

Stormwater Management and  
Functional Servicing Report  
**102 Spruce Street**  
Cambridge, Ontario

---

June 15, 2020

Project Reference Number 20-117



**K. SMART ASSOCIATES LIMITED**  
CONSULTING ENGINEERS AND PLANNERS

---

85 McINTYRE DRIVE, KITCHENER, ONTARIO N2R 1H6  
TELEPHONE (519) 748-1199 FAX (519) 748-6100

## **Table of Contents**

Introduction.....	1
Background Information.....	1
Existing Servicing Infrastructure and Drainage Conditions.....	1
Proposed Water Servicing .....	2
Proposed Sanitary Servicing.....	3
Proposed Grading and Drainage.....	3
Recommendations.....	4

## **Appendices**

- Appendix A – Water Demand Calculations
- Appendix B - Sanitary Sewer Design Sheet
- Appendix C – Drainage Area Plans

## Introduction

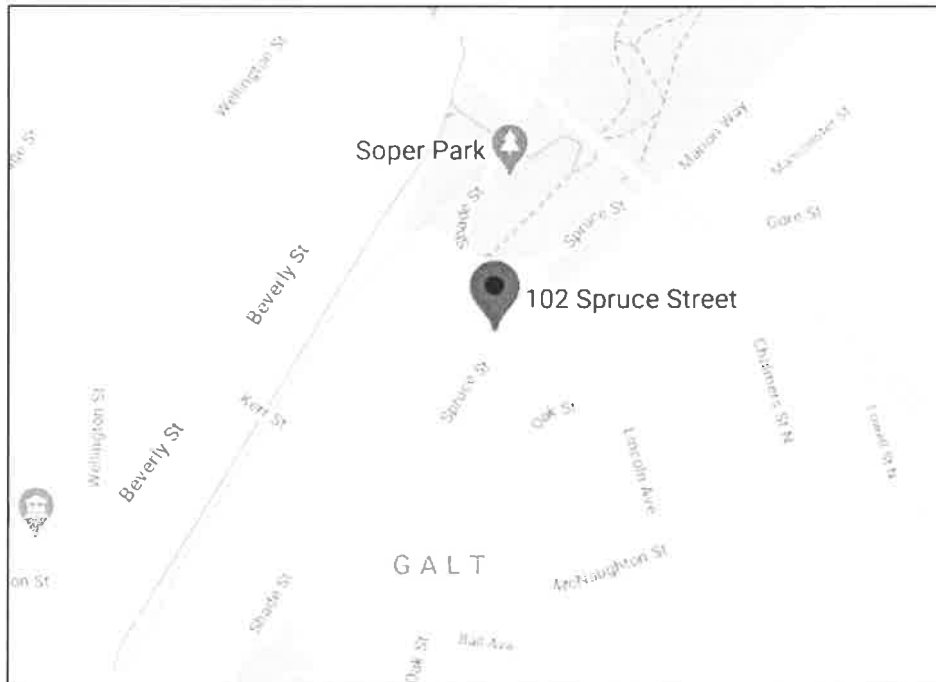
This report provides the stormwater management and functional servicing details for the proposed development at 102 Spruce Street in Cambridge, Ontario.

The subject property is 0.07 ha and is currently developed with a residential home. The proposed development will include dividing the existing lot into two lots. The existing building will be demolished and two semi-detached duplexes will be constructed.

## Background Information

The subject property is located on the north side of Spruce Street, west of Dundas Street, in the City of Cambridge.

The site is bounded by residential properties to the north, west and east. The site location is shown in Figure 1.



**Figure 1: Location of Subject Property, 102 Spruce Street, Cambridge, Ontario (Google Maps)**

## Existing Servicing Infrastructure and Drainage Conditions

There is an existing 150mm diameter watermain, a 200mm diameter sanitary sewer and a 300mm diameter storm sewer in the Spruce Street right of way. There is an existing water service and a sanitary service to the existing residence.

The existing topography is such that the majority of the site drains in a northerly direction, to the rear of the site. A portion of the roof and the driveway drains toward the road. There is no stormwater management provided on site.

## Proposed Water Servicing

There is an existing 150mm diameter watermain on Spruce Street. There is an existing water service to the property. It is proposed to retain this existing water service to service the first proposed lot. A new 25mm water service will be installed to service the second proposed lot.

The water demand has been calculated in accordance with the Region of Waterloo's Design Guidelines (2019) with a usage rate of 225 L/c/d. The peaking factors for the minimum hourly, maximum daily, and peak hourly demands were obtained from the Ministry of the Environment Drinking Water Guidelines.

### **Lot 1 (Duplex 1)**

$$\begin{aligned}\text{Average Water Demand} &= 2 \text{ units} \times 3 \text{ people/unit} \times 225 \text{ L/c/d} \\ &= 1,350 \text{ L/day} \\ &= 0.016 \text{ L/s}\end{aligned}$$

A Maximum Day Peak Factor of 2.75 and a Peak Hourly Factor of 4.13 was applied to the average water demand.

$$\begin{aligned}\text{Maximum Day Demand} &= 0.016 \text{ L/s} \times 2.75 = 0.043 \text{ L/s} \\ \text{Peak Hourly Demand} &= 0.016 \text{ L/s} \times 4.13 = 0.065 \text{ L/s}\end{aligned}$$

### **Lot 2 (Duplex 2)**

$$\begin{aligned}\text{Average Water Demand} &= 2 \text{ units} \times 3 \text{ people/unit} \times 225 \text{ L/c/d} \\ &= 1,350 \text{ L/day} \\ &= 0.016 \text{ L/s}\end{aligned}$$

A Maximum Day Peak Factor of 2.75 and a Peak Hourly Factor of 4.13 was applied to the average water demand.

$$\begin{aligned}\text{Maximum Day Demand} &= 0.016 \text{ L/s} \times 2.75 = 0.043 \text{ L/s} \\ \text{Peak Hourly Demand} &= 0.016 \text{ L/s} \times 4.13 = 0.065 \text{ L/s}\end{aligned}$$

The water demand for the proposed development is summarized in the table below. Calculations are included in Appendix A.

<b>Water Demand</b>	<b>Per Lot (Per Duplex)</b>	<b>Total Development</b>
Average Water Demand	0.016 L/s	0.032 L/s
Maximum Day	0.043 L/s	0.086 L/s
Peak Hourly	0.065 L/s	0.130 L/s

The Fire Flow Requirements were determined in accordance with the Fire Underwriters Survey, 1999. As per the recommendations in the FUS, a fire flow requirement of 8,000 L/min is used for two storey, contiguous residential dwellings.

## Proposed Sanitary Servicing

The size, condition and location of the existing sanitary service to the existing dwelling is unknown. Therefore, it is proposed to install two new 100mm diameter sanitary services from the 200mm diameter sanitary sewer in Spruce Street to each of the proposed lots to service the duplexes.

The sanitary sewer flow has been estimated based on the Region of Waterloo Design Guidelines, which state that an average flow of 275 L/c/d is to be used to determine the sewage flow. The peak factor is calculated using the Harmon Formula. An infiltration/inflow allowance of 0.25 L/s/ha was included in the peak flow calculations

The peak sewage flow from the proposed development was calculated to be 0.09 L/s per lot, for a total proposed peak sewage flow of 0.18 L/s

The sanitary sewer design sheet is included in Appendix B.

## Proposed Grading and Drainage

The proposed development does not require on site stormwater management. However, the drainage conditions must be considered to ensure no impacts to adjacent properties.

Under existing conditions, much of the site drains to the rear of the site, with runoff onto the adjacent properties. In order to reduce the impact to the adjacent property, the proposed site is graded to direct as much of the site as possible to drain toward the road. The rear yard and side yards will continue to drain to the rear of the site. However, these areas are pervious and will not result in significant runoff volumes. As well, the drainage area to the rear of the site is reduced compared to existing conditions. Therefore, the overall impact of the development will be a reduction in runoff to the adjacent property.

Existing and Proposed Drainage Areas are included in Appendix C. The change in drainage areas is summarized in the table below

<b>Catchment ID</b>	<b>Outlet</b>	<b>Existing Conditions</b>	<b>Proposed Conditions</b>
101/201	South to Spruce Street	0.061 ha	0.023 ha
102/202	North to Adjacent Property	0.009 ha	0.047 ha

The reduction in drainage area contributing runoff to the north, onto adjacent property is much less under proposed conditions. Therefore, the proposed development will not negatively impact the adjacent properties.

## Recommendations

Site Servicing and grading will be implemented on this property as follows:

1. The existing diameter water service is to be extended to the proposed Duplex 1. A new 25mm water service is to be installed from the main to Duplex 2.
2. A new 100mm diameter sanitary service is to be installed from the sanitary sewer to each of the proposed lots to service each duplex.
3. The site shall be graded as shown on the Site Grading Plan so as to direct runoff to the road.

All of which is respectfully submitted:



Sandra Swanton, P.Eng.  
K. Smart Associates Limited



# Appendix A

---

Water Demand Calculations

# 102 SPRUCE STREET, CAMBRIDGE

## WATER DEMAND CALCULATIONS

K. Smart Associates Limited

Project Number: 20-117

Date: 15-Jun-20

Designed by: Sandra Swanton, P. Eng.

Checked by: Kevin Death, C.E.T.

Residential Units	Residential Densities	Average Daily Demand			Peaking Factors <sup>2</sup>		
		Residential <sup>1</sup>	Commercial <sup>2</sup>	Industrial <sup>2</sup>	Residential	Commercial	Industrial
	3 persons/unit	225 L/cap/d	28,000 L/hr/d	35,000 L/hr/d	Min Hour Factor 0.4	Max Day Factor 2.75	Peak Hour Factor 4.13

<sup>1</sup> Region of Waterloo Design Guidelines

<sup>2</sup> Ministry of Environment Guidelines for Drinking Water Systems

Lot	Residential			Water Demand			
	# of Units	Population	Cumulative Population	Average Day Demand (L/s)	Min Hour Demand (L/s)	Max Day Demand (L/s)	Peak Hour Demand (L/s)
1	2	6	6	0.016	0.006	0.043	0.065
2	2	6	6	0.016	0.006	0.043	0.065



# Appendix B

---

Sanitary Sewer Design Sheet

**102 Spruce Street, Cambridge, Ontario**

SANITARY SEWER DESIGN SHEET

K. Smart Associates Limited	Residential Sewage Flow	275 L/c/d
Project Number: 20-117	Density - Duplex	3 c/unit
Date: 15-Jun-20	Residential Peaking Factor	$F = 1 + \frac{14}{4 + \sqrt{P}}$
Designed by: Sandra Swanton, P. Eng.	Infiltration	0.25 L/s/ha
Checked by: Kevin Death, C.E.T.		

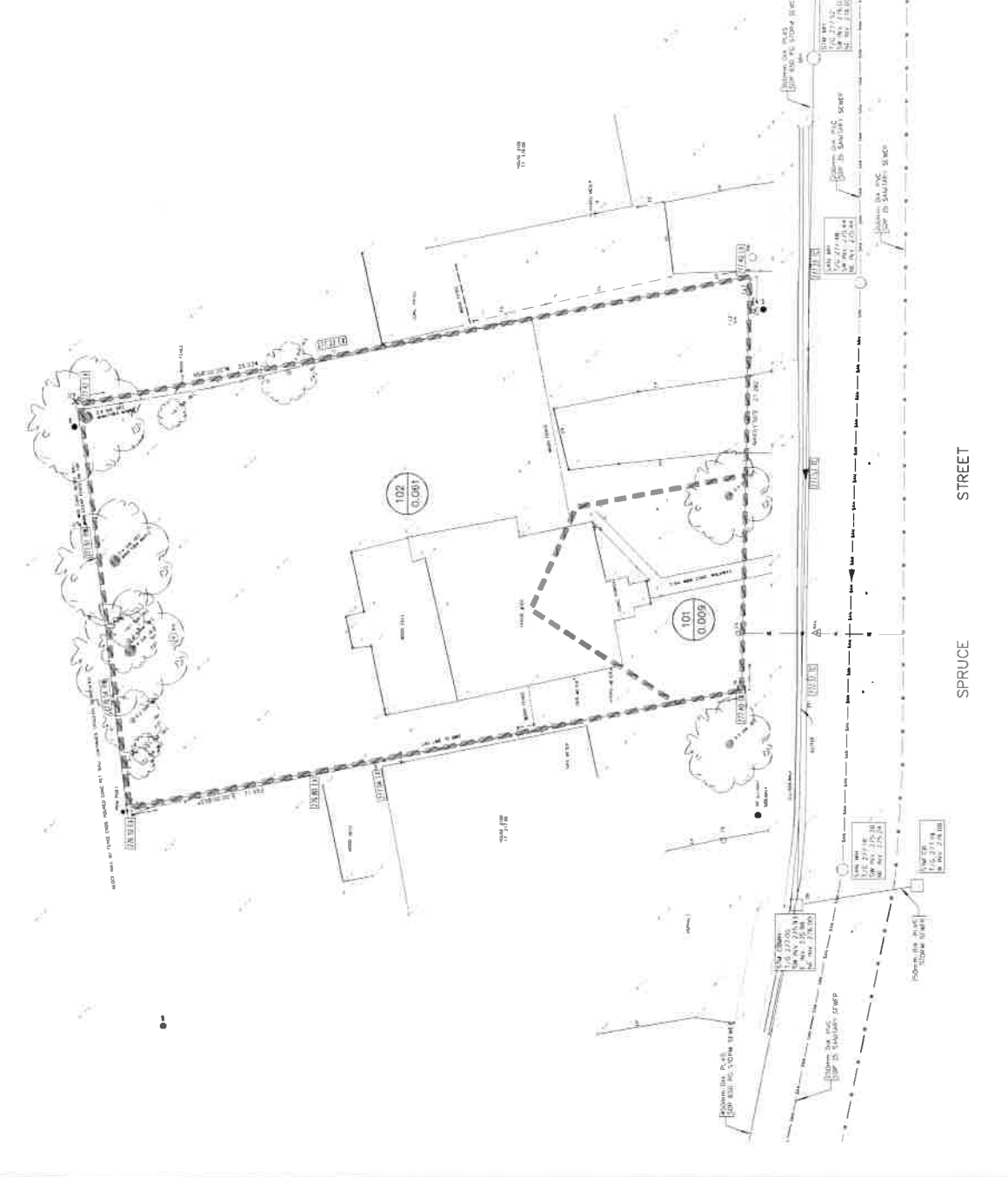
LOCATION			SEWAGE FLOWS					SEWER DESIGN								
Street	From MH	To MH	Total Area (ha)	Units	Total Pop.	Res. Peaking Factor	Average Res. Flow (L/s)	Peak Res. Flow (L/s)	Infiltration (L/s)	Total Peak Flow (L/s)	Mannings 'n'	Pipe Size (mm)	Slope (%)	Length (m)	Capacity (L/s)	Velocity (m/s)
Duplex 1	Duplex 1	Ex. San	0.0412	2	6	4.43	0.019	0.085	0.010	0.09	0.013	100	2.00	22	7.31	0.930
Duplex 2	Duplex 2	Ex. San	0.0412	2	6	4.43	0.019	0.085	0.010	0.09	0.013	100	2.00	22	7.31	0.930

# Appendix C

---

Drainage Area Plans

102 PLAN



101  
0.0009  
DRAINAGE AREA NUMBER  
DRAINAGE AREA (SQ)  
DRAINAGE AREA BOUNDARY

I hereby certify that this grading, retaining and drainage plan for this area conforms to the requirements of the Professional Code of Ethics and the Professional Code of Practice for the State of Michigan.  
I, Michael J. Kasper  
Professional Engineer  
No. 2016-000001  
Exp. 12/31/2018  
Signature of Licensed Professional Engineer  
Date

NO.	REVISION	DATE

102 SPRUCE STREET  
CITY OF LANSING  
EXISTING  
STORM AREA PLAN

**K. SMART ASSOCIATES LIMITED**  
22200 EIGHTH AVENUE AND HUNTERS  
BLVD  
ANN ARBOR, MI 48106  
PH: 734.769.1100  
WWW.KSMART.COM



PROJECT NO.	102	DATE	10/1/18
PROJECT NAME	102 SPRUCE STREET	SHEET	1 OF 2
DESIGNED BY		SCALE	
DRAWN BY		PROJECT NO.	
CHECKED BY		DATE	

© 2018 K. Smart Associates Limited. All rights reserved. No part of this document may be reproduced without written permission from K. Smart Associates Limited.

102 SPRUCE



101  
0.009

102  
0.009

I HEREBY CERTIFY THAT THE DESIGN, SURVEY AND  
CONSTRUCTION OF THIS PROJECT CONFORMS TO THE  
REQUIREMENTS OF THE PROFESSIONAL ENGINEERING ACT  
AND THE PROFESSIONAL SURVEYING ACT OF THE  
PROVINCE OF ALBERTA AND THE REGULATION  
THEREUNDER.

1. Signature: *[Signature]*  
2. Signature  
3. Signature  
Date: \_\_\_\_\_

NO.	DESCRIPTION	DATE
1	ISSUED FOR PERMITS	10/15/2010
2	ISSUED FOR PERMITS	10/15/2010
3	ISSUED FOR PERMITS	10/15/2010
4	ISSUED FOR PERMITS	10/15/2010
5	ISSUED FOR PERMITS	10/15/2010
6	ISSUED FOR PERMITS	10/15/2010
7	ISSUED FOR PERMITS	10/15/2010
8	ISSUED FOR PERMITS	10/15/2010
9	ISSUED FOR PERMITS	10/15/2010
10	ISSUED FOR PERMITS	10/15/2010

### 102 SPRUCE STREET

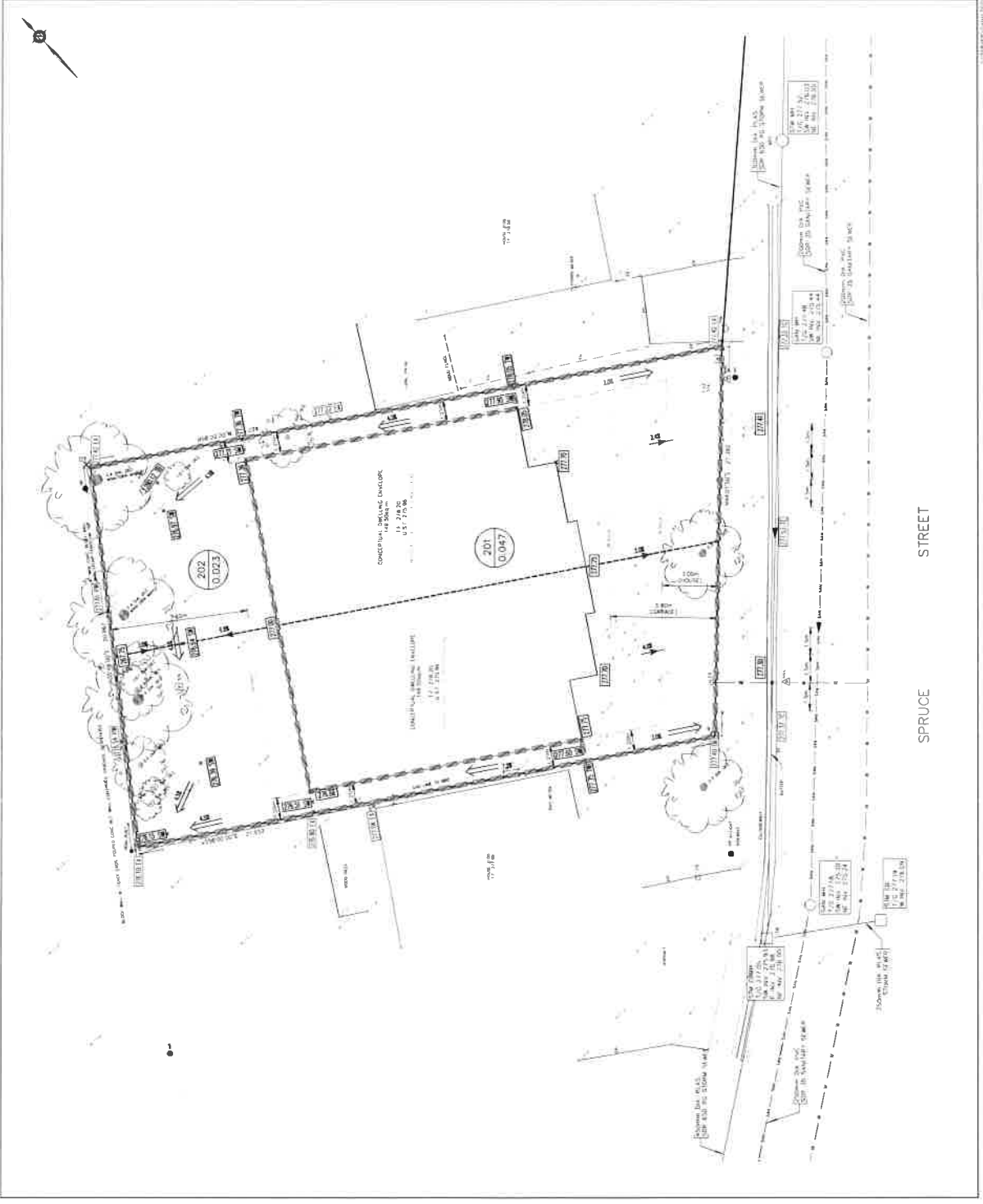
MUNICIPALITY OF CALGARY

### PROPOSED SIORM AREA PLAN

**K. SMART ASSOCIATES LIMITED**  
CITY OF CALGARY  
SUBURBY



DATE: 10/15/2010	SCALE: 1" = 100'
PROJECT NO.: 102 SPRUCE	SHEET NO.: 2 OF 2
CLIENT: K. SMART ASSOCIATES LIMITED	
PROJECT: 102 SPRUCE STREET	



102 SPRUCE STREET

SPRUCES STREET

