REPORT

Denison Avenue Extension
Park Street to Mill Street N.

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Stormwater Management Report

NOVEMBER 2019

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1 INTRODUCTION

Associated Engineering (Ont.) Ltd. was selected by the City of Brampton to prepare a Schedule "B" Municipal Class Environmental Assessment (EA) study for the extension of Denison Avenue, connecting Park Street to Mill Street N. The proposed extension will change the impervious surface characteristics of the study area, altering the current drainage pattern and potential runoff volumes and flow rates. The purpose of this report is to adequately characterize the changes in drainage and stormwater runoff associated with the preliminary preferred design alternative (Alternative #1) for the extension of Denison Avenue, and provide a stormwater management solution for control and treatment of that runoff as may be necessary and feasible.

2 BACKGROUND

A preferred alignment (Design Alternative #1) was selected for the extension of Denison Avenue, resulting in approximately 90 m of new road between Park Street and Mill St. N. The location of the new road extension will be approximately 40 m south from the current alignment of Denison Avenue west of Park Street. The proposed alignment is at the south end of the proposed 45 Railroad Street development and allows for the accommodation of the development as well as increasing the setback distance of the new intersection from the current intersection of Mill St. N. and Railroad St. The proposed roadway would be located where two (2) residential properties with single family homes (36 Park Street and 47 Mill Street) were acquired by the City and subsequently removed for purposes of the installation of the proposed roadway.

The adjacent proposed development of 45 Railroad Street (Functional Servicing and Stormwater Management Report, Schaeffers, June 2016) provides onsite stormwater management, recognizing the future road extension in the development plan, but it is not included in the site stormwater management consideration.

3 DESIGN CRITERIA

The design criteria for stormwater management control are subject to the *TRCA Stormwater Management Guidelines* and the *City of Brampton's Engineering Design Procedures Manual (2008)*. The primary criteria from these documents is listed as follows:

- Runoff Calculation – Rational Method based on City storm sewer design criteria.
- Quantity Control – post development runoff minor (5-year) and major (100-year) storm peak flow rate controlled to pre-development runoff rates, or best efforts for a site under 0.5 ha;
- Quality Control – Enhanced Level (80% TSS) removal, or best efforts for a site under 0.5 ha;
- 5mm retention – onsite retention of 5mm from all surfaces for all storm events, or best efforts for a site under 0.5 ha; and
- Sediment and Erosion Control – contain sediment discharge from site during construction activities.

The City of Brampton Runoff Coefficients (C-values) are listed as:

- Parks = 0.25
- Single and Semi-detached = 0.50
- Multiple, institutional = 0.75
- Commercial/Industrial = 0.90

4 EXISTING CONDITIONS

The existing conditions of the subject site consists of two (2) empty residential lots. However, until recent years, these lots contained dwellings; 47 Mill Street, a single family detached dwelling fronting onto Mill St. N., and 36 Park Street, a 3-unit townhouse style dwelling fronting onto Park Street. Each property included driveways, sidewalks and rear-yard patios and garage/shed units, making up impervious area. The pervious area consisted of grassed, garden and general refuse storage. These structures, including hard surface pavement areas have been recently removed as part of the ongoing 45 Railroad Street development work.

It is a reasonable assumption that the existing City storm infrastructure would have been constructed under the assumption that these lots were developed and will have sufficient flow capacity to account for this. As such, for the sake of this study, the existing site conditions will be considered to be as they have been for the majority of the previous 40+ years, developed with residential dwellings.

The drainage area for the study area is to account for the existing lots and future right-of-way extents of the road extension, which is approximately 80 m long, varies in width between 25 m and 15 m, for a total drainage area of 1860 m^2. Within this area, the existing conditions are single detached and semi-detached homes, which amounts to a C-value of 0.5 at a minimum.

Figure 4-1
Existing Conditions Study Area

For such a small area, the Rational Method for runoff calculation will be used to determine the 5-year peak flow from the existing site. The following formula will be used:

Q = 2.78 CIA
Q = 2.78 (0.5) (104.99) (0.186)
Q = **27.1 L/s**

Where:

- Q = Peak flow rate (L/s)
- C = Runoff Coefficient (C=0.5 for single family home, City of Brampton)
- I = Rainfall intensity (mm/hr), 104.99 mm/hr for 5-year storm, 10 min time of concentration
- A = Runoff Area (ha), 0.186 ha

The existing conditions runoff peak flow rate is **27.1 L/s**, which is what can be expected for such a small area.

5 PROPOSED CONDITIONS

The proposed conditions for this site will include a new asphalt road surface, curb and gutter, sidewalk and grassed boulevards. The new road will be standard 8.5 m wide asphalt surface, two 3.75 m shared vehicle/bicycle (sharrow) - traffic lanes and with a 1.5 m wide sidewalk on the north side only. The basis for the proposed road layout is the City of Brampton's 23 m typical section for a Local Minor Collector roadway; however, due to property constraints the typical section was altered to include a sidewalk on the north side only and the on-road cycle lane was eliminated in lieu of recommending wider (3.75 m) traffic lanes that can accommodate a shared vehicle/cycle facility.

Figure 5-1 shows the figure of the preferred alternative for the roadway connection, where this scenario can be seen.

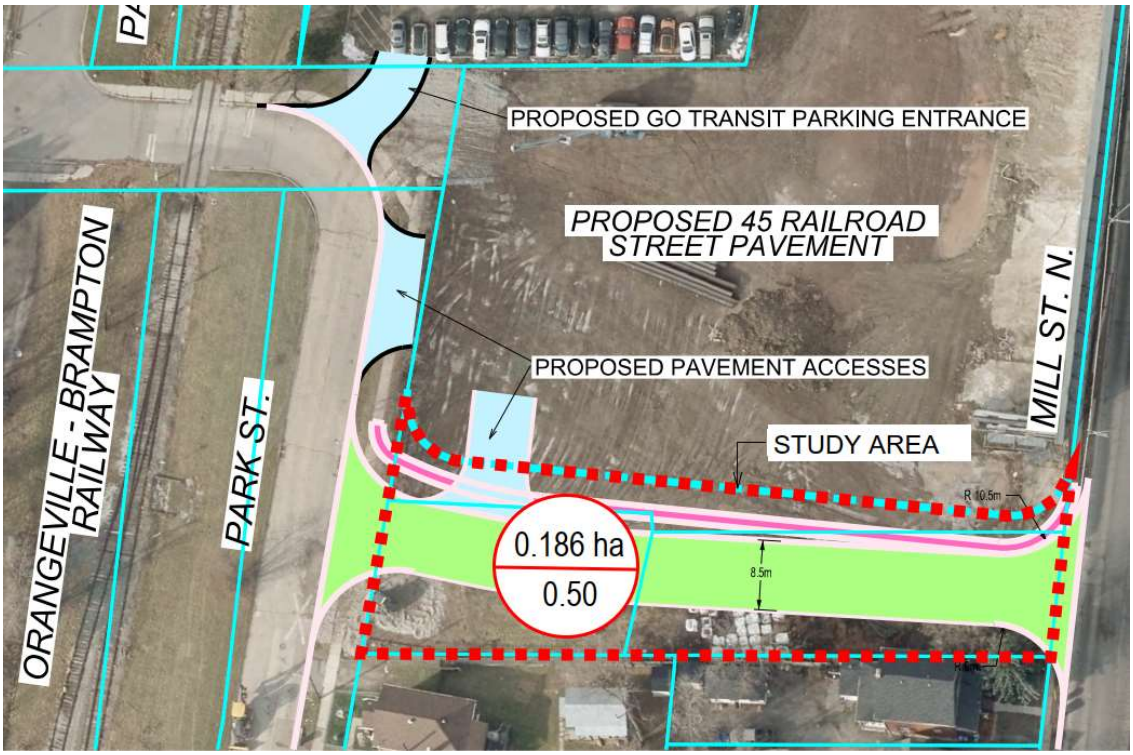

Figure 5-1
Proposed Conditions Study Area

Similarly, with the peak flow calculation from existing conditions, the proposed conditions peak flow rate will be determined using the rational method as well. The parameters of the formula, such as Area, Rainfall Intensity, Duration, will be unchanged from existing conditions, with the only potential difference being the land use and imperviousness, or Runoff Coefficient (C value). In this case, the new road surface, sidewalks, boulevards, etc, equate to a C value of approximately 0.5 as well, therefore the proposed condition peak flow rate will also be approximately **27.1 L/s**.

6 STORMWATER MANAGEMENT

6.1 Quantity Control

Aside from being a new roadway, the subject site is also much less than 0.5 ha, which is the minimum requirement for to achieve full TRCA stormwater management requirements. As a result, the minimum goal for site SWM criteria is to achieve a best efforts approach, attempting to provide quantity/quality control and retention wherever is feasible.

The goal of meeting quantity control is to restrict the post conditions storm runoff peak flow rate to achieve less than or equal to existing conditions peak flow rate. Due to the small size and the nature of this being a short roadway site, no quantity controls or treatment facilities can feasibly be implemented. In this case, the existing and post conditions produce the same peak flow rate, therefore no flow controls will be necessary to achieve this goal.

6.2 Quality Control

Considering the site limitations for the study area, very little can be achieved for stormwater runoff treatment. All proposed runoff will be gathered within the gutters and conveyed directly to adjacent Part Street or Mill Street, contributing to existing storm sewer inlets. To this end, minimal treatment will occur through existing catchbasin sumps, achieving **30% TSS** removal for direct road surface runoff. Grassed Boulevards and sidewalks will be inherently treated through pervious grassed surfaces and being not-directly-connected to the gutter collection.

At this stage of the study (pre-design), it has not been decided if any storm sewers/structures will even be required onsite, as they are not warranted by City design standards based on flow distance to downstream inlets. However, if new structures are installed and inlet controls, Goss Traps, Storm Shields, open bottom structures, or other devices or design features can improve treatment efficiency to as much as 60-80% TSS removal.

6.3 Retention and Erosion Control

The TRCA SWM criteria target 5mm retention of runoff onsite, through storage, infiltration, evapotranspiration or water reuse. Due to the small size and limitations of the subject area, this will be difficult to achieve for runoff from all surfaces, particularly from direct road surface runoff, which is limited to 1-2 mm of retention due to evaporation and minor depression storage. The boulevards will be treated with extra depth topsoil (300mm) to promote increased retention from the typical 5mm, up to 8-10 mm. The boulevards will also be depressed from the top of curb to promote a small amount of surface ponding, which will also capture and retain sidewalk runoff.

7 CONCLUSIONS AND RECOMMENDATIONS

The proposed road connection of Denison Street between Park Street and Mill St. N. is a challenge to meet all targets for stormwater management as result of its small size and existing infrastructure limitations. Proposed stormwater management targets are met through:

- Quantity Control – Proposed conditions match existing conditions peak flow rates, no storage required and best efforts are achieved.
- Quality Treatment – Limited to downstream inlet catchbasin treatment and existing end-of-pipe controls. No onsite treatment methods are feasible.
- Retention – Topsoil depth increased to 300mm to promote increased retention within boulevards for sidewalk runoff. No retention of road surface runoff can occur within the study area.

During the detailed design stage, providing it would be possible to connect to existing adjacent storm sewers, a new set of catchbasins at each end of the propose road would be sufficient to meet quality treatment effectively for such a small, controlled area. The addition of goss traps and/or inlet control devices (CoB standard orifice plates/plugs) would further increase the effectiveness of treatment through separate of oils/grits, restricting flow and promoting sediment settling within the catchbasin sumps. It is also recommended that any proposed storm inlet structures also be outfitted with a Storm Shield or similar device to prevent re-suspension of sediment within storm flow events.

Respectfully submitted,

Prepared by:	Reviewed by:
	
Don McBrayne, P.Eng. Water Resources Engineer	Peter Lejcar , P.Eng. Project Manager