



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

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)**

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

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 **CEIS 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.

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 CEIS 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 (CEIS).

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.

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;



- 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 m³ per hectare of contributing impervious area. The extended detention release rate for the ponds should be designed based on 0.002 m³/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 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.

- 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.

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 m³ 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:

- **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 m³. 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:

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.

5.5. NHS CHANNELIZATION WORKS

Refer to the HLCP and CEIS 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 m³/s, the overall channel gradient is 0.06%, the width and depth of the bankfull channel for the NLT-1 reach is 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;

- 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.

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 m³, which meets the required Regional pond volume of 39,897 m³. 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 m³/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 m³/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.

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**.

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 condominium blocks will be provided with a minimum of two service connections where required for internal looping. A pressure zone separation chamber will be provided along Anatig Boulevard (Street A) to isolate the pressure zones with appropriate looping for each zone. All freehold and condominium units will be provided with individual water service laterals per Region standards.

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**, including calculation of fire flow demands. Recommendations are summarized in Table 7-1.

Table 7-1: Fire Flow Requirements

Type	Fire Flow ¹ L/s	PZ-4A Min. Available Fire Flow ² L/s	PZ-5A Min. Available Fire Flow ² L/s	Maximum number of units between firewalls	Maximum area calculated between firewalls (all floors)
ROW Townhouses	217	315-350	250	4 units	890 m ²
Back to Back Townhouses	217	315-350	250	4 units	925 m ²
Dual Front Townhouses	183	315-350	250	4 units	890 m ²
Apartments	233	N/A	250	N/A	N/A
School	217	315-350	N/A	N/A	N/A

1-Refer to calculations for required fire flow in Appendix F

2-Per preliminary modeling results provided by Region of Peel

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

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*.”

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.

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

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APPENDIX A

STORM AND SANITARY SEWER DESIGN SHEETS

APPENDIX B

SWM POND CALCULATIONS

APPENDIX C

LID CALCULATIONS

APPENDIX D

DRAWINGS

APPENDIX E

HYDROLOGICAL MODEL VALIDATION

APPENDIX F**WATER & WASTEWATER CALCULATIONS**