MEMORANDUM

To	From
Peter Wise	Jun Xiong, P.Eng. Cristina Hutchinson, P.Eng.
Re	**Date**
Servicing Brief	April 11, 2022

BACKGROUND

This Servicing Brief has been prepared as part of a proposed development at 1177 Foothills Boulevard located in Prince George, British Columbia. The site information is as follows:

- Site Location: 1177 Foothills Boulevard
- PID: 004-343-603
- Legal Description: Lot 104 Plan PGP22809 District Lot 2507 Land District 05 & DL 2609

The proposed development is a 125-unit seniors housing building. The existing lot is currently zoned RM4 – Multiple Residential. Typically, RM4 zoning is for multiple housing such as a community care facility or apartment housing with a maximum density of 90 dwellings per hectare. The parcel size is just over one hectare at 1.002 Ha, which would permit 90 dwellings. A variance would be required to approve the proposed 125-unit development.

The water and sanitary demands in this servicing brief have been provided based on assumptions of maximum flows required for the proposed development. This brief is intended to provide a high-level analysis of servicing demands and identify any major servicing constraints. Documents that have been used to prepare this memorandum include:

- City of Prince George Bylaw No. 8618, 2014
- City of Prince George Design Guidelines
- City of Prince George Water Service Network Plan, 2014

WATER SERVICING

Existing Conditions

The existing water service to 1177 Foothills is a 150mm diameter AC pipe from the 300mm diameter watermain on Foothills Boulevard based on the lot services sketch from PGMap. The lot is within CPG Pressure Zone 2.

The proposed development is located at the base of one of the City's water reservoirs, PW805. From the Water Service Network Plan, the node in front of the proposed development has average day pressures in the range of 60-100psi and fire flows greater than 250L/s under future conditions.

Water Demands

Based on the proposed development of 125 units with a population density of 2.8 people per unit (CPG Design Guidelines - West Bowl Area) the design flows are shown in the table below. Using this method, the total number of people estimated with this development is 350 people.

Metric	Flow	Velocity in Service (150mm AC Pipe)
ADD	1.9 L/s	0.1 m/s
MDD	6.0 L/s	0.3 m/s
PHD	8.2 L/s	0.5 m/s

From a conceptual design phase, the existing watermain and the 150mm service connection indicated in the lot services sketch would support the proposed development. The actual condition of the existing service connection will need to be confirmed during construction and depending on the design of the sprinkler system, the adequacy of the service pipe will be confirmed in the detailed design stage. During detailed design, McElhanney will complete topographic survey of the site and confirm the presence and location of a curb stop.

Fire Flows

There is an existing fire hydrant located approximately 20m from the front property line on the southeast side of the lot. This fire hydrant will not be within 45m of the principal entrance, and we propose a new fire hydrant located on the site within the limiting distance requirement as shown on the architectural drawings. In addition, a fire department Siamese connection will be required at the building. Based on CPG Design Guidelines, 150L/s is required from the hydrant to service the lot.

Based on velocities and expected fire demand, the existing water service is appropriately sized for the proposed development. From our review of the Water Service Network Plan, the property will receive adequate fire flows as the development is at the base of the reservoir with fire flows modelled in the range of 250L/s.

Fire Underwriter's Survey (FUS) calculations were performed according to the overall site plan as designed by EFG Architects Inc.:

Building No.:	1177 Foothills Boulevard - Single Building				
Types of Construction:	Wood frame		C =	1.5	
Effective Ground Floor Area:	1397.7	m^2	No.of Stories:	6	
Total Floor Area:	8386	m^2			
Fire Flow Formula:	30000	L/min.			
Occupancy Contents:	Limited	Add/Subtract:	-15% =	-4500	L/min.
			Sub-Total =	25500	L/min.
Automatic Sprinklers:	Yes	Subtract:	40% =	10200	L/min.
Exposures:	Distance/Exposure				
Front	72.00 m		Add	0%	
Left	0.00 m		Add	0%	
Rear	0.00 m		Add	0%	
Right	80.00 m		Add	0%	
			Total	**0%**	
		Use	0% =	0	L/min.
Roof Type:				0	L/min.
	(For shingles or shakes add 2000-4000L/min.)				
			Total =	15300	L/min.
			Fire Flow Required =	**15300**	**L/min.**
				255	L/s

Note: Fire Flow Estimate Template/Form is based on Fire Underwriter's Survey Calculations 1999. Below assumptions were considered:

- Wood frame construction
- Total effective area is approximately 2/3 of the total area as indicated by the architectural plan that a fire wall and fire door would separate the floor area into two fire zones. One zone is approximately 1/3 of the total area and the other zone is approximately 2/3 of the total area.
- Sprinklered building
- Limited Combustible Fire Hazard
- No charges for proximity to adjacent buildings

The results of the preliminary FUS calculations show that approximately 255L/s could be required for fire flow, depending on the final building design. We requested that the City confirm the specific flow available at the closest hydrant with the use of their water model (See Report in Appendix A). The water modeling result from the City showed that the available fire flow at the hydrant is 1,220L/s. This value would support the FUS fire flow that was calculated based on the above assumptions.

SANITARY SEWER SERVICING

Existing Service Connections

Based on the lot servicing sketch available from PG Map, the existing service connection is a 200mm diameter AC pipe connected to the sewer system on Elkhorn Crescent under an existing walkway.

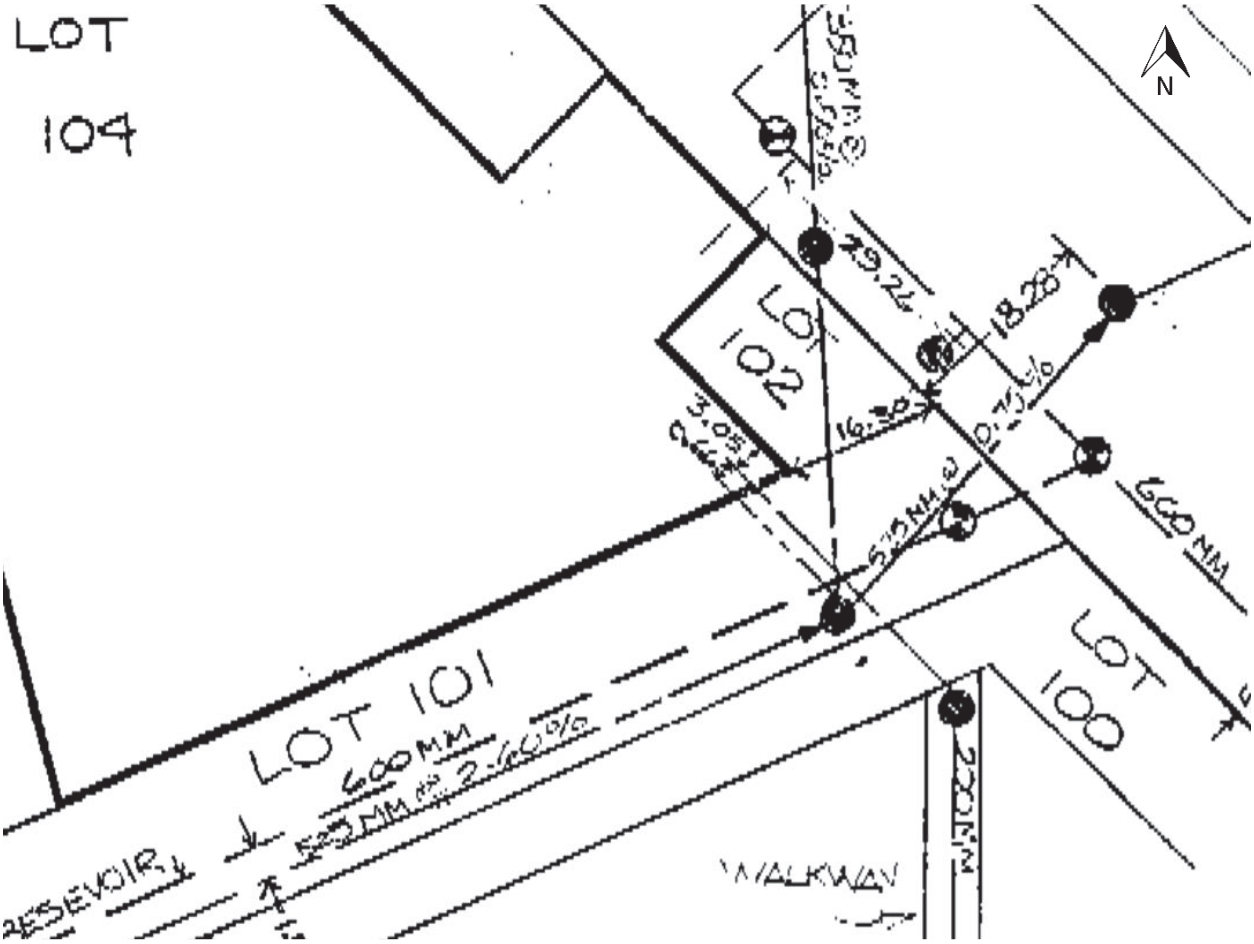

Figure 1: Sanitary Service as shown on Lot History Sketch

This connection needs to be verified during Detailed Design because it is not shown in the City's record drawings. Our team reviewed the site on January 26, 2022, but due to snow and ice conditions were

unable to verify if the manhole exists in the walkway. Once conditions allow, utility locations and presence should be confirmed through utility locates and survey during our Detailed Design.

If during the site inspection the service cannot be confirmed, we would design an offsite extension of the sanitary system from Elkhorn Crescent to service the proposed development as was indicated on the Lot History Sketch. Further details on our proposed sanitary connection are described below.

Sanitary Demands

Based on the proposed development of 125 units and the population method described in the water demands section, the following table provides the estimated sanitary flows. This assumes a 200mm service with a 1% slope.

Metric	Flow
Peak Flow	6.2L/s
Peak Flow and I&I	6.4L/s

The existing 200mm service will meet the peak flow requirements of the proposed development. Calculated using manning's equation, at 6.4L/s flowrate, the service pipe with be partially full with a flow depth at 55mm and flow velocity at 0.91m/s.

Downstream Capacity

Overall sanitary capacity was reviewed for two connection alternatives:

- If the service is connected to the sewer system on Elkhorn Crescent, the minimum system capacity at 11L/s along Tabor Boulevard near Antler Avenue will be reduced to 4.6L/s and may require upgrade in the future if additional future sewer flows are connected to this trunk main.
- If the service is connected to the sewer system on Ochakwin Crescent, the minimum system capacity at 11L/s along Pilot Street near 5th Avenue will be reduced to 4.6L/s, as well. However, the construction cost will be much higher to connect the service to the sewer system on Ochakwin Crescent because it will be installed across Foothills Boulevard and traffic control, or closure will be required during construction.

To reduce impacts to the City's road infrastructure, we would recommend the connection to the sanitary system via the Elkhorn Crescent route. The downstream has the capacity to support this additional load on the system, and specific routing would be confirmed during detailed design of the proposed development. We also reviewed the width of the walkway for the feasibility of the construction if the existing service does not exist as indicated in the lot sketch. The width is narrow and will not allow

construction of the pipe using open cut method without impacting the neighbouring properties but is it possible for directional drilling. This assumption will need to be confirmed in the detailed design stage and McElhanney may recommend the other alternative for connection via Ochakwin if this option is determined to be infeasible.

STORMWATER INFRASTRUCTURE

The minor storm system consists of the local and trunk mains of the storm sewer that are generally designed to convey storm flows from a 1 in 5-year or 1 in 10-year storm event. In the City's case, the preference is to design for the 1:10 year event.

The lot services sketch shows a 300mm diameter vitreous clay pipe which has not been confirmed at this stage, is available for perimeter drainage and surface drainage connection. The proposed stormwater management plan will be to retain the 1 in 10-year post development flows on the site, with overflow directed into the storm system. Geotechnical information from the site confirmed the applicability of a recharge chamber if constructed on the southeast corner of the site.

The maximum and limiting flows were calculated using the Rational Method:

Q = RAIN
where: Q = flow (m^3/s)
R = runoff coefficient (0.8 for proposed development)
A = drainage area (Ha)
I = rainfall intensity (mm/hr)
N = 0.00278 (or 1/36)

The Rational Method is commonly used for design calculations for minor storm systems where the catchment area is less than 20 Ha. The below table summarizes the parameters used in storm runoff calculations, as well as the results:

Catchment Area	10082	m^2
Maximum Site Coverage	45%	
Runoff Coefficient	0.45	
Time of Concentration	15	min
Rainfall Intensity (15min,10 years return)	52.8	Mm/hr
Rainfall Intensity (15min,100 years return)	82.4	Mm/hr
Storm Runoff (15min, 10 years return)	66.5	L/s
Storm Runoff (15min,100 years return)	118.0	L/s

The geotechnical report determined the ground infiltration rate to be 0.00005m/s. For the 15-minute 1 in 10-year storm, the recharge chamber will be designed to contain all the runoff flow volume. The total runoff volume calculated at $57m^3$ would be retained on the site. A combination of underground storage in

the storm pipes and appropriately sized recharge chambers will be used to manage the stormwater on the site. These details, such as diameter of the piping, sizing of the chamber(s), and actual condition of the existing service pipe, would be confirmed during design.

CLOSURE

Based on our initial assessment of the existing utilities, the proposed development would be serviceable at 1177 Foothills Boulevard. The actual conditions of the existing water, sanitary sewer, and storm sewer services will need to be confirmed in the detail design stage and McElhanney will confirm or revise the designs presented in this report when that information is obtained. This Servicing Brief has been prepared by McElhanney Ltd. for Peter Wise. The information and data contained herein represent McElhanney's best professional judgment considering the knowledge and information available to McElhanney at the time of preparation.

McElhanney Ltd. denies any liability whatsoever to other parties who may obtain access to this report for any injury, loss or damage suffered by such parties arising from their use of, or reliance upon, this document or any of its contents without the express written consent of McElhanney and Peter Wise.

Should you have any questions or require additional information, please do not hesitate to contact the undersigned.

Sincerely,

Prepared by:

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
J. XIONG
51795

April 11, 2022

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Reviewed by:

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APPENDIX A

WM000126 Water Modelling for 1177 Foothills Boulevard

CITY OF PRINCE GEORGE
Infrastructure and Public Works

1100 Patricia Boulevard, Prince George, BC V2L 3V9
Telephone (250) 561-7511 Fax (250) 612-5603

MEMO

To: **Jun Xiong, P.Eng.**
McElhanney
jxiong@mcelhanney.com

From: **Alex Childs, EIT**
1-250-614-7807
Alex.Childs@princegeorge.ca

Date: **February 25, 2022**

Subject: **WM000126 Water Modelling for 1177 Foothills Boulevard PID: 004-343-603**
Total number of pages (including this sheet): 3 Original WILL NOT follow by mail.

Jun Xiong,

Water modelling has been carried out for 1177 Foothills Boulevard PID: 004-343-603under the conditions provided by yourself via the attached email on February 4, 2022. As requested, the scenario has been evaluated at the locations shown on the attached map.

The results of the modelling are outlined in Table 1. The design flows at Node 1 meet the City guideline of at least 150l/s with a minimum residual pressure of 20psi for commercial areas.

Table 1: Modelling Scenarios for 1177 Foothills Boulevard PID: 004-343-603

Node	Modelling Node #	Pressure During ADD	Pressure During PHD	Design Fire Flow During MDD
Node 1	1745	511.73 kPa (74.22 PSI)	505.18 kPa (73.27 PSI)	1220.13 l/s

Keep in mind that the values provided are at the proposed main and any losses within the service connections must be taken into account by the designer.

If you have any questions please contact me.

Modelling has been carried out using the most recent version of the City's water model, analyzed under Average Day Demands (ADD), Maximum Day Demands (MDD), and Peak Hour Demands (PHD). Average Day represents the expected average demand over the entire year. Maximum Day represents the average demand during the expected highest demand day of the year. Peak Hour represents the expected highest single-hour average demand with a 3-year return period. Fire Flows given are Design Fire Flows, representing the highest flow that can be drawn from a hydrant under Maximum Day Demand, without reducing pressure at any point in the network below 20 PSI.

Regards,

Prepared by
Alex Childs, EIT
Engineering Technologist

Alan Clark

Reviewed by
Al Clark, P.Eng
Infrastructure Engineer

CC: Wil Wedel, AScT, RTMgr, Utilities Manager
Natalie Payne, Supervisor of Subdivision and Building Inspection

From: Jun Xiong
To: devserv
Cc: Cristina Hutchinson; petewise@icloud.com
Subject: Water Modelling Request - 1177 Foothills Blvd - McElhanney
Date: Friday, February 4, 2022 9:48:43 AM
Attachments: Map.pdf

We would like to request the water modeling for a proposed residential development (apartment) on 1177 foothills Blvd.

- Project information: multifamily
  - Civic address and/or legal description : 1177 Foothills Blvd / LT 104 DL 2507 PL 22809
  - Applicant contact information: as below
  - Related City file no. (if applicable)
- A PDF map or drawing indicating: o Node location(s) (including elevations)
  - Municipal Watermains
  - Hydrant: 645

Please see attached Map and drawing for service location.

- Water demands information: o ADD: __1.9__L/s
  - MDD: _6___L/s
  - PHD: __8.2__ L/s

Would you please call me as well for modeling, so we will not have any miscommunication.

Regards,

Jun Xiong, MSc, P.Eng.
Project Engineer
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Node Map for 1177 Foothills Blvd

CITY OF
PRINCE GEORGE

Notes:

0 15 30
m

This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. This map should not be used for: navigation, a plan of survey, routes, nor locations.

Printed: February 23, 2022 8:46