

5259 Dorchester Road

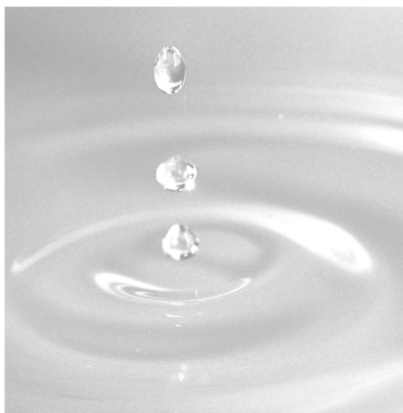
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1. Project Scope

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 1782 residential units and 1830 m² of commercial space fronting Dorchester Road, on approximately 7.54 ha of land, as shown in **Figure 1-1**.

It should be noted that the proposed development was considered as part of the 2021 Region Master Servicing Plan Update as well as 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. Wastewater System Review

2.1. Local Wastewater System

The proposed site will tie-in to the existing sewers on McLeod Road, as shown in **Figure 2-1**.

- 410m of 1200-1500mm City sewers on Dorchester Road from the development at Dawson Street to Service Road, which discharges into the Dorchester Road Sewage Pumping Station (SPS).

The sanitary flows originating at the proposed development contribute to the Dorchester Road SPS. The scope of the servicing review will be limited to the City-owned sewers upstream of the SPS.



Figure 2-1. Wastewater Flow Route

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 Upper Canada Planning & Engineering Ltd. and supplied in their Functional Servicing Report. The Upper Canada Planning & 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 Upper Canada Planning & Engineering Ltd. calculated sanitary flows against the methodology outlined in the Engineering Design Standards Manual. It is noted that the Upper Canada Planning & 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 Upper Canada Planning & Engineering Ltd. report is more conservative than the the City's methodology. The GEI system review was completed using **29.50 L/s** based on the per capita flow criteria provided by Upper Canada Planning & Engineering Ltd., with corrected peak commercial flows and without RDII contributions, for consistency with the City's methodology.

Table 2-1. Wastewater Flow Projections

Criteria	Upper Canada Planning & Engineering Ltd.	City of Niagara Falls	Units
Lot Area	7.54		ha
Residential Population	Apartment 1782 units @ 1.6 <i>ppu</i> 2851 pop	Apartment 1782 units @ 1.55 <i>ppu</i> 2762 pop	pop
Residential Per Capita Flow	255	255	L/c/d
Average Residential Flow	8.41	8.15	L/s
Residential Peaking Factor (PF)	3.461 (Harmon's PF)	3.473 (Harmon's PF)	
Peak Residential Flow	29.12	28.31	L/s
Peak Commercial Flow	1830 m ² @ 28 m ³ /ha/d and 2.0 PF 0.12 (0.38 corrected)	1830 m ² @ 70 m ² /pp, 310 L/c/d (Niagara Falls DC Study), and 4.0 PF 0.38	L/s
Total Peak Flow	29.24 (29.50 corrected)	28.69	L/s
Infiltration Allowance	0.286	0.286	L/s/ha
RDII	2.16 (0.0 ⁽¹⁾)	0.0 ⁽¹⁾	L/s
Design Flow	31.40 (29.50⁽¹⁾)	28.69 ⁽¹⁾	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 Dorchester Rd to Dorchester Rd SPS (1200-1500mm City Sewer)	
		d/D	Freeboard (m)
1:2 Year	Pre-Dev	0.62	Within obvert
	Post-Dev	0.62	
1:5 Year	Pre-Dev	0.69	
	Post-Dev	0.69	
1:10 Year	Pre-Dev	0.73	
	Post-Dev	0.74	

As seen in **Table 2-2**, the existing City-owned sewers from the development tie-in on Dorchester Road to the Dorchester Road SPS 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 Dorchester Road SPS. It is noted that the existing peak 5-year and 10-year design storm flows (which exceed the Regional design allowance for wet weather flows) exceed the capacity of the pump station as identified in the 2021 Region MSPU, causing upstream surcharging exceeding the 2.1m basement protection freeboard elevation. These results are confirmed based on the recently calibrated model as part of the ongoing MSP-WWMS.

The proposed development represents an approximately 6.14% increase in flows to the sewage pumping station under the 10-year design storm and does not appear to trigger new overflows or storage upgrade needs. The proposed development is within the station's upgrade capacity when utilizing the Region's design flow allowance. The 2021 Region MSPU recommends increasing the sewage pumping station capacity from 185 L/s to 345 L/s and replacing the existing 350mm Dorchester SPS forcemain with a new 500mm forcemain to address growth needs. Although the additional flows at this time do not trigger any planned upgrades, the applicant should coordinate with the Region regarding sewage pumping station capacity allocations.

3. Summary

Based on the analysis, the impact of the 1782 apartment units and 1830 m² of commercial space development on 5259 Dorchester Road on the wastewater system is as follows:

- The existing City-owned sewers from the development tie-in on Dorchester Road to the Dorchester Road SPS 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 site to the Dorchester Road SPS

Based on the above findings, the proposed development is not expected to have a significant impact on the existing downstream City-owned sewer system. 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.