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Functional Servicing & Stormwater Management Report

4375 Millcroft Park Drive

City of Burlington, Ontario

Submitted to:
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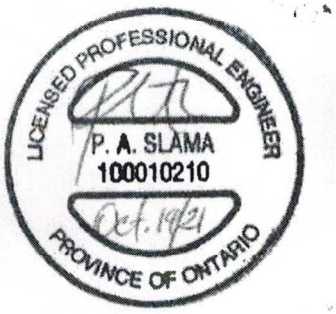
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Record of Revisions

Issues and Revisions Registry

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Refer to Appendix B for proposed engineering plans.

Appendices

A. Background Information
    a. B-8703 – Sanitary Drainage Area Plan
    b. MX-12/87 2E 2A_26, MX-12 87 2E 2A_27 – Storm Drainage Area Plans
    c. MM-19_13A – Millcroft Park Drive Plan and Profile
    d. MC-36 – Clubview Drive Plan and Profile
    e. Topographic Plan of Survey of Block 133, Registered Plan 20M-811
    f. Sanitary Capacity Confirmation E-mail from the Region of Halton
B. Engineering Drawings
    a. 101 – General Plan
    b. 201 – Storm Drainage Area Plan
    c. 301 – Sanitary Drainage Area Plan
    d. 401 – Grading Plan
    e. 501, 502 – Street A Plan and Profile
    f. 503, 504 – Storm Sewer Outfall Plan and Profile
    g. 601 – Erosion & Sediment Control, Construction Management and Mobility Plan
    h. 602 – Erosion & Sediment Control, Construction Management and Mobility Details
C. Stormwater Management Analysis
D. Water Demand Calculations

1. Introduction

1.1 Background

GEI Consultants Inc. (GEI) was retained by Salotto Building Group Inc. (the "Client") to prepare a Functional Servicing & Stormwater Management Report (FSR) in support of a Draft Plan Application (DPA) for a residential development consisting of 30 single family homes located at the former school block (previously owned by the Roman Catholic Episcopal Corporation of the Diocese of Hamilton), located at municipal address 4375 Millcroft Park Drive, opposite Taywood Drive.

The purpose of this report is to provide site-specific information for the City of Burlington and Region of Halton reviews with respect to infrastructure required to support the proposed development regarding stormwater management, water supply, and sanitary discharge. The following documents were reviewed:

- *Preliminary Geotechnical Investigation – 4375 Millcroft Park Drive*, prepared by Toronto Inspection Ltd., dated April 9, 2021;
- *City of Burlington - Geometric Design Guidelines for Roadways*, dated June 1998*;*
- *Stormwater Management Design Guidelines – City of Burlington,* dated May 21, 2020;
- *Halton Region – Water and Wastewater Linear Design Manual, v5*, dated October 2019;
- *Water Supply for Public Fire Protection - A Guide to Recommended Practice in Canada*, prepared by Fire Underwriters Survey, dated 2019;
- Topographic survey prepared by Schaeffer Dzaldov Bennett Ltd.., dated August 11, 2021, and;
- Draft Plan prepared by KLM Planning, dated October 14, 2021.

1.2 Existing Site Conditions

The existing 2.44 ha site is a former school block with the following legal description: Block 133, Registered Plan 20M-811. The site is bound by existing single-family residences to the west and south, existing Taywood Park to the east and Millcroft Park Drive to the north. See **Figure LOC-1** for details.

The site is currently open grassed field and was rough graded and serviced to the property line as part of the development program by Monarch Construction Ltd. (now part of Mattamy Homes). The existing site slopes from the northwest corner with a high point elevation of 153.30m, to the southeast corner of the site with a low point elevation of 149.00m.

Connections for municipal services have been extended into the site, specifically a 150mm diameter watermain connection, a 200mm diameter sanitary connection and a 750mm diameter storm connection. The connections are located approximately 95m west of the intersection of Millcroft Park Drive and Taywood Drive, as per the asbuilt engineering drawing for Millcroft Park Drive-Plan and Profile in **Appendix A**.

Storm drainage from existing external residential lands enters the site from the adjacent rear yards along the west and south property lines, with existing overland flow exiting the site at the southeast corner of the property draining through the adjacent Taywood Park.

1.3 Proposed Development

The proposed development is a 30 lot single-family residential development, which will be accessed by a proposed municipal road loop designated as Street 'A'. Street 'A' is a crescent, with both ends intersecting with Millcroft Park Drive.

1.4 Proposed Grading

The proposed road and lot design grading has been provided in the form of a **Grading Plan** in **Appendix B** of the report. Detailed grading has been provided along the perimeter property lines to demonstrate that the site largely conforms to the existing boundary conditions.

Grading of the proposed municipal roadway is designed in accordance with the following City of Burlington design criteria:

- Minimum longitudinal grade: 0.6%; and,
- Maximum grade: 8.0%.

As all units in the subject site are proposed to be single-family detached units, the units are graded following the front, split, and back split type drainage patterns. The units have been graded in accordance with the following City of Burlington design criteria:

- Lot lines slopes fall between 2.0% - 5.0%, with 3H:1V sloping utilized where slopes exceed 5.0%;
- Lot grading is self-contained on-site and prevents spills onto adjacent properties; and,
- Lot grading blends into existing topography and grades surrounding the site.

The site has been graded to split the drainage towards two different outlets, utilizing high points created approximately 40m south of the Millcroft Park Drive right-of-way (ROW) to divide the site into north and south halves. The existing outlet on Millcroft Park Drive will be designated as Outlet No. 1 and will service the north half of the site. The south half of the site will drain towards the southeast corner, and runoff up to the 100-year storm event will be captured and conveyed to an outlet on Clubview Drive to the southeast through Taywood Park and Charles R. Beaudoin Public School. Limited 3H:1V sloping is proposed into existing Taywood Park to support the proposed boulevard elevation for Street 'A'.



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LEGEND

SUBJECT SITE

LOCATION PLAN

SALOTTO BUILDING CORP.
BLOCK 133, REGISTERED PLAN 20M-811
CITY OF BURLINGTON
REGIONAL MUNICIPALITY OF HALTON

DATE:	OCTOBER 2021	PROJECT No.:	2102761
SCALE:	N.T.S.	FIGURE No.:	LOC-1

B:\WORKING\ARMLAND GROUP\2102761 4375 MILLCROFT PARK DR\00_CAD\FIGURES\2102761 – LOC-1 LOCATION PLAN.DWG

2. Storm Water Management (SWM)

2.1 Background and Design Criteria

This development will be designed to meet the SWM criteria applied, including the City of Burlington Stormwater Management Design Guidelines, Conservation Halton Guidelines for Stormwater Management Engineering Submissions, and the Province of Ontario as set out by the MECP 2003 Stormwater Management Planning and Design (SWMPD) Manual.

Given that the subject site was included in the downstream SWM ponds design as a school block, which has a higher overall impervious level than the current proposed residential block, the downstream SWM ponds were confirmed to have adequate capacity to provide all the required controls outlined below. Hence, the required and achieved SWM quality and quantity control details for the school block will not be repeated in this FSR. Calculations of the site SWM characteristics, such as area, runoff coefficients, flows, using Rational Method, were provided in the following sections to demonstrate that the proposed site is compatible with the previous proposed school block. The detailed calculations and the related portions of the downstream SWM ponds design report was provided in **Appendix C** for reference.

However, constrained by the grading scheme, a portion of the site will have total capture for all runoff up to 100-year storm. As the existing municipal storm sewer was sized based on 5-year storm, on-site peak flow mitigation will be required to ensure the downstream storm sewer will not be surcharged.

Hence, the applied SWM criteria for the SWM servicing design for the site are as outlined below:

Storm Water Quantity Control

- Post-development peak flows from the site for all storm events (up to and including the 100-year storm event) shall be controlled to the 5-year flow rate; and

- Modified Rational Method shall be applied for the SWM storage sizing calculations and City's standard IDF curves will be applied in the Rational Method calculations with a minimum time of concentration of 10 minutes.

Site Water Balance

- The runoff resulting from a 5 mm rainfall event can be retained on-site via infiltration or other rainwater reuse measures, such as infiltration galleries, extra depth of topsoil, rain gardens.

2.2 Site SWM Scheme as per Existing SWM Pond Design

As mentioned previously, the subject site was originally included in the drainage area plan for the Millcroft Phase 2 Plan and was proposed as former School Block 133. Due to the changes to the proposed land use type for the site, the following SWM analysis will conform to the Millcroft Phase 2 Plan to ensure that the SWM design is compatible with the existing SWM servicing scheme downstream.

Based on the downstream SWM Facility designs, the storm sewer connections will convey up to the 5-year storm event from the site to the downstream SWM facility. **Table 2-1** provides a summary of the drainage characteristic anticipated for the site applied for the downstream SWM Facility. The runoff coefficient was sourced from the Millcroft Phase 2 Storm Drainage Area Plan which is enclosed in **Appendix A** for reference.

Table 2-1 Post Development Catchment Parameters

Drainage Area ID	Area (ha)	Runoff Coefficient "C"	Time of Concentration (min.)
A1 Pre	1.80	0.75	10
A2 Pre	0.61	0.75	10

The site release rate for the 5-year storm event was calculated using the Rational Method under the former proposed conditions for the subject site. The IDF design storm parameters, as per City of Burlington standards, were applied to calculate the peak flows as the target release rates. The target release rate as proposed is summarized in **Table 2-2** below. Detailed Rational Method calculations are provided in **Appendix C** and drainage patterns are illustrated on **Figure DAP-1** provided in **Appendix C**.

Table 2-2 Target Peak Flows

Drainage Area ID	Total Site Area (ha)	Storm Event	Target Peak Flows (L/s)
A1 Pre	1.80	5-Year	379

2.3 Current SWM Drainage Characteristics

The proposed development will consist of 30 single-family detached units and a municipal ROW Street 'A'. Based on the latest draft plan and preliminary grading concept, the post-development drainage parameters for the subject site have changed. The updated post-development SWM parameters are summarized in **Table 2-3**.

Table 2-3 Post Development Catchment Parameters

Catchment	Area (ha)	Time of Concentration (min.)	Runoff Coefficient (C)
A1 Post	1.37	10	0.60
A2 Post	0.61	10	0.60

Catchment	Area (ha)	Time of Concentration (min.)	Runoff Coefficient (C)
A3 Post	0.42	10	0.60
Ext1	0.90	10	0.40
Ext2	0.10	10	0.40

The updated site plan will have similar drainage patterns in comparison to the Storm Drainage Plan prepared by Urban Engineering Consultants. In terms of confirming the SWM pond capacity, the product of contributing drainage areas and their runoff coefficient (AC) of the new site plan should be equal or less than the previous ones. Given that the subject site was included in the downstream SWM ponds design as a school block, which has a higher overall impervious level than the current proposed residential block, the overall AC value of the site is less than the previous design, therefore, the downstream SWM facilities will have the adequate capacity to provide the required SWM quality and erosion controls for the site.

2.3.1 Proposed Storm Connections

The proposed development has two outlets available for stormwater management. Drainage areas A2 Post and EXT2 will be serviced by Outlet no. 1, which is an existing 1050mm diameter storm sewer across the frontage of the subject site within the Millcroft Park Drive ROW. As per **Table 2-4**, since the proposed AC is less than 1.04, there are no expected impacts on the downstream SWM facility and no additional quantity controls are required for this drainage area.

Table 2-4 Runoff Comparison to Valley View SWM Facility

Drainage Area	SWM Plan	Area (ha)	Runoff Coefficient	AC
Total area to Valley View SWM Facility	Former School Block 133, 20M-811	1.38	0.75	1.04
	Proposed Development A2 Post	0.61	0.60	0.36

Outlet no. 2 which services the south half of the proposed development, is an existing 750mm diameter storm sewer within the Clubview Drive ROW, located approximately 300m to the southeast. The sewer will be constructed through Taywood Park to the east, aligned 2.5m from the south property line and will continue, centred within an existing 5.0m easement adjacent to the west and southern property limit of Charles R. Beaudoin Public School. The outlet storm sewer will be oversized and orifice controlled to limit the release rate to match the allowed 5-year release rate defined by the as-constructed Millcroft Phase 2 Storm Drainage Area Plan. This outlet will service areas A1 Post, A3 Post and EXT1. Area A1 Post will see storm runoff up to the 100-year storm event captured, and areas A3Post and EXT1 will capture only up to

the 5-year storm event, with an emergency spill point proposed at the southeast corner of the development.

The post-development drainage areas are illustrated on **Figure DAP-2** in **Appendix C**.

2.3.2 Stormwater Total Capture and Quantity Control

As mentioned previously, the post-development peak flow will be controlled to the allowable downstream 5-year release rate. All storm events up to the 100-year storm in Area A1 Post are to be captured, and areas A3 Post and EXT1 will capture only up to the 5-year storm event, with an emergency spill point proposed at the southeast corner of the development. The runoff coefficient used in calculating the post-development peak runoff rate is assigned as per City standards. A time of concentration of 10 minutes was applied as per City standards. Result of the 100-year storm event is summarized in **Table 2-5** below. Detailed post-development quantity control calculations are provided in **Appendix C**.

Table 2-5 Post-Development Quantity Control and Peak Flow Summary

Storm Event	5-Year Target Flow (L/s)	Total (Controlled) Site Release Rate (L/s)	Storage Required (m^3)	Storage Provided (m^3)
100-Year	379	377	160	170

Storage will be provided through a series of 675 and 750mm oversized pipes within the 5.0m easement to Clubview Drive as mentioned in **Section 2.3.1**. To ensure that flows to the storm sewer do not exceed the 5-year target flow of the downstream system, a 300 mm orifice plate is proposed to be installed at the control manhole MH26 at an invert of 144.12m. The maximum flow rate of the orifice structure is 377 L/s with a maximum head of 3.89m up to the lowest MH cover elevation of 147.41 m.

The required quantity control storage to achieve the target flow rate is 160 m^3, which is provided using the oversized the storm sewer pipes downstream of the site. The total provided storage is 170 m^3 using the 675 mm and 750 mm oversized storm pipes.

Detailed storage sizing and orifice control calculations for the site are provided in **Appendix C** following the report.

2.4 Water Balance

As per the City's criteria, the first 5 mm of rainfall on the site is retained and infiltrated on site for water balance. Therefore, the required storage volume is calculated to be 122m^3. To achieve the water balance criteria for the site, a total topsoil depth of 300mm is proposed for the pervious areas in residential lots. The total infiltration volume provided is 154 m^3 and achieves

the required water balance criteria. Detailed water balance calculations are provided in **Appendix C**.

3. Sanitary Drainage System

3.1 Existing Sanitary Drainage System

The subject site is serviced by an existing municipal sanitary sewer system. An existing 200mm dia. sanitary lateral connection has been provided for the subject site with an outlet invert of 149.02m, centrally located at the Millcroft Park Drive property line. The existing municipal sanitary sewer system conveys the flows to the Burlington Skyway Wastewater Treatment Plant. Calculations in **Table 3-1** derived from the existing Sanitary Drainage Area Plan prepared by Urban Engineering Consultants in **Appendix B** demonstrates that the subject site has an allowable release rate of 1.76 L/s.

Table 3-1 Existing Sanitary Allowable Flow

Site Area (ha)	Equivalent Population Density (People / ha)	Total Population	Community Services Unit Sewage Flow (m^3/ha/day)	Peaking Factor (80% For Instituional)	Sewage Flow (L/s)	Infiltration Rate (L/ha/s)	Infiltration Flow (L/s)	Total Flow (L/s)
2.44	40	98	11.0	3.40	1.06	0.286	0.70	1.76

3.2 Proposed Sanitary Flows

The proposed development will consist of 30 single-family residential units. The proposed sanitary flow has been calculated in **Table 3-2** below using the Region of Halton's sanitary design criteria.

Table 3-2 Proposed Sanitary Flow

Site Area (ha)	Equivalent Population Density (People / ha)	Total Population	Domestic Consumption (Lcd)	Peaking Factor	Domestic Flow (L/s)	Infiltration Rate (L/ha/s)	Infiltration Flow (L/s)	Total Flow (L/s)
2.44	55	134	275	4.21	1.79	0.286	0.70	2.49

Therefore, the anticipated sanitary flow from the site is 2.49 L/s, which is a negligible increase of 0.73 L/s compared to the allowable (or 'as-of-right') release rate of 1.76 L/s. The Region of Halton has advised that increased sanitary flow in this range is not expected to negatively impact the downstream sanitary infrastructure, as per the e-mail communication in **Appendix A**.

The proposed residential units are all expected to contain normal depth basements, therefore, the existing 200mm dia. sanitary lateral available to the site is not suitably located in terms of sufficient depth to service the entire property. The existing 200mm dia. sanitary lateral will be grouted and decommissioned and the site will connect to an existing sanitary maintenance hole at the intersection of Millcroft Park Drive and Taywood Drive, at a deeper, more appropriate elevation to service the proposed houses.

Refer to engineering drawings in **Appendix B** for a depiction of the proposed sanitary sewer alignment and depth within the site and proposed connection to existing sanitary sewer.

4. Water Supply System

4.1 Water System Design Guidelines

As per the Region's Water and Wastewater Linear Design Manual (2019) and MECP guidelines, the system design pressure and demand requirements for the residential development are summarized as follows:

- Daily Average Domestic Demand: 275 L/c/d;
- Demand Peaking Factor: Maximum Day = 2.25; Peak Hour = 4.0;
- A minimum hour demand peaking factor of 0.40 was as per the Ministry of the Environment, Conservation and Parks' *Design Guidelines for Drinking Water Systems;*
- Fire Flow: 8000 L/min (133 L/s), as per *Table 7 – Simple Method for One and Two Family Dwellings Up to 450m^2*, *Water Supply for Public Fire Protection,* prepared by the Fire Underwriters Survey (FUS);
- System Pressure:
    - Normal Operating Pressure = 350 kPa to 550 kPa (50 psi to 80 psi), and not less than 275 kPa (40 psi)
    - Minimum Pressure = 140 kPa during maximum Day + fire flow;
    - Maximum Pressure = 700 kPa (100 psi);
- Pipeline Sizing: Minimum size of 150 mm diameter in residential areas; and,
- "C" Factor: C=130 for 100 mm diameter to 400mm diameter watermain.

4.2 Existing System

The subject site is currently serviced by an existing 300mm diameter watermain located along the south boulevard of Millcroft Park Drive. An existing 150mm dia. water connection has been provided to the subject site, approximately 100m west of the Millcroft Park Drive and Taywood Drive intersection.

4.3 Proposed Water Distribution System

The proposed development will include two water connections to the existing Millcroft Park Drive watermain, the first water connection is at the existing Millcroft Park Drive and Taywood Drive intersection, and the second, 100m west of the existing intersection. The first connection will core into the existing valve chamber at the Millcroft/Taywood intersection and connect to the existing 300mm diameter watermain with a new 4-way cross.

The second connection consists of a new valve chamber and proposed 200mm diameter tee connection installed on the existing 300mm dia. watermain. The existing 150mm diameter water lateral connection will be removed entirely.

The site servicing schematic can be seen on the **General Plan** in **Appendix B**.

Based on the Region's design criteria and the *Fire Underwriters' Survey – Water Supply for Public Fire Protection* (2019), the largest maximum day plus fire flow is 134.0 L/s. The calculated water demands for the subject development are summarized below **Table 4-1**. Fire flow and water demand calculations can be found in **Appendix D**.

Table 4-1 Water Demand Calculations

Development	Site Area (ha)	Total Population	Demand (L/s)				
			Average Day	Min Hour	Max Hour	Max Day	Fire Flow
Block 133, Registered Plan 20M-811	2.44	134	0.43	0.17	1.71	0.96	133

A hydrant flow test was conducted on September 27, 2021, from the hydrant immediately fronting the subject site and the results indicate that the static pressure is approximately 480 kPa (70 psi) in the existing 300mm diameter watermain. The hydrant flow test and head loss calculations for the proposed watermain have been included in **Appendix D**.

Calculations for the proposed watermain were completed at the proposed 200mm diameter watermain's midpoint, equidistant from both connections. Under the minimum hour demand, the proposed watermain is calculated to have a residual pressure of 505 kPa (73.3 psi), and under the maximum day plus fire flow demand, the proposed watermain is calculated to have a residual pressure of 370 kPa (53.5 psi). As this range of operating pressures falls within the City's normal operating pressure range of 350 kPa to 550 kPa (50 psi to 80 psi), the proposed 200mm diameter watermain will operate within the City's normal operations guidelines under all analyzed conditions. The residual pressure of 370 kPa (53.5 psi) during the maximum day plus fire flow demand scenario also satisfies the Region's minimum operating pressure requirement during firefighting events of 140 kPa (20 psi).

5. Conclusions and Recommendations

Based on our investigations, we conclude that the site is serviceable, and our recommendations are summarized below:

5.1 Site Grading

The proposed road grading scheme follows the City of Burlington's *Geometric Design Guidelines for Roadways* and respects the perimeter grading of the surrounding residential properties. Limited sloping at three parts horizontal to one part vertical has been proposed into the existing park to the east to support the proposed roadway. The proposed sloping will not negatively impact the existing drainage pattern of the park.

5.2 Stormwater Management

The proposed development has two outlets available for stormwater management. Outlet no. 1 which services the northern half of the former school block, is an existing 1050mm diameter storm sewer across the frontage of the subject site within the Millcroft Park Drive ROW. This outlet has an existing AC allowance of 1.04. The proposed development will contribute an AC of 0.36. Therefore, there will not be any negative impacts to the downstream storm sewers due to the proposed development.

Outlet no. 2 which services the southern half of the former school block, is an existing 750mm diameter storm sewer within the Clubview Drive ROW, located approximately 300m to the southeast. The outlet is accessed via Taywood Park to the east and an existing 5.0m easement adjacent to the west and southern property limit of Charles R. Beaudoin Public School. An AC allowance of 0.82 was provided for the former school block. The proposed development will increase the AC value to Outlet no. 2 to 1.18. This tributary area to Outlet no. 2 will also capture the 100-year flow for conveyance to Clubview Drive. Therefore, an oversized storm sewer is proposed within the 5.0m easement to Clubview Drive for volume control, and the release rate to the existing storm sewer will be orifice controlled to match the 5-year allowance provided for in the existing Monarch / Mattamy subdivision.

5.2.1 Water Balance

Water balance for the proposed development will be achieved with 300mm topsoil depth which will provide the required 5mm depth of infiltration.

5.3 Sanitary Sewers

The proposed sanitary sewers will drain via gravity to the existing municipal sanitary sewer on Millcroft Park Drive. The total proposed sanitary sewage flow from the subject site is 2.5 L/s, marginally over the assigned capacity of 1.8 L/s, representing an increase in flow of 0.7 L/s.

The Region of Halton has verified that the additional flow will have a negligible impact to the downstream wastewater system and is therefore not expected to negatively impact the downstream sewers.

5.4 Water Supply

The subject site will require a combined fire flow and maximum day demand of 134.7 L/s. The existing 150mm diameter stub and tee located on the west branch of Street 'A' will be removed up to the existing watermain and replaced with a 200mm diameter tee and valve chamber to provide an adequately sized connection to the site.

A second connection to the existing 300mm diameter watermain on Millcroft Park Drive is proposed to create a watermain loop. The connection is proposed to connect at an existing valve chamber at the intersection of Millcroft Park Drive and Taywood Drive, by coring into the chamber and replacing the existing tee with a cross. Calculations based on hydrant flow testing indicate that there is sufficient pressure to satisfy the Region of Halton's water demand criteria for the proposed development.