Functional Stormwater Management Report

401 – 417 Martha Street
City of Burlington
Project #TPB163165; Client Name: 2413350 Ontario Inc.

Prepared for:

2413350 Ontario Inc.
205 - 3390 South Service Road, Burlington, ON L7N 3J5

1/4/2021

Functional Stormwater Management Report

401 – 417 Martha Street
Project Location
Project #TPB163165; Client Name: 2413350 Ontario Inc.

Prepared for:

2413350 Ontario Inc.
205 - 3390 South Service Road, Burlington, ON L7N 3J5

Prepared by:

Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited
3450 Harvester Road, Suite 100, Burlington, ON L7N 3W5

1/4/2021

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Issued and Revisions Registry

Date	Description of Issued and/or Revision
March 2020	1st submission
January 2021	2nd submission

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1.0 Introduction

Wood Environment & Infrastructure Solutions, a Division of Wood Canada Limited ("Wood"), has been retained by 2413350 Ontario Inc. (the "Owner") to prepare a Functional Stormwater Management Report in support of a Site Plan Application for the proposed residential condo development at 401-417 Martha Street in the City of Burlington (the "City").

The purpose of this report is to examine and demonstrate the serviceability of this development with respect to stormwater management and ensure servicing strategies are consistent with the City of Burlington and Region of Halton requirements.

1.1 Existing Site Conditions

The subject land of approximately 0.32 ha is located at 401-417 Martha Street, in the City of Burlington. The site is bounded by an existing 12-storey Martha Terrace apartment building to the south, Martha Street to the west, Rambo Creek to the east and the Waterfront Trail to the north. The existing land use of the site is residential consisting of six (6) detached residential houses fronting Martha Street. The existing houses on-site are proposed to be demolished.

The grading around the existing residential lots drain away from the houses to the east and into existing Rambo Creek. The front yards are generally flat but drainage is directed away from the houses towards the street or side yard areas. There are no known external drainage areas to the site (Refer to the Existing Conditions Plan).

1.2 Proposed Development

The proposed site development is comprised of a 11-storey residential condo building with 130 residential units. The development will be serviced by four (4) levels of underground parking. One (1) entrance off of Martha Street is proposed and will accommodate the new building.

In order to remain consistent with the Rational Method that the City of Burlington uses to determine the storm sewer capacity, the proposed area weighted runoff coefficient has been calculated to be 0.65 with the following runoff coefficient values: lawn = 0.25, grass pavers = 0.35 and roof/asphalt/concrete = 0.90 applied.

The total impervious area of the proposed site will be 0.194 ha. The impervious coverage of the development including the concrete walkways will increase from 29% to approximately 61%. (Refer to **Appendix A** for runoff coefficient calculations).

1.3 Design Criteria

Due to the small drainage area of the site (less than 5 ha), the Rational Method has been used to determine design flows as a conservative approach.

Post development peak flow for the 100-year storm event should be controlled to the 5-year target flow with a runoff coefficient of 0.44.

Stormwater should be treated to Level 1 quality (Enhanced) as defined in the MOE 2003 SWMPD Manual, for the removal of 80% of the total suspended solids.

The City of Burlington Intensity-Duration-Frequency (IDF) data to be used for analysis including the 100-year storm multiplier.

2.0 Runoff Calculations

2.1 Target Conditions

The City of Burlington 5-year Intensity Duration Frequency coefficients (A = 697.40, B = 5.00, and C = 0.764) was used to calculate the intensity values for the 5-year target flows from the site. Target flow calculations to be based on a composite runoff coefficient of 0.44. Due to the small total area of the site, the City's minimum Time of Concentration (Tc) of 10 minutes was used. (Refer to **Appendix A** for allowable flow and runoff coefficient calculations). **Table 1** below shows a summary of the target input parameters.

Table 1: TARGET INPUT PARAMETERS (EXISTING SITE)

Catchment	C-value	Tc (min.)	Intensity (mm/hr)	Area (ha)	Flow (m^3/sec)
PRE	0.44	10	88.09	0.316	**0.034**

As shown in **Table 1** above, the post development flows will need to be controlled to the target flow of 0.034 m^3/sec (34 L/sec).

2.2 Proposed Conditions

Stormwater runoff around the proposed development is to be controlled to the 5-year target flow established in **Table 1**. The proposed building covers the majority of the site, and stormwater runoff from the proposed building will be captured within the on-site storm sewer system, except for the small landscaped and walkway areas around the proposed building draining to Rambo Creek and Martha Street. The subject property is proposed to discharge into the existing 525 mm storm sewer on Martha Street. The storm runoff will be collected and released in a controlled manner without adversely impacting adjacent lots.

The Post development drainage area and runoff coefficient are summarized in **Table 2** below. (Refer to **Appendix A** for post development calculations).

Table 2. POST DEVELOPMENT INPUT PARAMETERS (PROPOSED SITE)

Catchment	C-value	C-100YR	Tc (min.)	Area (ha)
A1 Post (Controlled)	0.90	1.00	10	0.188
A2 + A3 Post (Uncontrolled)	0.28	0.35	10	0.129

2.3 Stormwater Management – Quantity Control (Rational Method)

Since the proposed condition flow rate is higher than the target condition flow rate, on-site stormwater storage will be required. Using the City's IDF data, rational method calculations were undertaken to determine the maximum storage required at a duration event of 2 hours. In order to control post-development flows to 5-year pre-development allowable conditions, a target flow of 0.034 m^3/sec is to be satisfied.

To achieve the allowable flow of 0.034 m^3/sec (34 L/s) during the 100-year storm event, a 73 mm diameter orifice tube is proposed. With a maximum head of 1.98 m above the centroid of the orifice, a flow rate of 0.016 m^3/s (16 L/s) was determined for the controlled flow (A1 Post). (Refer to **Appendix A** for post development calculations).

A1 Post delineates the area that will be controlled via an underground stormwater tank and orifice. Details of the stormwater tank and orifice are described in the subsequent section. A2 Post represents the uncontrolled landscaped and walkway areas around the proposed building with overland flow being directed towards Rambo Creek. A3 Post represents the uncontrolled landscaped and walkway areas on the west side of the proposed building with overland flow being directed towards Martha Street. Refer to the Storm Drainage Area Plan for post development drainage areas and runoff coefficients.

The maximum uncontrolled flow (A2+A3 Post) during the 100-year storm event is 18 L/s. Therefore, the total post-development site release rate during the 100-year storm is 34 L/s (A1+A2+A3 Post).

A 300 mm diameter storm sewer service at a slope of 1.0% is to be connected to the proposed storm MH1 that ultimately connects to the existing 525 mm diameter storm sewer on Martha Street. The 300 mm diameter storm sewer connection will be adequate to convey the maximum controlled design flow of 16 L/s that will be released from the site during the 100-year storm event (Refer to the Site Servicing Plan).

Underground Stormwater Tank

An underground storage tank will be constructed which will be capable of retaining the flow from the proposed site. Based on the stormwater analysis, a total storage volume of ±83 m^3 with a surface area of 41 m^2 will be provided within an underground storage tank on parking level P1.

The water surface elevation within the SWM tank is anticipated to reach a maximum active depth of 2.02 m above the centroid of the proposed 73 mm orifice tube, resulting in a total controlled flow of 16 L/s outletting to the municipal storm sewers under 100-year storm event.

Two (2) access hatches will be provided and will also serve as an emergency overflow outlet (Refer to **Appendix A** for detailed orifice calculations).

2.4 Stormwater Management – Quality Control

As per the City requirements, stormwater should be treated to the Ministry of the Environment (MOE) Enhanced Level protection and the removal of 80% T.S.S. is required.

It is noted that generally the entire site area will consist of mainly the roof area and landscaped areas around the building. Quality control will be achieved through the combined use of rooftops and landscaped areas of the proposed building which is considered to be inherently clean as it is not exposed to oil and grit. As a result, no additional quality control devices are required for this development.

Also, planting of landscaping gardens and other vegetation is used to reduce rainwater runoff by increasing evaporation, transpiration, and infiltration. These landscaping areas around the proposed building can also use rainwater as a watering source and provide significant water quality, erosion and water balance benefits.

3.0 Summary

Based on the assessments outlined within this report, it is concluded that the proposed residential condo development at 401-417 Martha Street meets the design criteria and is serviceable for stormwater management in compliance with the City of Burlington design requirements.

We trust the above functional stormwater management report is sufficient for your purpose. Should you have any questions or concerns please do not hesitate to contact our office.

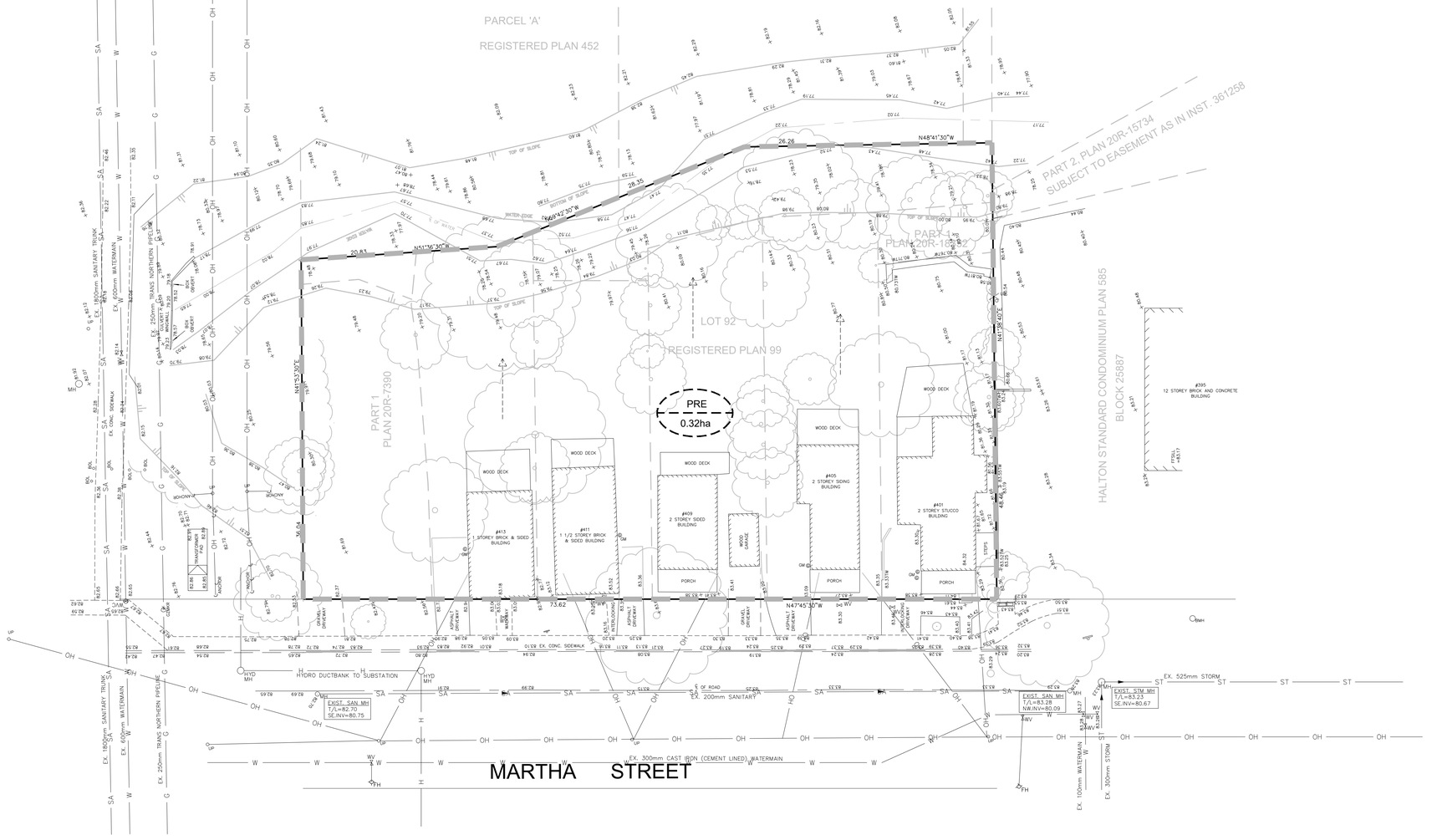
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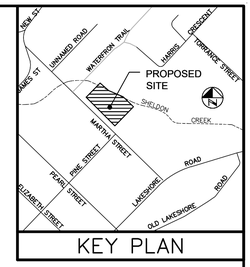
Wood Environment & Infrastructure Solutions,
a Division of Wood Canada Limited

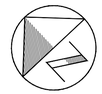
Per: Paul Pagazani, P. Eng.
Project Manager

PP/kf











LEGEND

- EXISTING GROUND ELEVATION — × 100.00
- EXISTING STORM SEWER — ST
- EXISTING SANITARY SEWER — SA
- EXISTING WATERMAIN — W
- EXISTING UNDERGROUND HYDRO — H
- EXISTING OVERHEAD WIRE — OH
- EXISTING MANHOLE — MH
- EXISTING CATCHBASIN/MANHOLE — CB/MH
- EXISTING CATCHBASIN/MANHOLE — CB
- EXISTING DOUBLE CATCHBASIN — DCB
- EXISTING DOUBLE CATCHBASIN — TH
- EXISTING DOUBLE CATCHBASIN — WV
- EXISTING WATER VALVE CHAMBER — WVC
- EXISTING LIGHT STANDARD — LS
- EXISTING PADMOUNT TRANSFORMER
- EXISTING UTILITY POLE — UP
- EXISTING BELL PEDESTAL
- EXISTING CABLE PEDESTAL
- EXISTING CHAIN LINK FENCE — X
- EXISTING GASMAIN — G
- EXISTING OVERLAND FLOW
- EXISTING SUBCATCHMENT BOUNDARY
- SUBCATCHMENT NUMBER — 101
- EXISTING SUBCATCHMENT AREA IN HECTARES — 0.32ha

SURVEY:

TOPOGRAPHIC SURVEY PROVIDED BY MACKAY MACKAY & PETERS LTD. DATED APRIL 27, 2017.

BENCHMARK:

CITY OF BURLINGTON
BENCHMARK No. 198
DESCRIPTION: PLATE ON PUMP HOUSE LOCATED JUST WEST OF RAMBO CREEK, BEING 320m EAST OF BRANT STREET ON LAKESHORE ROAD. PLATE IS FIXED TO THE SOUTH FACE OF BRICK BUILDING, BEING 0.15m EAST OF THE SOUTHWEST CORNER AND 0.30m ABOVE EXISTING CONCRETE SIDEWALK.
ELEVATION = 78.036 METRES (CGVD-1928: 1978 ADJUSTMENT)

NOT ISSUED FOR CONSTRUCTION

SCALE VALID ONLY FOR 24"x36" VERSION

No	Date	Drawn	Appr'd	Revisions
4	JAN 04, 21	ML	PP	RE-ISSUED FOR SITE PLAN APPLICATION
3	NOV 03, 20	ML	PP	RE-ISSUED FOR SITE PLAN APPLICATION
2	MAR 31, 20	ML	PP	RE-ISSUED FOR SITE PLAN APPLICATION
1	NOV 19, 18	ML	PP	ISSUED FOR SITE PLAN APPLICATION

APPROVALS

Design	PP	Checked	MD
Drawn	ML	Checked	PP
Scale	1:250		
Date	NOVEMBER 2018		

LICENSED PROFESSIONAL ENGINEER
P. PAGAZANI
100053989
Jan 04, 2021
PROVINCE OF ONTARIO

401 - 417 MARTHA STREET CITY OF BURLINGTON, ON

2413350 ONTARIO INC.

EXISTING CONDITIONS PLAN

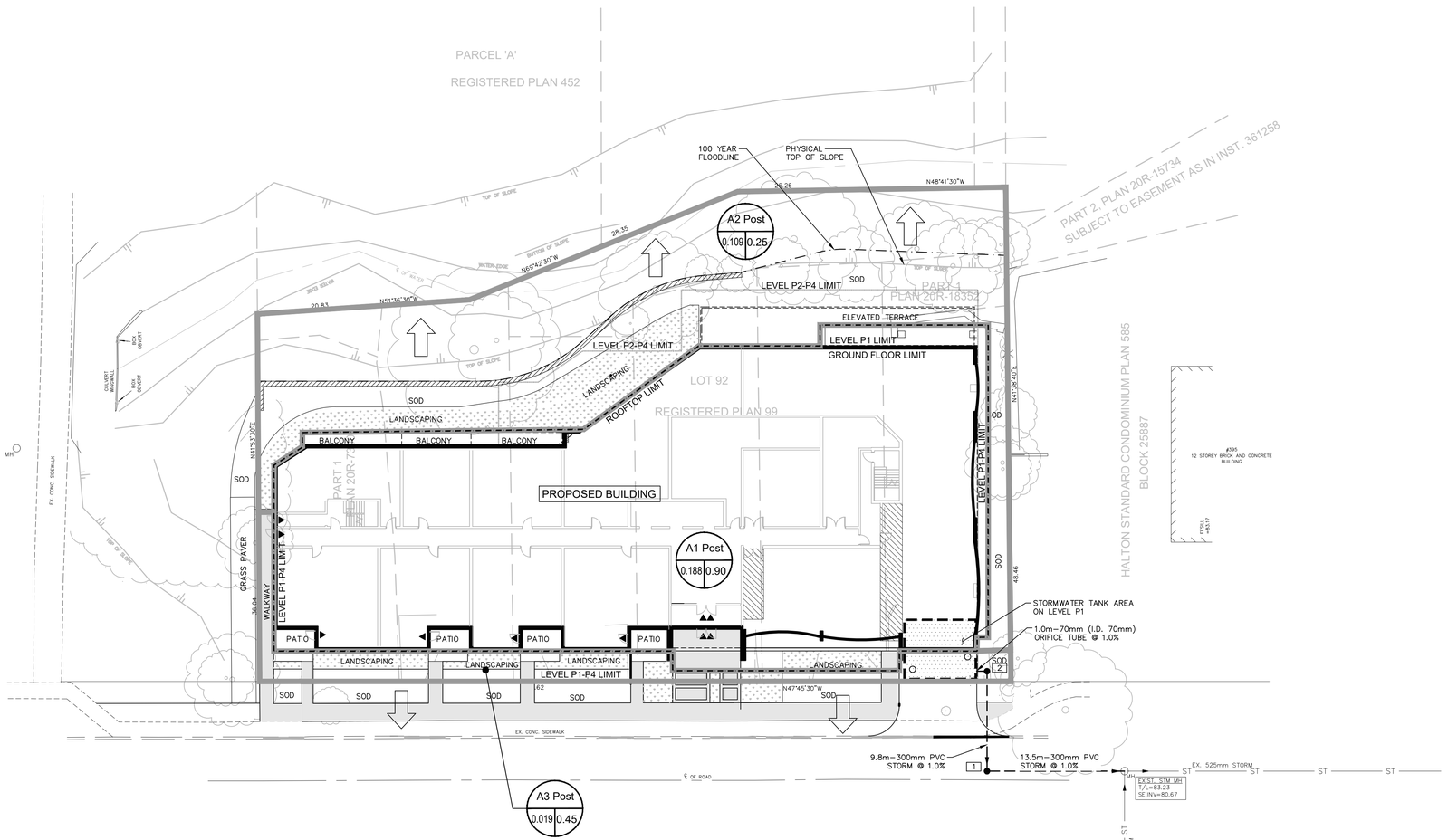
wood.
3450 HARVESTER ROAD, SUITE 100
BURLINGTON, ON. L7N 3W5
TEL: +1 (905) 335-2353

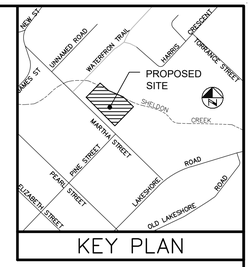
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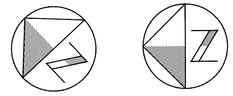
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Drawing No. FIGURE 1

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LEGEND

- STORM SEWER
- EXISTING STORM SEWER (ST)
- STORM MANHOLE
- EXISTING STORM MANHOLE (MH)
- EXISTING CATCHBASIN (CB)
- STORM MANHOLE NUMBER (1)
- GROUND FLOOR LAYOUT
- UNDERGROUND P2–P4 LIMIT
- UNDERGROUND P1 LIMIT
- ROOFTOP LIMIT
- STORM DRAINAGE AREA BOUNDARY
- MAJOR OVERLAND FLOW ROUTE
- DRAINAGE AREA IDENTIFIER NUMBER (1)
- AREA (IN HECTARES) (0.48)
- RUNOFF COEFFICIENT (0.72)

SURVEY:

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Scale	1:250		
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LICENSED PROFESSIONAL ENGINEER
P. PAGAZANI
100053989
Jan 04, 2021
PROVINCE OF ONTARIO

401 - 417 MARTHA STREET
CITY OF BURLINGTON, ON
2413350 ONTARIO INC.

STORM DRAINAGE AREA PLAN

wood.
3450 HARVESTER ROAD, SUITE 100
BURLINGTON, ON. L7N 3W5
TEL: +1 (905) 335-2353

Scale 1:250
Consultant File No. TPB163165
Drawing No. FIGURE 2

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NOTES:

1. ALL SURVEY POINTS AMD EXISTING PIPE INVERT ELEVATIONS SHALL BE VERIFIED IN THE FIELD BY THE CONTRACTOR.
2. ANY DISCREPANCIES BETWEEN SITE CONDITIONS AND THE DRAWING MUST BE REPORTED TO THE CONSULTANT PRIOR TO COMMENCEMENT OF CONSTRUCTION.
3. CONTRACTOR SHALL VERIFY ALL LOCATIONS OF GASMAINS, WATERMAINS, TV CABLES, HYDRO AND TELEPHONE DUCTS, SANITARY AND STORM SEWERS AND ALL EXISTING PRIVATE SEWER, WATER AND UTILITY SERVICES PRIOR TO START OF CONSTRUCTION.
4. CONTRACTOR SHALL VERIFY DEPTHS OF ALL EXISTING SANITARY AND STORM SEWERS AND WATERMAINS PRIOR TO START OF CONSTRUCTION, AND NOTIFY THE ENGINEER OF ANY DISCREPANCIES.

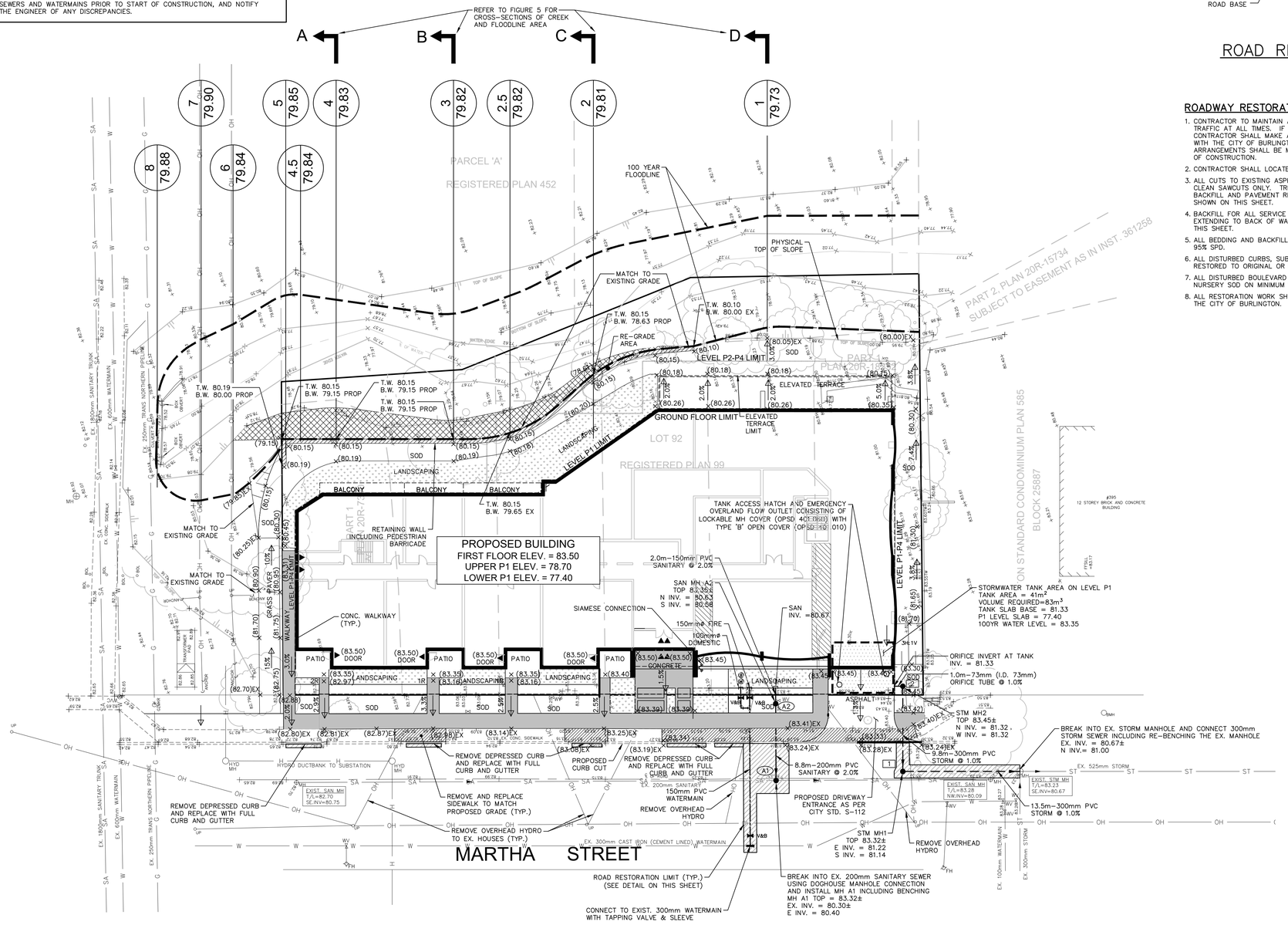
EXISTING WATER SERVICE ABANDONMENT

ALL EXISTING WATER SERVICES TO BE ABANDONED SHALL BE ABANDONED AS FOLLOWS:

1. PAVEMENT RESTORATION, IF NECESSARY, SHALL BE PER NOTES AND DETAIL ON THIS SHEET.
2. MAINSTOP SHALL BE SHUT OFF AT MAIN AND COPPER SERVICE DISCONNECTED AND CRIMPED.
3. CURB STOP BARREL TO BE REMOVED AT STREET LINE AND COPPER SERVICE CRIMPED.

EXISTING SANITARY LATERAL ABANDONMENT

EXISTING SANITARY LATERALS SHALL BE REMOVED TO BACK OF SIDEWALK OR AS SHOWN ON THE DRAWING, AND CAPPED/PLUGGED. THE REMAINING PIPING TO BE ABANDONED BY INSERTION OF A WATER TIGHT PLUG INSIDE THE EXISTING SEWER MAIN. AFTER THE INSERTION OF PLUGS, THE ENTIRE LENGTH OF SEWER FROM MANHOLE TO MANHOLE SHALL BE FLUSHED AND VIDEO RECORDED WITH VIDEO DETAILING OF PLUGS TO DISPLAY WATER TIGHTNESS.





ROAD RESTORATION DETAIL

N.T.S.

KEY PLAN

ROADWAY RESTORATION NOTES

1. CONTRACTOR TO MAINTAIN A MINIMUM OF ONE LANE OF TRAFFIC AT ALL TIMES. IF THIS IS NOT FEASIBLE, THE CONTRACTOR SHALL MAKE ALL NECESSARY ARRANGEMENTS WITH THE CITY OF BURLINGTON FOR ROAD CLOSURES. THESE ARRANGEMENTS SHALL BE MADE FAR IN ADVANCE OF START OF CONSTRUCTION.
2. CONTRACTOR SHALL LOCATE AND PROTECT ALL UTILITIES.
3. ALL CUTS TO EXISTING ASPHALT AND CONCRETE SHALL BE CLEAN SAWCUTS ONLY. TRENCH BEDDING, COVER MATERIAL, BACKFILL AND PAVEMENT RESTORATION SHALL BE PER DETAIL SHOWN ON THIS SHEET.
4. BACKFILL FOR ALL SERVICE TRENCHES WITHIN ROADWAY AND EXTENDING TO BACK OF WALK SHALL BE AS PER DETAIL ON THIS SHEET.
5. ALL BEDDING AND BACKFILL SHALL BE COMPACTED TO MIN. 95% SPD.
6. ALL DISTURBED CURBS, SUBDRAINS, CULVERTS ETC. SHALL BE RESTORED TO ORIGINAL OR BETTER CONDITIONS.
7. ALL DISTURBED BOULEVARD SHALL BE RESTORED WITH No. 1 NURSERY SOD ON MINIMUM 150mm TOPSOIL.
8. ALL RESTORATION WORK SHALL BE TO THE SATISFACTION OF THE CITY OF BURLINGTON.



TRUE NORTH



CONSTRUCTION NORTH

LEGEND

EXISTING GROUND ELEVATION	×100.00
PROPOSED GROUND ELEVATION	×(100.00)
PROPOSED GROUND ELEVATION TO MATCH EXISTING GRADE	×(100.00)EX
DIRECTION OF SHEET FLOW	
STORM SEWER	ST
SANITARY SEWER	SA
WATER SERVICE	W
WATER METER	W
BACKFLOW PREVENTER	B
EXISTING STORM SEWER	ST
EXISTING SANITARY SEWER	SA
EXISTING WATERMAIN	W
EXISTING UNDERGROUND HYDRO	H
EXISTING OVERHEAD WIRE	OH
EXISTING MANHOLE	MH
EXISTING HYDRANT	FH
EXISTING WATER VALVE	WV
EXISTING WATER VALVE CHAMBER	WVC
EXISTING LIGHT STANDARD	LS
EXISTING PADMOUNT TRANSFORMER	
EXISTING UTILITY POLE	UP
EXISTING BELL PEDESTAL	
EXISTING CABLE PEDESTAL	
EXISTING CHAIN LINK FENCE	X
EXISTING GASMAIN	G
MANHOLE	
GROUND FLOOR LAYOUT	
UNDERGROUND P1 OUTLINE	
UNDERGROUND P2-P4 OUTLINE	
100 YEAR FLOODLINE	
CONCRETE WALKWAYS	
LANDSCAPING AREAS	
REINFORCED EARTH EMBANKMENT	
RETAINING WALL	

100-YEAR WSEL — 1 SECTION NO. / 79.73 ELEV.

SURVEY:

TOPOGRAPHIC SURVEY PROVIDED BY MACKAY MACKAY & PETERS LTD. DATED APRIL 27, 2017.

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Design	PP	Checked	MD
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Date	NOVEMBER 2018		

LICENSED PROFESSIONAL ENGINEER — P. PAGAZANI 100053989 — Jan 04, 2021 — PROVINCE OF ONTARIO

401 - 417 MARTHA STREET CITY OF BURLINGTON, ON

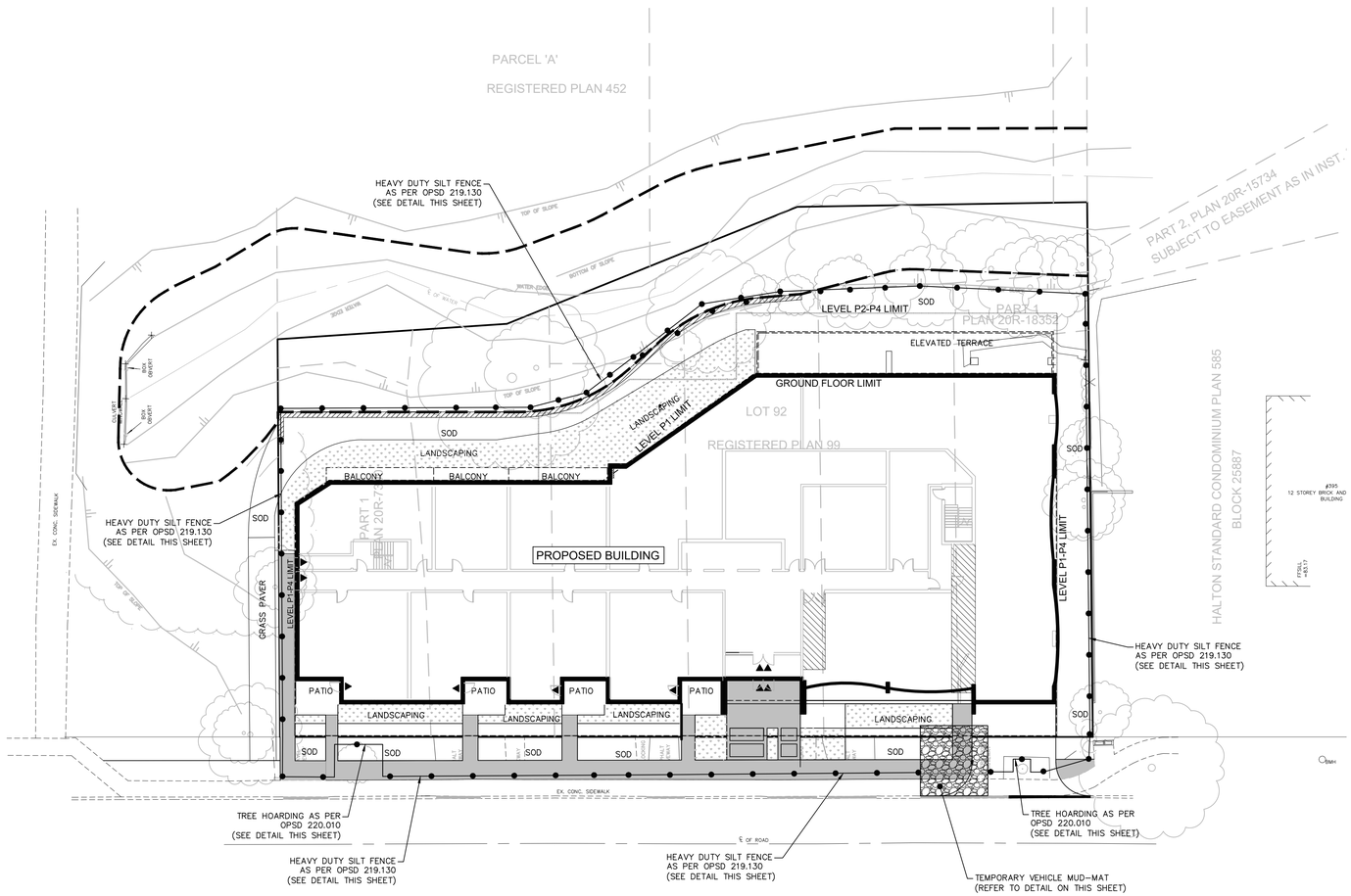
2413350 ONTARIO INC.

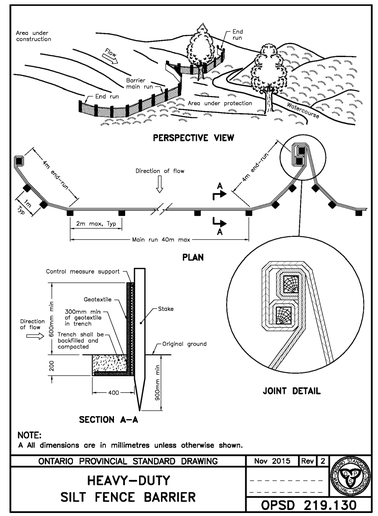
FUNCTIONAL SITE SERVICING AND GRADING PLAN

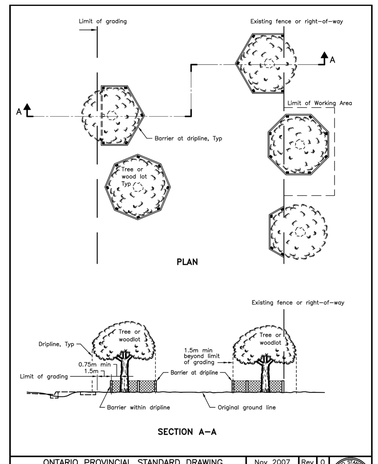
wood.
3450 HARVESTER ROAD, SUITE 100
BURLINGTON, ON. L7N 3W5
TEL: +1 (905) 335-2353

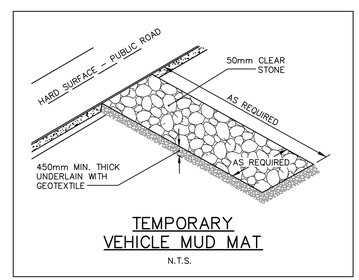
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Consultant File No. TPB163165
Drawing No. FIGURE 3

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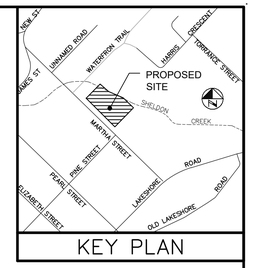


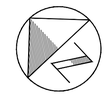




TEMPORARY VEHICLE MUD MAT

N.T.S.





TRUE NORTH



CONSTRUCTION NORTH

EROSION AND SEDIMENT CONTROL

1. ALL SILTATION CONTROL MEASURES INCLUDING SEDIMENT CONTROL FENCES, BASINS AND WORK LIMIT FENCES MUST BE INSTALLED PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.
2. SEDIMENT CONTROL FENCES SHALL CONSIST OF FILTER CLOTH (TERRAFENCE FABRIC TERRATRACK 4-15 OR APPROVED EQUIVALENT). REFER TO DETAIL ON THIS SHEET.
3. EROSION OF SOIL SHALL BE PREVENTED. ALL DISTURBED AREAS WITHOUT IMMEDIATE BUILDING ACTIVITY (WITHIN 5 DAYS) SHALL BE SEEDED AND MAINTAINED TO THE SATISFACTION OF THE CITY ENGINEER. PLACEMENT OF VEGETATION SHALL BE IN ACCORDANCE WITH OPSS 804. WHERE REQUIRED, EROSION CONTROL BLANKETS SHALL BE INSTALLED AS PER OPSS 804, AT THE DIRECTION OF THE ENGINEER.
4. ALL SILTATION CONTROL MEASURES SHALL BE CLEANED AND MAINTAINED AFTER EACH RAINFALL OR AS DIRECTED AND TO THE SATISFACTION OF THE CITY ENGINEER.
5. ADDITIONAL SEDIMENT CONTROL LOCATIONS MAY BE REQUIRED AS DETERMINED BY THE CITY ENGINEER.
6. CONSTRUCTION MUD-MAT TO BE INSTALLED AT ENTRANCE INTO SITE. MUD-MAT TO BE MAINTAINED DURING CONSTRUCTION. REFER TO DETAIL ON THIS SHEET.

LEGEND

- SEDIMENT CONTROL FENCE
- GROUND FLOOR LAYOUT
- UNDERGROUND P1 OUTLINE
- UNDERGROUND P2-P4 OUTLINE
- REGIONAL FLOODLINE

SURVEY:

TOPOGRAPHIC SURVEY PROVIDED BY MACKAY MACKAY & PETERS LTD. DATED APRIL 27, 2017.

BENCHMARK:

CITY OF BURLINGTON
BENCHMARK No. 198
DESCRIPTION: PLATE ON PUMP HOUSE LOCATED JUST WEST OF RAMBO CREEK, BEING 320m EAST OF BRANT STREET ON LAKESHORE ROAD. PLATE IS FIXED TO THE SOUTH FACE OF BRICK BUILDING, BEING 0.15m EAST OF THE SOUTHWEST CORNER AND 0.30m ABOVE EXISTING CONCRETE SIDEWALK.
ELEVATION = 78.036 METRES (CGVD-1928: 1978 ADJUSTMENT)

NOT ISSUED FOR CONSTRUCTION

SCALE VALID ONLY FOR 24"x36" VERSION

No	Date	Drawn	Appr'd	Revisions
4	JAN 04, 21	ML	PP	RE-ISSUED FOR SITE PLAN APPLICATION
3	NOV 03, 20	ML	PP	RE-ISSUED FOR SITE PLAN APPLICATION
2	MAR 31, 20	ML	PP	RE-ISSUED FOR SITE PLAN APPLICATION
1	NOV 19, 18	ML	PP	ISSUED FOR SITE PLAN APPLICATION

APPROVALS

Design	PP	Checked	MD
Drawn	ML	Checked	PP
Scale	1:250		
Date	NOVEMBER 2018		

LICENSED PROFESSIONAL ENGINEER
P. PAGAZANI
100053989
Jan 04, 2021
PROVINCE OF ONTARIO

401 - 417 MARTHA STREET
CITY OF BURLINGTON, ON

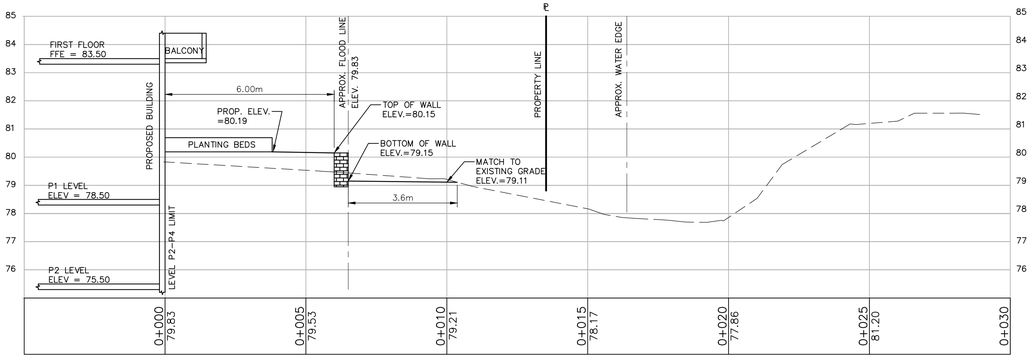
2413350 ONTARIO INC.

FUNCTIONAL EROSION AND SEDIMENT CONTROL PLAN

wood.
3450 HARVESTER ROAD, SUITE 100
BURLINGTON, ON. L7N 3W5
TEL: +1 (905) 335-2353

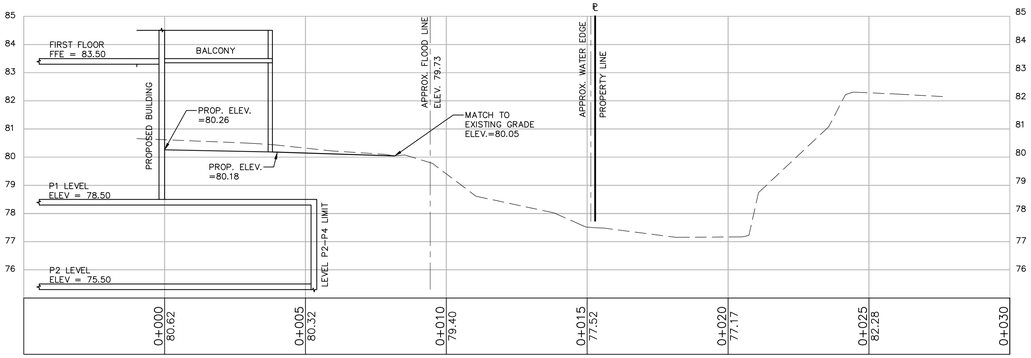
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Consultant File No. TPB163165
Drawing No. FIGURE 4

Plotted: 2021-01-04
Last Saved: 2020-11-18
Plotted By: paul.pagazani
Last Saved By: paul.pagazani
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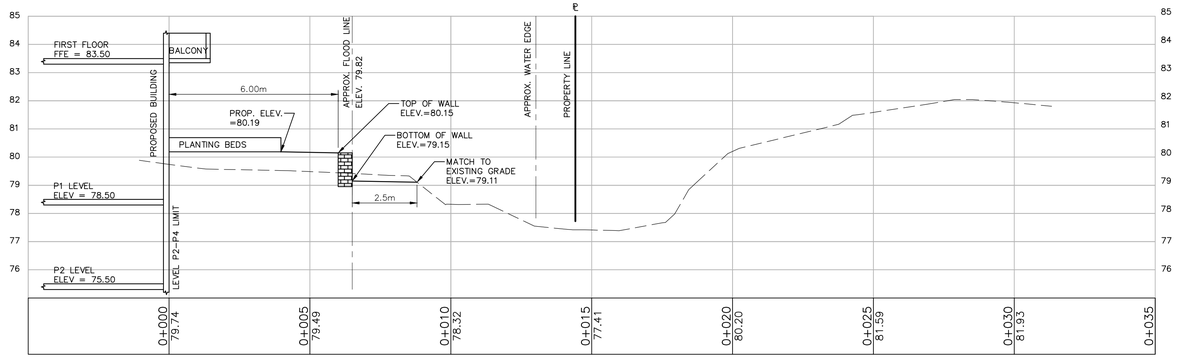
SECTION A–A

H 1:100
V 1:100



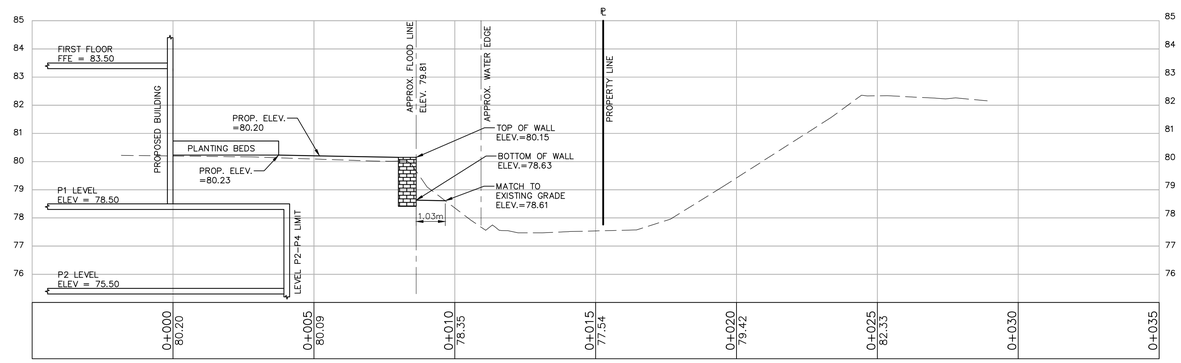
SECTION D–D

H 1:100
V 1:100



SECTION B–B

H 1:100
V 1:100



SECTION C–C

H 1:100
V 1:100

SURVEY:

TOPOGRAPHIC SURVEY PROVIDED BY MACKAY MACKAY & PETERS LTD. DATED APRIL 27, 2017.

BENCHMARK:

CITY OF BURLINGTON
BENCHMARK No. 198
DESCRIPTION: PLATE ON PUMP HOUSE LOCATED JUST WEST OF RAMBO CREEK, BEING 320m EAST OF BRANT STREET ON LAKESHORE ROAD. PLATE IS FIXED TO THE SOUTH FACE OF BRICK BUILDING, BEING 0.15m EAST OF THE SOUTHWEST CORNER AND 0.30m ABOVE EXISTING CONCRETE SIDEWALK.
ELEVATION = 78.036 METRES (CGVD–1928: 1978 ADJUSTMENT)

NOT ISSUED FOR CONSTRUCTION SCALE VALID ONLY FOR 24"x36" VERSION

Plotted: 2020–11–04
Last Saved: 2020–11–02
Plotted By: paul.pagazani
Last Saved By: paul.pagazani
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No	Date	Drawn	Appr'd	Revisions
2	NOV 03, 20	ML	PP	RE–ISSUED FOR SITE PLAN APPLICATION
1	MAR 31, 20	ML	PP	ISSUED FOR SITE PLAN APPLICATION

APPROVALS

Design	PP	Checked	BB
Drawn	ML	Checked	PP
Scale	AS NOTED		
Date	AUGUST 2019		

LICENSED PROFESSIONAL ENGINEER
P. PAGAZANI
100053989
Nov 03, 2020
PROVINCE OF ONTARIO

401 - 417 MARTHA STREET
CITY OF BURLINGTON, ON
2413350 ONTARIO INC.

CROSS-SECTIONS

wood.
3450 HARVESTER ROAD, SUITE 100
BURLINGTON, ON. L7N 3W5
TEL: +1 (905) 335-2353

Scale: AS NOTED
Consultant File No.: TPB163165
Drawing No.: FIGURE 5

APPENDIX A
STORMWATER MANAGEMENT CALCULATIONS

Pre-Development Composite Coefficient

401-417 Martha Street, Burlington
File No. TPB163165
Date: November 2020

Prepared By: Paul Pagazani, P.Eng.

PRE

Internal Site Area

	(ha)		
Total Area:	0.316		
Impervious:	0.091	**Coefficient:**	0.90
Lawns / Unimproved:	0.225	**Coefficient:**	0.25
Composite C:	**0.44**		

			% Impervious
Total Area:	3162	m2	
Impervious:	910	m2	29%
Lawns / Unimproved:	2252	m2	71%

Prepared By: Paul Pagazani, P.Eng.

Rational Method
Allowable Flow Calculations

401-417 Martha Street, Burlington
File No. TPB163165
Date: November 2020

Time of Concentration Calculation

Area Number	Area (ha)	C	Tc (min.)
A1 Pre	0.316	0.44	10

Post Development Allowable Peak Flow	
Storm Event	**Peak Flow (L/s)**
5	34

Rational Method Calculation: Proposed Site

Event 5 yr
IDF Data Set City of Burlington
a = 697.40
b = 5.00
c = 0.764

Formula:	a/(b+T)^c	
	a,b,c	Constants
	T	Time of concentration
	I	Rainfall intensity

Area Number	A (ha)	C	AC	Tc (min.)	I (mm/h)	Q (m^3/s)	Q (L/s)
A1 Pre	0.316	0.44	0.14	10	88.1	0.034	34

Post-Development Composite Coefficient

401-417 Martha Street, Burlington
File No. TPB163165
Date: November 2020

Prepared By: Paul Pagazani, P.Eng.

A1 Post (Controlled)

Internal Site Area

	(ha)		
Total Area:	0.188		
Impervious (Roof):	0.188	**Coefficient:**	0.90
Lawns / Unimproved:	0.000	**Coefficient:**	0.25
Composite C:	**0.90**		

			% Impervious
Total Area:	1877	m2	
Impervious (Roof):	1877	m2	100%
Lawns / Unimproved:	0	m2	0%

A2 + A3 Post (Uncontrolled)

Internal Site Area

	(ha)		
Total Area:	0.129		
Impervious:	0.006	**Coefficient:**	0.90
Grassed Pavers:	0.002	**Coefficient:**	0.35
Lawns / Unimproved:	0.120	**Coefficient:**	0.25
Composite C:	**0.28**		

			% Impervious
Total Area:	1285	m2	
Impervious:	58.5	m2	5%
Grassed Pavers:	23.7	m2	2%
Lawns / Unimproved:	1202.8	m2	94%

Post-Development Composite Coefficient

401-417 Martha Street, Burlington
File No. TPB163165
Date: November 2020

Prepared By: Paul Pagazani, P.Eng.

A1+A2+A3 Post (total site)

Internal Site Area

	(ha)		
Total Area:	0.316		
Impervious:	0.006	**Coefficient:**	0.90
Impervious (Roof):	0.188	**Coefficient:**	0.90
Grassed Pavers:	0.002	**Coefficient:**	0.35
Lawns / Unimproved:	0.120	**Coefficient:**	0.25
Composite C:	**0.65**		

			% Impervious
Total Area:	3162	m2	
Impervious:	58.5	m2	1.9%
Impervious (Roof):	1877	m2	59.4%
Grassed Pavers:	23.7	m2	0.7%
Lawns / Unimproved:	1202.8	m2	38.0%

Project: 401-417 Martha Street, Burlington
Project No.: TPB163165
Date: November 2020
Prepared by: P. Pagazani

A1 POST 100 - year
CONTROLLED

	Areas	C	AxC
	0.188	0.90	0.169
	0.000	0	0.000
	0	0	0.000
	0	0	0.000
TOTAL	0.188		0.169

Avg. C = 0.90 C_{100YR} = 1.00

100-yr Design Storm		
a	b	c
1114.2	5	0.761

A1 PRE-(A2+A3 POST)

t	i	Q	Vol in	set Q out	Vol out	Vol req'd
10	141.89	0.074	44.39	0.016	9.74	34.65
15	113.99	0.059	53.49	0.013	11.71	41.78
20	96.19	0.050	60.18	0.011	13.16	47.02
25	83.73	0.044	65.48	0.010	14.30	51.18
30	74.46	0.039	69.88	0.008	15.25	54.63
40	61.50	0.032	76.96	0.007	16.76	60.19
50	52.79	0.028	82.57	0.006	17.96	64.61
60	46.49	0.024	87.26	0.005	18.96	68.29
70	41.69	0.022	91.30	0.005	19.82	71.47
80	37.90	0.020	94.86	0.004	20.58	74.28
90	34.83	0.018	98.06	0.004	21.26	76.80
100	32.27	0.017	100.96	0.004	21.88	79.08
110	30.11	0.016	103.63	0.003	22.44	81.19
120	28.26	0.015	106.10	0.003	22.96	83.13
130	26.66	0.014	108.40	0.003	23.45	84.95
140	25.24	0.013	110.56	0.003	23.91	86.65
150	23.99	0.013	112.60	0.003	24.34	88.26
160	22.88	0.012	114.52	0.003	24.74	89.78
170	21.88	0.011	116.35	0.002	25.13	91.22
180	20.97	0.011	118.09	0.002	25.50	92.60
190	20.15	0.011	119.76	0.002	25.85	93.91
200	19.40	0.010	121.36	0.002	26.18	95.17

A2 + A3 POST 100 - year
UNCONTROLLED

	Areas	C	AxC
	0.006	0.90	0.005
	0.120	0.25	0.030
	0.002	0.35	0.001
	0	0	0.000
TOTAL	0.129		0.036

Avg. C = 0.28 **avg. C**

C_{100YR} = 0.35

t	i	Q
10	141.89	0.018
15	113.99	0.014
20	96.19	0.012
25	83.73	0.011
30	74.46	0.009
40	61.50	0.008
50	52.79	0.007
60	46.49	0.006
70	41.69	0.005
80	37.90	0.005
90	34.83	0.004
100	32.27	0.004
110	30.11	0.004
120	28.26	0.004
130	26.66	0.003
140	25.24	0.003
150	23.99	0.003
160	22.88	0.003
170	21.88	0.003
180	20.97	0.003
190	20.15	0.003
200	19.40	0.002

A1 PRE 5 - year
ALLOWABLE FLOW

	Areas	C	AxC
	0.316	0.44	0.139
	0	0	0.000
	0	0	0.000
	0	0	0.000
TOTAL	0.316		0.139

0.44 **avg. C**

5-yr Design Storm		
a	b	c
697.4	5	0.764

t	i	Q
10	88.094	0.034
15	70.712	0.027
20	59.629	0.023
25	51.875	0.020
30	46.112	0.018
40	38.056	0.015
50	32.647	0.013
60	28.735	0.011
70	25.759	0.010
80	23.410	0.009
90	21.503	0.008
100	19.920	0.008
110	18.583	0.007
120	17.436	0.007
130	16.440	0.006
140	15.567	0.006
150	14.793	0.006
160	14.103	0.005
170	13.483	0.005
180	12.923	0.005
190	12.414	0.005
200	11.948	0.005

ORIFICE SIZING CALCULATIONS

Project: 401-417 Martha Street, Burlington
Project No.: TPB163165
Date: November 2020

C = 0.62 (100-yr release to City storm sewer system)

Q =	0.016	From Allowable Flow Calculations (m3/s)
Water Elevation =	83.35	Water elevation at 100-yr storm (m)
invert =	81.33	invert of Stormwater Tank (m)
head =	1.984	to center of orifice (m)
orifice dia =	0.073	assumed orifice (m)
Dia. =	**0.073**	outlet orifice pipe (m)
Q =	0.016	flow check (m3/s)

Project Name: 401-417 Martha Street, Burlington
Project Number: TPB163165
Date: November 2020
Prepared by: P. Pagazani

Storm Sewer Design Sheet - Pipe Sizing

LOCATION			TOTAL PEAK DESIGN FLOW Q (L/s)	PROPOSED SEWER					
STREET	FROM	TO		PIPE LENGTH (m)	PIPE SIZE (mm)	PIPE MATERIAL	PIPE SLOPE (%)	PIPE CAPACITY (L/s)	% FULL
Connection to Martha Street	Property Line	Prop. Storm MH1 on Martha Street	16.0	9.8	300	PVC n = 0.013	1.0	96.70	17%

Therefore, the proposed 300mm diameter storm sewer connection to Martha Street is 17% full and will have enough capacity to convey the allowable controlled peak design flow of 16.0 L/s.