

**6009-6017 Valley Way**

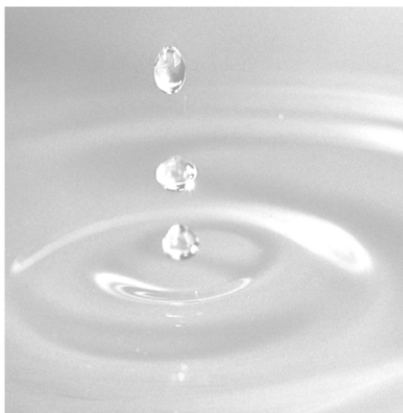
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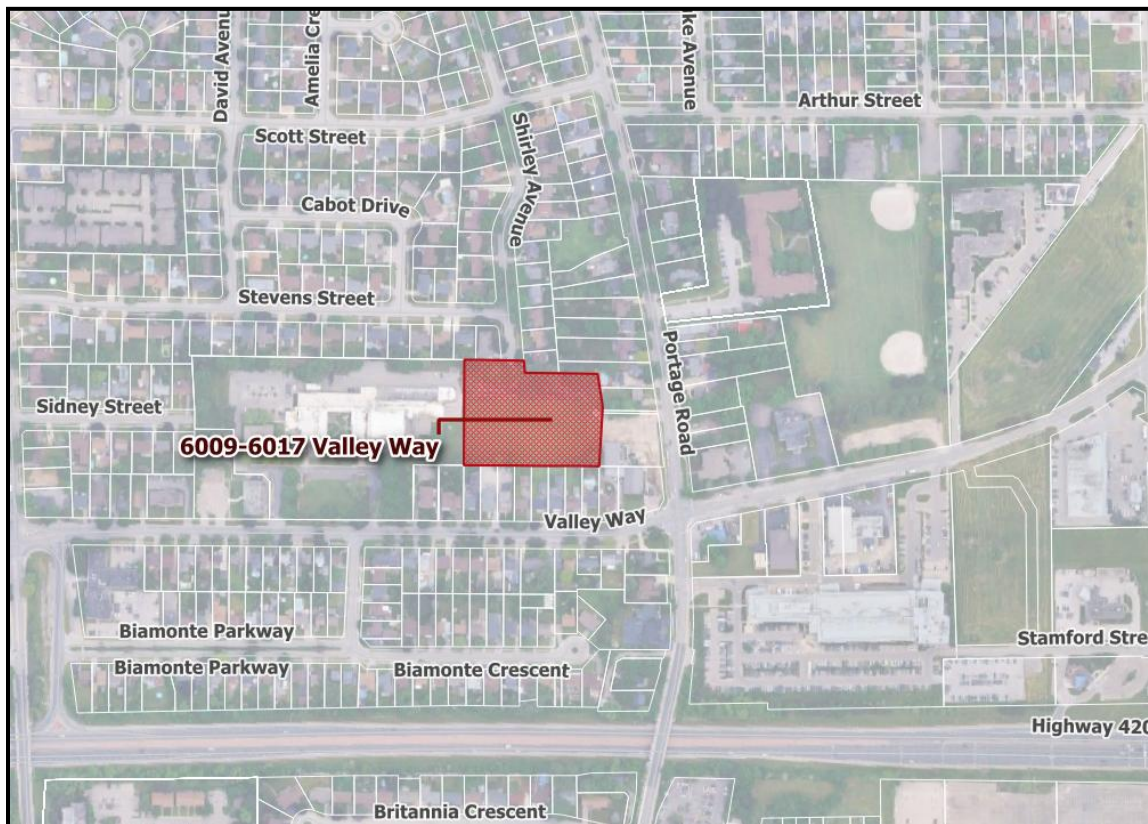
# 1. Project Scope

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## 1.1. Study Area

The City of Niagara Falls has retained GEI Consultants Canada Ltd. to assess the impacts of a proposed development on the City's existing wastewater system. The proposed development would consist of five-stacked townhouse blocks consisting of 99 residential units in total fronting Shirley Avenue, on approximately 1.086 ha of land, as shown in **Figure 1-1**.

It should be noted that the proposed development was not considered as part of the 2021 Region Master Servicing Plan Update nor part of the City's ongoing Master Servicing Plan and Wet Weather Management Strategy.



**Figure 1-1. Study Area**

## 1.2. Analysis Tool

The wastewater system was assessed using the City's existing wastewater model that was developed as part of the City's Pollution Prevention Control Plan (2016), updated as part of the Region's Master Servicing Plan Update (MSPU) completed in 2021 and most recently calibrated as part of the City's ongoing Master Servicing Plan and Wet Weather Management Strategy (MSP-WWMS).



## 2.2. Wastewater Flow Analysis

The system was evaluated under both existing and post-development conditions to gauge the development impact holistically on the sanitary system. Post-development sanitary flows were calculated by Hallex Engineering Ltd. and supplied in their Functional Servicing Report. The Hallex Engineering Ltd. flow rates were reviewed against City of Niagara Falls Engineering Design Standards Manual *Section 3: Sanitary Drainage Systems* methodology, outlined below, with an updated average domestic flow allowance of 255 L/cap/d for residential properties and 310 L/cap/d for commercial properties based on the recently completed 2021 MSPU.

$$Q(d) = \frac{PqM}{86.4} + (I A)$$

Where: P = design population in thousands  
q = avg. daily per capita flow in l/cap.day  
M = peaking factor =  $5 / P^{0.2}$ ) (Babbitt Formula)  
I = infiltration in l/ha. sec  
A= tributary area in ha  
Q(d) = peak domestic sewage flow in l/sec (including extraneous flows)

- a) for design purposes a maximum infiltration allowance of 0.28 l/ha.sec has been provided
- b) for design purposes a maximum avg. domestic flow allowance of 450 l/cap.day has been provided
- c) check with Municipal staff when designing sewers in areas where high I/I has been identified

**Table 2-1** summarizes the Hallex Engineering Ltd. calculated sanitary flows against the methodology outlined in the Engineering Design Standards Manual. It is noted that the Hallex Engineering Ltd. report used a combination of values that partially differed from the City's criteria to estimate sanitary flows. The per capita flow criteria used in the Hallex Engineering Ltd. report is more conservative than the the City's methodology. The GEI system review was completed using **8.25 L/s**, with corrected peaking factor and without RDII contributions, for consistency with the City's methodology.

**Table 2-1. Wastewater Flow Projections**

Criteria	Hallex Engineering Ltd.	City of Niagara Falls	Units
<b>Lot Area</b>	1.086		ha
<b>Population</b>	<u>Townhouse</u> 99 units @ 4 ppu <b>396 pop</b>	<u>Townhouse</u> 99 units @ 2.05 ppu <b>203 pop</b>	pop
<b>Per Capita Flow</b>	450	255	L/bed/d
<b>Average Domestic Flow</b>	2.063	0.599	L/s
<b>Peaking Factor (PF)</b>	4.5 (Babbitt's PF) <b>(4.0 corrected Harmon's PF)</b>	4.0 (Harmon's PF)	
<b>Peak Domestic Flow</b>	9.281 <b>(8.25 corrected)</b>	2.397	L/s
<b>Infiltration Allowance</b>	0.28	0.286	L/s/ha
<b>RDII</b>	0.304 (0.0 <sup>(1)</sup> )	0.0 <sup>(1)</sup>	L/s
<b>Design Flow</b>	9.585 <b>(8.25<sup>(1)</sup>)</b>	2.397 <sup>(1)</sup>	L/s

Notes:

1. Redevelopment of existing catchment area. No new RDII contributions.

## 2.3. Wastewater System Impacts and Modelling Results

### 2.3.1. Sewer System Capacity

For existing sewer capacities, sewer performance criteria were assessed using the following conditions:

- Maintaining depth of flow in pipe equal to or less than obvert elevation ( $d/D \leq 1$ ); and, if failing to do so then,
- Maintain system hydraulic grade line (HGL) of a surcharging sewer below the basement protection freeboard of 2.1 meters below grade.

Under dry weather flow conditions, no downstream sewer surcharging, or system overflows are anticipated under both existing and post-development conditions.

The system performance was reviewed under a variety of design storm conditions under the 2-year, 5-year, and 10-year design storms using the City's existing wastewater model. **Table 2-2** summarizes the sewer system performance before and after development.

**Table 2-2. Downstream Gravity Sewer Performance**

Scenario		Peak Wet Weather Flow			
		Development on Shirley Av to Portage Rd at Valley Way (375mm City Sewer)		Valley Way from Portage Rd to Regional trunk near Park St (1500-2100mm City Sewer)	
		d/D	Freeboard (m)	d/D	Freeboard (m)
1:2 Year	Pre-Dev	0.99	1.30	0.64	Within obvert
	Post-Dev	≥1	1.25	0.65	
1:5 Year	Pre-Dev	≥1	1.16	0.71	
	Post-Dev		1.10	0.71	
1:10 Year	Pre-Dev	≥1	1.10	0.74	
	Post-Dev		0.87 <sup>(1)</sup>	0.74	

Notes:

1. Model noise.

As seen in **Table 2-2**,

- The existing 375-450mm City-owned sewers from the development tie-in on Shirley Avenue to Portage Road at Valley Way is surcharging under the 2-year, 5-year, and 10-year design storm, with existing flows
  - Sewer surcharge exceeds the basement flood protection freeboard of 2.1m below grade, due to high wet weather flow and shallow sewers.
  - The proposed service connection and addition of the proposed development flows would contribute a negligible/minor increase to the risk of basement flooding to the new development and connected properties.
- The remaining existing 1500-2100mm City-owned sewers on Valley Way at Portage Road to the Regional trunk sewer near Park Street have sufficient capacity to safely convey the 2-year, 5-year and 10-year design storm, with and without development flows.

### **2.3.2. Wastewater Pumping Station Performance**

Flows ultimately discharge to the Region's Central SPS. In the 2021 Region MSPU, it was noted that the existing peak 2-year, 5-year, and 10-year design storm flows (which exceed the Regional design allowance for wet weather flows) exceed the capacity of the SPS due to high wet weather flows and system overflows from significant combined sewer areas upstream of the SPS. The updated hydraulic model as part of the City's on-going MSP-WWMS show that although the existing peak 2-year, 5-year, and 10-year design storm flows exceed the SPS capacity, there is no sewer surcharging. The proposed development represents an approximately 0.2% increase in flows to the SPS under the 10-year design storm. The proposed development is within the station's current Region design flow allowance capacity.

The 2021 Region MSPU recommends increasing the pump capacity from 800 L/s to 1000 L/s and localized wet weather flow management. The proposed development is within the station's upgrade capacity when utilizing the Region's design flow allowance. The ongoing MSP-WWMS further recommends a sewer separation strategy including a localized flow monitoring program and updated site conditions to ascertain the magnitude of the existing surcharge risks. Although the additional development flow at this time does not trigger any planned upgrades, the applicant should coordinate with the Region regarding SPS capacity allocations.

### 3. Summary

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Based on the analysis, the impact of the 99-unit townhouse development on 6009-6017 Valley Way on the wastewater system is as follows:

- The existing 375-450mm City-owned sewers from the development tie-in on Shirley Avenue to Portage Road at Valley Way is surcharging under the 2-year, 5-year, and 10-year design storm, with existing flows
  - Sewer surcharge exceeds the basement flood protection freeboard of 2.1m below grade, due to high wet weather flow and shallow sewers.
  - The proposed service connection and addition of the proposed development flows would contribute a negligible/minor increase to the risk of basement flooding to the new development and connected properties.
- The remaining existing 1500-2100mm City-owned sewers on Valley Way at Portage Road to the Regional trunk sewer near Park Street have sufficient capacity to safely convey the 2-year, 5-year and 10-year design storm, with and without development flows.

Further, the proposed development results in:

- Negligible increase in wastewater flows from the proposed development to the Central SPS

Based on the above findings, the sewer at the proposed tie-in location for the development do not meet the City's capacity and performance targets with development flows due to high wet weather flow and shallow sewers. The proposed development is located within an inflow and infiltration reduction area identified as part of the ongoing MSP-WWMS, which may alleviate surcharging to accommodate the development. However, it is recommended that the applicant contact the Region regarding the development flow contribution to the Region-owned trunk sewer and sewage pumping station.