URBANTECH®

FUNCTIONAL SERVICING &
STORMWATER MANAGEMENT REPORT

Derry-Britannia Developments Limited
(North and South Draft Plans)

CITY OF MISSISSAUGA
REGIONAL MUNICIPALITY OF PEEL

PREPARED FOR

DERRY-BRITANNIA DEVELOPMENTS LIMITED

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1 INTRODUCTION

Urbantech Consulting has been retained by Derry-Britannia Developments Limited to prepare a functional servicing and stormwater report (FSR / SWM) for the proposed mixed-use subdivision, located within the Ninth Line Lands, City of Mississauga, Region of Peel, hereafter referred to as the subject lands.

The information in this report applies to the North and South parcels of the proposed draft plan. As shown on the proposed *Location Plan*, the subject lands are bounded by Ninth Line to the east, an Enbridge Gas facility to the north, Sixteen Mile Creek and Highway 407 ETR to the west, and the existing Lisgar stormwater pond outlet channel (NLT-1) to the south. The subject lands are considered part of Block 2 within the overall Ninth Line Secondary Plan Area.

This study presents the recommended stormwater management and municipal servicing scheme for the development of the subject lands. This report is also applicable for any future revisions to the site plan, assuming the revisions are minor and in general conformance with the concepts outlined herein. The proposed Draft Plan and the design concepts in this report have also considered development of adjacent lands not currently owned by the applicant and these recommendations may be followed should those lands ever be incorporated into the Draft Plan in the future.

The design information presented in this report considers the following guidelines:

- City of Mississauga T&W Development Requirements
- Region of Peel Public Works Design, Specifications & Procedures Manual
- Credit Valley Conservation Authority Stormwater Management Criteria Document
- Draft Ministry of the Environment and Climate Change LID SWM Guidance Manual
- Stormwater Management Planning and Design Manual by the Ministry of Environment and Climate Change

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2 BACKGROUND INFORMATION

The development concepts contained in this report are an extension of the information contained within the following reports:

- **High Level Concept Plan (HLCP) for the Ninth Line Heritage System Corridor (2023)**

  This study should be referenced for high-level information regarding development of the Block 2 Natural Heritage System with respect to the entire Ninth Line Secondary Plan Area. This study also includes detailed analysis of riparian storage and the Regional Floodplain for the Ninth Line Lands.

- **Comprehensive Environmental Impact & Integration Study (CEIIS) (2023)**

  This study should be referenced for detailed information regarding implementation of the proposed Block 2 Natural Heritage System.

- **Ninth Line Lands Scoped Subwatershed Study by Wood (2018)**

  This study should be referenced for background stormwater management information which has been further evaluated and expanded in the HLCP and CEIIS.

- **Ninth Line Lands: Servicing Strategy Report by Region of Peel (2016)**

  This study should be referenced for high-level water and wastewater servicing information for the Ninth Line Lands including the preferred overall servicing strategies by the Region based on current and planned infrastructure.

- **Preliminary Geotechnical Investigation by DS Consultants (2019)**

- **Hydrogeological Analysis by DS Consultants (2021)**

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3 PROPOSED DEVELOPMENT

The proposed Draft Plan of subdivision (refer to **Appendix D**) features a mixture of townhouses and midrise blocks in both freehold and condominium tenures. Overall, there are between 1,262 and 1,362 units proposed on 115.4 acres including lands designated for City parks, an elementary school, stormwater management facility, 407 Transitway and an integrated Natural Heritage System (NHS). The draft plan reflects the approved Secondary Plan in terms of proposed population and density.

Further the proposed NHS Corridor also reflects the Secondary Plan and Subwatershed Study vision to contain the Regional Floodplain and create enhancements to the natural heritage features and functions within the Ninth Line Corridor, as compared to existing conditions, and includes:

- the creation of a contiguous and connected NHS corridor west of the 407 transitway consisting of wetlands, woodlands and meadow habitat in place of the existing, isolated natural heritage features

- grading to contain the Regional Storm flood plain such that the proposed development does not result in increases to floodplain elevations east of Ninth Line

In addition to the improvements as proposed by the Subwatershed Study, the development proposal also provides for the following benefits, not anticipated as part of the Subwatershed Study:

- enhancements to the NLT-1 watercourse corridor (i.e., the watercourse that receives outflows from the Lisgar stormwater management pond) through the removal of the existing concrete lined channel and creation of a low-flow channel with natural channel design within a widened corridor

- improvements to the NLT-1 channel to minimize increases in flood plain elevation along Ninth Line that is anticipated as a result of the City's Ninth Line road widening and the 407 transitway crossing of NLT-1

- increase in the overall channel length of NLT-1 from 265 m to over 400 m to provide an overall net increase in habitat area and provide additional provisions for flood control

3.1. *DEVELOPMENT PHASING*

Due to the scale of this development and the adjacent public infrastructure projects, it is anticipated that the development will be built out over several years and that various interim conditions will be encountered. While it is impossible to predict every potential interim condition, there are several important phasing principles to consider:

NHS Construction and Site Earthworks

As established through the HLCP and CEIIS, the construction of the new NHS corridor and improvements to the NLT-1 channel should generally precede or be completed simultaneously

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with removal of the existing features on site. Since the excess material generated from the NHS excavation will be needed to fill the development lands, an efficiently staged earthworks program will be critical to avoid unnecessary import/export, stockpiling and double handling of material, while also managing the existing features prior to their decommissioning. Refer to **CEIIS Drawings 12.1A**, "*Stage 1 – NHS*", and **12.1B**, "*Stage 2 – Subdivision*" for further information on the proposed construction sequence. Additional details will be provided through the future detailed design and permitting process and consultation with the City and Conservation Halton. To optimize the construction schedule and meet the timing window requirements, it is anticipated that the earthworks program will be separated into several permits.

North and South Draft Plan Parcels

While the proposed Draft Plan of Subdivision is separated into two parcels, it is generally required that the public elements of the South Plan proceed first (or simultaneously) since the South Plan contains critical infrastructure to service the overall development, including the proposed stormwater management pond and Street 'A,' which provides servicing outlets and overland flow conveyance. The exact limits of the first phase of development may be subject to change through detailed design, however, a preliminary phasing concept for the two separate Draft Plans has been provided on **Drawing 3.1**, "*Development Phasing Plan*," in **Appendix D**.

Condominium Blocks

It is anticipated that the condominium blocks will generally proceed with similar timing to the adjacent municipal roads which will provide the necessary municipal accesses and servicing outlets. Condominium Block 5 would likely be the first block to develop since it will be the first to have available access and outlets from Street 'A.' Given the nature of this development, where the majority of the proposed roads and services are private, special consideration from the City may be warranted to facilitate an efficient construction program and allow the condo blocks to be serviced in tandem with the adjacent roads.

Ninth Line Urbanization

The City of Mississauga is currently completing an Environmental Assessment for the urbanization and widening of Ninth Line. Preliminary design information (horizontal and vertical design) has been referenced in the preparation of this report to ensure that the development concepts are compatible with the Ninth Line urbanization works. It is possible for either project to proceed first; however, phasing and staging details regarding the road connections and intersection design shall be further evaluated as the detailed design of these projects progresses to ensure satisfactory interim conditions.

Future MTO Transitway

The Environmental Assessment for the future MTO Transitway bisecting the subject lands is approved. The EA design has been incorporated into the design of the subject lands to ensure compatibility; however, it is generally assumed and acknowledged that the proposed development will proceed in advance of the transitway construction. Accordingly, suitable access from the development side will be provided to facilitate future transitway construction and maintenance. The proposed development will not hinder the transitway in any way.

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4 EXISTING CONDITIONS

4.1. *TOPOGRAPHY AND DRAINAGE*

The subject lands have been predominantly cleared for past agricultural use; however, the site also contains several existing environmental features including wetlands and wooded areas (refer to CEIIS for detailed information). Several of the smaller properties along Ninth Line which comprise the larger study area are existing rural residences.

The subject lands are relatively flat and gently sloped from north to south. All overland drainage is ultimately directed to Sixteen Mile Creek and the confluence of the main branch and the east branch, NLT-1 (Lisgar stormwater outlet channel).

Lands to the east of Ninth Line are predominantly residential. Stormwater management for the lands to the east is primarily provided by the Lisgar SWM facility which is an online pond along the watercourse east of Ninth Line; in addition, two SWM facilities, located within the Ninth Line Lands near Thomas Street, provide the requisite stormwater quantity control for the Churchill Meadows Subdivision east of Ninth Line.

Refer to **Drawing 5.2A**, "*Existing Storm Drainage Plan,"* in **Appendix D**.

For detailed information regarding the existing natural features, please refer to the Block 2 Comprehensive Environmental Impact & Integration Study (CEIIS).

4.2. *SOILS*

For detailed geotechnical and hydrogeological information, please refer to the following reports:

- Preliminary Geotechnical Investigation, DS Consultants (2019)
- Hydrogeological Investigation, DS Consultants (2021)

The soils within the Study Area consist of Chinguacousy clay loam and Jeddo clay loam, which are classified as SCS Type 'C' soils, exhibiting relatively low rates of infiltration and comparatively high rates of runoff. Based on the subsurface drilling investigation, the Subject Lands are underlain by surficial / fill material, which in turn is underlain by native soil deposits consisting of clayey silt to silty clay till and sandy silt to silty sand till. Shale bedrock was encountered at the Site underlying the overburden till and was generally found at shallower depths in the northern portion of the Site and declined in elevation towards the south.

A total of seven in-situ infiltration tests (TP1, TP2, TP3, TP4, TP5, TP6 and TP7) were completed in the northern portion of the Subject Lands on April 3, 2020 and a total of six (6) in-situ infiltration tests (TP1, TP2, TP3, TP4, TP5 and TP6) were completed in the southern portion of the Subject Lands and April 6, 2020. The purpose of the in-situ infiltration testing was to estimate the soil percolation rates in the surficial soils within the Subject Lands. The in-situ

infiltration tests were conducted using the double ring infiltrometer method in general accordance with guidelines outlined in the *Low Impact Development (LID) Stormwater Management Planning and Design Guide for Stormwater Infiltration"* by the Toronto and Region Conservation Authority (TRCA), dated 2010. The double ring infiltrometer testing was conducted within the upper 0.3 m to 0.45 m of surficial soil consisting of earth fill (disturbed sandy silt to silty clay with trace amounts of gravel). Based on the results of the testing, the soil percolation rates within the surficial soils at the subject lands generally ranged from 10.8 mm/hour to 43.2 mm/hour, with an average rate of 26.5 mm/hour. The result of an infiltration test at the location of TP5 in the northern portion was estimated to be 158.4 mm/hour, which is considered to be an outlier and not representative of the infiltration rates of the surficial soils across the Subject Lands. During the infiltration testing in the southern portion, infiltration rates in four (4) testing locations (TP3, TP4, TP5 and TP6) were estimated to be approximately zero due to wet ground conditions, likely as a result of the spring snow melt.

4.3. *EXISTING FLOODPLAIN*

A significant portion of the subject lands are occupied by the existing Regional floodplain. A detailed analysis of the existing floodplain has been undertaken as part of the High Level Concept Plan (HLCP) study; please refer to that document for detailed information regarding the existing floodplain conditions within the Ninth Line Lands.

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5 STORMWATER MANAGEMENT PLAN

5.1. *STORM DRAINAGE DESIGN CRITERIA AND REQUIREMENTS*

The following storm drainage criteria have been adopted for the stormwater conveyance system within the proposed development:

- The minor drainage system shall be designed for the 10-year storm event using the Rational Method and City of Mississauga IDF curves;

- The major system shall be designed to accommodate runoff exceeding the capacity of the minor system for flows up to and including the 100-year storm event. The major system should be contained within road allowances and designated easements without over-flowing onto the arterial roads. Where required, 100-year capture into the minor system will be accommodated in the minor system sizing / grate sizing;

- For residential lots, runoff from roof leaders should be directed towards pervious areas where possible;

- Storm sewers should be installed at adequate depth to enable connection of all basement foundation drains where possible, otherwise it is assumed that sump pumps will be required;

- On-site retention of the first 5 mm of runoff from the entire impervious surface area by way of infiltration, evapotranspiration or re-use is required. Where soil conditions do not permit infiltration, the first 5 mm of runoff should be filtered instead. Various Low Impact Development (LID) practices will be considered to provide the on-site runoff retention. This may include, but is not limited to:

    - Additional topsoil depth
    - cisterns for water re-use
    - infiltration trenches in rear yards
    - enhanced grass swales and bioretention areas within park blocks and buffers

In accordance with the recommended stormwater management plan presented in the Scoped SWS (Wood, 2022), stormwater quality, erosion and quantity control for the subject lands will be provided by an end-of-pipe SWM facility (Pond 294 in the SWS), as follows:

- The SWM facility shall be designed as an off-line wet pond with permanent storage for water quality control in accordance with the “enhanced” protection level for the receiving watercourse as defined in the March 2003 Ministry of Environment guidelines;

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- The SWM facility shall incorporate extended detention storage for erosion control to maintain the volume of runoff above the critical flow rate at existing levels, for the 4-hour 25mm storm event and calculated based on 275 m^3 per hectare of contributing impervious area. The extended detention release rate for the ponds should be designed based on 0.002 m^3/s per hectare of contributing area;

- The SWM facility should provide water quantity control for all storm events up to and including the Regional Storm (Hurricane Hazel) event. The storage and discharge requirements are summarized in **Table 5-1.**

Table 5-1: SWM Pond Storage and Discharge Requirements

Return Period	Unit storage volume (m^3/imp ha)	SWS Unit flow rate* (m^3/s/ha)	Corrected unit flow rate* (m^3/s/ha)
2	450	0.09	0.002
5	600	0.38	0.010
100-year	875	1.02	0.027
Regional	1,775	1.53	0.041

Note: Storage volumes are measured from permanent pool and include extended detention volume of 275m^3/imp ha.

*Note that Wood staff has indicated that the unit flow rates reported in Table 2.2.2 of the SWS were incorrectly labelled as “unit flow rates”; these were in fact “total flow rates for the modelled area to SWS Pond 294 (37.10 ha). Therefore, the actual / “corrected” unit flow rates are the Table 2.2.2 rates divided by 37.10.

- The SWM facility design shall include a bottom draw outlet structure, sediment forebay, outlet plunge pool, emergency overflow spillway and a maintenance access route from a municipal road; and,

- The SWM facility shall be graded with side slopes 5:1 for 3 m horizontally above and below the permanent water level and side slopes of 3:1 to 4:1 elsewhere.

5.2. *PROPOSED STORM DRAINAGE PLAN*

The storm drainage concept for the site has been designed to maintain flows and contributing drainage areas to the existing outlets on the site where possible and meet the existing targets established in the preceding section. Storm sewers for the subject lands have been sized according to the City of Mississauga sewer design criteria (10-year storm).

Flows exceeding the minor system even will generally be conveyed to the SWM pond via the proposed roadways and overland flow routes. Due to grading constraints, several major system capture points are required throughout the development where overland flow cannot be maintained to the downstream pond.

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Refer to the Storm Sewer Design Sheets in **Appendix A.**

Refer to **Drawing 5.2B**, "*Storm Servicing Plan*," in **Appendix D.**

5.3. *LOW IMPACT DEVELOPMENT PRACTICES*

As per the City of Mississauga requirements, the first 5mm of runoff from the entire impervious area of the proposed development will be retained on site. On-site runoff retention will be achieved using the following measures.

- The topsoil depth on the lots will be increased from 150 mm to 300 mm
- Roof leaders will be discharged to pervious areas wherever possible

The site imperviousness is roughly 73%; total impervious area is 22.83 ha. The 5 mm volume over this area is 1,142m3. Conversely, the total pervious area of the proposed lots is 29,222m2. In order to store the total 1,142 m3 runoff volume, the required storage depth is approximately 39 mm. At an assumed porosity of 0.4, 300 mm depth of topsoil within the pervious areas will exceed this requirement.

It is typical to assume that topsoil has a porosity of 0.4, which in this case provides a 7.7 mm total retention depth for the subject site. To conservatively assume the soil is more compact, a porosity of 0.261 can still achieve the 5mm total retention requirement. Furthermore, precautions during construction to avoid compaction can be taken (similar to LID installation) in which compaction is avoided or the effects of compaction can be mitigated. Refer to LID calculations for increased topsoil in **Appendix C**.

Although the LID approach of increased topsoil is currently proposed for on-site retention mitigation, it is potentially subject to change based on resolution between the Province and the City regarding the CLI-ECA program, where other possible hierarchical approaches will be proposed, where applicable, for retaining the 27 mm runoff event. As per the new MECP criteria, increased topsoil approach cannot be considered for on-site retention. Therefore, if the 27 mm retention criteria are initiated, potential additional LID measures will be required:

Rear Yard Infiltration Trenches

Using resources from the City of Toronto *Wet Weather Flow Management Guidelines (WWFMG, 2006),* rainfall depth infiltrated for each trench can manage up to 96% of the total average annual rainfall (refer to **Appendix C** for details), depending on the associated drainage catchment. A soil percolation rate of 25 mm/hour was also assumed based on minimum soil percolation rate for sandy loam in order to confirm the infiltration trench sizing requirements, as per Section 5.2.3.3 in the *MESP*. Refer to Table 4.4 from the *MOE SWMP Manual (2003)* for soil percolation rate and refer to the Preliminary Geotechnical Investigation by DS Consultants for site soil type. The maximum LID depth is also constrained by high groundwater level which requires further confirmation by geotechnical consultant, although considering that the site will be filled several meters above the existing ground elevation, groundwater is not anticipated to be a constraint for infiltration depth. The maximum trench width of 1.55m was applied based on spacing constraints in the proposed rear-yards. The potential preliminary infiltration trench

locations are shown on **Drawing 5.3** provided in **Appendix D**. Infiltration trench sizing calculations are also provided in **Appendix C** for reference.

Front Yard Soakaway Pits (along Ninth Line)

Due to standard construction and lot grading principles, overland drainage from the front yards of units along Ninth Line will be directed towards the Ninth Line right-of-way. To mitigate impact to the right-of-way, drainage from this catchment should be controlled within the lots by a private LID such as a soakaway pit. The proposed soakaway pits as detailed on **Drawing 5.3** in **Appendix D** can manage up to 95% of the total average annual rainfall and capture the equivalent of 27mm runoff from their respective catchment (refer to **Appendix C**).

Underground Infiltration Systems within Blocks (School and Parks)

Strong consideration should be given to permitting the use of underground infiltration facilities within the school and public park blocks to retain at least 27mm of runoff from their respective catchments (or more if sufficient space is available). Systems such as the Greenstorm Geocellular Module have been approved and implemented on other similar projects in the GTA; this or an equivalent system would be a suitable candidate for this site. For the school and public parks combined, a total storage volume of 2,100 m^3 would be required to control up to 100% of the total average annual rainfall which would exceed the 27mm requirement. These systems typically provide highly efficient storage volumes, up to 96% of the LID volume depending on the configuration. Please refer to **Drawing 5.3** for preliminary details or refer to Stormcon.ca for additional product information.

Re-Use (High-Density Blocks)

It is anticipated that the high-density blocks will require underground parking structures to meet the population density requirements for those areas, thus prohibiting many conventional infiltration-based LIDs. Opportunities for on-site re-use such as mechanical or irrigation, should be explored at the future site plan design; however, it would not be practical to retain 27mm of runoff on these blocks.

In the event that the CLI-ECA 27 mm retention requirement is initiated by the City, the total maximum retention volume provided by the above additional LIDs would be approximately 19.3mm (totaling to 27mm when fairly accounting for the additional 7.7mm of retention provided from the increased topsoil depth). Refer to **Appendix C** for details.

5.4. *STORMWATER MANAGEMENT POND*

The minor and major system flows from the subject lands will be conveyed to the proposed SWM Pond located at the southern limit of the development. The design of the facility will be conducted in conjunction with the proposed grading and servicing design for the proposed development, interim transitway berm design and NHS channel reconfiguration works along NLT-1.

The proposed SWM facility will consist of the following components:

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- **Quality and Erosion Control** - The water quality control outlet will be a bottom draw consisting of a reverse-slope outlet pipe with vertical bends connected to a control manhole. An orifice will be installed vertically within the manhole at the permanent water elevation, allowing the extended detention volume to drain over a minimum period of 48 hours. Treated flows will be conveyed from the common manhole to a headwall at NLT-1.

- **Quantity Control -** The controlled flows will be conveyed via an orifice / weir control structure within a concrete chamber. Controlled flows will be conveyed to the headwall at NLT-1. It should be noted that the storage stacking of the quantity control volume over the extended detention volume in the proposed SWM pond facility is to be provided, as per CVC guidelines.

- **Emergency Spillway** - In the event of temporary blockage of the quantity control outlet structure, all flow will be conveyed by an emergency spillway located on the south side of the facility.

- The pond will be designed with a sediment forebay sized according to the MOE SWM Planning and Design Guidelines. Pond liner requirements and berm stability will be established at the detailed design stage through geotechnical investigations.

- A maintenance access road (5 m wide) is proposed around the facility within the 15m wide buffer area.

The SWM Pond will provide drainage control for the lands shown on **Drawing 5.2B, "***Storm Servicing Plan*." The facility will be constructed as an off-line wet pond and will provide water quality, erosion and quantity control for the contributing 31.28 ha drainage area with an average impervious level of 73%. The pond will be located within the approximately 2.81 ha block located at the southern part of the development.

The permanent pool storage for water quality control in the pond has been sized to achieve an "enhanced" protection level for the receiving watercourse as defined in the 2003 MOE "*Stormwater Management Practices Planning and Design Manual*". The target volume is approximately 5,882 m^3. The permanent pool level has been established at 187.75 m to facilitate gravity drainage to the lowered NLT-1 watercourse.

Based on the proposed drainage area and imperviousness, **Table 5-2** summarizes the required and provided storage volumes:

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Table 5-2: Required and Provided Storage Volumes

Return Period	Unit storage volume (m^3/imp ha)	Target Storage based on 31.28 ha @ 75 % IMP (m^3)	Provided Storage (Active Storage) (m^3)	Provided Storage (Active Storage+ED) (m^3)	Designed Pond Water Level (m)	Unit flow rate (m^3/s/ha)	Target flow (m^3/s) based on 31.28 ha
Permanent Pool	188 m^3/ha	5,882	18,360	-	187.75	-	-
Extended Detention	275	6,313	6,540	6,540	188.25	0.0020	0.063
2-year	450	10,330	4,169	10,708	188.55	0.0024	0.075
5-year	600	13,774	7,765	14,305	188.80	0.0102	0.319
100-year	875	20,087	13,751	20,291	189.20	0.0275	0.860
Regional	1,775	40,748	36,059	42,599	190.55	0.0412	1.289

The regional storm volume was calculated assuming that the extended detention volume was completely full, in accordance with the "storm stacking" approach as requested by Conservation Halton. Note that due to the use of volumetric unit rates, the calculation of stacking is "static" in that it does not consider the dynamic drawdown of the pond similar to a hydrological model would consider. Therefore, the stacking volume calculated for this FSR is conservative and will be refined during detailed design using a hydrological model and the detailed outlet structure rating curve. In practice/ through experience on other projects, the stacking volumes are typically not considerably higher than the non-stacking regional volume. This is due to the fact that although the extended attention volume is not available, the regional storm begins to discharge at a higher rate via the two-year and greater outlet structure, instead of the slow release and accumulation of storage in the extended detention volume. At this time, the conservative approach to adding the regional storage requirement above the extended detention requirement is sufficient to demonstrate that the pond block can accommodate the range of storms including stacking conditions.

The required sediment forebay length for settling is 20 m and for dispersion is 41 m. The forebay has been designed with 70 m forebay length with a minimum length-to-width ratio of 2:1 as per the municipal standards. The extended detention target discharge rate will be maintained with a 205 mm ø orifice. The designed extended detention discharge rate is 55 L/s, which is lower than the target 63 L/s discharge rate. The drawdown time will be 48.6 hours greater than 48 hours as per municipal standards.

Refer to SWM calculations in **Appendix B** and **Drawing 5.5**, "*SWM Pond*," in **Appendix D** for further details.

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5.5. *NHS CHANNELIZATION WORKS*

Refer to the HLCP and CEIIS for details of the proposed NHS. As part of HLCP study, Reach NLT-1, which serves as the outlet for the proposed SWM pond, is proposed to be realigned downstream of Ninth Line to its confluence with the Lisgar Creek tributary. The channel was designed with bankfull discharge of 2.27 m^3/s, the overall channel gradient is 0.06%, the width and depth of the bankfull channel for the NLT-1 reach in from 5.3 m - 6.90 m and 0.95 m - 1.3 m. the width and depth of the low flow channel ranges from 3.8 m - 4.5 m and 0.7 m - 1.05 m. Average riffle gradient is 0.30%. However, the design concept is preliminary in nature and will be further refined through detailed design.

5.6. *GEOMORPHIC ANALYSIS AND NATURAL CHANNEL DESIGN*

Refer to the HLCP for all details by GEO Morphix regarding the proposed natural channel design.

5.7. *EROSION AND SEDIMENT CONTROL*

Rigorous erosion and sediment control measures will be designed, implemented and maintained throughout the construction period. At detailed design, an Erosion and Sediment Control Plan will be prepared in conformance with the City and Conservation Authority guidelines. Erosion and sediment control will be implemented for all construction activities including topsoil stripping, earthworks, foundation excavation and stockpiling of materials and will remain in place and functional until bare surfaces are stabilized.

The following erosion and sediment control measures should be considered for use during construction:

- Natural features will be staked and temporary fencing provided to keep machinery out of sensitive areas;
- Sediment control fence and snow fence will be placed prior to earthworks;
- Logistics/construction plan will be implemented to limit the size of disturbed areas, minimizing the non-essential clearing and grading areas;
- Temporary sediment ponds fitted with one or more turbidity curtains to increase sediment removal efficiency;
- Rock check-dams and cut-off swales will be provided, where required, in order to control, slow down and direct runoff to sediment basins;
- Sediment traps will be provided;
- Gravel mud mats will be installed at construction vehicle access points to minimize off-site tracking of sediments;

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- All temporary erosion and sediment control measures will be routinely inspected monitored and repaired during construction. Temporary controls will not be removed until the areas they serve are restored and stable;

- Where underground services are located below the water table, the use of trench collars are recommended to provide barriers to flow to prevent groundwater flow along granular bedding material.

General mitigative measures that will be considered are:

- Erosion and sediment control measures will be identified, implemented monitored maintained throughout the construction period;

- Construction timing windows for works in streams and for clearing of vegetation will be implemented;

- Fish and wildlife rescues will be carried out if necessary; and,

- Tree protection measures to be installed where required

Reference will be made to the *Guidelines for Erosion and Sediment Control for Urban Construction Sites* prepared by the Greater Golden Horseshoe Area Conservation Authorities (2006) when preparing Erosion and Sediment Control Plans.

Practical measures for the maintenance of water levels in wetlands and watercourses during construction, as well as monitoring requirements, will be identified and implemented, where feasible. Conceptual staging plans for the NHS construction, demonstrating the extent to which the existing natural features may be retained during construction, are presented in the CEIIS. Refer to **CEIIS Drawings 12.1A**, "*Stage 1 – NHS*", and **12.1B**, "*Stage 2 – Subdivision*" for further information on the proposed construction sequence. Additional details will be provided through the future detailed design and permitting process. To optimize the construction schedule and meet the timing window requirements, it is anticipated that the earthworks program will be separated into several permits.

5.8. *RIPARIAN STORAGE REQUIREMENT*

The HLCP has demonstrated that riparian storage is matched under post-development conditions and there are no negative flooding impacts upstream or downstream. Conceptual grading plans have demonstrated that sufficient area exists within the NHS Corridor to accommodate all the required vegetation communities within the appropriate topography (i.e., wetlands are not proposed on slopes, woodlands are not proposed in areas that will be flooded regularly). Recommended planting schematics and natural habitat elements have been identified for all habitat types throughout the corridor.

As the grading of the FSR is consistent with the HLCP corridor design, the results and conclusion of the HLCP analysis are valid for the FSR. Note that analysis of riparian storage is not included in the HLCP study, but the total flood storage with culverts in place is assessed as advised by CH. Refer to the HLCP study for the details regarding riparian storage.

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5.9. *HYDROLOGICAL MODEL VALIDATION*

As per the City's request, a hydrological model validation is provided to document conformity to the Scoped SWS. The original model from the Ninth Line SWS by Wood (2022) and the Future scenarios updated by Urbantech are listed below:

- 5-B_SWS-Future-NoSWM_Ex Reg Control-AMC III
- 5-C_SWS-Future-NoSWM_All Ex. SWM-AMC II
- 6-A_SWS-Future-SWM_Reg Control-AMC II
- 6-B_SWS-Future-SWM_Reg Control-AMC III
- 6-C_SWS-Future-SWM_All SWM-AMC II
- 6-D_SWS-Future-SWM_All SWM-AMC III

Table 5-3: Updated Information for VO Model Validation

Original Scenario from Ninth Line SWS (Wood, 2022)	Updated Scenario for updated area and imperviousness (Urbantech, 2023)
• VO ID 211, Catchment area is 37.1 ha with 75% TIMP and 60% XIMP	• VO ID 211, Catchment area is 5.82 ha with 75% TIMP and 60% XIMP; • VO ID 600, Catchment area is 31.28 ha with 73% TIMP and 73% XIMP; • SWM pond 294 with rating curve of target discharge and target volume based on drainage area of 31.28 ha

The provided pond volume for the Regional storm event is 42,599 m^3, which meets the required Regional pond volume of 39,897 m^3. Refer to Scenario 6-B of the VO6 model provided in **Appendix E**.

As a confirmation, the total flows at Britannia Road West (VO ID 237), Sixteen Mille Creek East (VO ID 74) and Sixteen Mille Creek East and West (VO ID 104) were evaluated for the Regional and 2 to 100-year storm events to ensure targets are not exceeding the original peak flows for the entire study area. The peak flow at the three specified locations are compared between original and updated model. Refer to the flow comparison tables and VO6 Model Schematic for flow locations in **Appendix E**.

The proposed values are at most 1.45 m^3/s higher than the original Future VO model by Wood at Britannia Road West (VO ID 237). The peak flows at Britannia Road West are higher at this location as the time to peak is shorter than the original SWS model scenarios. The proposed values are at most 0.547 m^3/s lower than the original Future VO model at Sixteen Mille Creek. As lower imperviousness and drainage area is proposed, the peak flows at downstream Sixteen Mille Creek decreased.

Based on the preceding results, the SWM pond has sufficient quality, erosion and quantity control volume to accommodate the proposed drainage area and land use.

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6 WASTEWATER SERVICING PLAN

6.1. *EXISTING WASTEWATER SERVICING*

The following existing wastewater infrastructure is located within the vicinity of the site:

- 450mm trunk sewer on Ninth Line (from north of Saratoga Way to north of Parkgate Drive).
- 900mm trunk sewer on Ninth Line (from north of Parkgate Drive to Britannia Road)

The Region of Peel identified the above sewers as the preferred outlets for the subject lands in the Ninth Line Lands: Servicing Strategy Report (2019). These are part of the West Trunk Sewer System which ultimately drains to the Clarkson Water Pollution Control Plant. The plant is anticipated to be expanded and the 900mm trunk sewer system is adequately sized to convey projected flows from the subject property.

6.2. *PROPOSED WASTEWATER SERVICING*

Proposed sanitary sewers to service the development will be designed in accordance with the Region of Peel standards and the recommendations for the *Ninth Line Lands: Servicing Strategy Report (2019).* All proposed sanitary sewers 375mm diameter and higher shall be considered as DC-recoverable infrastructure.

Since the existing 450mm sanitary sewer does not have adequate capacity for the proposed development, and to avoid having multiple parallel sanitary trunks in the same section of the road, the Region of Peel has confirmed the optimal strategy will be to replace the existing 450mm pipe from Street A to the downstream 900mm trunk, with a 600mm pipe. Due to crossing constraints with existing services, the replacement pipe will run at the exact same slope as the existing pipe (0.15%). Further details regarding by-pass pumping and staging of the works shall be provided at the detailed design stage.

Where possible, all other proposed sanitary sewers will be located within the subject lands rather than within Ninth Line. All units fronting onto Ninth Line will be serviced from the rear – no local services are proposed within the Ninth Line right-of-way.

Due to servicing and grading constraints, a portion of the proposed trunk sewer is required to be constructed at a reduced slope of 0.2%. Based on the anticipated flows, the minimum cleaning velocity is still achieved for this section of the sewer. It should be noted and considered that many of the existing sanitary sewers in the vicinity of the subject lands are also at reduced slopes (less than 0.2%) to accommodate the extremely flat topography. The proposed sewers will ultimately be extended north in the future to provide an outlet for developments in Block 1 north of Derry Road. This concept is in accordance with the *Ninth Line Lands: Servicing Strategy Report.*

Population densities have been assigned per Region standards (175 people per hectare for townhouses and 2.7 people per unit for high density blocks). Refer to the Sanitary Sewer Design Sheet in **Appendix A.** Refer to **Drawing 6.1**, "*Sanitary Servicing Plan*," in **Appendix D.**

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7 WATER SUPPLY AND DISTRIBUTION PLAN

7.1. *EXISTING WATER SERVICING*

The Ninth Line Lands: Servicing Strategy Report (2019) confirms the Region's water supply and distribution system has sufficient capacity to service the subject lands.

There are two existing pressure zone systems, PZ-5A and PZ-4A, which will service the development. The following water services are in the vicinity of the site:

- 300 mm diameter watermain on Beacham Street (PZ-5A)
- 150 mm diameter watermain on Doug Leavens Boulevard (PZ-5A)
- 150 mm diameter watermain on Beechnut Street (PZ-5A)
- 300 mm diameter watermain on Saratoga Way (PZ-4A)
- 300 mm diameter watermain on Foxwood Avenue (PZ-4A)
- 300 mm diameter watermain on Osprey Boulevard (PZ-4A)

7.2. *PROPOSED WATER SERVICING*

Proposed water servicing within the development will be designed in accordance with the Region of Peel standards. The following proposed connection points will service the development:

- Connection to 300 mm diameter watermain on Beacham Street (PZ-5A)
- Connection to 150 mm diameter watermain on Doug Leavens Boulevard (PZ-5A)
- Connection to 300 mm diameter watermain on Osprey Boulevard (PZ-4A)

The watermain network will be looped within public lands and all blocks will be provided with a minimum of two service connections where required for internal looping. All freehold and condominium units will be provided with individual water service laterals per Region standards. The interface between pressure zones will be further investigated at detailed design (i.e. zone separation chamber).

There is other proposed infrastructure in the vicinity of this development. The project number is 22-1114 with 400 mm diameter watermain on Derry Road (PZ-5A) to 620 m southerly.

Refer to the Watermain Analysis by Municipal Engineering Solutions in **Appendix F.**

Refer to **Drawing 7.1**, "*Water Servicing*," in **Appendix D** for further details.

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8 ROADS & UTILITIES

8.1. *PUBLIC ROADS*

The following road cross sections are proposed for the public rights-of-way throughout the development:

- Minor Residential Collector Road – 8m Pavement on 22m ROW (mod City Std. 2211.080)

Geometric design for all roads will comply with the City of Mississauga standards. Sightline and truck turning analyses will be completed at detailed design.

All services (water, sanitary and storm) and utilities (hydro, gas, telecom) within the public rights-of-way will be designed in standard locations per the approved cross sections. In extenuating circumstances, approval from the City and Region will be required for any deviations.

The City of Mississauga is currently completing an Environmental Assessment for the urbanization and widening of Ninth Line. Preliminary design information (horizontal and vertical design) has been referenced in the preparation of this report to ensure that the development concepts are compatible with the Ninth Line urbanization works. It is possible for either project to proceed first; however, phasing and staging details regarding the road connections and intersection design shall be further evaluated as the detailed design of these projects progresses to ensure satisfactory interim conditions.

Refer to the Draft Plan of Subdivision in **Appendix D** for proposed ROW sizes and **Drawing 8.1B**, "*Typical ROW Details*" for additional information about the proposed ROW configuration.

8.2. *PRIVATE ROADS*

Typical private roads will follow the applicable City standards for common element condominium roads (City Stds. 2211.154, 2211.155) in principle, including the provision for two 3.5m-wide travel lanes, on-street parking where required, and 3m-wide servicing easements (clear of any buildings, steps, porches etc.) beyond the curb / sidewalk.

It is noted that the City's standard condo road cross sections do not account for all potential servicing scenarios and may require modification to suit this particular style of development. For example, the condo blocks include rear-lane product, where public sidewalks are available at the fronts of units and would not be required to access the garages along the back / condo road. Similarly, utilities (hydro, gas, telecom) would be provided from the public frontage and not the rear-lane, eliminating the need for the 3m-wide servicing easements in some cases.

Conceptual cross sections showing the intended servicing and utility layout for the units with frontage on both public and condo roads are provided on **Drawing 8.1A**, "*Typical ROW Cross Sections*," in **Appendix D** for details. Also refer to **Drawing 8.1B**, "*Typical ROW Details*." Preliminary unit types and lot details are available on **Drawing 8.1C**, "*Preliminary Lot Details.*"

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9 GRADING

The site grading design considers the following objectives and constraints:

- Conform to City of Mississauga grading criteria
- Match existing boundary conditions
- Minimize cut and fill operations and work towards a balanced site
- Provide overland flow conveyance for major storm conditions
- Provide minimum cover on proposed servicing
- Provide flood protection and flood storage where required (refer to HLCP)
- Achieve acoustic requirements (refer to Acoustic Report by YCA)

9.1. *NINTH LINE EA*

As identified in the preceding section, an Environmental Assessment for the urbanization and widening of Ninth Line is currently ongoing. Preliminary horizontal and vertical design information provided by the City has been referenced in preparation of the grading concepts herein to ensure that the proposed development is compatible with the future conditions of Ninth Line. Interim conditions will need to be established and evaluated during the detailed design of whichever project proceeds first. Should the development proceed first, the grades along the future ROW limit will be set based on the ultimate profile of Ninth Line and interim transition sloping will be provided where necessary (refer to **Drawings 9.1E to H,** *"Grading Cross Sections,"* for examples).

9.2. *MTO TRANSITWAY*

The Environmental Assessment for the future MTO Transitway bisecting the subject lands is approved. The transitway centerline elevations have been established from the approved EA drawings; however, limited additional details within the transitway corridor are not available at this time. Conservatively, the proposed development grades along the transitway boundary have been set as close to the approved centerline elevations as possible to provide maximum flexibility for grading within the transitway corridor in the future. It is generally assumed and acknowledged that the proposed development will proceed in advance of the transitway construction. Interim sloping to the existing ground will be required in this scenario. The proposed development boundary grades are set higher than the proposed Regional floodline elevations to provide flood protection, regardless of whether the transitway proceeds or not. On the west side of the future transitway, the NHS creation will respect the transitway alignment, plus the associated 14m buffer. Suitable access will be provided from the development side to facilitate future construction and maintenance activities. The development grading concept will in no way hinder the future transitway.

Refer to **Drawings 9.1 A to D**, "*Ultimate Grading Plans*," for the ultimate grading condition of the development. **Drawings 9.1a to d**, "*Interim Grading Plans*," reflect the interim condition (without the transitway). **Drawings 9.1E to H**, "*Grading Cross Sections*," illustrate the proposed grading cross sections at key locations around the proposed site and include profiles for the interim and ultimate grading conditions for reference.

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10 CONCLUSION

The proposed Derry-Britannia development can be adequately serviced through a combination of existing and proposed municipal infrastructure. In summary:

- Stormwater quantity and quality control for all lands (both public and private) will be provided by the proposed SWM Pond
- Water balance will be achieved through increased topsoil and other potential LIDs where required to meet the applicable requirements
- Wastewater servicing will be provided by replacing the existing 450mm sewer on Ninth Line with a 600mm sewer, connecting to the existing 900mm trunk
- Water servicing for domestic supply and fire protection will be provided from the existing PZ5A and PZ4A watermains in the vicinity of Ninth Line

Report Prepared by:

Scott Riemer, P.Eng.
Associate, Design

APPENDIX A

STORM AND SANITARY SEWER DESIGN SHEETS

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STORM SEWER DESIGN SHEET

10 Year Storm

DERRY BRITANNIA DEVELOPMENTS LIMITED

CITY OF MISSISSAUGA

PROJECT DETAILS

Project No: 20-652
Date: 14-Apr-23
Designed by: TL
Checked by: SR

DESIGN CRITERIA

Min. Diameter = 300 mm
Mannings 'n'= 0.013
Starting Tc = 15 min
Factor of Safety = 15 %

Rainfall Intensity = $\frac{A}{(Tc+B)^c}$

A = 1010
B = 4.6
c = 0.78

NOMINAL PIPE SIZE USED

STREET	FROM MH	TO MH	AREA (ha)	RUNOFF COEFFICIENT "R"	'AR'	ACCUM. 'AR'	RAINFALL INTENSITY (mm/hr)	FLOW (m3/s)	CONSTANT FLOW (m3/s)	ACCUM. CONSTANT FLOW (m3/s)	TOTAL FLOW (m3/s)	LENGTH (m)	SLOPE (%)	PIPE DIAMETER (mm)	FULL FLOW CAPACITY (m3/s)	FULL FLOW VELOCITY (m/s)	INITIAL Tc (min)	TIME OF CONCENTRATION (min)	ACC. TIME OF CONCENTRATION (min)	PERCENT FULL (%)
STREET A	1	2	0.54	0.65	0.35	0.35	99.2	0.097	0.081	0.081	0.178	107.0	0.50	525	0.304	1.40	15.00	1.27	16.27	58%
STREET A	2	3				0.35	94.4	0.092		0.081	0.173	13.3	0.50	525	0.304	1.40	16.27	0.16	16.43	57%
STREET A	3	4	1.32	0.90	1.19	1.54	93.9	0.401		0.081	0.482	67.8	0.30	750	0.610	1.38	16.43	0.82	17.25	79%
PARK	CTRL 1_1	4	0.76	0.30	0.23	0.23	99.2	0.063			0.063	12.0	0.50	375	0.124	1.12	15.00	0.18	15.18	51%
STREET A	4	5				1.77	91.1	0.447		0.081	0.528	49.8	0.30	750	0.610	1.38	17.25	0.60	17.85	87%
STREET A	5	6				1.77	89.2	0.438		0.081	0.519	117.6	0.30	750	0.610	1.38	17.85	1.42	19.27	85%
STREET A	6	7				1.77	85.0	0.417		0.081	0.498	118.2	0.30	750	0.610	1.38	19.27	1.43	20.69	82%
FUT CONDO ROAD	CTRL 1	7	0.67	0.65	0.44	0.44	99.2	0.120			0.120	13.5	0.50	450	0.202	1.27	15.00	0.18	15.18	60%
STREET A	7	8	0.09	0.90	0.08	2.28	81.3	0.516		0.081	0.597	39.7	0.30	825	0.786	1.47	20.69	0.45	21.14	76%
CONDO ROAD G	CTRL 2	8	3.23	0.65	2.10	2.10	99.2	0.578	0.395	0.395	0.973	13.1	0.50	900	1.280	2.01	15.00	0.11	15.11	76%
STREET A	8	9	0.19	0.90	0.17	4.55	80.2	1.014		0.476	1.490	90.5	0.30	1200	2.135	1.89	21.14	0.80	21.94	70%
CONDO BLOCK	CTRL 3	9_1	0.82	0.90	0.74	0.74	99.2	0.203			0.203	11.0	0.50	525	0.304	1.40	15.00	0.13	15.13	67%
CONDO BLOCK	CTRL 4	9_1	0.83	0.90	0.75	0.75	99.2	0.206			0.206	14.0	0.50	525	0.304	1.40	15.00	0.17	15.17	68%
STREET B	9_1	9	0.33	0.90	0.30	1.78	98.5	0.488	0.241	0.241	0.729	103.3	0.50	825	1.015	1.90	15.17	0.91	16.07	72%
STREET A	9	11	0.20	0.90	0.18	6.52	78.3	1.417		0.717	2.134	93.5	0.30	1350	2.923	2.04	21.94	0.76	22.71	73%
CONDO ROAD J	CTRL 5	11	2.78	0.65	1.81	1.81	99.2	0.498			0.498	13.5	0.50	675	0.594	1.66	15.00	0.14	15.14	84%
STREET A	11	12	0.08	0.90	0.07	8.40	76.6	1.785		0.717	2.502	37.0	0.30	1350	2.923	2.04	22.71	0.30	23.01	86%
CONDO ROAD J	CTRL 6	12	0.30	0.65	0.20	0.20	99.2	0.054			0.054	13.5	0.50	300	0.068	0.97	15.00	0.23	15.23	79%
STREET A	12	13	0.09	0.90	0.08	8.67	75.9	1.828		0.717	2.545	39.1	0.30	1500	3.872	2.19	23.01	0.30	23.31	66%
CONDO ROAD L	CTRL 7	13	0.90	0.65	0.59	0.59	99.2	0.161	0.109	0.109	0.270	14.5	0.50	600	0.434	1.54	15.00	0.16	15.16	62%

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CITY OF MISSISSAUGA

PROJECT DETAILS

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Mannings 'n'=	0.013			
Starting Tc =	15	min	A =	1010
			B =	4.6
Factor of Safety =	15	%	c =	0.78

NOMINAL PIPE SIZE USED

STREET	FROM MH	TO MH	AREA (ha)	RUNOFF COEFFICIENT "R"	'AR'	ACCUM. 'AR'	RAINFALL INTENSITY (mm/hr)	FLOW (m3/s)	CONSTANT FLOW (m3/s)	ACCUM. CONSTANT FLOW (m3/s)	TOTAL FLOW (m3/s)	LENGTH (m)	SLOPE (%)	PIPE DIAMETER (mm)	FULL FLOW CAPACITY (m3/s)	FULL FLOW VELOCITY (m/s)	INITIAL Tc (min)	TIME OF CONCENTRATION (min)	ACC. TIME OF CONCENTRATION (min)	PERCENT FULL (%)
STREET A	13	14	0.79	0.90	0.71	9.97	75.3	2.084		0.826	2.910	104.9	0.30	1500	3.872	2.19	23.31	0.80	24.10	75%
ELEMENTARY SCHOOL	CTRL 8	14	2.84	0.90	2.56	2.56	99.2	0.704			0.704	14.5	0.50	825	1.015	1.90	15.00	0.13	15.13	69%
CONDO ROAD K	CTRL 9	14	0.77	0.65	0.50	0.50	99.2	0.138			0.138	13.5	0.50	450	0.202	1.27	15.00	0.18	15.18	68%
STREET A	14	15				13.02	73.6	2.664		0.826	3.490	51.3	0.30	1200x1800 (BOX)	4.605	2.13	24.10	0.40	24.50	76%
STREET A	15	16				13.02	72.9	2.635		0.826	3.461	100.8	0.30	1200x1800 (BOX)	4.605	2.13	24.50	0.79	25.29	75%
STREET A	16	17				13.02	71.3	2.581		0.826	3.407	101.6	0.30	1650	4.992	2.33	25.29	0.73	26.02	68%
PARK	CTRL 10	17	1.36	0.30	0.41	0.41	99.2	0.112			0.112	13.0	0.50	450	0.202	1.27	15.00	0.17	15.17	56%
STREET A	17	18	0.16	0.90	0.14	13.58	70.0	2.641		0.826	3.467	70.5	0.15	1800	4.452	1.75	26.02	0.67	26.69	78%
CONDO ROAD O	CTRL 11	18	0.91	0.65	0.59	0.59	99.2	0.163			0.163	12.5	0.50	450	0.202	1.27	15.00	0.16	15.16	81%
STREET A	18	19	0.13	0.90	0.12	14.28	68.9	2.732		0.826	3.558	59.0	0.15	1800	4.452	1.75	26.69	0.56	27.25	80%
CONDO ROAD P	CTRL 12	19	1.28	0.65	0.83	0.83	99.2	0.229	0.272	0.272	0.501	12.5	0.30	750	0.610	1.38	15.00	0.15	15.15	82%
STREET A	19	20	1.79	0.65	1.16	16.28	67.9	3.071		1.098	4.169	125.2	0.15	1200x2400 (BOX)	4.658	1.62	27.25	1.29	28.54	89%
STREET A	20	21				16.28	65.8	2.977		1.098	4.075	125.2	0.15	1200x2400 (BOX)	4.658	1.62	28.54	1.29	29.83	87%
STREET A	21	22				16.28	63.9	2.890		1.098	3.988	127.1	0.15	1950	5.511	1.85	29.83	1.15	30.98	72%
CONDO ROAD R	CTRL 13	22	1.80	0.65	1.17	1.17	99.2	0.322	0.332	0.332	0.654	12.5	0.50	750	0.787	1.78	15.00	0.12	15.12	83%
STREET A	22	23	0.39	0.90	0.35	17.80	62.3	3.080		1.430	4.510	56.4	0.15	1950	5.511	1.85	30.98	0.51	31.49	82%
CONDO ROAD S	CTRL 14	23	1.73	0.65	1.12	1.12	99.2	0.310	0.037	0.037	0.347	12.5	0.30	675	0.460	1.29	15.00	0.16	15.16	75%
STREET A	23	26				18.93	61.6	3.238		1.467	4.705	99.1	0.15	1950	5.511	1.85	31.49	0.90	32.38	85%
STREET A		24	0.65	0.90	0.59	0.59														
STREET A	24	25	0.34	0.90	0.31	0.89	99.2	0.245	0.020	0.020	0.265	67.3	0.50	600	0.434	1.54	15.00	0.73	15.73	61%
STREET A	25	26				0.89	96.4	0.239		0.020	0.259	16.3	0.50	600	0.434	1.54	15.73	0.18	15.91	60%
SWM POND	26	27				19.82	60.4	3.326		1.487	4.813	68.0	0.15	2100	6.715	1.94	32.38	0.58	32.97	72%

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STORM SEWER DESIGN SHEET

10 Year Storm

DERRY BRITANNIA DEVELOPMENTS LIMITED

CITY OF MISSISSAUGA

PROJECT DETAILS

Project No: 20-652
Date: 14-Apr-23
Designed by: TL
Checked by: SR

DESIGN CRITERIA

Min. Diameter =	300	mm	Rainfall Intensity =	A / (Tc+B)^c
Mannings 'n'=	0.013			
Starting Tc =	15	min	A =	1010
			B =	4.6
Factor of Safety =	15	%	c =	0.78

NOMINAL PIPE SIZE USED

STREET	FROM MH	TO MH	AREA (ha)	RUNOFF COEFFICIENT "R"	'AR'	ACCUM. 'AR'	RAINFALL INTENSITY (mm/hr)	FLOW (m3/s)	CONSTANT FLOW (m3/s)	ACCUM. CONSTANT FLOW (m3/s)	TOTAL FLOW (m3/s)	LENGTH (m)	SLOPE (%)	PIPE DIAMETER (mm)	FULL FLOW CAPACITY (m3/s)	FULL FLOW VELOCITY (m/s)	INITIAL Tc (min)	TIME OF CONCENTRATION (min)	ACC. TIME OF CONCENTRATION (min)	PERCENT FULL (%)
PARK	28	27	0.42	0.30	0.13	0.13	99.2	0.035			0.035	6.0	0.50	300	0.068	0.97	15.00	0.10	15.10	51%
SWM POND	27	29				19.94	59.7	3.307		1.487	4.794	17.9	0.15	1200x3000 (BOX)	6.097	1.69	32.97	0.18	33.15	79%
SWM POND	29	HW 1				19.94	59.5	3.295		1.487	4.782	13.1	0.15	1950	5.511	1.85	33.15	0.12	33.26	87%

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PROJECT DETAILS	
Title1:	**STORM SEWER DESIGN SHEET**
Title2:	**100YR Capture/Constant Flow Calculations**
Project Name:	**DERRY BRITANNIA DEVELOPMENTS LIMITED**
Municipality:	**CITY OF MISSISSAUGA**
Project No:	**20-652**
Date:	**14-Apr-23**
Designed by:	**TL**
Checked by:	**SR**

IDF Parameters for Mississauga			
		10-yr	100-yr
$I=A/(T+b)^C$	A	1010	1450
	B	4.6	4.9
	C	0.78	0.78

ID	MH	A *ha*	R (10-Yr)	R (100-Yr) *R(10-Yr) x 1.25*	AR (10-Yr)	AR (100-Yr)	L *m*	Tc *min*	I10 *mm/hr*	I100 *mm/hr*	Q10 *m3/s*	Q100 *m3/s*	Q100-Q10 *m3/s*	Const. flow *m3/s*
100YR-1	MH1	0.61	0.65	0.81	0.40	0.50	138	16.15	94.85	134.66	0.104	0.185	0.081	0.081
100YR-2	CTRL MH 2	3.09	0.65	0.81	2.01	2.51	260	17.17	91.38	129.79	0.510	0.905	0.395	0.395
100YR-3	MH9_1	1.78	0.90	1.00	1.60	1.78	170	16.42	93.91	133.34	0.418	0.659	0.241	0.241
100YR-4	CTRL MH 7	0.82	0.65	0.81	0.53	0.67	124	16.03	95.27	135.24	0.141	0.250	0.109	0.109
100YR-5	CTRL MH 12	2.10	0.65	0.81	1.37	1.71	212	16.77	92.7	131.7	0.352	0.624	0.272	0.272
100YR-6	CTRL MH 13	2.58	0.65	0.81	1.68	2.10	245	17.04	91.79	130.37	0.428	0.759	0.332	0.332
100YR-7	CTRL MH 14	0.27	0.65	0.81	0.18	0.22	37	15.31	98.0	139.0	0.048	0.085	0.037	0.037
100YR-8	MH 24	0.14	0.90	1.00	0.13	0.14	22	15.18	98.45	139.69	0.034	0.054	0.020	0.020

Tc calcs *where Tc = starting Tc + length/velocity*

Starting Tc (min) =	15
Velocity (m/s) =	2

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SANITARY SEWER DESIGN SHEET

INTERIM CONDITIONS (NO EXTERNAL)

DERRY BRITANNIA DEVELOPMENTS LTD.

CITY OF MISSISSAUGA, REGION OF PEEL

PROJECT DETAILS

Project No: 20-652
Date: October 2023
Designed by: TL
Checked by: SR

DESIGN CRITERIA

Min. Flow =	13	l/s			
Min Diameter =	250	mm	Avg. Domestic Flow =	302.8	l/c/d
Mannings 'n'=	0.013		Infiltration =	0.200	l/s/ha
Min. Velocity =	0.75	m/s	Max. Peaking Factor =	4.00	
Max. Velocity =	3.50	m/s	Min. Peaking Factor=	1.50	
			Domestic Sewage flow for < 1000 ppl = 0.013m^3/s		
Factor of Safety =	20	%	(Region of Peel Std. 2-5-2)		

NOMINAL PIPE SIZE USED

STREET	FROM MH	TO MH	RESIDENTIAL AREA (ha)	RES. ACC. AREA (ha)	RES. UNITS (#)	RES. DENISTY (P/ha)	RES. DENSITY (P/unit)	RES. POP	RES. ACCUM. POP.	COMMERCIAL/INDUSTRIAL/INSTITUTIONAL AREA (ha)	C/I/I ACC. AREA (ha)	C/I/I EQUIV. POP. (p/ha)	C/I/I FLOW RATE (l/s/ha)	C/I/I EQUIV. POP.	C/I/I ACCUM. EQUIV. POP.	FLOW CALCULATIONS INFILTRATION (l/s)	TOTAL ACCUM. POP.	PEAKING FACTOR	RES. FLOW (l/s)	MIN. RES. FLOW (l/s)	COMM. FLOW (l/s)	ACCUM. COMM. FLOW (l/s)	TOTAL FLOW (l/s)	PIPE DATA SLOPE (%)	PIPE DIAMETER (mm)	FULL FLOW CAPACITY (l/s)	FULL FLOW VELOCITY (m/s)	ACTUAL VELOCITY (m/s)	PERCENT FULL (%)
STREET A	1A	2A	0.55	0.55		175		97	97							0.1	97	4.00	1.4	13.0			13.1	0.30	375	96.0	0.87	0.61	14%
STREET A - PARK	2A	3A	0.76	1.31					97							0.3	97	4.00	1.4	13.0			13.3	0.30	375	96.0	0.87	0.61	14%
STREET A	3A	4A	1.33	2.64		175		233	330							0.5	330	4.00	4.6	13.0			13.5	0.30	375	96.0	0.87	0.61	14%
STREET A	4A	5A		2.64					330							0.5	330	4.00	4.6	13.0			13.5	0.30	375	96.0	0.87	0.61	14%
STREET A	5A	6A		2.64					330							0.5	330	4.00	4.6	13.0			13.5	0.30	375	96.0	0.87	0.61	14%
STREET A	6A	7A		2.64					330							0.5	330	4.00	4.6	13.0			13.5	0.30	375	96.0	0.87	0.61	14%
FUTURE RES	CTRL 1A	7A	0.77	0.77		175		135	135							0.2	135	4.00	1.9	13.0			13.2	0.50	250	42.0	0.86	0.75	31%
STREET A	7A	8A	0.08	3.49					465							0.7	465	3.99	6.5	13.0			13.7	0.30	375	96.0	0.87	0.61	14%
CONDO ROAD G	CTRL 2A	8A	3.64	3.64		175		637	637							0.7	637	3.92	8.7	13.0			13.7	0.50	250	42.0	0.86	0.75	33%
STREET A	8A	9A	0.15	7.28					1102							1.5	1102	3.77	14.6	14.6			16.0	0.30	375	96.0	0.87	0.64	17%
BLOCK 8N	CTRL 3A	9A	0.82	0.82	325		2.7	878	878							0.2	878	3.84	11.8	13.0			13.2	0.50	250	42.0	0.86	0.75	31%
STREET A	9A	10A	0.50	8.60					1980							1.7	1980	3.59	24.9	24.9			26.6	0.30	375	96.0	0.87	0.74	28%
BLOCK 13S	CTRL 4A	10A	0.83	0.83	325		2.7	878	878							0.2	878	3.84	11.8	13.0			13.2	0.50	250	42.0	0.86	0.75	31%
STREET A	10A	11A	0.43	9.86					2858							2.0	2858	3.46	34.7	34.7			36.6	0.30	375	96.0	0.87	0.78	38%
CONDO ROAD J	CTRL 5A	11A	2.69	2.69		175		471	471							0.5	471	3.99	6.6	13.0			13.5	0.50	250	42.0	0.86	0.75	32%
STREET A	11A	12A		12.55					3329							2.5	3329	3.40	39.7	39.7			42.2	0.30	375	96.0	0.87	0.81	44%
CONDO ROAD J	CTRL 6A	12A	0.29	0.29		175		51	51							0.1	51	4.00	0.7	13.0			13.1	0.50	250	42.0	0.86	0.75	31%
STREET A	12A	13A		12.84					3380							2.6	3380	3.40	40.3	40.3			42.8	0.30	375	96.0	0.87	0.83	45%
CONDO ROAD L	CTRL 7A	13A	1.01	1.01		175		177	177							0.2	177	4.00	2.5	13.0			13.2	0.50	250	42.0	0.86	0.75	31%
STREET A	13A	14A		13.85					3557							2.8	3557	3.38	42.1	42.1			44.9	0.30	375	96.0	0.87	0.83	47%
ELEMENTARY SCHOOL	CTRL 8A	14A						450	450	2.83	2.83					0.6	450	4.00	6.3	13.0			13.6	0.50	250	42.0	0.86	0.75	32%
CONDO ROAD K	CTRL 9A	14A	0.77	0.77		175		135	135							0.2	135	4.00	1.9	13.0			13.2	0.50	250	42.0	0.86	0.75	31%
STREET A	14A	15A	0.58	15.20					4142		2.83					3.6	4142	3.32	48.2	48.2			51.8	0.20	450	127.5	0.80	0.75	41%
STREET A	15A	16A		15.20					4142		2.83					3.6	4142	3.32	48.2	48.2			51.8	0.20	450	127.5	0.80	0.75	41%
STREET A	16A	17A	1.36	16.56					4142		2.83					3.9	4142	3.32	48.2	48.2			52.1	0.20	450	127.5	0.80	0.75	41%
STREET A	17A	18A	0.13	16.69					4142		2.83					3.9	4142	3.32	48.2	48.2			52.1	0.20	450	127.5	0.80	0.75	41%
CONDO ROAD O	CTRL 11A	18A	1.09	1.09		175		191	191							0.2	191	4.00	2.7	13.0			13.2	0.50	250	42.0	0.86	0.75	31%
STREET A	18A	19A	0.14	17.92					4333		2.83					4.2	4333	3.30	50.1	50.1			54.3	0.20	450	127.5	0.80	0.75	43%

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STREET	FROM MH	TO MH	RESIDENTIAL							COMMERCIAL/INDUSTRIAL/INSTITUTIONAL						FLOW CALCULATIONS								PIPE DATA					
			AREA (ha)	ACC. AREA (ha)	UNITS (#)	DENISTY (P/ha)	DENSITY (P/unit)	POP	ACCUM. RES. POP.	AREA (ha)	ACC. AREA (ha)	EQUIV. POP. (p/ha)	FLOW RATE (l/s/ha)	EQUIV. POP.	ACCUM. EQUIV. POP.	INFILTRATION (l/s)	TOTAL ACCUM. POP.	PEAKING FACTOR	RES. FLOW (l/s)	MIN. RES. FLOW (l/s)	COMM. FLOW (l/s)	ACCUM. COMM. FLOW (l/s)	TOTAL FLOW (l/s)	SLOPE (%)	PIPE DIAMETER (mm)	FULL FLOW CAPACITY (l/s)	FULL FLOW VELOCITY (m/s)	ACTUAL VELOCITY (m/s)	PERCENT FULL (%)
CONDO ROAD P	CTRL 12A	19A	1.38	1.38		175		242	242							0.3	242	4.00	3.4	13.0			13.3	0.50	250	42.0	0.86	0.75	32%
STREET A	19A	20A	1.78	21.08		175		312	4887		2.83					4.8	4887	3.25	55.7	55.7			60.5	0.20	450	127.5	0.80	0.77	47%
STREET A	20A	21A		21.08					4887		2.83					4.8	4887	3.25	55.7	55.7			60.5	0.20	450	127.5	0.80	0.77	47%
WALKWAY BLOCK	CTRL 13A	21A	1.92	1.92		175		336	336							0.4	336	4.00	4.7	13.0			13.4	0.50	250	42.0	0.86	0.75	32%
STREET A	21A	22A		23.00					5223		2.83					5.2	5223	3.23	59.1	59.1			64.2	0.20	450	127.5	0.80	0.79	50%
STREET A	22A	23A		23.00					5223		2.83					5.2	5223	3.23	59.1	59.1			64.2	0.20	450	127.5	0.80	0.79	50%
CONDO ROAD R	CTRL 14A	23A	1.90	1.90		175		333	333							0.4	333	4.00	4.7	13.0			13.4	0.50	250	42.0	0.86	0.75	32%
STREET A	23A	24A	0.12	25.02					5556		2.83					5.6	5556	3.20	62.4	62.4			67.9	0.20	450	127.5	0.80	0.79	53%
CONDO ROAD S	CTRL 15A	24A	2.17	2.17		175		380	380							0.4	380	4.00	5.3	13.0			13.4	0.50	250	42.0	0.86	0.75	32%
STREET A	24A	25A	0.42	27.61					5936		2.83					6.1	5936	3.18	66.1	66.1			72.1	0.20	450	127.5	0.80	0.81	57%
STREET A	25A	26A		27.61					5936		2.83					6.1	5936	3.18	66.1	66.1			72.1	0.20	450	127.5	0.80	0.81	57%
STREET A	26A	27A		27.61					5936		2.83					6.1	5936	3.18	66.1	66.1			72.1	0.20	450	127.5	0.80	0.81	57%
STREET A	27A	28A		27.61					5936		2.83					6.1	5936	3.18	66.1	66.1			72.1	0.20	450	127.5	0.80	0.81	57%
NINTH LINE	28A	29A		27.61					5936		2.83					6.1	5936	3.18	66.1	66.1			72.1	0.20	450	127.5	0.80	0.81	57%
EXISTING NINTH LINE	*A*	*29A*						*10750*	*10750*								*10750*	*2.92*	*110.1*	*110.1*			*110.1*	*0.15*	*450*	*110.4*	*0.69*	*0.79*	*100%*
NINTH LINE	29A	30A		27.61					16686		2.83					6.1	16686	2.73	159.7	159.7			165.8	0.15	600	237.8	0.84	0.90	70%
NINTH LINE	30A	EX. MH		27.61					16686		2.83					6.1	16686	2.73	159.7	159.7			165.8	0.15	600	237.8	0.84	0.90	70%

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URBANTECH®

SANITARY SEWER DESIGN SHEET

ULTIMATE CONDITIONS

DERRY BRITANNIA DEVELOPMENTS LTD.

CITY OF MISSISSAUGA, REGION OF PEEL

PROJECT DETAILS

Project No: 20-652
Date: 14-Apr-23
Designed by: TL
Checked by: SR

DESIGN CRITERIA

Min. Flow =	13	l/s			
Min Diameter =	250	mm	Avg. Domestic Flow =	302.8	l/c/d
Mannings 'n'=	0.013		Infiltration =	0.200	l/s/ha
Min. Velocity =	0.75	m/s	Max. Peaking Factor =	4.00	
Max. Velocity =	3.50	m/s	Min. Peaking Factor=	1.50	
			Domestic Sewage flow for < 1000 ppl = 0.013m^3/s		
Factor of Safety =	20	%	(Region of Peel Std. 2-5-2)		

NOMINAL PIPE SIZE USED

STREET	FROM MH	TO MH	RESIDENTIAL							COMMERCIAL/INDUSTRIAL/INSTITUTIONAL						FLOW CALCULATIONS								PIPE DATA					
			AREA (ha)	ACC. AREA (ha)	UNITS (#)	DENISTY (P/ha)	DENSITY (P/unit)	POP	ACCUM. RES. POP.	AREA (ha)	ACC. AREA (ha)	EQUIV. POP. (p/ha)	FLOW RATE (l/s/ha)	EQUIV. POP.	ACCUM. EQUIV. POP.	INFILTRATION (l/s)	TOTAL ACCUM. POP.	PEAKING FACTOR	RES. FLOW (l/s)	MIN. RES. FLOW (l/s)	COMM. FLOW (l/s)	ACCUM. COMM. FLOW (l/s)	TOTAL FLOW (l/s)	SLOPE (%)	PIPE DIAMETER (mm)	FULL FLOW CAPACITY (l/s)	FULL FLOW VELOCITY (m/s)	ACTUAL VELOCITY (m/s)	PERCENT FULL (%)
EXTERNAL - NINTH LINE	EX. 100	1A	31.40	31.40				2615	2615							6.3	2615	3.49	32.0	32.0			38.3	0.30	375	96.0	0.87	0.81	40%
STREET A	1A	2A	0.55	31.95		175		97	2712							6.4	2712	3.48	33.1	33.1			39.5	0.30	375	96.0	0.87	0.81	41%
STREET A - PARK	2A	3A	0.76	32.71					2712							6.5	2712	3.48	33.1	33.1			39.6	0.30	375	96.0	0.87	0.81	41%
STREET A	3A	4A	1.33	34.04		175		233	2945							6.8	2945	3.45	35.6	35.6			42.4	0.30	375	96.0	0.87	0.81	44%
STREET A	4A	5A		34.04					2945							6.8	2945	3.45	35.6	35.6			42.4	0.30	375	96.0	0.87	0.81	44%
STREET A	5A	6A		34.04					2945							6.8	2945	3.45	35.6	35.6			42.4	0.30	375	96.0	0.87	0.81	44%
STREET A	6A	7A		34.04					2945							6.8	2945	3.45	35.6	35.6			42.4	0.30	375	96.0	0.87	0.81	44%
FUTURE RES	CTRL 1A	7A	0.77	0.77		175		135	135							0.2	135	4.00	1.9	13.0			13.2	0.50	250	42.0	0.86	0.75	31%
STREET A	7A	8A	0.08	34.89					3080							7.0	3080	3.43	37.1	37.1			44.0	0.30	375	96.0	0.87	0.83	46%
CONDO ROAD G	CTRL 2A	8A	3.64	3.64		175		637	637							0.7	637	3.92	8.7	13.0			13.7	0.50	250	42.0	0.86	0.75	33%
STREET A	8A	9A	0.15	38.68					3717							7.7	3717	3.36	43.8	43.8			51.5	0.30	375	96.0	0.87	0.86	54%
BLOCK 8N	CTRL 3A	9A	0.82	0.82	325		2.7	878	878							0.2	878	3.84	11.8	13.0			13.2	0.50	250	42.0	0.86	0.75	31%
STREET A	9A	10A	0.50	40.00					4595							8.0	4595	3.28	52.8	52.8			60.8	0.30	375	96.0	0.87	0.90	63%
BLOCK 13S	CTRL 4A	10A	0.83	0.83	325		2.7	878	878							0.2	878	3.84	11.8	13.0			13.2	0.50	250	42.0	0.86	0.75	31%
STREET A	10A	11A	0.43	41.26					5473							8.3	5473	3.21	61.5	61.5			69.8	0.30	375	96.0	0.87	0.93	73%
CONDO ROAD J	CTRL 5A	11A	2.69	2.69		175		471	471							0.5	471	3.99	6.6	13.0			13.5	0.50	250	42.0	0.86	0.75	32%
STREET A	11A	12A		43.95					5944							8.8	5944	3.17	66.1	66.1			74.9	0.30	375	96.0	0.87	0.95	78%
CONDO ROAD J	CTRL 6A	12A	0.29	0.29		175		51	51							0.1	51	4.00	0.7	13.0			13.1	0.50	250	42.0	0.86	0.75	31%
STREET A	12A	13A		44.24					5995							8.8	5995	3.17	66.6	66.6			75.5	0.30	375	96.0	0.87	0.95	79%
CONDO ROAD L	CTRL 7A	13A	1.01	1.01		175		177	177							0.2	177	4.00	2.5	13.0			13.2	0.50	250	42.0	0.86	0.75	31%
STREET A	13A	14A		45.25					6172							9.1	6172	3.16	68.3	68.3			77.4	0.30	375	96.0	0.87	0.96	81%
ELEMENTARY SCHOOL	CTRL 8A	14A						450	450	2.83	2.83					0.6	450	4.00	6.3	13.0			13.6	0.50	250	42.0	0.86	0.75	32%
CONDO ROAD K	CTRL 9A	14A	0.77	0.77		175		135	135							0.2	135	4.00	1.9	13.0			13.2	0.50	250	42.0	0.86	0.75	31%
STREET A	14A	15A	0.58	46.60					6757		2.83					9.9	6757	3.12	73.9	73.9			83.8	0.20	450	127.5	0.80	0.84	66%
STREET A	15A	16A		46.60					6757		2.83					9.9	6757	3.12	73.9	73.9			83.8	0.20	450	127.5	0.80	0.84	66%
STREET A	16A	17A	1.36	47.96					6757		2.83					10.2	6757	3.12	73.9	73.9			84.1	0.20	450	127.5	0.80	0.84	66%
STREET A	17A	18A	0.13	48.09					6757		2.83					10.2	6757	3.12	73.9	73.9			84.1	0.20	450	127.5	0.80	0.84	66%
CONDO ROAD O	CTRL 11A	18A	1.09	1.09		175		191	191							0.2	191	4.00	2.7	13.0			13.2	0.50	250	42.0	0.86	0.75	31%
STREET A	18A	19A	0.14	49.32					6948		2.83					10.4	6948	3.11	75.7	75.7			86.2	0.20	450	127.5	0.80	0.84	68%
CONDO ROAD P	CTRL 12A	19A	1.38	1.38		175		242	242							0.3	242	4.00	3.4	13.0			13.3	0.50	250	42.0	0.86	0.75	32%

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STREET	FROM MH	TO MH	RESIDENTIAL							COMMERCIAL/INDUSTRIAL/INSTITUTIONAL						FLOW CALCULATIONS								PIPE DATA					
			AREA (ha)	ACC. AREA (ha)	UNITS (#)	DENISTY (P/ha)	DENSITY (P/unit)	POP	ACCUM. RES. POP.	AREA (ha)	ACC. AREA (ha)	EQUIV. POP. (p/ha)	FLOW RATE (l/s/ha)	EQUIV. POP.	ACCUM. EQUIV. POP.	INFILTRATION (l/s)	TOTAL ACCUM. POP.	PEAKING FACTOR	RES. FLOW (l/s)	MIN. RES. FLOW (l/s)	COMM. FLOW (l/s)	ACCUM. COMM. FLOW (l/s)	TOTAL FLOW (l/s)	SLOPE (%)	PIPE DIAMETER (mm)	FULL FLOW CAPACITY (l/s)	FULL FLOW VELOCITY (m/s)	ACTUAL VELOCITY (m/s)	PERCENT FULL (%)
STREET A	19A	20A	1.78	52.48		175		312	7502		2.83					11.1	7502	3.08	80.9	80.9			92.0	0.20	450	127.5	0.80	0.86	72%
STREET A	20A	21A		52.48					7502		2.83					11.1	7502	3.08	80.9	80.9			92.0	0.20	450	127.5	0.80	0.86	72%
WALKWAY BLOCK	CTRL 13A	21A	1.92	1.92		175		336	336							0.4	336	4.00	4.7	13.0			13.4	0.50	250	42.0	0.86	0.75	32%
STREET A	21A	22A		54.40					7838		2.83					11.4	7838	3.06	84.0	84.0			95.5	0.20	450	127.5	0.80	0.87	75%
STREET A	22A	23A		54.40					7838		2.83					11.4	7838	3.06	84.0	84.0			95.5	0.20	450	127.5	0.80	0.87	75%
CONDO ROAD R	CTRL 14A	23A	1.90	1.90		175		333	333							0.4	333	4.00	4.7	13.0			13.4	0.50	250	42.0	0.86	0.75	32%
STREET A	23A	24A	0.12	56.42					8171		2.83					11.9	8171	3.04	87.1	87.1			98.9	0.20	450	127.5	0.80	0.87	78%
CONDO ROAD S	CTRL 15A	24A	2.17	2.17		175		380	380							0.4	380	4.00	5.3	13.0			13.4	0.50	250	42.0	0.86	0.75	32%
STREET A	24A	25A	0.42	59.01					8551		2.83					12.4	8551	3.02	90.6	90.6			102.9	0.20	450	127.5	0.80	0.88	81%
STREET A	25A	26A		59.01					8551		2.83					12.4	8551	3.02	90.6	90.6			102.9	0.20	450	127.5	0.80	0.88	81%
STREET A	26A	27A		59.01					8551		2.83					12.4	8551	3.02	90.6	90.6			102.9	0.20	450	127.5	0.80	0.88	81%
STREET A	27A	28A		59.01					8551		2.83					12.4	8551	3.02	90.6	90.6			102.9	0.20	450	127.5	0.80	0.88	81%
NINTH LINE	28A	29A		59.01					8551		2.83					12.4	8551	3.02	90.6	90.6			102.9	0.20	450	127.5	0.80	0.88	81%
EXISTING NINTH LINE	*A*	*29A*						*10750*	*10750*								*10750*	*2.92*	*110.1*	*110.1*			*110.1*	*0.15*	*450*	*110.4*	*0.69*	*0.79*	*100%*
NINTH LINE	29A	30A		59.01					19301		2.83					12.4	19301	2.67	180.5	180.5			192.8	0.15	600	237.8	0.84	0.93	81%
NINTH LINE	30A	EX. MH		59.01					19301		2.83					12.4	19301	2.67	180.5	180.5			192.8	0.15	600	237.8	0.84	0.93	81%

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APPENDIX B

SWM POND CALCULATIONS

URBANTECH®

SWM DESIGN CALCULATIONS
HYRDO-0: Contributing Drainage Area and Land Use

Project Name: Derry - Britannia Developments Limited
Municipality: City of Mississauga
Project No.: 20-652
Date: 12-Apr-23

Prepared by: D.L.
Checked by: K.R.
Submission #: 2nd Submission

SWMF

Contributing Drainage Area

SWMF	Area [ha]	Runoff Coefficient	Imperviousness
			IMP
Condominium Apartments / Townhouses	17.21	0.65	64%
Apartments	1.65	0.9	100%
Future Residential	0.65	0.9	100%
Park	2.54	0.3	14%
School	2.84	0.9	100%
Right of way	3.58	0.9	100%
Total to HW (Development Area)	**28.47**		**71%**
Pond Block	**2.81**	**0.90**	100%
Total Drainage Area (Quality Control Only)	31.28		73%
Total Drainage Area (Quantity Control Only)	**31.28**		**73%**
Total Drainage Area to Pond	**31.28**		**73%**

URBANTECH®

SWM POND DESIGN CALCULATIONS
HYDRO-1: Hydrologic Modelling Parameters

Project Name: Derry - Britannia Developments Limited
Municipality: City of Mississauga
Project No.: 20-652
Date: 12/Apr/23

Prepared by: D.L.
Checked by: K.R.
Submission Number: 2nd Submission

Post-Development Area (ha)	Imperviousness
31.28	73%

Component	Unit Storage Volume (m^3/impe ha)	SWS Unit Release Rate (m^3/s/ha)	Corrected Unit Release Rate (m^3/s/ha)	Target Release Rate (m^3/s)
Permanent Pool	N/A	N/A	N/A	N/A
Quality Control	N/A	N/A	N/A	N/A
Extened Detention	275	0.002	0.002	0.063
2-yr	450	0.09	0.0024	0.075
5-yr	600	0.38	0.0102	0.319
100-yr	875	1.02	0.0275	0.860
Regional	1775	1.53	0.0412	1.289

Note: Storage volumes are measured from permanent pool and include extended detention volume of 275m3/imp ha.

*Note that Wood staff has indicated that the unit flow rates reported in Table 2.2.2 of the SWS were incorrectly labelled as “unit flow rates”; these were in fact “total flow rates for the modelled area to SWS Pond 294 (37.10 ha). Therefore, the actual / “corrected” unit flow rates are the Table 2.2.2 rates divided by 37.10.

SWM POND DESIGN CALCULATION
SWMF-1 TARGET SUMMARY

Project Name: Derry - Britannia Developments Limited
Municipality: City of Mississauga
Project No.: 20-652
Date: 28-Sep-23

Prepared by: D.L.
Checked by: K.R.
Submission #: 2nd Submission

SWMF

Pond Layout

Headwall(s)		
Number of Headwalls:	1	
Drainage Area to HW:	28.5	ha
Minor System Flows @ HW:	4.65	m^3/s

Elevation	Storm Event	Surface Area (m^2)	Incr. Volume (m^3)	Cumulative Volume (m^3)	Ex. Det. Volume (m^3)	Stacking Volume (m^3)
185.75	BOTTOM WET CELL	6436			0	0
185.80	--	6572	325	325	0	0
185.85	--	6709	332	657	0	0
185.90	--	6845	339	996	0	0
185.95	--	6982	346	1342	0	0
186.00	--	7118	352	1694	0	0
186.05	--	7254	359	2054	0	0
186.10	--	7391	366	2420	0	0
186.15	--	7527	373	2793	0	0
186.20	--	7663	380	3172	0	0
186.25	--	7800	387	3559	0	0
186.30	--	7936	393	3952	0	0
186.35	--	8073	400	4353	0	0
186.40	--	8209	407	4760	0	0
186.45	--	8345	414	5174	0	0
186.50	--	8482	421	5594	0	0
186.55	--	8618	428	6022	0	0
186.60	--	8755	434	6456	0	0
186.65	--	8891	441	6897	0	0
186.70	--	9027	448	7345	0	0
186.75	--	9164	455	7800	0	0
186.80	--	9300	462	8261	0	0
186.85	--	9437	468	8730	0	0
186.90	--	9573	475	9205	0	0
186.95	--	9709	482	9687	0	0
187.00	--	9846	489	10176	0	0
187.05	--	9982	496	10672	0	0
187.10	--	10118	503	11174	0	0
187.15	--	10255	509	11684	0	0
187.20	--	10391	516	12200	0	0
187.25	--	10528	523	12723	0	0
187.30	--	10664	530	13253	0	0
187.35	--	10800	537	13789	0	0
187.40	--	10937	543	14333	0	0
187.45	--	11073	550	14883	0	0
187.50	--	11210	557	15440	0	0
187.55	--	11346	564	16004	0	0
187.60	--	11564	573	16577	0	0
187.65	--	11783	584	17160	0	0
187.70	--	12001	595	17755	0	0
187.75	PERM POOL	12219	605	18360	0	0
187.80	--	12438	616	18977	616	0
187.85	--	12657	627	19604	1244	0
187.90	--	12875	638	20242	1882	0
187.95	--	13094	649	20892	2531	0
188.00	--	13183	657	21549	3188	0
188.05	--	13272	661	22210	3850	0
188.10	--	13361	666	22876	4515	0
188.15	--	13450	670	23546	5186	0
188.20	--	13539	675	24221	5860	0
188.25	EXT DET	13629	679	24900	6540	0
188.30	--	13718	684	25584	7223	684
188.35	--	13807	688	26272	7911	1372
188.40	--	13896	693	26964	8604	2064

SWM POND DESIGN CALCULATION
SWMF-1 TARGET SUMMARY

Project Name: Derry - Britannia Developments Limited
Municipality: City of Mississauga
Project No.: 20-652
Date: 28-Sep-23

Prepared by: D.L.
Checked by: K.R.
Submission #: 2nd Submission

SWMF

188.45	--	13985	697	27661	9301	2761
188.50	--	14074	701	28363	10003	3463
188.55	2-YR	14163	706	29069	10708	4169
188.60	--	14252	710	29779	11419	4879
188.65	--	14341	715	30494	12134	5594
188.70	--	14430	719	31213	12853	6313
188.75	--	14520	724	31937	13577	7037
188.80	5-YR	14609	728	32665	14305	7765
188.85	--	14698	733	33398	15038	8498
188.90	--	14787	737	34135	15775	9235
188.95	--	14876	742	34877	16516	9977
189.00	--	14965	746	35623	17262	10723
189.05	--	15054	750	36373	18013	11473
189.10	--	15143	755	37128	18768	12228
189.15	--	15232	759	37887	19527	12987
189.20	100-YR	15321	764	38651	20291	13751
189.25	--	15411	768	39420	21059	14520
189.30	--	15500	773	40192	21832	15292
189.35	--	15589	777	40969	22609	16069
189.40	--	15678	782	41751	23391	16851
189.45	--	15767	786	42537	24177	17637
189.50	--	15856	791	43328	24968	18428
189.55	--	15945	795	44123	25763	19223
189.60	--	16034	799	44922	26562	20022
189.65	--	16123	804	45726	27366	20826
189.70	--	16212	808	46535	28174	21635
189.75	--	16301	813	47348	28987	22448
189.80	--	16391	817	48165	29805	23265
189.85	--	16480	822	48987	30626	24087
189.90	--	16569	826	49813	31452	24913
189.95	--	16658	831	50643	32283	25743
190.00	--	16747	835	51479	33118	26579
190.05	--	16836	840	52318	33958	27418
190.10	--	16925	844	53162	34802	28262
190.15	--	17014	848	54011	35650	29111
190.20	--	17103	853	54864	36503	29964
190.25	--	17192	857	55721	37361	30821
190.30	--	17282	862	56583	38223	31683
190.35	--	17371	866	57449	39089	32549
190.40	--	17460	871	58320	39960	33420
190.45	--	17549	875	59195	40835	34295
190.50	--	17638	880	60075	41714	35175
190.55	REGIONAL	17727	884	60959	42599	36059
190.60	--	17815	889	61847	43487	36947
190.65	--	17903	893	62740	44380	37840
190.70	--	17991	897	63638	45277	38738
190.75	--	18080	902	64540	46179	39640
190.80	--	18168	906	65446	47085	40546
190.85	--	18256	911	66356	47996	41456
190.90	--	18344	915	67271	48911	42371
190.95	EMERGENCY	18432	919	68191	49830	43291

Note: Surface area and storage volume are generated from AutoCAD

SWM POND DESIGN CALCULATION
SWMF-1 TARGET SUMMARY

Project Name: Derry - Britannia Developments Limited
Municipality: City of Mississauga
Project No.: 20-652
Date: 28-Sep-23

Prepared by: D.L.
Checked by: K.R.
Submission #: 2nd Submission

SWMF

Design Target

Event	Discharge	
PERM POOL	-	
EXT DET	0.0002	$m^3/s/ha$
2 YR	0.0024	$m^3/s/ha$
5 YR	0.0102	$m^3/s/ha$
100 YR	0.0275	$m^3/s/ha$
REGIONAL	0.0412	$m^3/s/ha$

** Quantity storage tagets include extended detention storage.

Wet Pond *(REFER: MOECC Stormwater Management Planning and Design Manual 2003, Table 3.2)*

Impervious Level (%)	Water Quality Storage Vol m^3/ha	Extended Detention m^3/ha	Permanent Pool m^3/ha
55%	190	40	150
70%	225	40	185
85%	250	40	210

Interpolated Storage Requirement

73%	228	40	**188**

	Area [ha]	IMP%
Total Contributing Area	31.28	73%
Quantity Control Only	31.28	73%
Quality Control Only	31.28	73%

Return Period	Stage (m)	Target Discharge (m^3/s)	Unit Storage Volume (m3/Imp.ha)	Target Storage based on 31.28 ha @ 73 % IMP (m3)	Provided Volume (Active Storage) (m^3)	Provided Volume (Active storage+ED) (m^3)
PERM POOL	187.75	-	188	5882	18360	
EXT DET (275m^3/imp ha)	188.25	0.063	275	6313	6540	6540
2-YR	188.55	0.075	450	10330	4169	10708
5-YR	188.80	0.319	600	13774	7765	14305
100-YR	189.20	0.860	875	20087	13751	20291
REGIONAL	190.55	1.289	1775	40748	36059	42599
EMERGENCY	190.95				43291	49830

SWM POND DESIGN CALCULATIONS
SWMF-2: Drawdown Time

Project Name: Derry - Britannia Developments Limited
Municipality: City of Mississauga
Project No.: 20-652
Date: 12-Apr-23

Prepared by: D.L.
Checked by: K.R.
Submission Number: 2nd Submission

SWMF

Detention Time Calculations

$t = (0.66C_2h^{1.5}+2C_3h^{0.5})/2.75Ao$ *(MOECC Eq'n 4.11)*

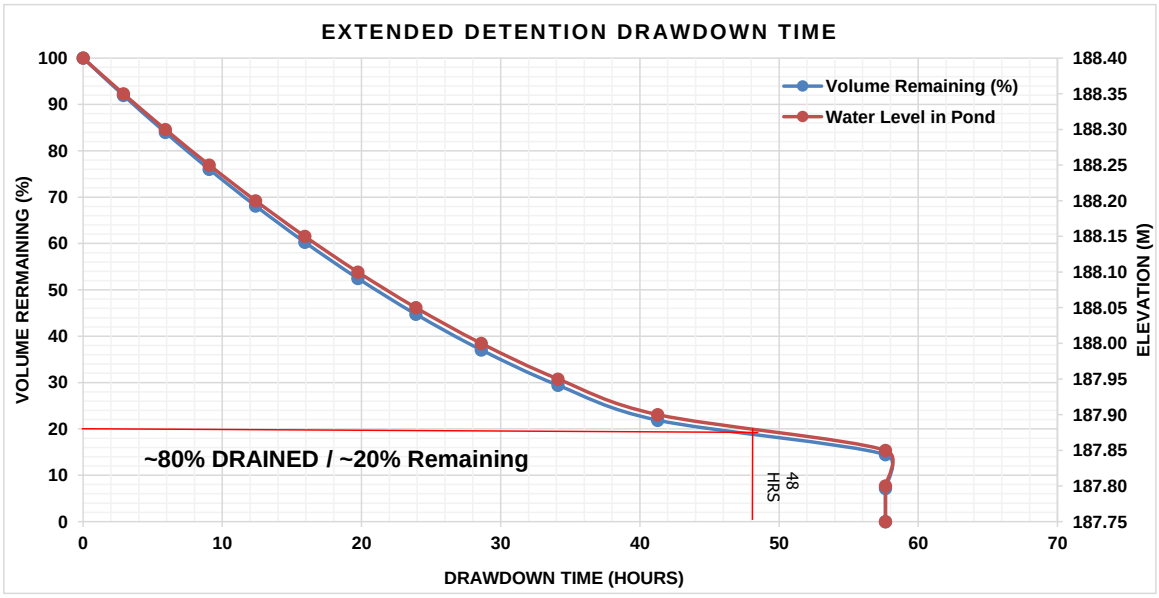
t= 174885	*Drawdown time in seconds*
t= 48.6	*Drawdown time in hours*
d= 0.205	*Diameter of the orifice (m)*
A_0= 0.0330	*Cross-sectional area of the orifice (m^2)*
h= 0.398	*Maximum water elevation above orifice (m)*
$Q_{ext\ det}$= 0.055	*Proposed extended detention release rate (m^3/s)*
Q_{target}= 0.063	*SWS Extended Detenion Target Release Rate*
C_2= 2819.15	*Slope coefficient from the area-depth linear regression*
C_3= 12219	*Intercept from the area-depth linear regression*

Pond area-depth relationship:

	Elevation (m)	Area (m^2)	Depth (m)
PERM POOL	187.75	12219	0.00
EXT DET	188.25	13629	0.50

The drawdown time for the SWMF is 48.6 hours (2 days)
The drawdown time is greater than the target of 48 hours.

From the graph below, after 48 hours, approximately 79.5% of the SWM Facility has drained.



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SWM POND DESIGN CALCULATIONS
SWMF-3: Sediment Forebay Sizing

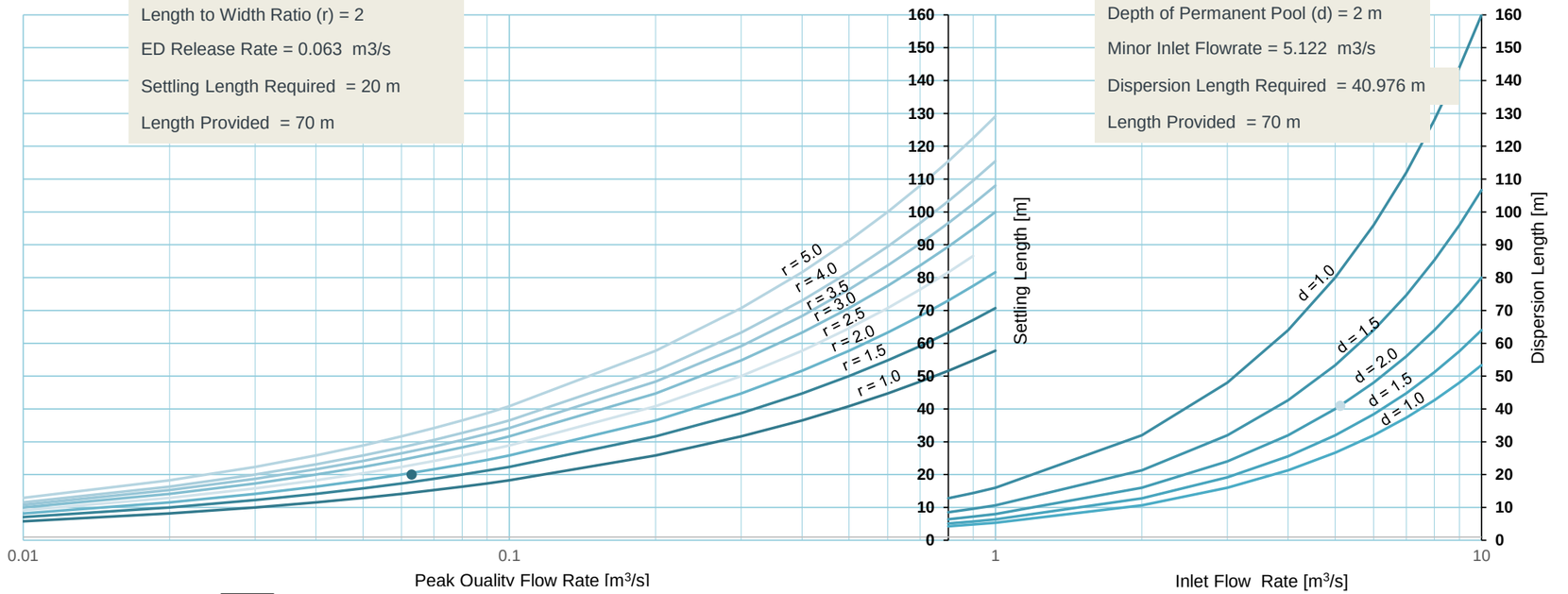
Project Name:	Derry - Britannia Developments Limited	Prepared by:	D.L.
Municipality:	City of Mississauga	Checked by:	K.R.
Project No.:	20-652	Submission:	2nd Submission
Date:	12/Apr/23		

Length to Width Ratio (r) = 2

ED Release Rate = 0.063 m3/s

Settling Length Required = 20 m

Length Provided = 70 m



$$Dist = \sqrt{\frac{r\,Q_p}{V_s}}$$

Equation 4.5: Forebay Settling Length

where Dist = forebay length (m)
r = length-to-width ratio of forebay
Q_p = peak flow rate from the pond during design quality storm
V_s = settling velocity (dependent on desired particle size to settle). It is recommended that a value of 0.0003 m/s be used in most cases.

Depth of Permanent Pool (d) = 2 m

Minor Inlet Flowrate = 5.122 m3/s

Dispersion Length Required = 40.976 m

Length Provided = 70 m

$$Dist = \frac{8Q}{dV_f}$$

Equation 4.6: Dispersion Length

where Dist = length of dispersion (m)
Q = inlet flowrate (m^3/s)
d = depth of the permanent pool in the forebay (m)
V_f = desired velocity in the forebay (m/s)

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SWM POND DESIGN CALCULATIONS
SWMF-4: Outlet Structure Calculation

Project Name: Derry - Britannia Developments Limited
Municipality: City of Mississauga
Project No.: 20-652
Date: 28-Sep-23

Prepared by: D.L.
Checked by: K.R.
Submission #: 2nd Submission

SWMF
OUTLET STRUCTURE CALCULAITONS (no tailwater)

Return Period	Elevation	Q_{TARGET}	$H_{EXT\ DET\ ORIFIC}$	H_{WEIR_1}	H_{WEIR_2}	H_{WEIR_3}	H_{WEIR_3}	$Q_{EXT\ DET}$	Q_{WEIR_1}	$Q_{ORIFICE\_1}$	Q_{WEIR_2}	$Q_{ORIFICE\_2}$	Q_{WEIR_3}	$Q_{ORIFICE\_3}$	Q_{WEIR_4}	$Q_{ORIFICE\_4}$	$Q_{TOTAL\_PROVIDED}$ VIA OPENINGS			
	[m]	[m^3/s]	[m]	[m]	[m]	[m]	[m]	[m^3/s]	[m^3/s]	[m^3/s]	[m^3/s]	[m^3/s]	[m^3/s]	[m^3/s]	[m^3/s]	[m^3/s]	[m^3/s]			
PERM POOL	187.75																			
EXT DET	188.25	0.063	0.390	0.000				0.063	0.00								0.063			
2 YR	188.55	0.075	0.690	0.300	0.000			0.084		0.01	0.00						0.097			
5 YR	188.80	0.319	0.940	0.550	0.250	0.000		0.098		0.02	0.10		0.00				0.220			
100 YR	189.20	0.860	1.340	0.950	0.650	0.400	0.000	0.117		0.03		0.42		0.08			0.641			
REG	190.55	1.289	2.690	2.300	2.000	1.750	1.350	0.166		0.04		0.88		0.17		0.03	1.288			
	190.60		2.740	2.350	2.050	1.800	1.400	0.167		0.04		0.89		0.18		0.03	1.306			
	190.65		2.790	2.400	2.100	1.850	1.450	0.169		0.04		0.90		0.18		0.03	1.323			
	190.70		2.840	2.450	2.150	1.900	1.500	0.170		0.04		0.92		0.18		0.03	1.340			

*Uncontrolled Regional Storm

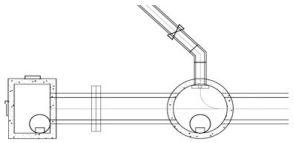
Rectangular Weir/Orifice-1	
Width(m):	Height(m):
0.10	0.10
INV.	188.25m

Rectangular Weir/Orifice-2	
Width(m):	Height(m):
0.50	0.50
INV.=	188.55m

Rectangular Weir/Orifice-3	
Width(m):	Height(m):
0.50	0.10
INV.=	188.80m

Rectangular Weir/Orifice-3	
Width(m):	Height(m):
0.10	0.10
INV.=	189.20m

Alternative Outlet to mitigate tailwater	
Area (m2)	1.1
Water Level (m)	190.55
Regional tailwater (m)	190.36
Orifice Capacity (m3/s)	1.28

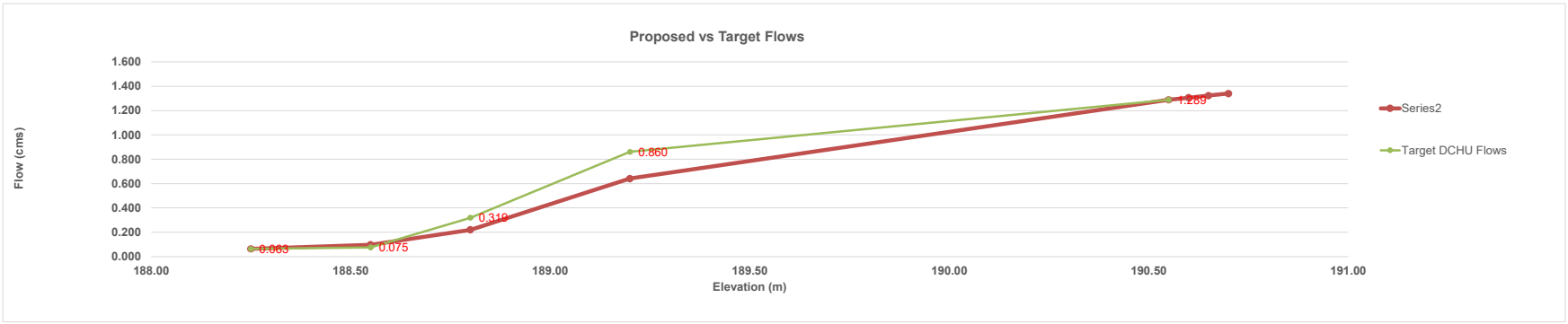


Conceptual Outlet Structure Schematic only

Extended Detention Orifice Plate	
Diameter (mm)	220
INV.=	187.75m

Outlet Pipe	
Diameter (mm)	525
INV.=	145.85m

Weir equation:	$Q = BxC_dxH^{3/2}$	$Q = BxC_dxH^{3/2}$	
where:	*q=flow rate (m^3/s)*	*q=flow rate (m^3/s)*	Cd = 1.65
	h= head on the weir (m)	*h= head on the weir (m)*	*g=9.81 (m/s^2) gravity*
	b=width of the weir (m)	*b=width of the weir (m)*	*C_d = coefficient of discharge*
Orifice equation:	$Q = C_dxAx(2gH)^{0.5}$	$Q = C_dxAx(2gH)^{0.5}$	
where:	*q=flow rate (m^3/s)*	*q=flow rate (m^3/s)*	C_d = 0.6, A=(1/4*π*D^2)
	h= head on the weir (m)	*h= head on the weir (m)*	*g=9.81 (m/s^2) gravity*
	a= area of orifice (m^2)	*a= area of orifice (m^2)*	*C_d = coefficient of discharge*



Urbantech Consulting, A Division of Leighton-Zec Ltd.25 Royal Crest Court, Suite 201 Markham, Ontario L3R 9X4TEL: 905.946.9461 FAX: 905.946.9595**www.urbantech.com**

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Nov 26 2021

20 ROW Capacity Calculation

User-defined

Invert Elev (m)	= 195.4900
Slope (%)	= 0.4000
N-Value	= Composite

Calculations

Compute by:	Q vs Depth
No. Increments	= 20

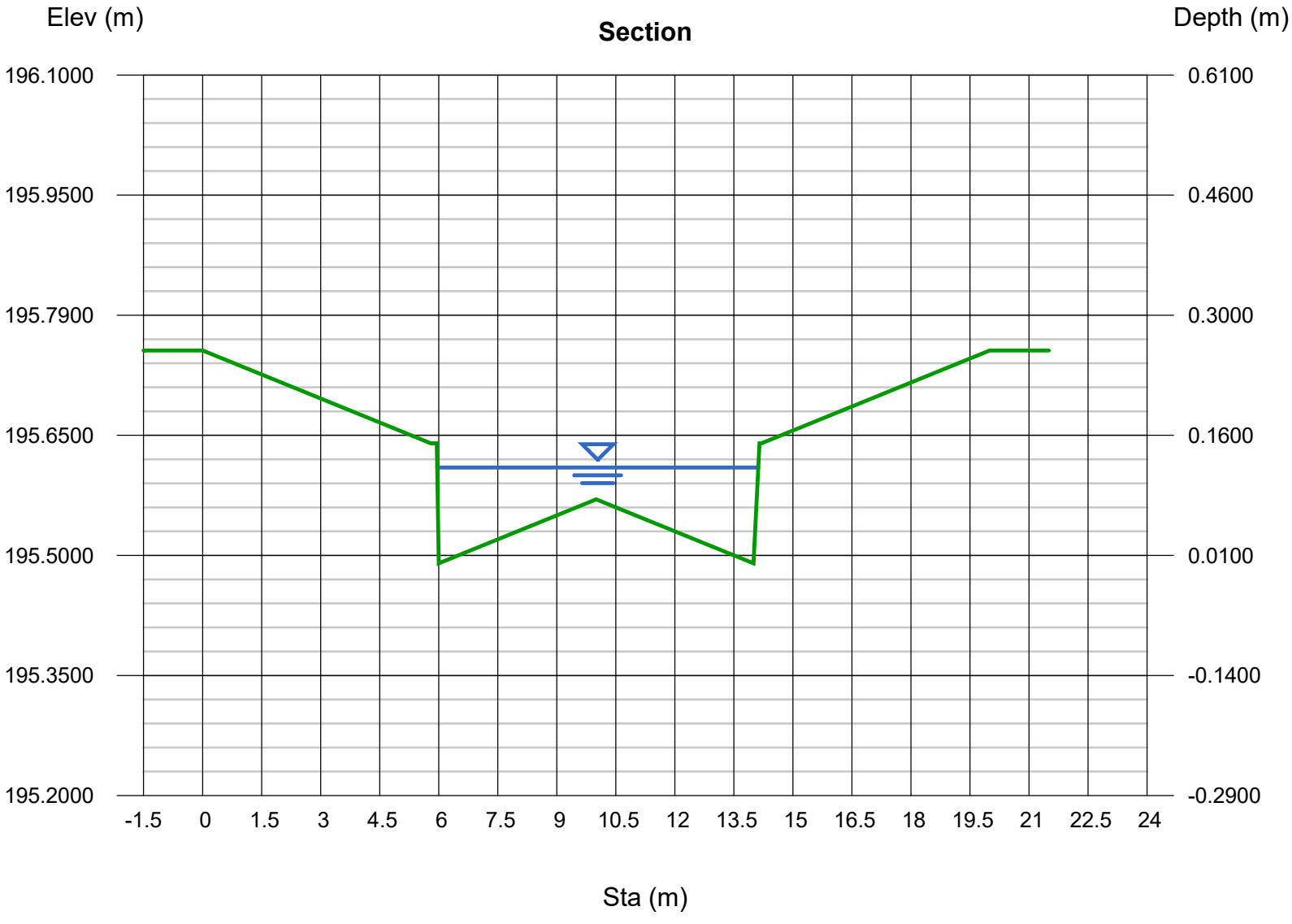
Highlighted

Depth (m)	= 0.1197
Q (cms)	= 0.5757
Area (sqm)	= 0.6471
Velocity (m/s)	= 0.8897
Wetted Perim (m)	= 8.2970
Crit Depth, Yc (m)	= 0.1219
Top Width (m)	= 8.1596
EGL (m)	= 0.1601

(Sta, El, n)-(Sta, El, n)...

(0.0000, 195.7560)-(5.8000, 195.6400, 0.013)-(5.9500, 195.6400, 0.013)-(6.0000, 195.4900, 0.013)-(10.0000, 195.5700, 0.013)-(14.0000, 195.4900, 0.013)-(14.150
-(14.2000, 195.6400, 0.013)-(20.0000, 195.7560, 0.013)

The maximum flow on the road will be 0.516 m^3/s, which is the 100-10year flow and will be captured at Point 100yr-4 shown on Drawing 5.2B



Depth	Q	Area	Veloc	Wp	Yc	TopWidth
(m)	(cms)	(sqm)	(m/s)	(m)	(m)	(m)
0.0133	0.002	0.009	0.1709	1.3633	0.0122	1.3480
0.0266	0.010	0.036	0.2714	2.7267	0.0244	2.6959
0.0399	0.029	0.081	0.3557	4.0900	0.0366	4.0439
0.0532	0.062	0.143	0.4309	5.4533	0.0518	5.3919
0.0665	0.112	0.224	0.5000	6.8167	0.0640	6.7398
0.0798	0.182	0.323	0.5646	8.1781	0.0792	8.0859
0.0931	0.293	0.431	0.6815	8.2314	0.0914	8.1241
0.1064	0.425	0.539	0.7893	8.2642	0.1067	8.1419
0.1197	0.576	0.647	0.8897	8.2970	0.1219	8.1596
0.1330	0.744	0.756	0.9841	8.3299	0.1372	8.1773
0.1463	0.928	0.865	1.0737	8.3627	0.1524	8.1951
0.1596	1.049	0.980	1.0699	9.5320	0.1676	9.3600
0.1729	1.189	1.114	1.0677	10.8625	0.1798	10.6902
0.1862	1.361	1.265	1.0760	12.1930	0.1920	12.0205
0.1995	1.565	1.433	1.0917	13.5235	0.2073	13.3507
0.2128	1.802	1.620	1.1125	14.8522	0.2195	14.6791
0.2261	2.074	1.824	1.1372	16.1827	0.2347	16.0093
0.2394	2.382	2.045	1.1647	17.5132	0.2499	17.3395
0.2527	2.729	2.285	1.1942	18.8437	0.2621	18.6698
0.2660	3.115	2.542	1.2252	20.1742	0.2660	20.0000

Energy
(m)
0.0148
0.0304
0.0464
0.0627
0.0793
0.0961
0.1168
0.1382
0.1601
0.1824
0.2051
0.2180
0.2310
0.2452
0.2603
0.2759
0.2921
0.3086
0.3254
0.3426

APPENDIX C

LID CALCULATIONS

SWM DESIGN CALCULATIONS
SWM-01: 5 mm Retention Calculation

Project Name: Derry-Britannia Development
Municipality: City of Mississauga
Project No.: 20-652
Date: 10-Apr-23

Prepared by: D.L.
Checked by: K.R
Submission #: 2nd Submission

Retention Calculation based on Additional 150 mm Top Soil

Lot Type	Number of Lots[1]	Lot Area (m^2)	Pervious Area[2] (m^2)	Impervious Area (m^2)	Cumulative Lot Area (m^2)	Cumulative Pervious Area Area (m^2)	Cumulative Impervious Area (m^2)
35' Lot (Rear Lane Detached)	27	225	112	112	6067	3033	3033
21' Lot (Dual Frontage Townhouse)	75	95	34	61	7053	2519	4534
21' Lot (back-to-back Townhouse)	212	97	35	62	20488	7317	13171
20' (Street Townhouse)	289	147	53	95	42483	15173	27311
20' (Rear lane Townhouse)	28	118	42	76	3303	1180	2124
Appartments	2	8250	0	8250	16500	0	16500
Total	633	8931	275	8656	95894	29222	66672

[1]The number of lots are based on the Draft Plan by GSAI Inc. dated on February 17, 2023
[2]Pervious areas are calculated based on runoff coefficient in the City of Mississauga's Secion 8 - Storm Drainage Design Requirements

A =	Total Site Area (ha)	31.28	ha
Imp. =	Total Sites Imperviousness	73	%
$A_{imp.}$ =	Total Impervious Area (ha)	22.83	ha
S =	5mm Required Storage	5	mm
V =	Total Required Retention Volume	1142	m^3
t =	Retention Time	48	hours

D_s =	Proposed Additional Top Soil Depth	0.15	m
n =	Assumed Porosity	0.4	
A_p =	Total Pervious Lot Area	29222	m^2
R_s =	Total Retention in Topsoil	1753	m^3

Total Retention Depth for the Entire Site **7.7 mm**

SWM DESIGN CALCULATIONS
ADDITIONAL LID: INFILTRATION TRENCH

URBANTECH

Project Name: Derry-Britannia Development
Municipality: City of Mississauga
Project No.: 20-652
Date: 2023-03-27

Prepared by: D.L.
Checked by: K.R
Submission # 2nd Submission

TABLE: LID PERFORMANCE AND ON-SITE RETENTION[1]

LID TYPE	TOTAL LID CAPTURE AREA (m^2)	TOTAL LID LENGTH (m)	TOTAL LID SURFACE AREA[2] (m^2)	MAX. LID DEPTH[3] (m)	PROPOSED LID DEPTH (m)	TOTAL LID VOL[4] (m^3)	TOTAL STORAGE VOL[5] (m^3)	EQUIV RAINFALL DEPTH[6] (mm)	% of Total Annual Rainfall Depth Captured[7]
Soakaway Pits	13300	998	751		1.2	901	360	27.1	95.2
Re-Use (High Density Blocks)	16500						82.0	5.0	46.7
Rear Yard Infiltration Trench	63995	2073	3214		1.5	4660	1864	29.1	95.7
Greenstorm (School and Public Parks)	53500						2100	39.3	100.0
						Total	**4406**	**m^3**	

[1]The LID trench is included in meeting the targets for 27mm as demonstrated in FSR Section 5.3

[2]Refer to Dwg 5.3 for LID Details

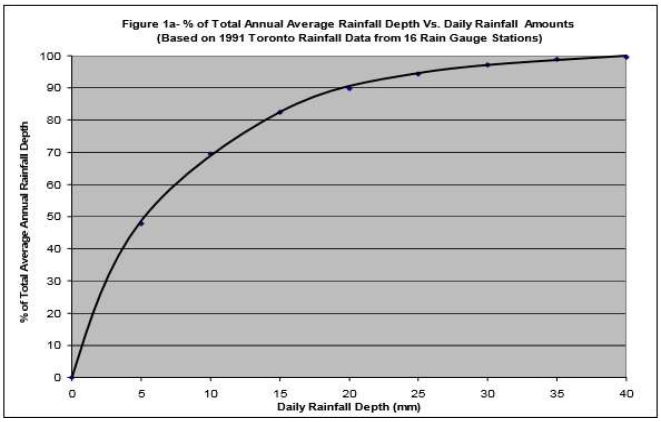
[3]Proposed LID Depth is assumed based on typical trench depth

[4]Total LID Volume = Total LID Surface Area x Proposed LID Depth

[5]Total LID Storage Volume = Total LID Volume x 0.40 (Porosity)

[6]Equivalent Rainfall Depth = Total LID Storage Volume / Total LID Capture Area

[7]% Total Annual Rainfall Depth Captured is y-value using "Equivalent Rainfall Depth" as x-value as input in dervied non-linear relationship from Figure 1a included below



A =	Total Site Area (ha)	31.28	ha
Imp. =	Total Sites Imperviousness	73	%
$A_{imp.}$ =	Total Impervious Area (ha)	22.83	ha
D_{req} =	Runoff Depth Capture Required (mm)	27	mm
V_{req} =	Runoff Volume Capture Required	6164	m^3

V_{tot} =	Total Volume Provided	4406	m^3	See above for calculation
Total Equialent Runoff Capture Provided for the Entire Site =		**19.3**	**mm**	(in addition to runoff capture from topsoil)

APPENDIX D

DRAWINGS

APPENDIX E

HYDROLOGICAL MODEL VALIDATION

Flow Comparison Tables

Project Name: Derry - Britannia Developments Limited
Municipality: City of Mississauga
Project No.: 20-652
Date: 10-Apr-23

Prepared by: D.L.
Checked by: K.R.
Submission #: 2nd Submission

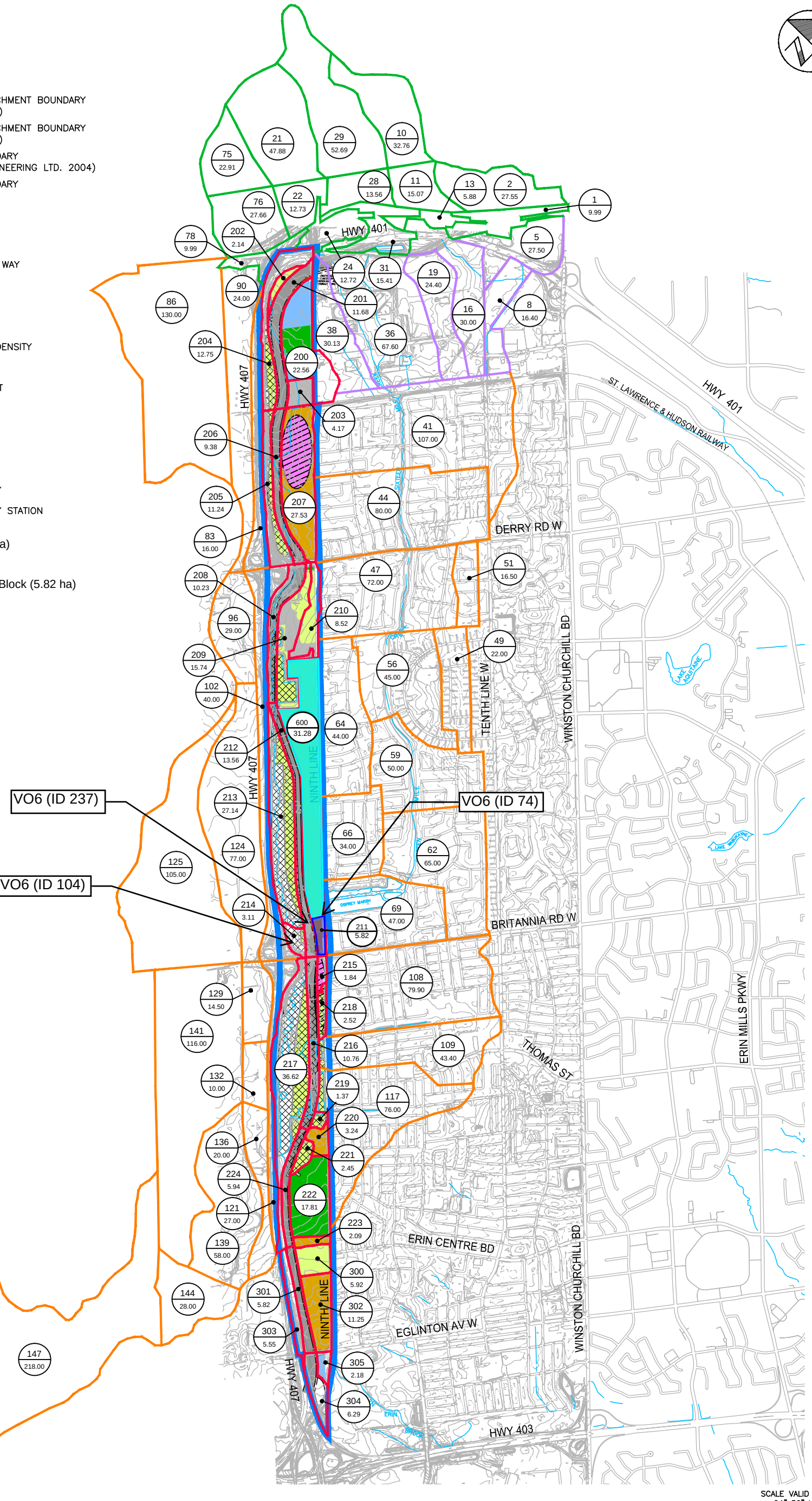
VO ID 237 (Downstream of Pond)	VO Flow Results [m3/s]											
	Future NoSWM Ex Reg Control AMC III			Future NoSWM All ExSWM AMC II			Future SWM Ex Reg Control AMC III			Future SWM All SWM AMC II		
	2B	5B	5B - 2B	2C	5C	5C - 2C	3B	6B	6B - 3B	3C	6C	6C - 3C
	Original	Updated	Difference	Original	Updated	Difference	Original	Updated	Difference	Original	Updated	Difference
2-YR				3.644	4.047	0.403				0.471	1.144	0.673
5-YR				5.371	5.937	0.566				0.803	1.761	0.958
10-YR				7.296	7.907	0.611				1.182	2.359	1.177
25-YR				8.781	9.945	1.164				1.674	2.910	1.236
50-YR				10.139	11.414	1.275				2.188	3.473	1.285
100-YR				12.367	13.163	0.796				2.787	4.237	1.450
REGIONAL	7.098	7.118	0.020	5.232	6.858	1.626	3.626	3.682	0.056	3.469	3.519	0.050

VO ID 74 (Sixteen Mille Creek - East)	VO Flow Results [m3/s]											
	Future NoSWM Ex Reg Control AMC III			Future NoSWM All ExSWM AMC II			Future SWM Ex Reg Control AMC III			Future SWM All SWM AMC II		
	2B	5B	5B - 2B	2C	5C	5C - 2C	3B	6B	6B - 3B	3C	6C	6C - 3C
	Original	Updated	Difference	Original	Updated	Difference	Original	Updated	Difference	Original	Updated	Difference
2-YR				4.161	4.502	0.341				3.775	3.760	-0.015
5-YR				7.356	7.354	-0.002				7.389	7.360	-0.029
10-YR				12.603	12.600	-0.003				12.782	12.693	-0.089
25-YR				18.334	18.326	-0.008				18.639	18.511	-0.128
50-YR				24.046	24.020	-0.026				24.468	24.280	-0.188
100-YR				30.887	30.882	-0.005				31.349	31.118	-0.231
REGIONAL	103.807	103.772	-0.035	72.269	72.243	-0.026	101.798	101.625	-0.173	72.892	72.355	-0.537

VO ID 104 (Sixteen Mille Creek - East and West)	VO Flow Results [m3/s]											
	Future NoSWM Ex Reg Control AMC III			Future NoSWM All ExSWM AMC II			Future SWM Ex Reg Control AMC III			Future SWM All SWM AMC II		
	2B	5B	5B - 2B	2C	5C	5C - 2C	3B	6B	6B - 3B	3C	6C	6C - 3C
	Original	Updated	Difference	Original	Updated	Difference	Original	Updated	Difference	Original	Updated	Difference
2-YR				6.730	7.024	0.294				5.591	5.588	-0.003
5-YR				11.526	11.525	-0.001				11.277	11.243	-0.034
10-YR				19.616	19.609	-0.007				19.472	19.378	-0.094
25-YR				27.908	27.891	-0.017				27.827	27.692	-0.135
50-YR				36.252	36.199	-0.053				36.168	35.980	-0.188
100-YR				45.910	45.904	-0.006				45.829	45.597	-0.232
REGIONAL	147.560	147.543	-0.017	111.120	111.078	-0.042	142.176	141.996	-0.180	109.727	109.185	-0.542

LEGEND

- STUDY AREA
- EXISTING ROADWAY
- WATERCOURSE
- CONTOUR (1m)
- APPROXIMATE SUBCATCHMENT BOUNDARY (AS PER DILLON 1996)
- APPROXIMATE SUBCATCHMENT BOUNDARY (AS PER DILLON 2000)
- SUBCATCHMENT BOUNDARY (AS PER PHILIPS ENGINEERING LTD. 2004)
- SUBCATCHMENT BOUNDARY (FUTURE CONDITIONS)
- SUBCATCHMENT ID# (e.g. 100)
- SUBCATCHMENT AREA (e.g. 25.00)
- TRANSITWAY RIGHT OF WAY
- 14m SETBACK
- 407 RIGHT OF WAY
- PROPOSED TRAIL
- RESIDENTIAL MEDIUM DENSITY
- MIXED USE
- BUSINESS EMPLOYMENT
- PUBLIC OPEN SPACE
- GREENLANDS
- UTILITY
- NATURAL HAZARDS
- PROPOSED TRANSITWAY
- PROPOSED TRANSITWAY STATION
- Subject Site (31.28 ha)
- Future Development Block (5.82 ha)



SCALE VALID ONLY FOR 24"x36" VERSION

NINTH LINE SCOPED SUBWATERSHED STUDY CITY OF MISSISSAUGA	VisualOTTHYMO SUBCATCHMENT BOUNDARY PLAN (FUTURE CONDITIONS)	amec foster wheeler	Scale 1:16000 (0 125 250 500) Consultant File No. TP114008 Figure No. WR1

Path: P:\Work\TP114008\Water\dwg\16-12 (catchment-fut)\DwgWR1 CatchmentMerge(Fut).dwg
Last Saved By: richard.bartolo Plotted: 2016-12-14 Plotted By: richard.bartolo
Last Saved: 2016-12-13

APPENDIX F

WATER & WASTEWATER CALCULATIONS

Municipal Engineering Solutions

April 19, 2023 Project No. 17003-54

Sent via email
Derry Britannia Developments Ltd.
Attn: Mr. Craig Scarlett
Mattamy Homes
c/o Urbantech Consulting
3760 14th Avenue, Suite 301
Markham, ON L3R 3T7

Subject: Derry Britannia Development
Water and Wastewater Calculations
City of Mississauga, Region of Peel

Dear Mr. Scarlett,

Municipal Engineering Solutions ("MES") was retained by Derry Britannia Developments Ltd. to calculate the water demands and sanitary flow for the proposed Derry Britannia Development in the City of Mississauga (Region of Peel). As part of this assignment MES was requested to calculate the flow requirements for the proposed development using Region of Peel, Fire Underwriters Survey, provincial and industry design standards to complete the Region's Water and Wastewater Modelling Demand Table.

Development Background

The development site is located on the west side of Ninth Line, between Britannia Road West and Derry Road West in the City of Mississauga. The development consists of townhouses, two residential apartment buildings and an elementary school. The development will have a total of 823 townhouses and 400 apartment units.

The development is located within two water pressure zones. The southern part of the development is in water Zone 4A and the northern part of the development is in water Zone 5A, divided at approximately Saratoga Way. The proposed water connection for Zone 4A will be from the existing 300 mm watermain on Ninth Line at Osprey Boulevard. Two proposed water connections for Zone 5A will be from the existing 300 mm watermain on Beacham Street (extended along Ninth Line to the development) and from the existing 150 mm watermain on Doug Leavens Boulevard.

The proposed sanitary connection will be to the existing 900 mm sanitary sewer along Ninth Line south of Osprey Boulevard.

55 Gilbank Drive, Aurora, Ontario L4G 6H9
Tel: 905.726.1016 Cell: 416.434.0186 Fax: 905.726.1225

Equivalent Population Serviced

To calculate the equivalent population for the proposed development MES used population densities outlined in the Region of Peel "*Water and Wastewater Modelling Demand Table, January 2023*" and "*Sanitary Sewer Design Criteria, March 2017*". **Table 1** summarizes the residential and institutional population densities.

Table 1 – Equivalent Population Density

Type of Development	Equivalent Population Density
Apartments	3.00 People/unit
Townhouse	3.40 People/unit
School	½ x number of students *

Source: Region of Peel Water and Wastewater Medelling Demand Table (January 2023)
*Source: Region of Peel Sanitary Seewer Design Criteria (March 2017)
600 students minimum for Junior Public Schools and 900 students minimum for Senior Public Schools

The equivalent population for the site was calculated to be 4448 people. Detailed calculations are attached.

Domestic Water Usage

The domestic water demands for the development were calculated using the design criteria outlined in the Region of Peel "*Watermain Design Criteria, June 2010*". **Table 2** summarizes the average daily demand and peaking factors used for this analysis.

Table 2 - Water Design Factors

Type of Development	Average Daily Demand	Maximum Daily Demand Peaking Factor	Peak Hourly Demand Peaking Factor
Residential	280 L/capita/day	2.0	3.0
Institutional	300 L/capita/day	1.4	3.0

Source: Region of Peel Watermain Design Criteria, 2010

Utilizing the equivalent population data from Table 1 and the corresponding Maximum Day and Peak Hour data from Table 2 the water demands for this development were calculated. The calculated demands for the development are summarized in **Table 3**. Detailed water demand calculations are attached.

Table 3 – Water Demand for the Derry Britannia Development

	Average Day Demand (L/s)	Maximum Day Demand (L/s)	Peak Hour Demand (L/s)
Water Demands Zone 4A (Residential and ICI)	4.05	8.11	12.16
Water Demands Zone 5A (Residential and ICI)	10.46	19.99	31.39

Fire Flow Demands

The fire demands for the development were calculated using the Fire Underwriters Survey ("FUS") formula outlined in the *'Water Supply For Public Fire Protection Guideline',* dated 2020. The minimum required fire flow for each area of the development is shown in **Table 4**. Detailed calculations are attached.

Table 4 - Fire Flow Requirements

Type of Development	Fire Flow (L/s)
Row Townhouses	350
Back to Back Townhouses	300
Apartments	233
School	217

Source: Fire Underwriters Survey, 2020

As noted, the fire flow in Table 4 above was calculated using the FUS formula. **Table 5** below summarizes the criteria utilized to calculate the fire flow requirements as well as the assumptions made. These minimum fire flow requirements are estimates only as the buildings have not yet been designed.

The townhouse blocks are assumed to be of wood-frame construction with no sprinklers. Fire walls will be required for every 600 m^2 footprint of the building. Should additional fire walls be included in the units then only firewalls with a fire resistive rating of 2 or more hours as per the current edition of the National Building Code of Canada would be considered to reduce the required fire flow for the buildings.

The apartment buildings are assumed to be of fire-resistive construction and fully sprinklered. Any townhouses attached to or within these buildings are assumed to be of the same construction, fire-resistive and fully sprinklered. The school is assumed to be of non-combustible construction with a fully supervised sprinkler system. The building areas for these buildings are not yet know and are estimated.

Once the detailed design data (specifics) for these building(s) are finalized the assumptions noted in Table 5 and in the FUS calculation must be reviewed and confirmed by the appropriate designer and any design/criteria changes required are to be reported to MES.

Table 5 – FUS Criteria/Assumptions

	Type of Development		
	Townhouses	**Apartments**	**School**
Type of Construction	**Wood Frame Construction**	**Fire-Resistive Construction**	**Non Combustible Construction**
Occupancy Type	**Limited Combustible**	**Limited Combustible**	**Limited Combustible**
Fire Protection (Sprinkler/Firewalls)	**2-hour rated firewall every 600m² of footprint**	**Fully Sprinklered (Unsupervised)**	**Fully Sprinklered (Supervised)**
Area Considered	**Townhouses** Total Effective Area for each building is the area between firewalls. Assume a 3 storey townhouses, 1800 m^2 between firewalls: Total Building Area 1,800 m^2 Effective Area (FUS) 1,800 m^2	**Apartments** Total Effective Area for each building is calculated as the largest two adjoining floors plus 50% of any floors immediately above them up to a maximum of eight. Assume a 10 storey apartment building with 60% lot coverage: Total Building Area 49,200 m^2 Effective Area (FUS) 29,520 m^2	**School** Total Effective Area for the building is calculated as the largest two adjoining floors plus 50% of any floors immediately above them up to a maximum of eight. Assume a 3 storey school with 40% lot coverage: Total Building Area 33,960 m^2 Effective Area (FUS) 28,300 m^2

Note: For Additional Information on FUS Criteria Refer to Water Supply for Public Protection Guide, Fire Underwriters Survey, 2020

Hydrant Test

Hydrant tests were performed along Ninth Line on July 19th, 2022 by Watermark Solutions Ltd. The results of the hydrant tests are attached.

The results of the hydrant test indicate that the theoretical available fire flow at 140 kPa (20 psi) from the existing hydrants is approximately 197 L/s (3,116 USgpm) for Zone 4A and 196 L/s (3,109 USgpm) for Zone 5A. The available flows at the proposed hydrants within the development have not been calculated.

Watermain Hydraulic Modelling

The intent of this report is to complete the Region's Water and Wastewater Modelling Demand Table. It should be noted that water hydraulic modeling will be required within the development to ensure that the required fire flows are met at the proposed hydrants within the development.

The observed flows from the hydrant tests (196 L/s at 20 psi) are lower than the maximum day plus fire flow requirements for the development (358-370 L/s at 20 psi). Depending on the final design of the buildings, modifications to the design of the buildings may be required to reduce the fire flow required for those buildings, such as the addition of firewalls or a sprinkler system.

Given the low fire flows available for this development for these types of buildings, the required fire flows for each of the buildings must be discussed and confirmed by the Region.

Sanitary Sewer Flow

The sanitary flow for the development was calculated using the design criteria outlined in the Region of Peel "*Sanitary Sewer Design Criteria, March 2017*". **Table 6** summarizes the sanitary flow and infiltration allowance used for this analysis.

Table 6 - Sanitary Design Factors

Type of Development	Sewage Flow
Domestic Sewage Flow	302.8 L/capita/day
Peak Flow Factor	Harmon Formula
Infiltration	0.0002 m^3/sec/Ha

The sanitary flow rate for this development was taken from STD. DWG. 2-9-2 in the Sanitary Sewer Design Criteria, utilizing the equivalent population rounded up to the next value in the table (4500 people). The infiltration allowance was then added to this value, based on the total site area of 27.6 Ha. The calculated sanitary flow for the development is summarized in **Table 7**. Detailed sanitary flow calculations are attached.

Table 7 – Total Sanitary Flow

	Sanitary Flow (L/s)
Total Sanitary Sewer Effluent	57.32

Conclusions/Recommendations

Please see the Region's Water and Wastewater Modelling Demand Tables attached for the projected water and sanitary flow rates for the proposed development. A Modelling Demand Table has been created for each of the two water pressure areas; Zone 4A and Zone 5A.

Once the building designs have been finalized the required fire flow for each building will need to be verified to determine the minimum required fire flow for the development as per the Fire Underwriters Survey. The

required fire flows for this site must be discussed and confirmed by the Region. Regardless, buildings will need to be designed to suit the fire flow available to the site.

Watermain hydraulic modelling will be required for the internal watermains to ensure that the minimum required fire flows can be met at each of the hydrants within the development.

We trust you find this report satisfactory. Should you have any questions or require further clarification, please call.

Yours truly,

Municipal Engineering Solutions

Kristin St-Jean, P.Eng.

/KS

Attachments:

Region of Peel Design Criteria
Fire Underwriters Survey (FUS) Calculations
Water and Wastewater Modelling Demand Table (Zone 4A)
Hydrant Test Results (Zone 4A)
Domestic Water Usage Calculations (Zone 4A)
Water and Wastewater Modelling Demand Table (Zone 5A)
Hydrant Test Results (Zone 5A)
Domestic Water Usage Calculations (Zone 5A)
Sanitary Sewer Flow Calculations

Region of Peel Design Criteria

Watermain Design Criteria, June 2010 (unless otherwise stated)

Equivalent Population by Unit

Type of Development	Equivalent Population Density *(Person/Unit)*
Apartments	3.00
Townhouses	3.40

Source: Region of Peel Water and Wastewater Modelling Demand Table, January 2023

Equivalent Population by Area

Type of Development	Equivalent Population Density *(Persons/Ha)*
Senior Public School	900 students minimum
Senior Public School (Equiv. Pop Sanitary)	1/2 x number of students

Source: Region of Peel Sanitary Sewer Design Criteria, March 2017

Water Design Factors

Residential	
Average Daily Demand (L/person/day)	280
Maximum Day Factor	2.0
Peak Hour Factor	3.0
Industrial, Commercial and Institutional (ICI)	
Average Daily Demand (L/person/day)	300
Maximum Day Factor	1.4
Peak Hour Factor	3.0

Sanitary Design Factors

Design Flow	Sewage Flow
Domestic Sewage Flow	302.8 L/capita/day
Peak Flow Factor	Harmon Formula
Domestic Sewage Flow (<1000 persons)	0.013 m^3/sec
Infiltration by Hectare	0.0002 m^3/sec/Ha

Source: Region of Peel Sanitary Sewer Design Criteria, March 2017

Calculations are based on "Water Supply for Public Fire Protection Guide" by Fire Underwriters Survey Dated 2020

Municipal Engineering Solutions

FUS CALCULATION

Project:	Derry Britannia Development	**Building Type/Block #**	Townhouses
Project Number:	17003-54	**Firewalls/Sprinkler:**	None
Project Location:	Region of Peel (Mississauga)	**Number of Units/Unit #'s**	
Date:	April 2023		

1.0 FUS Formula

$$RFF = 220C\sqrt{A}$$

where: RFF = required fire flow in litres per minute;
C = the Coefficient related to the type of construction; and
A = the Total Effective Floor Area (m^2) excluding basements at least 50% below grade) [a]

NBC Occupancy	Group C	
Type of Construction [b]	Wood Frame Construction	Type V
Protection (for C below 1.0)	na	
Footprint area	600.0	sq. metres
Storeys	3	
C =	1.5	
A =	1800.0	Total Effective Area [a]
F =	**14000**	**L/min** (rounded)

2.0 Occupancy Adjustment

Type of Occupancy [c]	Limited Combustible	
Hazard Allowance	-0.15	
	-2100	L/min
Adjusted Fire Flow	**11900**	**L/min**

3.0 Sprinkler Adjustment

		Credit	Total
NFPA 13 sprinkler standard	NO	0%	0%
Standard Water Supply	NO	0%	
Fully Supervised system	NO	0%	

Sprinkler Credit **0 L/min**

4.0 Exposure Adjustment

Construction Type of the Exposed Building Face: Type V

		Percent	Total*
North Side			
Distance to Building (m)	0 to 3	25%	75%
Length (ft) by height in storeys	na		
South Side			
Distance to Building (m)	0 to 3	25%	
Length (ft) by height in storeys	na		
East Side			
Distance to Building (m)	10.1 to 20	15%	
Length (ft) by height in storeys	na		
West Side			
Distance to Building (m)	10.1 to 20	15%	
Length (ft) by height in storeys	na		

*max 75%

Exposures Surcharge **8930 L/min**

Total Required Fire Flow (rounded)	**21000**	**L/min**
	350	**L/sec**

a) For buildings with a construction coefficient from 1.0 to 1.5, consider 100% of all floor areas. For buildings with a construction coefficient below 1.0 (vertical openings are inadequately protected), consider the two largest adjoining floors plus 50% of each of any floors immediately above them up to a maximum of eight. If the vertical openings and exterior vertical communications are properly protected, consider only the area of the largest floor plus 25% of each of the two immediately adjoining floors.

b) Wood Frame=1.5, Mass Timber= 0.8 to 1.5, Ordinary=1.0, Noncombustible=0.8, Fire-Resistive=0.6

c) Noncombustible=-25%, Limited Combustible=-15%, Combustible=0%, Free Burning=+15%, Rapid Burning=+25%

55 Gilbank Drive, Aurora, Ontario L4G 6H9
Tel: 905.726.1016 Cell: 416.434.0186 Fax: 905.726.1225

Calculations are based on "Water Supply for Public Fire Protection Guide" by Fire Underwriters Survey Dated 2020

Municipal Engineering Solutions

FUS CALCULATION

Project:	Derry Britannia Development	**Building Type/Block #**	Back to Back Townhouses
Project Number:	17003-54	**Firewalls/Sprinkler:**	Firewall every 600 sq.m footprint
Project Location:	Region of Peel (Mississauga)	**Number of Units/Unit #'s**	
Date:	April 2023		

1.0 FUS Formula

$$RFF = 220C\sqrt{A}$$

where: RFF = required fire flow in litres per minute;
C = the Coefficient related to the type of construction; and
A = the Total Effective Floor Area (m^2) excluding basements at least 50% below grade) [a]

NBC Occupancy	Group C	
Type of Construction [b]	Wood Frame Construction	Type V
Protection (for C below 1.0)	na	
Footprint area	600.0	sq. metres
Storeys	3	
C =	1.5	
A =	1800.0	Total Effective Area [a]
F =	**14000**	**L/min** (rounded)

2.0 Occupancy Adjustment

Type of Occupancy [c]	Limited Combustible	
Hazard Allowance	-0.15	
	-2100	L/min
Adjusted Fire Flow	**11900**	**L/min**

3.0 Sprinkler Adjustment

		Credit	Total
NFPA 13 sprinkler standard	NO	0%	0%
Standard Water Supply	NO	0%	
Fully Supervised system	NO	0%	

Sprinkler Credit **0 L/min**

4.0 Exposure Adjustment

Construction Type of the Exposed Building Face: Type V

		Percent	Total*
North Side			
Distance to Building (m)	0 to 3	25%	55%
Length (ft) by height in storeys	na		
South Side			
Distance to Building (m)	Firewall	0%	
Length (ft) by height in storeys	na		
East Side			
Distance to Building (m)	10.1 to 20	15%	
Length (ft) by height in storeys	na		
West Side			
Distance to Building (m)	10.1 to 20	15%	
Length (ft) by height in storeys	na		

*max 75%

Exposures Surcharge **6550 L/min**

Total Required Fire Flow (rounded)	**18000**	**L/min**
	300	**L/sec**

a) For buildings with a construction coefficient from 1.0 to 1.5, consider 100% of all floor areas. For buildings with a construction coefficient below 1.0 (vertical openings are inadequately protected), consider the two largest adjoining floors plus 50% of each of any floors immediately above them up to a maximum of eight. If the vertical openings and exterior vertical communications are properly protected, consider only the area of the largest floor plus 25% of each of the two immediately adjoining floors.

b) Wood Frame=1.5, Mass Timber= 0.8 to 1.5, Ordinary=1.0, Noncombustible=0.8, Fire-Resistive=0.6

c) Noncombustible=-25%, Limited Combustible=-15%, Combustible=0%, Free Burning=+15%, Rapid Burning=+25%

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Calculations are based on "Water Supply for Public Fire Protection Guide" by Fire Underwriters Survey Dated 2020

Municipal Engineering Solutions

FUS CALCULATION

Project:	Derry Britannia Development	**Building Type/Block #**	Apartments/Stacked Townhouses
Project Number:	17003-54	**Firewalls/Sprinkler:**	Sprinklered
Project Location:	Region of Peel (Mississauga)	**Number of Units/Unit #'s**	Blocks 8N and 13S, 140-200 units
Date:	April 2023		

1.0 FUS Formula

$$RFF = 220C\sqrt{A}$$

where: RFF = required fire flow in litres per minute;
C = the Coefficient related to the type of construction; and
A = the Total Effective Floor Area (m^2) excluding basements at least 50% below grade) [a]

NBC Occupancy	Group C	
Type of Construction [b]	Fire-Resistive Construction	Type I
Protection (for C below 1.0)	na	
Footprint area	4920.0	sq. metres (assumes 60% lot coverage)
Storeys	10	(number of storeys unkown)
C =	0.6	
A =	29520.0	Total Effective Area [a]
F =	**23000**	**L/min** (rounded)

2.0 Occupancy Adjustment

Type of Occupancy [c]	Limited Combustible	
Hazard Allowance	-0.15	
	-3450	L/min
Adjusted Fire Flow	**19550**	**L/min**

3.0 Sprinkler Adjustment

		Credit	Total
NFPA 13 sprinkler standard	YES	30%	40%
Standard Water Supply	YES	10%	
Fully Supervised system	NO	0%	

Sprinkler Credit **7820 L/min**

4.0 Exposure Adjustment

Construction Type of the Exposed Building Face: Type I-II (unprotected)

		Percent	Total*
North Side			
Distance to Building (m)	3.1 to 10	11%	11%
Length (ft) by height in storeys	over 100		
South Side			
Distance to Building (m)	over 30	0%	
Length (ft) by height in storeys	over 100		
East Side			
Distance to Building (m)	over 30	0%	
Length (ft) by height in storeys	over 100		
West Side			
Distance to Building (m)	over 30	0%	
Length (ft) by height in storeys	over 100		

*max 75%

Exposures Surcharge **2150 L/min**

Total Required Fire Flow (rounded)	**14000**	**L/min**
	233	**L/sec**

a) For buildings with a construction coefficient from 1.0 to 1.5, consider 100% of all floor areas. For buildings with a construction coefficient below 1.0 (vertical openings are inadequately protected), consider the two largest adjoining floors plus 50% of each of any floors immediately above them up to a maximum of eight. If the vertical openings and exterior vertical communications are properly protected, consider only the area of the largest floor plus 25% of each of the two immediately adjoining floors.

b) Wood Frame=1.5, Mass Timber= 0.8 to 1.5, Ordinary=1.0, Noncombustible=0.8, Fire-Resistive=0.6

c) Noncombustible=-25%, Limited Combustible=-15%, Combustible=0%, Free Burning=+15%, Rapid Burning=+25%

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Calculations are based on "Water Supply for Public Fire Protection Guide" by Fire Underwriters Survey Dated 2020

Municipal Engineering Solutions

FUS CALCULATION

Project:	Derry Britannia Development	**Building Type/Block #**	Elementary School
Project Number:	17003-54	**Firewalls/Sprinkler:**	Sprinklered
Project Location:	Region of Peel (Mississauga)	**Number of Units/Unit #'s**	
Date:	April 2023		

1.0 FUS Formula

$$RFF = 220C\sqrt{A}$$

where: RFF = required fire flow in litres per minute;
C = the Coefficient related to the type of construction; and
A = the Total Effective Floor Area (m^2) excluding basements at least 50% below grade) [a]

NBC Occupancy	Group C	
Type of Construction [b]	Non-combustible Construction	Type II
Protection (for C below 1.0)	na	
Footprint area	11320.0	sq. metres (assumes 40% lot coverage)
Storeys	3	
C =	0.8	
A =	28300.0	Total Effective Area [a]
F =	**30000**	**L/min** (rounded)

2.0 Occupancy Adjustment

Type of Occupancy [c]	Limited Combustible	
Hazard Allowance	-0.15	
	-4500	L/min
Adjusted Fire Flow	**25500**	**L/min**

3.0 Sprinkler Adjustment

		Credit	Total
NFPA 13 sprinkler standard	YES	30%	50%
Standard Water Supply	YES	10%	
Fully Supervised system	YES	10%	

Sprinkler Credit **12750 L/min**

4.0 Exposure Adjustment

Construction Type of the Exposed Building Face: Type I-II (unprotected)

		Percent	Total*
North Side			
Distance to Building (m)	over 30	0%	0%
Length (ft) by height in storeys	na		
South Side			
Distance to Building (m)	over 30	0%	
Length (ft) by height in storeys	na		
East Side			
Distance to Building (m)	over 30	0%	
Length (ft) by height in storeys	na		
West Side			
Distance to Building (m)	over 30	0%	
Length (ft) by height in storeys	na		

*max 75%

Exposures Surcharge **0 L/min**

Total Required Fire Flow (rounded)	**13000**	**L/min**
	217	**L/sec**

a) For buildings with a construction coefficient from 1.0 to 1.5, consider 100% of all floor areas. For buildings with a construction coefficient below 1.0 (vertical openings are inadequately protected), consider the two largest adjoining floors plus 50% of each of any floors immediately above them up to a maximum of eight. If the vertical openings and exterior vertical communications are properly protected, consider only the area of the largest floor plus 25% of each of the two immediately adjoining floors.

b) Wood Frame=1.5, Mass Timber= 0.8 to 1.5, Ordinary=1.0, Noncombustible=0.8, Fire-Resistive=0.6

c) Noncombustible=-25%, Limited Combustible=-15%, Combustible=0%, Free Burning=+15%, Rapid Burning=+25%

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Water and Wastewater Modelling Demand Table - Site Plan applications

Version - January 2023

Water Zone 4A

		units	persons
Proposed Residential[1)]			
	Singles/Semis		
	townhouses	368	1251
	large apartments (>750sqft)		
	small apartments (<=750sqft)		
Total Proposed Residential		368	1251
Proposed Institutional Population[2)]			
Proposed Employment Population[3)]			
Total		368	1251

Proposed GFA (commercial/retail) (sqm)	

WATER CONNECTION

Hydrant flow test				
	Hydrant flow test locations [4)]	Ninth Line and Osprey Boulevard		
		(Zone 4A)		
		Pressure (kPa)	Flow (in l/s)	Time
	Minimum water pressure	367 kPa	159 l/s	11:10 AM
	Maximum water pressure	552 kPa	0 l/s	11:10 AM

No.	**Water demands**				
	Demand type	**Demand (in l/s)**			
		Use 1 [6)]	**Use 2 [6)]**	**Use 3 [6)]**	**Total**
1	Average day flow	4.05 l/s			4.05 l/s
2	Maximum day flow	8.11 l/s			8.11 l/s
3	Peak hour flow	12.16 l/s			12.16 l/s
4	Fire flow [5)]	350 l/s			350 l/s
Analysis					
5	Maximum day plus fire flow	358.11 l/s			358.11 l/s

WASTEWATER CONNECTION

		Discharge Location[7)]	**Flow**
6	Wastewater sewer effluent (in l/s)	See Modelling Demand Table for Water Zone 5A	
7	Wastewater sewer effluent (in l/s)		
8	Wastewater sewer effluent (in l/s)		
9	Total Wastewater sewer effluent (in l/s)		

[1)] For the design flow calculations, please consider the following PPU's, which are found in the Region of Peel 2020 DC Background Study

☐Singles/Semi – 4.2

☐Multiples (Townhouses) – 3.4
☐Large Apartments (larger than 750 square feet) – 3.0
☐Small Apartments (equal to or less than 750 square feet) – 1.6

[2] refer to Region of Peel design criteria

[3] For the commercial and industrial design flow calculations, please use your site specific estimated population or the most current Ontario Building Code Occupant Load determination

[4] Please include the graphs associated with the hydrant flow test information table

[4] Hydrant flow tests should be performed within 2 years of submisison to the Region.
The Region will not permit hydrant flow tests during the winter, please check with the Region for scheduling

[5] Please reference the Fire Underwriters Survey Document

[6] Please identify the flows for each use type, if applicable

[7] Please include drainage plan for mutliple discharge locations

The calculations should be based on the development proposal
All required calculations must be submitted with the demand table submission
Table shall include Professional Engineer's signature and stamp
Site servicing concept shall be included

This table will be deemed complete when all the above is submitted and/or included. Modelling will commence with a complete table.

Hydrant Flow Test Report

Residual Hydrant Number _____

Operator: Colin Powell

Date: 19-Jul-22 Time: 11:10 AM

Witness: Region of Peel

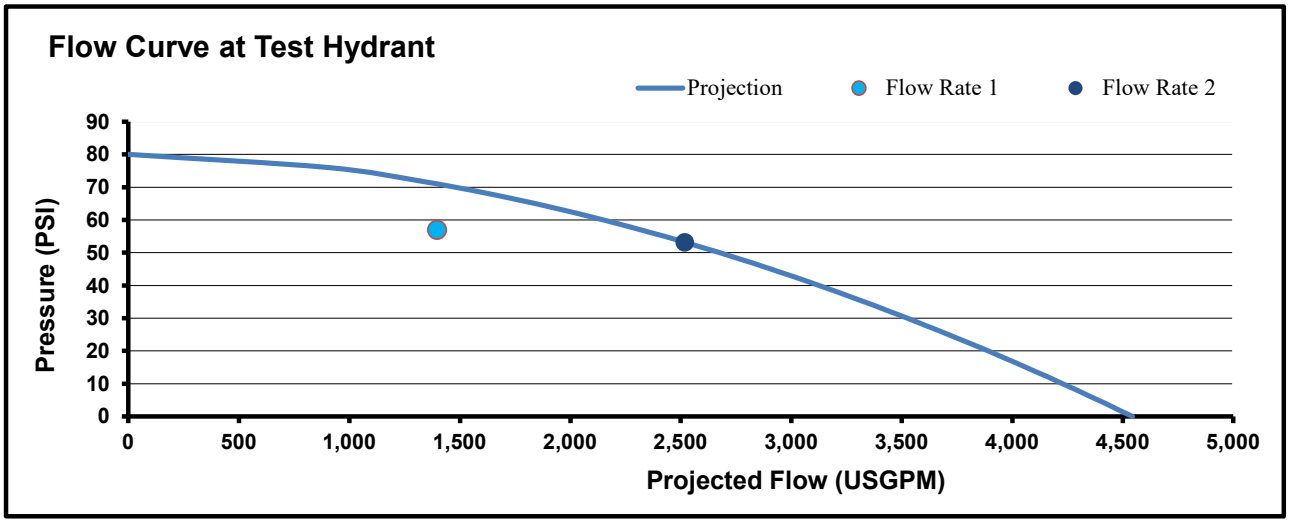
Residual Test Hydrant:	west of 5868 Osprey Blvd (on Ninth Line)		
Hydrant Number:	349034	NFPA Colour Code:	**CLASS AA - BLUE**
Owner:	Region of Peel		

STATIC PRESSURE:	80 psi	552 kPa	Pressure Drop
RESIDUAL PRESSURE 1:	57 psi	393 kPa	28.8%
RESIDUAL PRESSURE 2:	53.2 psi	367 kPa	33.5%

			Hydrant Number
Flow Hydrants:	A	next hydrant north of Osprey Blvd on Ninth Line	349033
	B		
	C		

Hydrant No.	Flow Device	Outlet Dia. (in.)	Flow Rate 1 Reading (psi)	Flow Rate 1 (USGPM)	Flow Rate 2 Reading (psi)	Flow Rate 2 (USGPM)
A	Pitot	2.5	20	698	14	584
A	Pitot	2.5	20	698	14	584
A	HoseMonster	4"		0	1400	1350
Total Flow (USGPM)			1395		2517	
Total Flow (L/second)			88		159	
Available Flow At Test Hydrant at 20 ps			2,342	USGPM	3,890	USGPM
			148	L/second	245	L/second

Average Projection at 20 PSI	3,116	USGPM



Comments/Discrepencies/Diagram:

Assuming booster pumps were called on during Flow Rate 2.

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Hydrant Flow Test Report

Residual Hydrant Number _____

Operator: Colin Powell

Date: 19-Jul-22 Time: 10:35 AM

Witness: Region of Peel

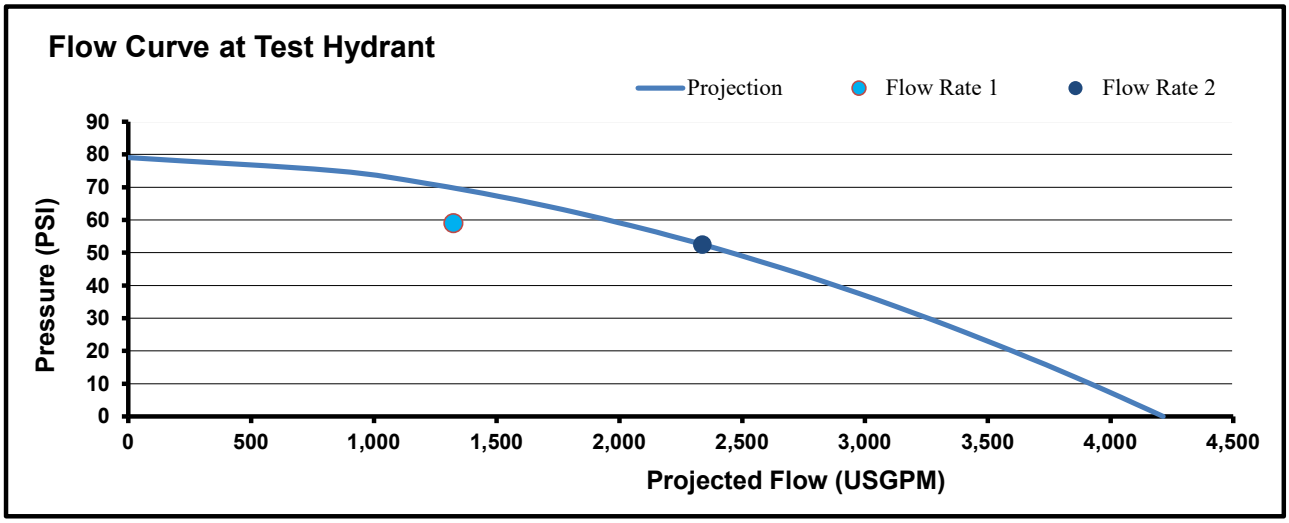
Residual Test Hydrant:	west of 3979 Foxwood Ave (on Ninth Line)		
Hydrant Number:	2027902	NFPA Colour Code:	**CLASS AA - BLUE**
Owner:	Region of Peel		

STATIC PRESSURE:	79 psi	545 kPa	Pressure Drop
RESIDUAL PRESSURE 1:	59 psi	407 kPa	25.3%
RESIDUAL PRESSURE 2:	52.5 psi	362 kPa	33.5%

			Hydrant Number
Flow Hydrants:	A	3969 Foxwood Avenue	2027913
	B		
	C		

Hydrant No.	Flow Device	Outlet Dia. (in.)	Flow Rate 1 Reading (psi)	Flow Rate 1 (USGPM)	Flow Rate 2 Reading (psi)	Flow Rate 2 (USGPM)
A	Pitot	2.5	18	662	10	493
A	Pitot	2.5	18	662	10	493
A	HoseMonster	4"		0	1250	1350
Total Flow (USGPM)				1324		2337
Total Flow (L/second)				84		147
Available Flow At Test Hydrant at 20 ps			2,374	USGPM	3,600	USGPM
			150	L/second	227	L/second

Average Projection at 20 PSI	2,987	USGPM



Comments/Discrepencies/Diagram:

Assuming booster pumps were called on during Flow Rate 2

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TOWNHOUSES

Population (Residential)

Unit Type	No. of Units	People/Unit	Population (Res)
Townhouses (Block 5)	316	3.40	1074.4
Townhouses (Freehold)	52	3.40	176.8
Residential Population			**1251**

Water Demands

Demand Type	Population	Demand Rate
Average Day (Residential)	1251	280 L/capita/day
Average Day Water Demand Townhouses		350280 L/day
		4.05 L/s

Water Demands

Demand Type	Peaking Factor (Res)	Water Demands (Res)
Average Day		4.05 L/s
Maximum Day	2.0	8.11 L/s
Peak Hour	3.0	12.16 L/s

TOTAL

Population

Total Population	1251

Total Demands

Demand Type	Demand (L/s)
Average Day	4.05
Maximum Day	8.11
Peak Hour	12.16

Water and Wastewater Modelling Demand Table - Site Plan applications

Version - January 2023

Water Zone 5A

		units	persons
Proposed Residential[1)]			
	Singles/Semis		
	townhouses	455	1547
	large apartments (>750sqft)		
	small apartments (<=750sqft)	400	1200
Total Proposed Residential		855	2747
Proposed Institutional Population[2)]			450
Proposed Employment Population[3)]			
Total		855	3197

Proposed GFA (commercial/retail) (sqm)	

WATER CONNECTION

Hydrant flow test				
	Hydrant flow test locations [4)]	3945 Doug Leavens Boulevard		
		at Ninth Line (Zone 5A)		
		Pressure (kPa)	Flow (in l/s)	Time
	Minimum water pressure	321 kPa	159 l/s	9:55 AM
	Maximum water pressure	600 kPa	0 l/s	9:55 AM

No.	**Water demands**				
	Demand type	**Demand (in l/s)**			
		Use 1 [6)]	**Use 2 [6)]**	**Use 3 [6)]**	**Total**
1	Average day flow	8.90 l/s	1.56 l/s		10.46 l/s
2	Maximum day flow	17.80 l/s	2.19 l/s		19.99 l/s
3	Peak hour flow	26.71 l/s	4.69 l/s		31.39 l/s
4	Fire flow [5)]	350 l/s	217 l/s		350 l/s
Analysis					
5	Maximum day plus fire flow	367.80 l/s	219.19 l/s		369.99 l/s

WASTEWATER CONNECTION

		Discharge Location[7)]	**Flow**
6	Wastewater sewer effluent (in l/s)	Ninth Line	57.32 l/s
7	Wastewater sewer effluent (in l/s)		
8	Wastewater sewer effluent (in l/s)		
9	Total Wastewater sewer effluent (in l/s)		

[1)] For the design flow calculations, please consider the following PPU's, which are found in the Region of Peel 2020 DC Background Study

☐Singles/Semi – 4.2

☐Multiples (Townhouses) – 3.4
☐Large Apartments (larger than 750 square feet) – 3.0
☐Small Apartments (equal to or less than 750 square feet) – 1.6

[2] refer to Region of Peel design criteria

[3] For the commercial and industrial design flow calculations, please use your site specific estimated population or the most current Ontario Building Code Occupant Load determination

[4] Please include the graphs associated with the hydrant flow test information table

[4] Hydrant flow tests should be performed within 2 years of submisison to the Region.
The Region will not permit hydrant flow tests during the winter, please check with the Region for scheduling

[5] Please reference the Fire Underwriters Survey Document

[6] Please identify the flows for each use type, if applicable

[7] Please include drainage plan for mutliple discharge locations

The calculations should be based on the development proposal
All required calculations must be submitted with the demand table submission
Table shall include Professional Engineer's signature and stamp
Site servicing concept shall be included

This table will be deemed complete when all the above is submitted and/or included. Modelling will commence with a complete table.

Hydrant Flow Test Report

Residual Hydrant Number _____

Operator: Colin Powell

Date: 19-Jul-22 Time: 9:55 AM

Witness: Region of Peel

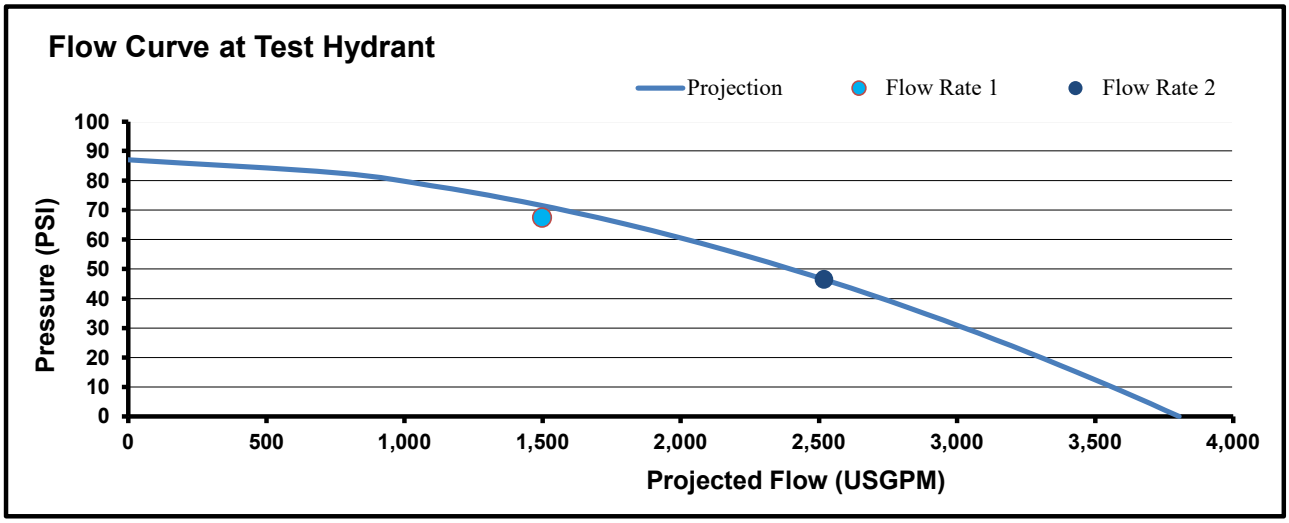
Residual Test Hydrant:	3945 Doug Leavens Blvd.		
Hydrant Number:	2027861	NFPA Colour Code:	**CLASS AA - BLUE**
Owner:	Region of Peel		

STATIC PRESSURE:	87 psi	600 kPa	Pressure Drop
RESIDUAL PRESSURE 1:	67.5 psi	465 kPa	22.4%
RESIDUAL PRESSURE 2:	46.5 psi	321 kPa	46.6%

			Hydrant Number
Flow Hydrants:	A	6562 Lisgar Drive	2027859
	B		
	C		

Hydrant No.	Flow Device	Outlet Dia. (in.)	Flow Rate 1 Reading (psi)	Flow Rate 1 (USGPM)	Flow Rate 2 Reading (psi)	Flow Rate 2 (USGPM)
A	Pitot	2.5	23	748	14	584
A	Pitot	2.5	23	748	14	584
A	HoseMonster	4"		0		1350
Total Flow (USGPM)			1496		2517	
Total Flow (L/second)			94		159	
Available Flow At Test Hydrant at 20 ps			2,914	USGPM	3,304	USGPM
			184	L/second	208	L/second

Average Projection at 20 PSI	3,109	USGPM



Comments/Discrepencies/Diagram:

Assuming booster pumps were called on during Flow Rate 2

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Hydrant Flow Test Report

Residual Hydrant Number _____

Operator: Colin Powell

Date: 19-Jul-22 Time: 9:30 AM

Witness: Region of Peel

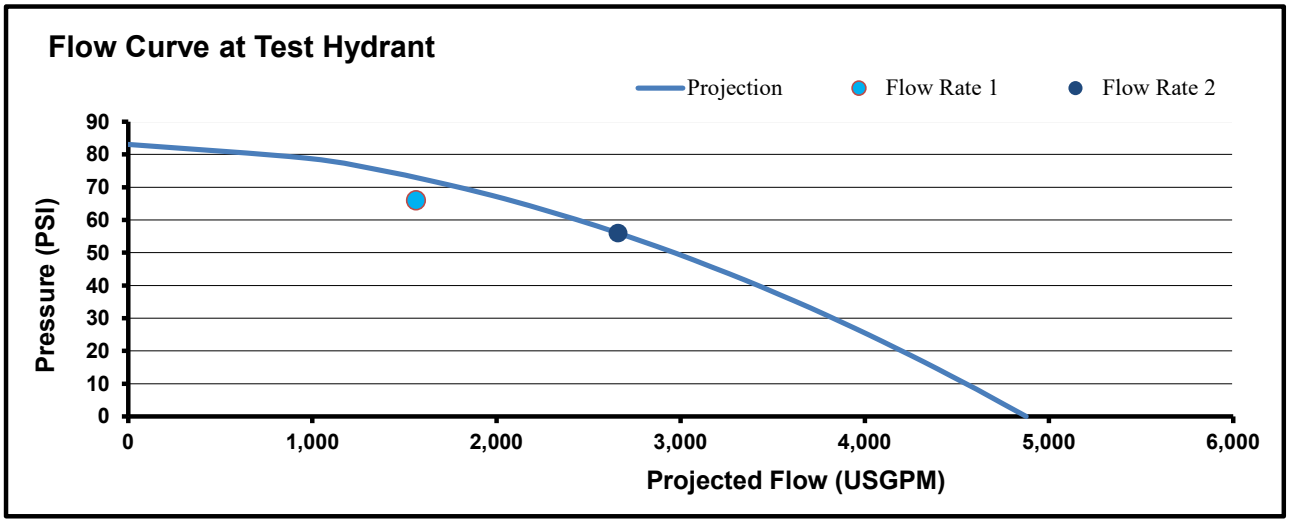
Residual Test Hydrant:	3979 Beacham Street		
Hydrant Number:	2027845	NFPA Colour Code:	**CLASS AA - BLUE**
Owner:	Region of Peel		

STATIC PRESSURE:	83 psi	572 kPa	Pressure Drop
RESIDUAL PRESSURE 1:	66 psi	455 kPa	20.5%
RESIDUAL PRESSURE 2:	56 psi	386 kPa	32.5%

			Hydrant Number
Flow Hydrants:	A	3931 Beacham Street	2027844
	B		
	C		

Hydrant No.	Flow Device	Outlet Dia. (in.)	Flow Rate 1 Reading (psi)	Flow Rate 1 (USGPM)	Flow Rate 2 Reading (psi)	Flow Rate 2 (USGPM)
A	Pitot	2.5	25	780	15	604
A	Pitot	2.5	25	780	15	604
A	HoseMonster	4"		0		1450
Total Flow (USGPM)			1560		2658	
Total Flow (L/second)			98		168	
Available Flow At Test Hydrant at 20 ps			3,165	USGPM	4,201	USGPM
			200	L/second	265	L/second

Average Projection at 20 PSI	3,683	USGPM



Comments/Discrepencies/Diagram:

Assuming booster pumps were called on during Flow Rate 2

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TOWNHOUSES and APARTMENTS

Population (Residential)

Unit Type	No. of Units	People/Unit	Population (Res)
Townhouses (Block 1)	167	3.40	567.8
Townhouses (Block 3)	53	3.40	180.2
Townhouses (Block 4)	72	3.40	244.8
Townhouses (Freehold)	45	3.40	153.0
Future TH (Block 6)	118	3.40	401.2
Apartments (8N/13S)	400	3.00	1200.0
Residential Population			**2747**

Water Demands

Demand Type	Population	Demand Rate
Average Day (Residential)	2747	280 L/capita/day
Average Day Water Demand Townhouses		769160 L/day
		8.90 L/s

Water Demands

Demand Type	Peaking Factor (Res)	Water Demands (Res)
Average Day		8.90 L/s
Maximum Day	2.0	17.80 L/s
Peak Hour	3.0	26.71 L/s

SCHOOL

Population (ICI)

Unit Type	Site Area (Ha)	People/Ha	Population (ICI)
Institutional	2.833		450 *
ICI Population			**450**

* Student population assumed to be 1/2 x 900 students (Junior/Senior Public School) from Sanitary Sewer Design Criteria (rev March 2017)

Water Demands

Demand Type	Population	Demand Rate
Average Day (ICI)	450	300 L/capita/day
Average Day Water Demand School		135000 L/day
		1.56 L/s

Water Demands

Demand Type	Peaking Factor (ICI)	Water Demands (ICI)
Average Day		1.56 L/s
Maximum Day	1.4	2.19 L/s
Peak Hour	3.0	4.69 L/s

TOTAL

Population

Total Population	3197

Total Demands

Demand Type	Demand (L/s)
Average Day	10.46
Maximum Day	19.99
Peak Hour	31.39

APARTMENTS AND TOWNHOUSES

Population (Residential)

Unit Type	No. of Units	People/Unit	Population (Res)
Townhouses	823	3.40	2798.2
Apartments	400	3.00	1200.0
Residential Population			**3998**

Population (ICI)

Unit Type	Site Area (Ha)		Population (ICI)
Retail	2.833		450 *
ICI Population			**450**

* Student population assumed to be 1/2 x 900 students (Junior/Senior Public School)

Design Flow

Demand Type	Population	Demand Rate
Domestic Flow	4448	302.8 L/capita/day
Average Domestic Sanitary Sewage Flow		1346854.4 L/day
		15.59 L/sec

Peak Flow

Harmon Peaking Factor (see notes below)	3.29
Peak Domestic Flow including the Harmon PF	4433427 L/day
Sanitary Sewage Flow (Calculated)	51.31 L/s (calculated)
Domestic Sanitary Sewage Flow	51.80 L/s (STD. DWG. 2-9-2)

The peak domestic sanitary sewage flow was taken from STD. DWG. 2-9-2 based on a population of 4500 people (Sanitary Sewer Design Criteria, March 2017).

Infiltration

Demand Type	Area (Ha)	Demand Rate
Infiltration	27.60	0.0002 m^3/sec/Ha
Infiltration		5.52 L/s

Total Sanitary Flow

Demand Type		Sanitary Flow
Domestic and Infiltration		57.32 L/s

TOTAL

Population

Total Population	4448

Total Sanitary Flow

Demand Type	Demand (L/s)
Peak Domestic Flow	57.32

Notes:

Harmon Formula

$$H = 1 + \frac{14}{4 + p^{0.5}}$$

Where:

H = Ratio of peak flow to average flow