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21 July 2020
SBM-20-1645

Attn: Ms. Christa De Wys

**Re: Servicing Feasibility Study (SFS)
Proposed Tiny Home Expansion
127-161 Bechtel Street, Cambridge**

1. INTRODUCTION

This Servicing Feasibility Study (Study) has been prepared by Strik, Baldinelli, Moniz Ltd. (SBM) for the Region of Waterloo to address the servicing feasibility for the proposed residential development located at 127-161 Bechtel Street, Cambridge. The site is approximately 0.66 ha in area.

The site is zoned RM4 Medium High Density Residential and abuts the Bechtel Street Right-Of-Way (ROW) with M3 Industrial and C3 Commercial on its west side, and N1R4 Institutional to the south, north and east. See the proposed concept site plans enclosed with this report, as received from the Region of Waterloo. The site currently consists of two 2-storey row townhomes with 18 total units, with associated surface walkways, parking and landscaping. The proposed project will consist of an additional 7 “tiny” homes, with associated surface parking and landscaping.

This Study is to determine the adequacy of the existing City of Cambridge (City) services in support of a Zoning By-Law Amendment (ZBA) application for the proposed redevelopment. While SBM was carrying out the due diligence in support of this report, the City of Cambridge’s as constructed drawings were obtained. SBM has also requested information that the City of Cambridge may have on record, but at the time of this report no other information has been obtained. SBM also visited the site on June 23rd, 2020 to confirm that information received is accurate and representative of the current condition of the site.

Design requirements have been based on the Region of Waterloo and Area Municipalities Design Guidelines & Supplemental Specifications (DGSSMS), revised January 2019 and Ministry of the Environment, Conservation and Parks (MECP) Design Guidelines for Drinking-Water Systems, 2008.

2. WATER SERVICING

2.1 - General Considerations

As per AECOM drawing A-542-4P, dated January 5, 2016 (attached) there is an existing 200mm watermain on Bechtel Street between Sheppard Avenue and Groh Avenue. It is proposed to use the site's existing water service, which has not been confirmed and would require some exploration (with hydrovac or hand digging), however based on an estimate of the existing sites fixture unit count and information received from the Region (which also includes an Auxiliary Locate Sheet attached as an appendix in the Grading and Servicing Assessment completed by MTE on December 6, 2018), the water service to the site is likely adequate for the proposed development. Note that locates are void after 30 days however the locate information provided in the MTE report were used as information for this SFS, and will need to be updated in the future with the proposed exploration to review the diameter of the sites water service and the most appropriate location to connect the future services prior to construction. During the site visit on June 23rd, 2020 it was observed onsite that the water service that was installed through the basement concrete floor slab in some of the units had a 19mm diameter copper water line that services the individual units.

The maximum hour domestic demand, as per the DGSSMS and MECP Design Guidelines for the building occupancy load of 150 people (25 units at 3 people per unit) is 173.4 L/min. See the attached Domestic Water Demand Calculations.

The existing houses and the proposed tiny homes are Part 9 buildings, therefore no fire demand calculation is required, however as a due diligence, SBM was able to confirm with the Cambridge superintendent that the static pressure on the hydrant located at the intersection of Bechtel Street and Groh Avenue is 64 PSI which will be sufficient for domestic demand. The distance from the hydrant to the development is less than 90m which is considered sufficient in accordance with current standards.

The adequacy of the existing 200mm diameter water service was verified based on the calculated number of fixtures within the proposed tiny homes expansion and the reported static pressure on the hydrant of 64 PSI. A total fixture unit count of 287.6 (212 fixture units for existing townhouse units and 75.6 fixture units for the proposed 7 tiny homes) as shown in water service sizing calculation attached to this study and as per the Ontario Building Code (OBC) Table A-7.6.3.1. (attached), with a pressure over 412 kPa (60 psi) and a maximum length of 76m (assumed maximum water service length based on Site Plan) from the watermain, a 50mm diameter water service (assumed existing water service on site,

to be confirmed) can serve up to 359 fixture units, which will provide sufficient service to the proposed 7 tiny homes and the existing 28 townhouse units.

3. SANITARY SERVICING

As per the City of Cambridge's as constructed drawing A-542-1, dated 1983 (see attached), there is an existing 300 mm sanitary sewer in the Bechtel Street ROW with one (assumed) service connections to the property. As per MTE OLS drawing, dated 2018 (see attached), one 200mm diameter PVC service connection is located at the property line and has an approximate slope of 6% to the sanitary service within the Bechtel Street ROW. The size and slope, and the condition should be verified prior to or during construction to confirm if it is acceptable and how the Private Drain Connections (PDC)'s will connect to the underground sanitary service in the private property. Hydrovac or hand-digging is proposed to confirm the location and connection of the future PDCs.

Service sizing calculations were performed to confirm the size of the building service per the OBC based on counted number of fixture units for the building. A total of 193 fixture units are within the existing 18 townhome units. An additional 66.5 fixture units from the proposed 7 tiny homes expansion is anticipated for a total of 259.5 fixture units for the entire site. To meet the requirements of the OBC, a 200 mm diameter sanitary service at 0.5% or a 150mm diameter sanitary service at 2.0% slope is required. Please refer to the Sanitary Fixture Unit Calculations attached to this study.

Based on the information collected and the as-built information received, there appears to be sufficient capacity in the receiving sewers immediately downstream of the proposed development. Investigation is required to validate the status of the sanitary system in the private development and how to connect the future PDCs. As per reports provided to SBM the Sanitary is adequate in the streets.

4. STORM SERVICING AND STORMWATER MANAGEMENT

4.1 - Pre-Development Conditions

Pre-development conditions were obtained from the topographic survey and the Grading and Servicing Assessment completed by MTE on December 6, 2018. There is an existing storm water management (SWM) system in the Bechtel Street ROW, with a 300mm storm pipe directed to the north (toward Maple Street) beyond the intersection at Sheppard Avenue and Bechtel Street as noted on AECOM drawing Sheet A542-4P, sealed on January 5, 2016 (see attached). Under pre-development conditions, the subject site is comprised of landscaped/ open space area (3,989.74 m²), building area (903.31 m²), and asphalt/ concrete area (1718.36 m²), for a total site area of 6611.41 m². Based on the existing site topography and drainage conditions, the north, south and west side of the site is elevated from the street and discharges water to the Bechtel Street ROW. The area at the east side of the site discharges overland to a private catch basin located at the rear of townhouse units 143-161 which discharges to

an unknown location. The entire site has a current pre-development calculated runoff-coefficient (C-value) of 0.48.

As there are SWM features existing on the site (i.e. catch basin located at the east side of the site), however no as-built information is available to confirm the discharge location, it is assumed that all site runoff discharges to an existing system and uncontrolled off the site under pre-development conditions. Please refer to the existing grading and pre-development catchment areas shown on the previously mentioned topographic survey, provided in Appendix D.

4.2 – Post-Development Conditions

Under post-development conditions, the entire site will be comprised of the existing buildings with the addition of 7 tiny homes (1065.92 m²), and asphalt/ concrete area (1917.90 m²), and landscape area (3627.59 m²/home). Assuming one tiny home will have a footprint of +/- 23.32 m² along with the additional concrete and asphalt areas (as confirmed by the Region of Waterloo, see attached email dated June 26th, 2020), the post-development C-value has been calculated to be 0.52, see Runoff Coefficient Calculations attached to this Study. Therefore, SWM quantity controls will be required to control post-development flows for the 5-year through 100-year storm events to the pre-development levels at the design C-Value of 0.48. The 250-year storm event will continue to be safely conveyed overland to the Bechtel Street ROW. Detailed SWM calculations should be submitted with a first site plan approval submission that SBM can prepare if requested. A more complete SWM strategy shall be detailed on a later stage once the design of the building(s) is finalized. Investigation is required to confirm the system inside of the private development and to review the best location of installation of a restrictor (orifice) or pipe to store some storm water to pre-development conditions. As per reports provided to SBM stormwater from the development will require onsite controls before discharge to the City storm system.

4.4 – Stormwater Management - Quantity Control

The proposed site post-development peak discharges must be less than or equal to the pre-development peak discharges for all design events up to and including the 100-year design storm.

4.5 – Stormwater Management - Quality Control

It is noted that a future study should include quality control measures in accordance with current clauses of the DGSSMS with possible solutions with devices as such as snouts, FleXtorms (or similar), or an Oil and Grit Separator. Confirmation about a Storm Water Management facility (pond, storage etc) is also required to confirm if the surrounding area takes care of quality of the storm system and may account for storm water management quality, therefore an onsite system may or may not be required.

5. MECHANICAL SERVICES

Natural gas for the residential units is provided by individual utility owned meters on the exterior of the buildings. New gas service will need to be added by the local utility from the existing main line to new exterior meters to service the new units. Enbridge was consulted and confirmed gas service availability for the proposed development.

All new connections will be performed by the utility company connecting to the main gas lines. Therefore, no upgrades to the existing gas lines (that provide service to the existing townhouse units) are required for the servicing of the proposed new buildings as the new homes would be separately serviced.

When connecting townhomes to natural gas, a connection request is submitted to the utility company and the utility company (Enbridge) brings the service and installs the meters up to 30m away from their main line free of charge. If the required length exceeds 30m, Enbridge will charge approximately \$45/metre. Additional charges may apply if extreme construction conditions are identified and/ or a service is being re-established at a location where a gas service was previously abandoned. The proposed 7 tiny homes will require a new line from the main to the new meters.

6. ELECTRICAL SERVICES

Energy+ was consulted for hydro service for the proposed tiny home expansions. Hydro service for the residential units is provided by individual customer-owned meter base and meter by hydro on the exterior of the buildings. Energy+ has confirmed that the existing transformer does not have the capacity to serve the new load for the proposed 7 additional tiny homes, therefore a new transformer is required. Termination of primary overhead lines at the hydro pole and potentially at the new transformer by the Energy+ will be required. The new pad-mounted transformer, primary and secondary cables shall be supplied and installed by customer electrical contractor. New duct and cable runs will need to be added by the customer electrical contractor from the new transformer to the new exterior meters to service the new units.

7. OTHER CONSIDERATIONS

The proposed locations of the 7 tiny homes will be determined during the SPA phase and should include snow clearing storage and hauling, waste collection, zoning, setbacks and parking spaces considerations.

8. SUMMARY

Based on the above, the existing city infrastructure have sufficient capacity however new services will be required to accommodate the proposed development of the 0.66 ha subject site located at 127 – 161 Bechtel St., Cambridge ON. A summary table of existing and proposed services is provided below:

Service	Existing	Proposed
Water	200 mm diameter watermain in the Bechtel St. ROW with a static pressure of 64PSI. Private water service to existing townhouses is unknown, assuming each townhouse building is individually serviced.	Utilize the existing 200mm diameter watermain with new 50 mm diameter private water service for the new proposed tiny homes to satisfy domestic water demand.
Sanitary	300 mm diameter sanitary sewer in the Bechtel St. ROW.	Utilize the existing 200mm diameter sanitary PDC.
SWM	300 mm diameter storm sewer in the Bechtel St. ROW.	SWM quantity and quality controls are required due to anticipated increase in impervious area on site.
Mechanical & Electrical	New mechanical and electrical services will be required	

9. LIMITATIONS

This Study was prepared by Strik, Baldinelli, Moniz Ltd. for the Region of Waterloo. Use of this study by any third party, or any reliance upon its findings, is solely the responsibility of that party. Strik, Baldinelli, Moniz Ltd. accepts no responsibility for damages, if any, suffered by a third party as a result of decisions made or actions undertaken as a result of this study. Third party use of this study, without the express written consent of the Consultant, denies any claims, whether in contract, tort, and/or any other cause of action in law, against the Consultant.

All findings and conclusions presented in this study are based on site conditions as they appeared in the information presented to SBM and related to in this document. This study is not intended to be exhaustive in scope, or to imply a risk-free development. It should be recognized that the passage of time may alter the opinions, conclusions, and recommendations provided herein, as well as any changes in the layout of the development.

The design was limited to the documents referenced herein and Strik, Baldinelli, Moniz Ltd. accepts no responsibility for the accuracy of the information provided by others. All designs and recommendations presented in this study are based on the information available at the time of the review.

This document is deemed to be the intellectual property of Strik, Baldinelli, Moniz Ltd. in accordance with Canadian copyright law.

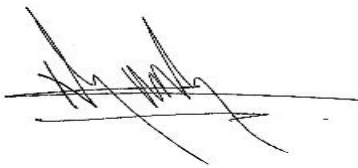
10. CLOSURE

We trust this Study meets your satisfaction. Should you have any questions or require further information, please do not hesitate to contact us.

Respectfully submitted,

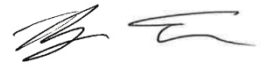
Strik, Baldinelli, Moniz Ltd.

Civil • Structural • Mechanical • Electrical



Nelson Guiot, P.Eng.

Eng. IV, Civil Department Manager



Ryan Frouws, P.Eng

Civil Eng. I, Project Manager

APPENDIX A

City of Cambridge's As-Constructed drawing A-542-1, dated 1983

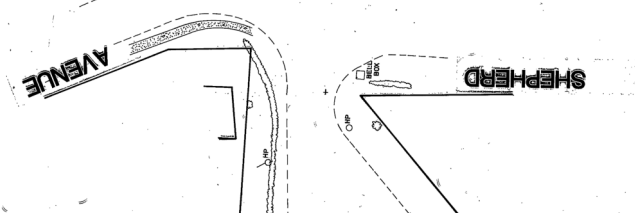
AECOM drawing A-542-4P, dated January 5, 2016

Legal Survey by MTE, dated November 29, 2018

Topographic by MTE, dated 2018



BECHTEL STREET

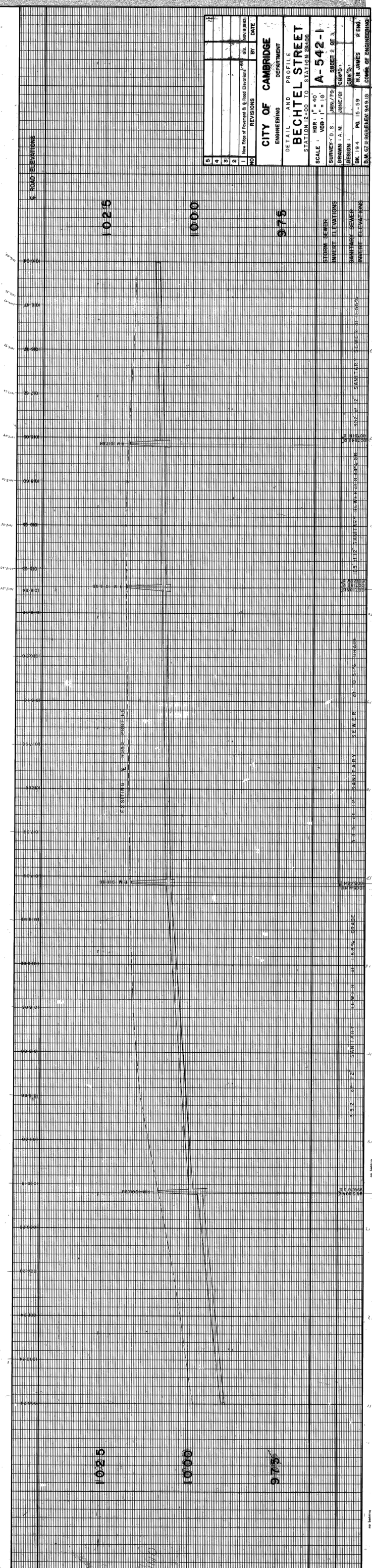


SEE SHEET 2

SEE SHEET 3

MATCHLINE STA. 12+00

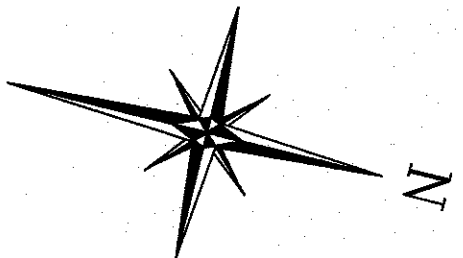
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1	New Edge of Pavement & Road Elevation	CH	NOV/98		

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		DATE: 10/15/81	
		DRAWN: J. H. JAMES	
		SCALE: 1/8" = 1'-0"	
		SHEET 2 OF 3	
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PLAN OF SURVEY
OF PART OF
LOT 18
REGISTERED PLAN No. 908
CITY OF CAMBRIDGE
REGIONAL MUNICIPALITY OF WATERLOO

MTE OLS LTD.
ONTARIO LAND SURVEYORS

SCALE 1:300
0 5 10 20 METRES

METRIC:
DISTANCES AND CO-ORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

LEGEND:
DENOTES PLANTED MONUMENT
DENOTES FOUND MONUMENT
DENOTES STANDARD IRON BAR
DENOTES SHORT STANDARD IRON BAR
DENOTES IRON BAR
DENOTES ROUND IRON BAR
DENOTES CUT CROSS
DENOTES MONUMENT TO SCALE
DENOTES WITNESS
DENOTES MEASURED
DENOTES CALCULATED
DENOTES MTE OLS LTD.
DENOTES MACDONALD-TAMERLIN SURVEYING LTD., O.L.S.
DENOTES INSTRUMENT NO. 421403
DENOTES INSTRUMENT NO. W5502108
DENOTES PLAN OF SURVEY BY MARSHALL, MACKLIN MONAGHAN LTD.,
P1 O.L.S., DATED JANUARY 6, 1970
P2 DENOTES PLAN 67R-355
P3 DENOTES PLAN OF SURVEY BY MARSHALL, MACKLIN MONAGHAN LTD.,
P4 O.L.S., DATED JANUARY 24, 1966
HR DENOTES HANDRAIL
BF DENOTES BOARD FENCE
CLF DENOTES CHAIN LINK FENCE
WIF DENOTES WROUGHT IRON FENCE

NOTES:
BEARINGS ARE UTM GRID, DERIVED FROM GPS OBSERVATIONS USING THE CANSEL NETWORK AND ARE REFERRED TO UTM ZONE 17, NAD83 (GSR5 4) EPOCH 2010.00.
DISTANCES ON THIS PLAN ARE GROUND DISTANCES AND CAN BE CONVERTED TO GRID DISTANCES BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.999989270.

TITLE NOTE:
THE LOCATION OF PLAN W.D.R. 339 HAS NOT BEEN SHOWN ON THIS PLAN.

SURVEYOR'S CERTIFICATE:

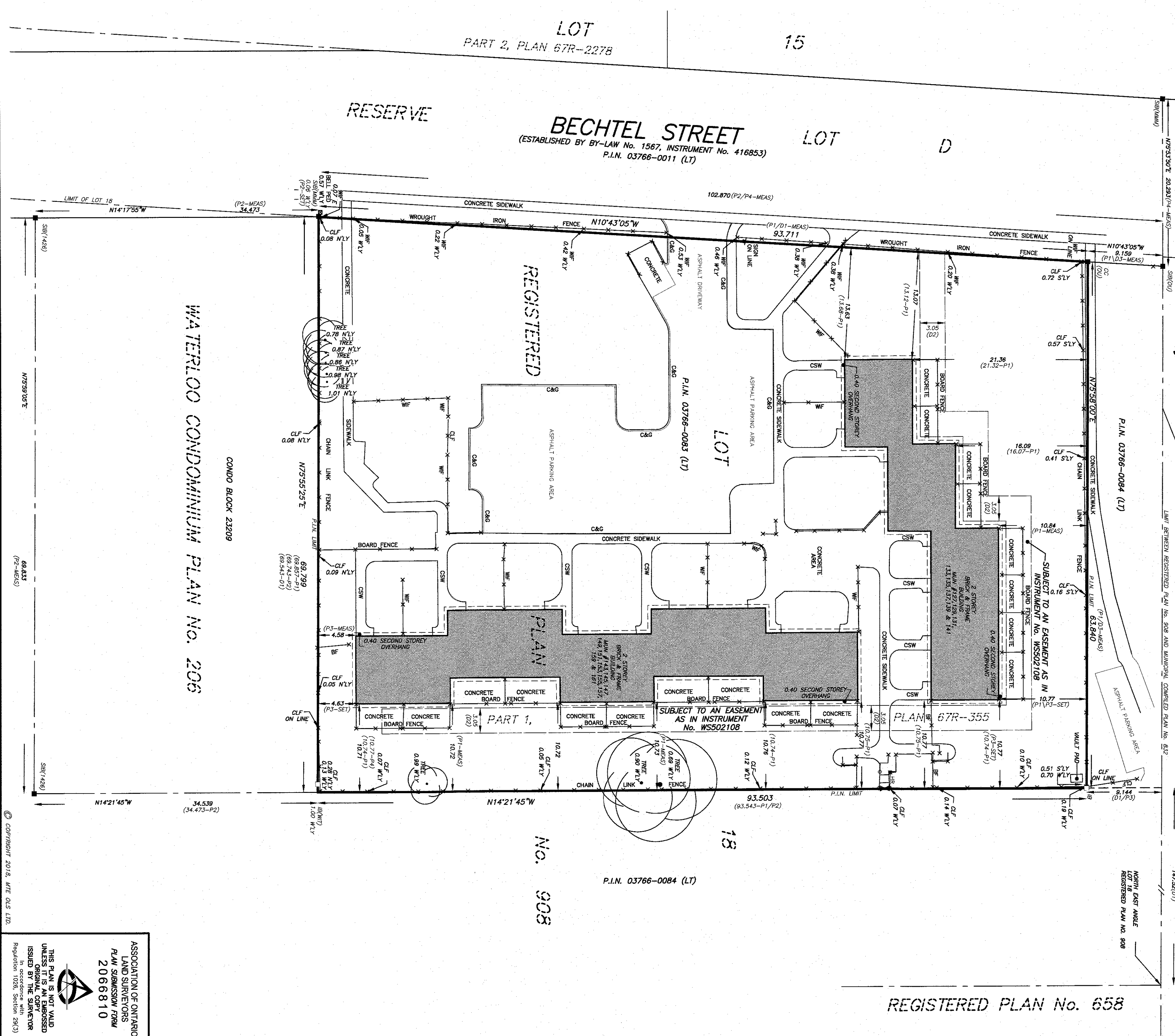
I CERTIFY THAT:
1. THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE REGULATIONS MADE UNDER THEM.
2. THE SURVEY WAS COMPLETED ON THE 22ND DAY OF NOVEMBER, 2018.

November 29, 2018
DATE
PATRICK WOOLLEY
ONTARIO LAND SURVEYOR

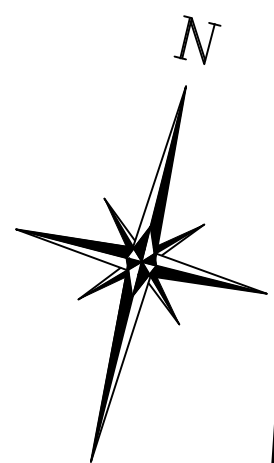
MTE OLS Ltd.
ONTARIO LAND SURVEYORS
520 BINGEMANS CENTRE DRIVE
KITCHENER, ONTARIO, N2B 3Y9
TEL: (519) 743-6500 FAX: (519) 743-6513

ASSOCIATION OF ONTARIO
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PLAN SUBMISSION FORM
2066810
THIS PLAN IS NOT VALID
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ORIGINAL COPY
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IN accordance with
Regulation 1028, Section 24(3)

Drawn By: V. FERNADES Checked By: P. WOOLLEY, O.L.S. File No.: 43512-151-SR1 (L)
CAD FILE: P:\43512\151\43512-151-SR1.DWG CODE: 43512-151-UNDERGROUND CSV



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TOPOGRAPHY OF
PART OF
LOT 18
COMPILED PLAN No. 908
CITY OF CAMBRIDGE
REGIONAL MUNICIPALITY OF WATERLOO

SCALE 1:300
0 5 10 20 METRES

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METRIC:

DISTANCES AND CO-ORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

TOPOGRAPHIC LEGEND:

H	DENOTES HANDRAIL
BF	DENOTES BOARD FENCE
CLF	DENOTES CHAIN LINK FENCE
WIF	DENOTES WROUGHT IRON FENCE
O/H	DENOTES OVERHEAD
CSW	DENOTES CONCRETE SIDEWALK
C&G	DENOTES CURB AND GUTTER
T/G	DENOTES TOP OF GRATE ELEVATION
MH	DENOTES MANHOLE
CB	DENOTES CATCH BASIN
CBMH	DENOTES CATCH BASIN MANHOLE
WV	DENOTES WATER VALVE
GV	DENOTES GAS VALVE
GM	DENOTES GAS METER
HM	DENOTES HYDRO METER
HP	DENOTES HYDRO POLE
HPLS	DENOTES HYDRO POLE AND LIGHT STANDARD
LS	DENOTES LIGHT STANDARD
BPED	DENOTES BELL PEDESTAL
CPED	DENOTES CABLE TV PEDESTAL
GLP	DENOTES GROUND LEVEL HYDRO PEDESTAL
STM	DENOTES STORM
SAN	DENOTES SANITARY
INV	DENOTES INVERT
---	DENOTES OVERHEAD UTILITY WIRES
-H-	DENOTES UNDERGROUND HYDRO
-G-	DENOTES UNDERGROUND NATURAL GAS
-W-	DENOTES UNDERGROUND WATER MAIN
-B-	DENOTES UNDERGROUND BELL
-S-	DENOTES SEWER
+	DENOTES BENCHMARK
+	DENOTES CONIFEROUS TREE
+	DENOTES DECIDUOUS TREE
+333.33	DENOTES EXISTING ELEVATION
PLS	DENOTES INFORMATION FROM PRIMARY LOCATE SHEETS PROVIDED BY G-TEL ENGINEERING
N/A	DENOTES STRUCTURE BLOCKED OR NO ACCESS TO INVERT

NOTES:

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UNDERGROUND UTILITY INFORMATION SHOWN ON THIS PLAN IS BASED ON UTILITY FIELD LOCATES UNDERTAKEN BY G-TEL ENGINEERING.

CAUTION: MANY OF THESE PIPES, WIRES AND CONDUIT ARE BURIED AT VARIOUS DEPTHS. LOCATIONS SHOWN ARE APPROXIMATE ONLY. IT IS THE OWNER/CONTRACTOR'S RESPONSIBILITY TO VERIFY AND LOCATE ALL UNDERGROUND FACILITIES PRIOR TO ANY CONSTRUCTION.

UTILITY INFORMATION PROVIDED IS FOR REFERENCE PURPOSES ONLY. MTE DOES NOT WARRANT THE ACCURACY OR COMPLETENESS OF THIS UTILITY INFORMATION AND IS NOT RESPONSIBLE FOR ANY DAMAGES OR LIABILITY DUE TO RELIANCE ON UTILITY INFORMATION SHOWN ON THIS PLAN.

BENCHMARK NOTE

BM CA-188

ELEVATIONS ARE GEODETIC AND REFERRED TO A TABLET SET IN NORTH FACE OF HESPELER BAPTIST CHURCH AT INTERSECTION OF ADAM STREET AND FRANKLIN BOULEVARD, REGIONAL ROAD 36. TABLET IS SET 0.15M BELOW FIRST COURSE OF BRICK AND 0.30M WEST OF NORTHEAST CORNER OF CHURCH FACE TO ADAM STREET.

ELEVATION = 307.026
(SOURCE REGION OF WATERLOO BENCHMARK BOOK)

• SITE BENCHMARK IS SHOWN ON THE FACE OF THIS PLAN.



ONTARIO LAND SURVEYORS

520 BINGEMANS CENTRE DRIVE

KITCHENER, ONTARIO, N2B 3X9

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FAX: (519) 743-6513

Cad File: P:\43512\151\43512-151-T1.DWG

COGO : 43512-151-UTMGROUND.CSV

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Drawn By: D. DINIZ

Checked By: P. WOOLLEY, O.L.S.

File No: 43512-151-T1 (L)

APPENDIX B

Domestic Water Demand Calculations

Email from Region of Waterloo confirming design assumptions, dated June 25, 2020

OBC Table A-7.6.3.1 Water Service Sizing

Watermain Pressure Information email from the Region of Waterloo

Fire Hydrant – Flow Test Report, dated July 20, 2020



CIVIL • STRUCTURAL • MECHANICAL • ELECTRICAL

LONDON LOCATION

1599 Adelaide Street N. Unit 301
London, Ont, N5X 4E8
P: 519.471.6667

www.sbmltd.ca

KITCHENER LOCATION

1415 Huron Rd. Unit 225
Kitchener, Ont, N2R 0L3
P: 519.725.8093

sbm@sbmltd.ca

WATER DEMAND CALCULATIONS

DATE:	July 20, 2020
JOB No.:	SBM-20-1645

Client:	Region of Waterloo
Project:	Proposed 7 Tiny Homes
Location:	127 - 161 Bechtel Street, Cambridge ON

Method 1: Domestic Flow as per Region of Waterloo DGSSMS and MOE Design Guidelines for Drinking-Water Systems

No. of Units	Population per Unit	Total Population	Daily Flow per Capita (L/cap.day)	Average Day (L/min)	Max Day (L/min) Factor = 4.9	Peak Hour (L/min) Factor = 7.4
25	3	75	225	11.71875	57.4	86.7

Domestic Flow Velocity:

Peak Water Demand	86.7	L/min
Water Service Diameter	200	mm
Velocity	0.05	m/s

Method 2: OBC Proposed Fixture Unit Calculations

Existing

Fixture Type	Fixture Units Each (FU)	Number of Fixture Type	Total Fixture	OBC Table
Washroom Group	6	18	108	Item 1
Kitchen Sink	2	18	36	Item 29
Washing Machines	1.4	18	25.2	Item 8
Laundry Sink	1.4	18	25.2	Item 31
Water Closet with Flush Tank	3	4	12	Item 38
Sink (Domestic)	1.4	4	5.6	Item 33
Total			212.0	

Proposed

Fixture Type	Fixture Units Each (FU)	Number of Fixture Type	Total Fixture	OBC Table
Washroom Group	6	7	42	Item 1
Kitchen Sink	2	7	14	Item 29
Washing Machines	1.4	7	9.8	Item 8
Laundry Sink	1.4	7	9.8	Item 31
Water Closet with Flush Tank	3	0	0	Item 38
Sink (Domestic)	1.4	0	0	Item 33
Total			75.6	

Total (Existing + Proposed)

Fixture Type	Fixture Units Each (FU)	Number of Fixture Type	Total Fixture	OBC Table
Washroom Group	6	25	150	Item 1
Kitchen Sink	2	25	50	Item 29
Washing Machines	1.4	25	35	Item 8
Laundry Sink	1.4	25	35	Item 31
Water Closet with Flush Tank	3	4	12	Item 38
Sink (Domestic)	1.4	4	5.6	Item 33
Total			287.6	

As per OBC Table A-7.6.3.1., for pressure over 60 psi and a length of 76m (assumed maximum water service length based on site plan), a 50mm diameter water service can serve up to 359 fixture units. The watermain is 200mm diameter up to the on-site fire hydrant(s) on Bechtel Street between Sheppard Avenue and Groh Avenue.

Ryan Frouws

From: Christa De Wys <CDeWys@regionofwaterloo.ca>
Sent: Thursday, June 25, 2020 10:47 AM
To: Ryan Frouws
Cc: Nelson Guiot; Katherine Peng; Nicholas Paneras
Subject: FW: Alternative Housing - Design Assumptions

Hello Ryan,

I received the following assumptions from our housing group. They are consistent with what I sent over yesterday except for Bechtel. I don't believe adjusting to a 2 bed or 3 bed changes anything though as they all have just one full bath. I would recommend taking worst case scenario that would be 7 tiny homes with full bath (no bathtub/just shower), laundry, no dishwasher. I believe those fixture units would be more than 4, 2- bedroom townhouse (incl. full bath, dishwasher, laundry).

Let me know if you have any further questions.

Thank you,
Christa

Christa De Wys, P.Eng., M.Eng.

Project Engineer | Region of Waterloo

20 Weber Street East, 3rd Floor, Kitchener, ON N2H 1C3

Ph: 226-752-9282

Email: CDeWys@regionofwaterloo.ca Website: <http://www.regionofwaterloo.ca>



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From: Jeffrey Schumacher <JSchumacher@regionofwaterloo.ca>
Sent: June 24, 2020 7:23 PM
To: Christa De Wys <CDeWys@regionofwaterloo.ca>; Jennifer Murdoch <JMurdoch@regionofwaterloo.ca>
Cc: Richard Schafer <RSchafer@regionofwaterloo.ca>
Subject: RE: Alternative Housing - Design Assumptions

Hi Christa:

I think those are good assumptions. For Bechtel, the zoning is more flexible, so we might end up with fewer units but with more bedrooms (i.e. 4 2-bed, 3 3-bed).

Jeff

From: Christa De Wys <CDeWys@regionofwaterloo.ca>

Sent: June 24, 2020 1:04 PM

To: Jeffrey Schumacher <JSchumacher@regionofwaterloo.ca>; Jennifer Murdoch <JMurdoch@regionofwaterloo.ca>

Cc: Richard Schafer <RSchafer@regionofwaterloo.ca>

Subject: Alternative Housing - Design Assumptions

Hello Jeff and Jennifer,

I am working with the consultant to get some design assumptions narrowed down regarding the three sites. They have asked me to confirm the style of townhouse that we would be looking to add to Sunnysdale and Guerin as there are several existing styles on these sites (2bd., 3bd., 4bd and 5bd). I'm thinking the following but please confirm if this is not accurate:

1. 14 Guerin Ave., 4BD, match existing design
2. Sunnysdale Pl., 5 bd. match existing floor plan, 4BD if needed to downsize to fit on site.
3. Bechtel Ave., Tiny homes, 250 ft².

Thank you,
Christa

Christa De Wys, P.Eng., M.Eng.

Project Engineer | Region of Waterloo

20 Weber Street East, 3rd Floor, Kitchener, ON N2H 1C3

Ph: [226-752-9282](tel:226-752-9282)

Email: CDeWys@regionofwaterloo.ca Website: <http://www.regionofwaterloo.ca>



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Table A-7.6.3.1.
Pipe Size Based on the Number of Fixtures Units Served⁽¹⁾

Water Service, inches	Water Distribution System, inches	Maximum Allowable Length, m														
		12	18	24	30	46	61	76	91	122	152	183	213	244	274	305
Pressure Range		Number of Fixture Units Served														
200 to 310 kPa (30 to 45 psi)																
¾"	½"	6	5	4	3	2	1	1	1	0	0	0	0	0	0	0
¾"	¾"	18	16	14	12	9	6	5	5	4	4	3	2	2	2	1
¾"	1"	29	25	23	21	17	15	13	12	10	9	7	6	6	6	6
1"	1"	36	31	27	25	20	17	15	13	12	10	8	6	6	6	6
1½"	1¼"	90	68	57	48	38	32	28	25	21	18	15	12	12	11	11
1½"	1½"	151	124	105	91	70	57	49	45	36	31	26	23	21	20	20
2"	1½"	151	151	132	110	80	64	53	46	38	32	27	23	21	20	20
2"	2"	359	329	292	265	217	185	164	147	124	96	70	61	57	54	51
2½"	2½"	445	418	390	370	330	300	280	265	240	220	198	175	158	143	133
311 to 413 kPa (46 to 60 psi)																
¾"	½"	8	7	6	5	4	3	2	2	1	1	1	0	0	0	0
¾"	¾"	21	21	19	17	14	11	9	8	6	5	4	4	3	3	3
1"	1"	42	42	41	36	30	25	23	20	18	15	12	10	9	8	8
1½"	1¼"	83	83	83	83	66	52	44	39	33	29	24	20	19	17	16
1½"	1½"	151	151	151	151	128	105	90	78	62	52	42	38	35	32	30
2"	1½"	151	151	151	151	150	117	98	84	67	55	42	38	35	32	30
2"	2"	359	359	359	359	359	318	280	250	205	165	142	123	110	102	94
2½"	2½"	611	611	610	580	535	500	470	440	400	365	335	315	285	267	250
Over 413 kPa (60 psi)																
¾"	½"	8	8	7	6	5	4	3	3	2	1	1	1	1	1	0
¾"	¾"	21	21	21	21	17	13	11	10	8	7	6	6	5	4	4
1"	1"	42	42	42	42	38	32	29	26	22	18	14	13	12	12	11
1½"	1¼"	83	83	83	83	83	74	62	54	43	34	26	25	23	22	21
1½"	1½"	151	151	151	151	151	151	130	113	88	73	51	51	46	43	40
2"	1½"	151	151	151	151	151	151	142	122	98	82	64	51	46	43	40
2"	2"	359	359	359	359	359	359	359	340	288	245	204	172	153	141	129
2½"	2½"	611	611	611	611	611	611	610	570	510	460	430	404	380	356	329
Column 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

Notes to Table A-7.6.3.1.:

- (1) Where total fixture unit values exceed those given in this Table, the system must be designed according to a detailed engineering design method.

RE: SBM-20-1645 Region of Waterloo - Alternative Housing Project (Civil +Elect) RE: P-20-216 RE: Region of Waterloo - Alternative Housing Project

Nelson Guiot <nguiot@sbmltd.ca>

Tue 6/23/2020 9:37 AM

To: Paul Holbrook <HolbrookP@cambridge.ca>

Cc: Ryan Frouws <rfrouws@sbmltd.ca>; Christa De Wys <CDeWys@regionofwaterloo.ca>

Hi Paul,

Thank you for the information yesterday that 64 PSI is the static pressure as measured at the hydrant in the intersection of Bechtel and Groh Ave.

Since the buildings are Part 9 we do not need any other information about water at the moment, but we have another request.

In all the files you may have, do you have maybe internal as-built information for this project or to give us a contact in the building department that may have information about the Civil services at the time when these units were built?

Thanks for all your assistance with projects done in Cambridge. As always, It is most appreciated!

Best Regards,

Please note I am working full-time from home. I do not have access to my work phone but do have access to my voicemail. Please leave me a detailed voicemail or reach out via email to communicate.

Nelson Guiot, P.Eng.

Eng. IV, Civil Department Manager

P: 519-471-6667 x128

E: nguiot@sbmltd.ca



From: Nelson Guiot

Sent: Friday, June 19, 2020 12:36 AM

To: Christa De Wys <CDeWys@regionofwaterloo.ca>; Paul Holbrook <HolbrookP@cambridge.ca>

Cc: Nicholas Paneras <npaneras@sbmltd.ca>; Katherine Peng <kpeng@sbmltd.ca>; Ryan Frouws <rfrouws@sbmltd.ca>; Jim Ghani <jghani@sbmltd.ca>; Rafael Muylaert <rmuylaert@sbmltd.ca>

Subject: RE: SBM-20-1645 Region of Waterloo - Alternative Housing Project (Civil +Elect) RE: P-20-216 RE: Region of Waterloo - Alternative Housing Project

Hi Christa,

Thank you for the phone conversation June 18th. As stated in the conversation, Ryan Frows will be in Cambridge on Tuesday morning, and after that he will be going to Waterloo and Kitchener to review the other two sites.



Fire Hydrant - Flow Test Report

Location: Waterloo Region Housring
Address: 127-161 Bechtel St., Cambridge, ON
Test performed by: Nathan Holland
Municipal Support: City of Cambridge
Hydrant Make & Model: Mueller, Canada Valve, Darling B50B
Date: Monday, July 20, 2020
Time: 8:00:00 PM
Representative of: Precision Hydrant Services
Witness: Darryll Holland

Flow Hydrant

Nozzle Size:	2.5	inches
Static Pressure:	68.0	psi
Residual Static Pressure:	52.0	psi
Pitot:	40.0	psi
Discharge Coefficient:	0.90	
Nozzle Fill:	100.0%	
Observed Flow w/Port 1:	1,061.58	U.S. gpm
Calculated Flow @ 20 PSI:	1,921.31	U.S. gpm

Calculated Fire Flow Colour Coding: Red (<500gpm), Orange (500-999gpm), Green (1,000-1,499gpm), Blue (1,500>gpm)

Flow Test Notes & Observations:

- Original valve stem with no butterfly.
- Temperature during test was approximately 25 celcius.
- Discharge difuser was flowed, water was very discoloured, flowed until clear, no damage or erosion noted.
- Fire Hydrant drained completely prior to installing port caps, no operation deficiencies were observed.

* **Note:** the Hazen-Williams calculation is based on the observed flow from a single port (port 1) and assumes a baseline residual pressure of 20psi.

Disclaimer: the calculations were not perform by a professional engineer and are the expressed opinion of Precision Hydrant Services who utilizes industry standard calculations in calculating the U.S Gpm. The calcualted results reflect the current and available water supply at the specific date & time the test was performed.

APPENDIX C

Sanitary Fixture Units Calculation



CIVIL • STRUCTURAL • MECHANICAL • ELECTRICAL

LONDON LOCATION

1599 Adelaide Street N. Unit 301
London, Ont, N5X 4E8
P: 519.471.6667

www.sbmltd.ca

KITCHENER LOCATION

1415 Huron Rd. Unit 225
Kitchener, Ont, N2R 0L3
P: 519.725.8093

sbm@sbmltd.ca

SANITARY FIXTURE UNIT CALCULATIONS

DATE: July 16, 2020
JOB NO.: SBM-20-1645

Client: Region of Waterloo
Project: Proposed 7 Tiny Homes
Location: 127-161 Bechtel Street, Cambridge ON

Building Information

Total Number of Suites: 18
Number of 2 BR Suites: 4
Number of 3 BR Suites: 10
Number of 4 BR Suites: 4
Number of Proposed Tiny Homes: 7

Existing Sanitary Load Calculation

Fixture Type	Number of Fixture Type	Fixture Units Each (FU)	Total Fixture Units (FU)
Washroom Group	18	6	108
Kitchen Sink	18	2	36
Washing Machines	18	1.5	27
Water Closet with Flush Tank	4	4	16
Sink (Domestic)	4	1.5	6
TOTAL (FU):			193

Proposed Sanitary Load Calculation (7 Tiny Homes)

Fixture Type	Number of Fixture Type	Fixture Units Each (FU)	Total Fixture Units (FU)
Washroom Group	7	6	42
Kitchen Sink	7	2	14
Washing Machines	7	1.5	10.5
Water Closet with Flush Tank	0	4	0
Sink (Domestic)	0	1.5	0
TOTAL (FU):			66.5
EXISTING + PROPOSED TOTAL (FU):			259.5

* Number of Amentities estimated from Architectural floor plans by Region of Waterloo

Sanitary Drain:

As per OBC Table 7.4.10.8., a drain size of 6" at a slope of 2% can serve up to 840 fixture units.

As per OBC Table 7.4.10.8., a drain size of 8 inch at 0.5% can hold up to 1400 fixture units.

APPENDIX D

Stormwater Run-Off Coefficient Calculation



**STRIK
BALDINELLI
MONIZ**

CIVIL • STRUCTURAL • MECHANICAL • ELECTRICAL

LONDON LOCATION

1599 Adelaide Street N. Unit 301
London, Ont, N5X 4E8
P: 519.471.6667

www.sbmltd.ca

KITCHENER LOCATION

1415 Huron Rd. Unit 225
Kitchener, Ont, N2R 0L3
P: 519.725.8093

sbm@sbmltd.ca

STORM RUN-OFF COEFFICIENT CALCULATIONS

DATE: July 20, 2020
JOB NO.: SBM-20-1645

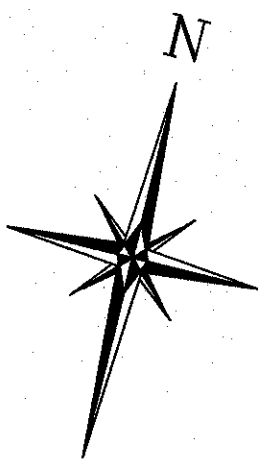
Client: Region of Waterloo
Project: Proposed Tiny Home Expansion
Location: 127-161 Bechtel Street, Cambridge, ON

PRE-DEVELOPMENT SITE AREA

	Area (m ²)	C	A*C
Total Area:	6611.41		
Building Area:	903.31	0.9	812.979
Concrete/Asphalt:	1718.36	0.9	1546.524
Gravel:	0.00	0.9	0
Landscaped/Open:	3989.74	0.2	797.948
Totals:	6611.41		3157.451
$C_{eq} = \text{Sum}(A*C)/\text{Sum}(A) =$	0.48		

POST-DEVELOPMENT SITE AREA

	Area (m ²)	C	A*C
Total Area:	6611.41		
Building Area:	1065.92	0.9	959.328
Concrete/Asphalt:	1917.90	0.9	1726.11
Gravel:	0.00	0.9	0
Landscaped/Open:	3627.59	0.2	725.518
Totals:	6611.41		3410.956
$C_{eq} = \text{Sum}(A*C)/\text{Sum}(A) =$	0.52		



REGISTERED LOT 139
PLAN No. 160
LOT 140
LOT 63
MUNICIPAL COMPILED PLAN No. 832

PLAN OF SURVEY
OF PART OF
LOT 18
REGISTERED PLAN No. 908
CITY OF CAMBRIDGE
REGIONAL MUNICIPALITY OF WATERLOO
SCALE 1:300
0 5 10 20 METRES
MTE OLS LTD.
ONTARIO LAND SURVEYORS

METRIC:
DISTANCES AND CO-ORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

LEGEND:
□ DENOTES PLANTED MONUMENT
■ DENOTES FOUND MONUMENT
SIB DENOTES STANDARD IRON BAR
SSIB DENOTES SHORT STANDARD IRON BAR
IB DENOTES IRON BAR
IB# DENOTES ROUND IRON BAR
CC DENOTES CUT CROSS
OU DENOTES ORIGIN UNKNOWN
NTS DENOTES NOT TO SCALE
WIT DENOTES WITNESS
MEAS DENOTES MEASURED
CALC DENOTES CALCULATED
MTE DENOTES MTE OLS LTD.
1428 DENOTES MACDONALD-TAMBLYN SURVEYING LTD., O.L.S.
MMH DENOTES MARSHALL MACKLIN MONAGHAN LTD., O.L.S.
D1 DENOTES INSTRUMENT No. 421493
D2 DENOTES INSTRUMENT No. WS502108
D3 DENOTES INSTRUMENT No. 343874
P1 DENOTES PLAN OF SURVEY BY MARSHALL MACKLIN MONAGHAN LTD., O.L.S., DATED JANUARY 6, 1970
P2 DENOTES PLAN 67R-3746
P3 DENOTES PLAN 67R-355
P4 DENOTES PLAN OF SURVEY BY MARSHALL MACKLIN MONAGHAN LTD., O.L.S., DATED JANUARY 24, 1966
HR DENOTES HANDRAIL
BF DENOTES BOARD FENCE
CLF DENOTES CHAIN LINK FENCE
WIF DENOTES WROUGHT IRON FENCE

NOTES:
BEARINGS ARE UTM GRID, DERIVED FROM GPS OBSERVATIONS USING THE CANSEL NETWORK AND ARE REFERRED TO UTM ZONE 17, NAD83 (CSRS v6) EPOCH 2010.00.
DISTANCES ON THIS PLAN ARE GROUND DISTANCES AND CAN BE CONVERTED TO GRID DISTANCES BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.999589270.

TITLE NOTE:
THE LOCATION OF PLAN W.D.R. 339 HAS NOT BEEN SHOWN ON THIS PLAN.

SURVEYOR'S CERTIFICATE:
I CERTIFY THAT:
1. THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT, THE SURVEYORS ACT AND THE LAND TITLES ACT AND THE REGULATIONS MADE UNDER THEM.
2. THE SURVEY WAS COMPLETED ON THE 22ND DAY OF NOVEMBER, 2018.

November 29, 2018
DATE
PATRICK WOOLLEY
ONTARIO LAND SURVEYOR

ASSOCIATION OF ONTARIO
LAND SURVEYORS
PLAN SUBMISSION FORM
2066810

THIS PLAN IS NOT VALID
UNLESS IT IS AN EMBOSSED
ORIGINAL COPY
ISSUED BY THE SURVEYOR
in accordance with
Regulation 1026, Section 29(3)

MTE OLS Ltd.
ONTARIO LAND SURVEYORS
520 BINGEMANS CENTRE DRIVE
KITCHENER, ONTARIO, N2B 3X9
TEL: (519) 743-6500 FAX: (519) 743-6513

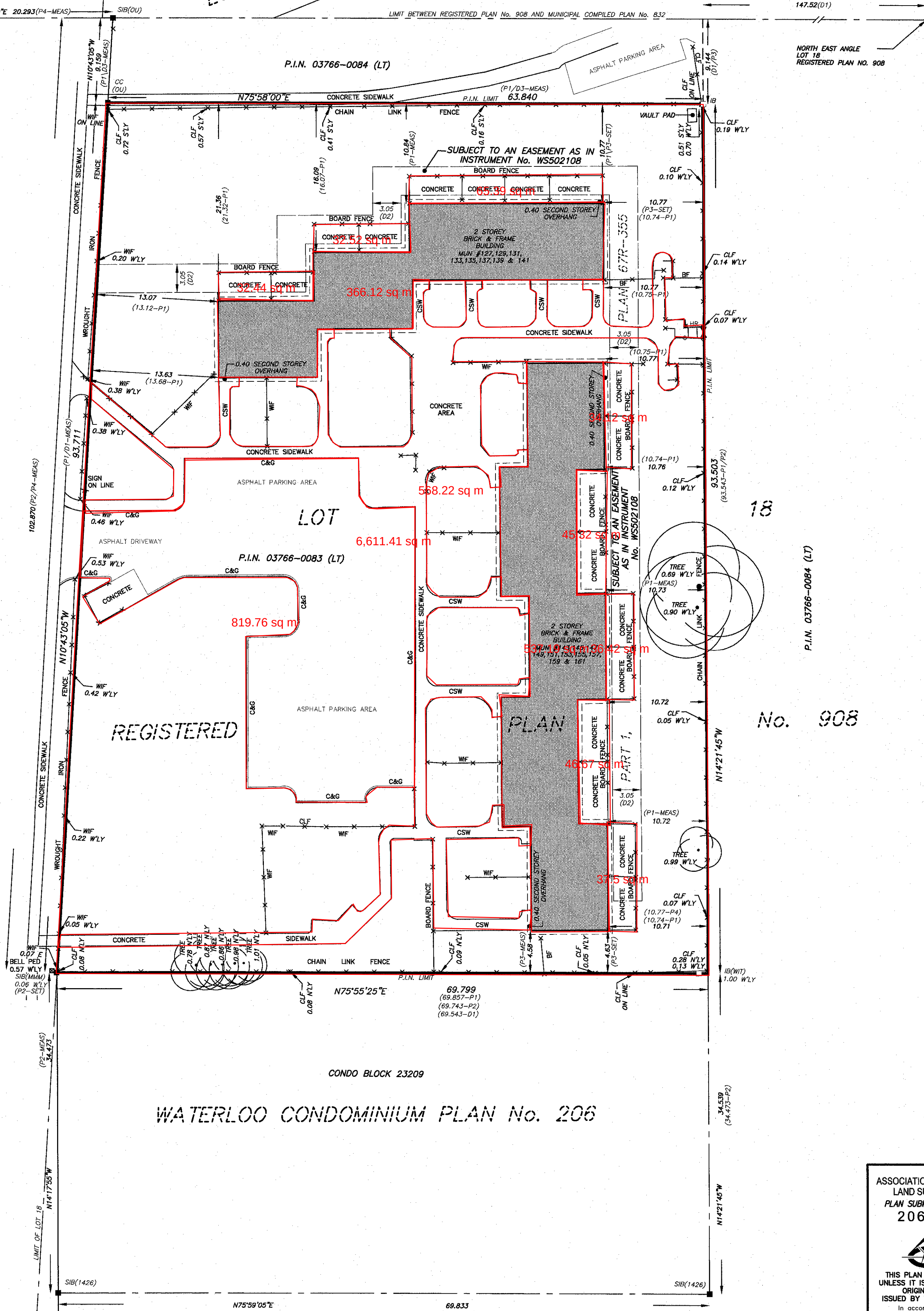
Cad File: P:\P\43512\151\43512-151-SR1.DWG COGO: 43512-151-UTMGROUND.CSV
Drawn By: V. FERNANDES Checked By: P. WOOLLEY, O.L.S. File No: 43512-151-SR1 (L)

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LOT
PART 2, PLAN 67R-2278

BECHTEL STREET
(ESTABLISHED BY BY-LAW No. 1567, INSTRUMENT No. 416853)
P.I.N. 03766-0011 (LT)

RESERVE



REGISTERED PLAN No. 658

No. 908

WATERLOO CONDOMINIUM PLAN No. 206

CONDO BLOCK 23209

APPENDIX E

Auxiliary Locates, from Grading and Servicing Assessment by MTE, dated December 6, 2018

Proposed Concept Site Plans – from Region of Waterloo Preliminary Presentation

Photos for Site Visit on June 23, 2020

Phone: 519-439-0763 Fax: 866-692-0209 Toll Free: 866-692-0208

Utilities Private Locates - MTE Housing, Located:	Date Located: 15-Oct-18	Request #: 3908939
--	----------------------------	-----------------------

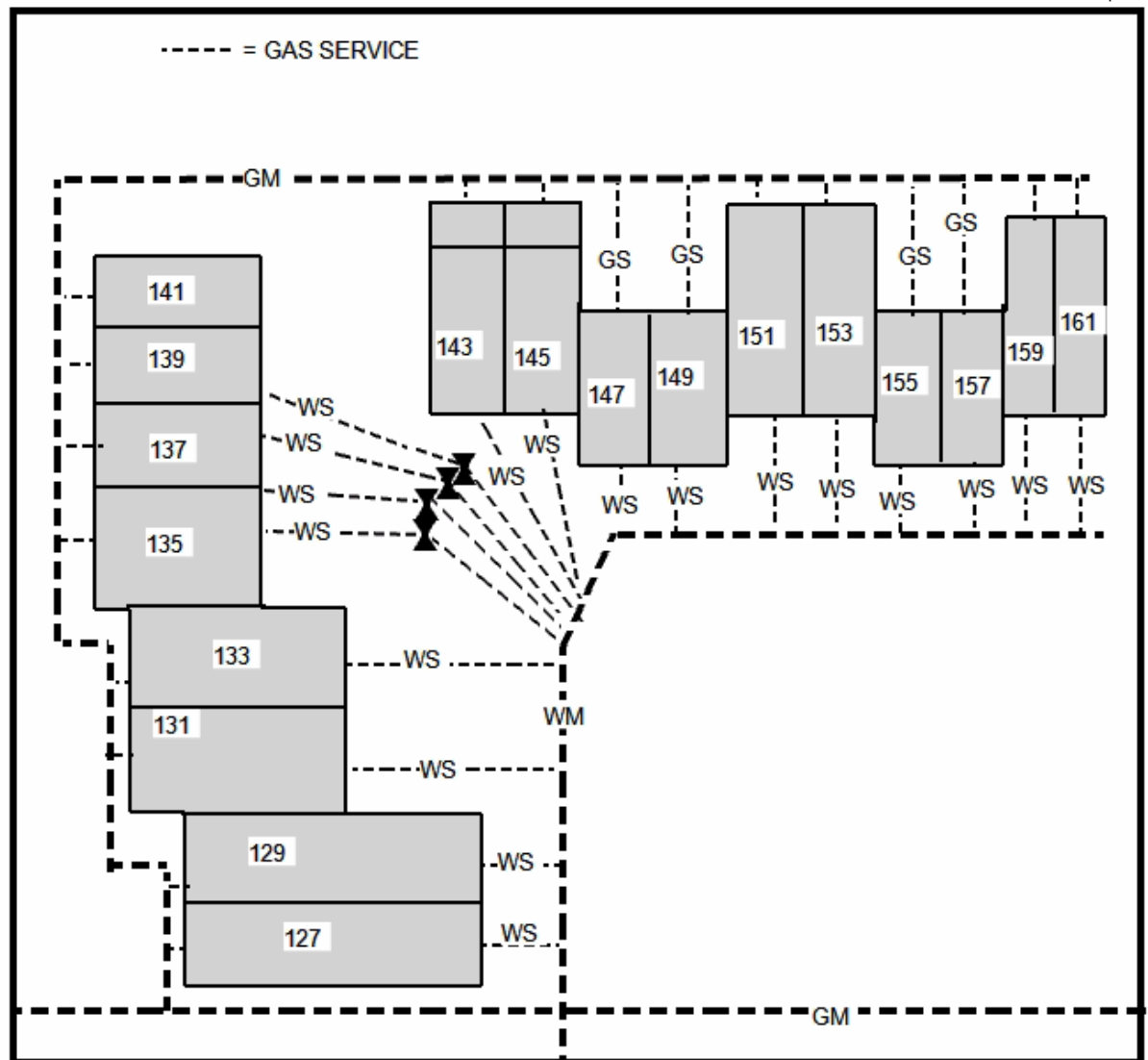
LOCATED AREA: EXCAVATOR SHALL NOT WORK OUTSIDE THE LOCATED AREA WITHOUT OBTAINING ANOTHER LOCATE.

From: FL ON N SIDE OF HYDRO TRANSFORMER	To: BECHTEL DR N CL
From: FL ON W SIDE OF HYDRO TRANSFORMER	To: FL ON E SIDE OF 161

Building Line	BL
Fence Line	FL
Face of Curb	CL
Road Edge	RE
Driveway	DW
Manhole	M/H
Catch Basin	CB
Sidewalk	SW
Pole	
Demarcation	DM
Flush to Grad Pedestal	FTG
Railway	
Pedestal	
Telephone Cable	-B-
Conduit	-C-
Buried Service Wire	-BSW-
Fiber Optic Cable	-FO-
Gas Main	-GM-
Gas Service	-GS-
Gas Valve	
Hydrant	
Transformer	
Hydro	-H-
North	N.
South	S.
East	E.
West	W.
Sanitary Sewer	-SAN-
Storm Sewer	-ST-
Valve Chamber	
Water Main Valve	
Water Service Valve	
Water	-W-
Traffic Signal	-TS-
Street Light	-SL-
Junction Box	JB

DEPTH VARIES AND MUST BE VERIFIED BY HAND DIGGING OR VACUUM EXCAVATION.

☐ LOCATED AREA HAS BEEN ALTERED AS PER: _____



This form is valid only with the primary locate sheet. This sketch is not to scale. Measurements are in metres.
Any privately owned services within the located area have not been marked – check with service/property owner

This form revised February 2015

127-161 Bechtel St., Cambridge



- Current zoning would permit 7 tiny homes (250ft²) or 3 micro homes
- Parking would need to be expanded
- Less impact on surrounding tenants



Existing parking lot, TYP



Existing catchment basin, TYP



Existing townhouse backyard, TYP



Existing townhouse unit, TYP