.95     c.m"
"             Rainfall losses        50.342     9.964      31.647     mm"
"             Runoff depth           39.618     79.996     58.313     mm"
"             Runoff volume          25.53      44.45      69.98      c.m"
"             Runoff coefficient     0.440      0.889      0.648      "
"             Maximum flow           0.015      0.032      0.039      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.039     0.039     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                  0.039     0.039     0.039     0.000"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total Site"
"             Maximum flow                 0.039    c.m/sec"
"             Hydrograph volume           69.976    c.m"
"                  0.039     0.039     0.039     0.039"
" 38          START/RE-START TOTALS 101"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                    0.120    hectare"
"             Total Impervious area                   0.056    hectare"
"             Total % impervious                     46.300"
" 19          EXIT"
```

Post-Development

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                            ie METRIC"
"                Job folder:          Q:\40459\101\Dec 2023 submission\Miduss\"
"                                           With impacted area only\2023-12-08"
"                Output filename:                                  2 Year Post.out"
"                Licensee name:                                                 A"
"                Company                                                         "
"                Date & Time last used:                12/8/2023 at 10:27:04 AM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     1101.000   Coefficient A"
"        9.258   Constant B"
"        0.882   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity          105.659    mm/hr"
"             Total depth                 32.400    mm"
"            6   002hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   Controlled Rooftop Drains Internally"
"      100.000   % Impervious"
"        0.056   Total Area"
"       10.000   Flow length"
"        1.500   Overland Slope"
"        0.000   Pervious Area"
"       10.000   Pervious length"
"        1.500   Pervious slope"
"        0.056   Impervious Area"
"       10.000   Impervious length"
"        1.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.829   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.013     0.000     0.000     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.056      0.056      hectare"
"             Time of concentration  15.795     1.267      1.267      minutes"
"             Time to Centroid       118.648    88.230     88.230     minutes"
"             Rainfall depth         32.400     32.400     32.400     mm"
"             Rainfall volume        0.00       18.14      18.14      c.m"
"             Rainfall losses        27.148     5.527      5.527      mm"
"             Runoff depth           5.252      26.873     26.873     mm"
"             Runoff volume          0.00       15.05      15.05      c.m"
"             Runoff coefficient     0.000      0.829      0.829      "
"             Maximum flow           0.000      0.013      0.013      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.013     0.013     0.000     0.000"
" 54          POND DESIGN"
"         0.013   Current peak flow    c.m/sec"
"         0.009   Target outflow    c.m/sec"
"          15.0   Hydrograph volume    c.m"
"           11.   Number of stages"
"         0.000   Minimum water level    metre"
"         0.150   Maximum water level    metre"
"         0.000   Starting water level    metre"
"             0   Keep Design Data: 1 = True; 0 = False"
"                   Level Discharge    Volume"
"                   0.000     0.000     0.000"
"                 0.01500   0.00045   0.03055"
"                 0.03000   0.00090    0.2444"
"                 0.04500   0.00135    0.8247"
"                 0.06000   0.00180     1.955"
"                 0.07500   0.00225     3.818"
"                 0.09000   0.00270     6.598"
"                  0.1050   0.00315    10.477"
"                  0.1200   0.00360    15.639"
"                  0.1350   0.00405    21.875"
"                  0.1500   0.00450    28.175"
"            1.   ROOFTOP"
"                 Roof area  Store area  Area/drain  Drain flow  Roof slope"
"                   hectare     hectare    sq.metre  L/min/25mm      g H:1V"
"                     0.056       0.042     275.000      22.500      66.667"
"             Using 2 roofdrains on roofstorage area of 420. square metre"
"             Peak outflow                  0.003    c.m/sec"
"             Maximum level                 0.092    metre"
"             Maximum storage               7.004    c.m"
"             Centroidal lag                1.927   hours"
"                  0.013     0.013     0.003     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total Site"
```

```
"             Maximum flow                  0.003    c.m/sec"
"             Hydrograph volume            15.045    c.m"
"                    0.013     0.013     0.003     0.003"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.013     0.000     0.003     0.003"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          202   Uncontrolled Area"
"       70.200   % Impervious"
"        0.064   Total Area"
"        5.000   Flow length"
"        2.500   Overland Slope"
"        0.019   Pervious Area"
"        5.000   Pervious length"
"        2.500   Pervious slope"
"        0.045   Impervious Area"
"        5.000   Impervious length"
"        2.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.162   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.793   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.011     0.000     0.003     0.003 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           0.019      0.045      0.064      hectare"
"             Time of concentration  8.940      0.717      1.374      minutes"
"             Time to Centroid       110.565    87.645     89.476     minutes"
"             Rainfall depth         32.400     32.400     32.400     mm"
"             Rainfall volume        6.18       14.56      20.74      c.m"
"             Rainfall losses        27.144     6.696      12.789     mm"
"             Runoff depth           5.257      25.704     19.611     mm"
"             Runoff volume          1.00       11.55      12.55      c.m"
"             Runoff coefficient     0.162      0.793      0.605      "
"             Maximum flow           0.000      0.010      0.011      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.011     0.011     0.003     0.003"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.011     0.011     0.011     0.003"
" 40          HYDROGRAPH   Combine    1"
```

```
"            6   Combine "
"            1   Node #"
"                Total Site"
"             Maximum flow                  0.013    c.m/sec"
"             Hydrograph volume            27.596    c.m"
"                     0.011     0.011     0.011     0.013"
" 38          START/RE-START TOTALS 202"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      0.120    hectare"
"             Total Impervious area                     0.101    hectare"
"             Total % impervious                       84.107"
" 19          EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                              ie METRIC"
"                Job folder:          Q:\40459\101\Dec 2023 submission\Miduss\"
"                                           With impacted area only\2023-12-08"
"                Output filename:                                  5 Year Post.out"
"                Licensee name:                                                 A"
"                Company                                                         "
"                Date & Time last used:                12/8/2023 at 10:25:54 AM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     1755.000   Coefficient A"
"       12.347   Constant B"
"        0.895   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity          136.512    mm/hr"
"             Total depth                 47.549    mm"
"            6   005hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   Controlled Rooftop Drains Internally"
"      100.000   % Impervious"
"        0.056   Total Area"
"       10.000   Flow length"
"        1.500   Overland Slope"
"        0.000   Pervious Area"
"       10.000   Pervious length"
"        1.500   Pervious slope"
"        0.056   Impervious Area"
"       10.000   Impervious length"
"        1.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.869   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.018     0.000     0.000     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.056      0.056      hectare"
"             Time of concentration  10.845     1.126      1.126      minutes"
"             Time to Centroid       111.105    87.419     87.419     minutes"
"             Rainfall depth         47.549     47.549     47.549     mm"
"             Rainfall volume        0.00       26.63      26.63      c.m"
"             Rainfall losses        35.232     6.249      6.249      mm"
"             Runoff depth           12.317     41.300     41.300     mm"
"             Runoff volume          0.00       23.13      23.13      c.m"
"             Runoff coefficient     0.000      0.869      0.869      "
"             Maximum flow           0.000      0.018      0.018      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.018     0.018     0.000     0.000"
" 54          POND DESIGN"
"         0.018   Current peak flow    c.m/sec"
"         0.009   Target outflow    c.m/sec"
"          23.1   Hydrograph volume    c.m"
"           11.   Number of stages"
"         0.000   Minimum water level    metre"
"         0.150   Maximum water level    metre"
"         0.000   Starting water level    metre"
"             0   Keep Design Data: 1 = True; 0 = False"
"                   Level Discharge    Volume"
"                   0.000     0.000     0.000"
"                 0.01500   0.00045   0.03055"
"                 0.03000   0.00090    0.2444"
"                 0.04500   0.00135    0.8247"
"                 0.06000   0.00180     1.955"
"                 0.07500   0.00225     3.818"
"                 0.09000   0.00270     6.598"
"                  0.1050   0.00315    10.477"
"                  0.1200   0.00360    15.639"
"                  0.1350   0.00405    21.875"
"                  0.1500   0.00450    28.175"
"            1.   ROOFTOP"
"                 Roof area  Store area  Area/drain  Drain flow  Roof slope"
"                   hectare     hectare    sq.metre  L/min/25mm      g H:1V"
"                     0.056       0.042     275.000      22.500      66.667"
"             Using 2 roofdrains on roofstorage area of 420. square metre"
"             Peak outflow                   0.003    c.m/sec"
"             Maximum level                  0.108    metre"
"             Maximum storage               11.644    c.m"
"             Centroidal lag                 2.117   hours"
"                  0.018     0.018     0.003     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total Site"
```

```
"             Maximum flow                  0.003    c.m/sec"
"             Hydrograph volume            23.162    c.m"
"                    0.018     0.018     0.003     0.003"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.018     0.000     0.003     0.003"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          202   Uncontrolled Area"
"       70.200   % Impervious"
"        0.064   Total Area"
"        5.000   Flow length"
"        2.500   Overland Slope"
"        0.019   Pervious Area"
"        5.000   Pervious length"
"        2.500   Pervious slope"
"        0.045   Impervious Area"
"        5.000   Impervious length"
"        2.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.257   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.825   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.015     0.000     0.003     0.003 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           0.019      0.045      0.064      hectare"
"             Time of concentration  6.138      0.637      1.279      minutes"
"             Time to Centroid       105.507    87.105     89.254     minutes"
"             Rainfall depth         47.549     47.549     47.549     mm"
"             Rainfall volume        9.07       21.36      30.43      c.m"
"             Rainfall losses        35.335     8.333      16.380     mm"
"             Runoff depth           12.214     39.216     31.169     mm"
"             Runoff volume          2.33       17.62      19.95      c.m"
"             Runoff coefficient     0.257      0.825      0.656      "
"             Maximum flow           0.001      0.014      0.015      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.015     0.015     0.003     0.003"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.015     0.015     0.015     0.003"
" 40          HYDROGRAPH   Combine    1"
```

```
"            6   Combine "
"            1   Node #"
"                Total Site"
"             Maximum flow                  0.017    c.m/sec"
"             Hydrograph volume            43.111    c.m"
"                     0.015     0.015     0.015     0.017"
" 38          START/RE-START TOTALS 202"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      0.120    hectare"
"             Total Impervious area                     0.101    hectare"
"             Total % impervious                       84.107"
" 19          EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                              ie METRIC"
"                Job folder:           Q:\40459\101\Dec 2023 submission\Miduss\"
"                                            With impacted area only\2023-12-08"
"                Output filename:                                100 Year Post.out"
"                Licensee name:                                                 A"
"                Company                                                         "
"                Date & Time last used:                12/8/2023 at 10:24:27 AM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     4692.000   Coefficient A"
"       17.437   Constant B"
"        0.956   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           239.793    mm/hr"
"             Total depth                  89.960    mm"
"            6   100hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   Controlled Rooftop Drains Internally"
"      100.000   % Impervious"
"        0.056   Total Area"
"       10.000   Flow length"
"        1.500   Overland Slope"
"        0.000   Pervious Area"
"       10.000   Pervious length"
"        1.500   Pervious slope"
"        0.056   Impervious Area"
"       10.000   Impervious length"
"        1.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.900   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.032     0.000     0.000     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.056      0.056      hectare"
"             Time of concentration  6.587      0.887      0.887      minutes"
"             Time to Centroid       101.523    85.335     85.335     minutes"
"             Rainfall depth         89.960     89.960     89.960     mm"
"             Rainfall volume        0.00       50.38      50.38      c.m"
"             Rainfall losses        50.405     9.010      9.010      mm"
"             Runoff depth           39.556     80.950     80.950     mm"
"             Runoff volume          0.00       45.33      45.33      c.m"
"             Runoff coefficient     0.000      0.900      0.900      "
"             Maximum flow           0.000      0.032      0.032      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.032     0.032     0.000     0.000"
" 54          POND DESIGN"
"         0.032   Current peak flow    c.m/sec"
"         0.009   Target outflow    c.m/sec"
"          45.3   Hydrograph volume    c.m"
"           11.   Number of stages"
"         0.000   Minimum water level    metre"
"         0.150   Maximum water level    metre"
"         0.000   Starting water level    metre"
"             0   Keep Design Data: 1 = True; 0 = False"
"                   Level Discharge    Volume"
"                   0.000     0.000     0.000"
"                 0.01500   0.00045   0.03055"
"                 0.03000   0.00090    0.2444"
"                 0.04500   0.00135    0.8247"
"                 0.06000   0.00180     1.955"
"                 0.07500   0.00225     3.818"
"                 0.09000   0.00270     6.598"
"                  0.1050   0.00315    10.477"
"                  0.1200   0.00360    15.639"
"                  0.1350   0.00405    21.875"
"                  0.1500   0.00450    28.175"
"            1.   ROOFTOP"
"                 Roof area  Store area  Area/drain  Drain flow  Roof slope"
"                   hectare     hectare    sq.metre  L/min/25mm      g H:1V"
"                     0.056       0.042     275.000      22.500      66.667"
"             Using 2 roofdrains on roofstorage area of 420. square metre"
"             Peak outflow                   0.004    c.m/sec"
"             Maximum level                  0.147    metre"
"             Maximum storage               26.894    c.m"
"             Centroidal lag                 2.568   hours"
"                  0.032     0.032     0.004     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total Site"
```

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"             Maximum flow                  0.004    c.m/sec"
"             Hydrograph volume            45.314    c.m"
"                    0.032     0.032     0.004     0.004"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.032     0.000     0.004     0.004"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          202   Uncontrolled Area"
"       70.200   % Impervious"
"        0.064   Total Area"
"        5.000   Flow length"
"        2.500   Overland Slope"
"        0.019   Pervious Area"
"        5.000   Pervious length"
"        2.500   Pervious slope"
"        0.045   Impervious Area"
"        5.000   Impervious length"
"        2.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.435   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.840   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.029     0.000     0.004     0.004 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           0.019      0.045      0.064      hectare"
"             Time of concentration  3.729      0.502      1.083      minutes"
"             Time to Centroid       97.991     85.114     87.434     minutes"
"             Rainfall depth         89.960     89.960     89.960     mm"
"             Rainfall volume        17.16      40.42      57.57      c.m"
"             Rainfall losses        50.830     14.363     25.230     mm"
"             Runoff depth           39.130     75.597     64.730     mm"
"             Runoff volume          7.46       33.96      41.43      c.m"
"             Runoff coefficient     0.435      0.840      0.720      "
"             Maximum flow           0.005      0.025      0.029      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.029     0.029     0.004     0.004"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.029     0.029     0.029     0.004"
" 40          HYDROGRAPH   Combine    1"
```

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"            6   Combine "
"            1   Node #"
"                Total Site"
"             Maximum flow                  0.032    c.m/sec"
"             Hydrograph volume            86.741    c.m"
"                     0.029     0.029     0.029     0.032"
" 38          START/RE-START TOTALS 202"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                     0.120    hectare"
"             Total Impervious area                    0.101    hectare"
"             Total % impervious                      84.107"
" 19          EXIT"
```