Glen Williams Estates
Functional Servicing Study
Town of Halton Hills

Volume 2 of 3

August 2020

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GeoProcess Research Associates

DS Consultants

Town of Halton Hills - Halton Region

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FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT

GLEN WILLIAMS ESTATES

RESIDENTIAL DEVELOPMENT

Hamlet of Glen Williams (Town of Halton Hills)

Prepared for

Glen Williams Estates Inc. (Rinaldi)

Project #: 18-604

August 2020

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1 Introduction

The Subject Lands are 18.6 ha and are located on the west side of Confederation Street, north of Main Street, in the Hamlet of Glen Williams Town of Halton Hills), refer to **Figure 1** for details. The Functional Servicing Report FSR) will be in support of a proposed residential subdivision with thirty-four 34) detached homes. The concepts presented in this report are in general conformance with the latest standards and criteria prepared by the Town of Halton Hills roads, grading, and storm drainage) and Halton Region water distribution and sanitary drainage).

In addition to an FSR, an Environmental Implementation Report EIR) is required to support the proposed development application on the Subject Lands. Through the pre-consultation process, a combined EIR/FSR Terms of Reference ToR) were prepared however, at the request of the Region of Halton, the two reports are being prepared separately but will utilize the approved combined EIR/FSR ToR for guidance. A copy of the approved EIR/FSR ToR, dated September 6, 2019, is included in **Appendix A1**.

2 Land Use

2.1 Existing Conditions

The Subject Lands are currently comprised of agricultural lands as well as a tributary of the Credit River and its associated valleyland and wetlands along the western and southern property limits. The natural heritage features associated with the Credit River valley and wetlands are within the Region of Halton's Natural Heritage System (RNHS).

2.2 Proposed Conditions

The proposed development will consist of thirty-four 34) detached homes at the northeast corner of the Subject Lands and a 20.0 m right-of-way (Street A as shown on the attached **Draft Plan**. Vehicular access is provided off Confederation Street via Street A. A storm drainage block is proposed at the southeast corner and natural heritage buffer blocks are proposed along the western and southern limits of the residential lots. In addition, a 3 m walkway block is proposed between Lots 16 and 17 to provide pedestrian access to a trail within the Credit River tributary valley. Additional details with respect to the natural heritage buffer blocks and trail can be found in the EIR.

The limits of the developable area are determined by the greater of the 30.0 m wetland and woodland dripline buffer along the western limit of development and the greater of a 30.0 m wetland, 10.0 m top of bank and 10.0 m dripline buffer for the southern limit of development respectively, as well as the northern and eastern property lines. The valleyland, woodlands and wetlands, plus their associated buffers, form the refined extent of the RNHS on the Subject Lands and, with the exception of some grading within the buffers to minimize the use of retaining walls, will not be altered as part of the proposed development (see **Figure 3**). More details related to the RNHS can be found in the EIR.

The developable area of the Subject Lands (excluding the RNHS) is approximately 4.9 ha, which includes the residential area, road, and a storm drainage block.

3 Grading

3.1 Existing Conditions

Within the developable area, there is a high point at the northeast corner of the Subject Lands. Existing grades slope southerly and westerly towards the RNHS. There is a significant variability in grades with an approximate 21.0 m fall across the site from the northeast to the southwest corners of the developable area. The grades along the north property line vary considerably from east to west due to the undulating terrain.

3.2 Proposed Conditions

The proposed grading design for the site is generally influenced by boundary conditions and will match existing grades along all property and buffer limits. An exception to this is the northern property boundary where external grading is required into the northern lands to allow for grade matching, refer to Section 3.2.2. The site grading design is shown on **Figure 3** and takes into consideration the following requirements and constraints:

- Conform to the Town of Halton Hills' design criteria;
- Minimize cut and fill operations and work towards a balanced site;
- Match existing boundary conditions, where feasible;
- Provide overland flow conveyance for major storm conditions;
- Reduce or eliminate (where possible) the need for retaining walls;
- Maximize the self-contained portion of the site conveying runoff to the storm sewer system(s);
- Maintain feature-based water balances to existing natural heritage features;
- Provide suitable cover on proposed servicing; and,
- Attempt to reduce or eliminate stormwater discharge from the site onto Confederation Street.

3.2.1 Road Grades

Generally, the right-of-way is graded with slopes falling within the range of 0.5% – 5.5%. Due to site constraints, a small portion of the site along the western and southern development limits are graded towards the RNHS, which will be the direction of storm drainage for these areas. Additionally, another small portion of Street A is graded towards Confederation Street. A maximum slope of 2.5:1 is required along the southern development limit, and 2:1 sloping is required along the western development limit and as well as on either side of the entrance of Street A in order to match the existing grades. It is recognized that the 2:1 slope area may require additional stabilization measures. As shown on **Figure 5**, a small portion of drainage is directed to Confederation Street, but can potentially be reduced through the implementation of LID practices in the ROW island.

3.2.2 Northern Property Boundary

Due to the undulating / extreme grade difference along the north property line, which would necessitate the use of retaining walls in excess of 4 m high in order to match existing elevations with the property to the north, a grade transition is proposed on the property to the north, in conjunction with grade changes on the Subject Lands. The cut and fill associated with the grade transition is intended to normalize the elevations along the northern property limit such that the existing low point along the northern property limit (near Lot 9) is proposed to be filled, and the existing high point (near Lot 5) will be lowered to "normalize" / flatten the rear property line grades. It is recognized that the proposed grading relies on the cooperation of the landowner to the north. This grading proposal will not restrict drainage from the lands to the north but will instead improve drainage conditions by eliminating steep slopes and low points as well as creating a more suitable surface for agricultural activities. Discussions with the landowner to the north have been initiated and are on-going in this regard. It is anticipated that such grading activities would be undertaken through a site alteration permit, outside of the draft plan of subdivision process.

For the remainder of the site, storm drainage flows are self-contained within the development. During major storm events, storm drainage will be directed overland to the RNHS via the storm drainage block. The proposed grading design matches into existing property line grades and buffer limits along the eastern and southern sides of the developable area. A description of the proposed grading along the western side of the developable area is provided in Section 3.2.3.

3.2.3 Grading Adjacent to the Credit River Tributary Valley

Proposed grading within the RNHS buffer, along the western development limit, has been minimized to the extent possible. In order to minimize the need for retaining walls, grading has been proposed between the primary and secondary top of bank **Figure 3**). The geotechnical and environmental impacts of the proposed grading have been evaluated in the EIR and have been confirmed to have no negative impact on slope stability or the natural heritage features to the west. In an email dated March 4, 2020, CVC staff advised they would be open to proceed with the considering the lower-tier valley slope (i.e., Primary Top of Bank on **Figure 3**) as the CVC Regulated Valley Slope (i.e. they would not regulate the top tier or the engineered top of slope) subject to the following:

1. A geotechnical/slope stability report to determine the Long Term Stable Slope Line associated with the lower tier top of bank and confirmation of no impacts to this slope from the proposed grading.
    a. A minimum 10 m setback to the proposed grading and lot lines from the greater of the Top of Bank or Long Term Stable Slope line of this slope however, it is expected that this buffer be maximized where possible.
    b. Further, the works for the upper tier slopes should be confirmed by a Geotechnical Engineer and confirmation is required from a Geotechnical Engineer the proposed

grading works would not negatively impact the slope stability of the lower tier top of bank. This is especially important in the southern portion of the lower tier top of bank as the grades of this slope starts to connect to the higher tier top of slope.

2. Preparation and implementation of a robust restoration and enhancement landscape planting plan for the area between the CVC Regulated lower tier top of bank and the proposed new lots in order to provide an enhanced valley corridor compared to the current/existing condition.

3. At the south-west corner of the proposed subdivision [at the end of the higher tier i.e. secondary top of bank], the proposed lot line should be shifted further away from the Significant Woodland feature in order to provide more room to allow for a larger buffer between the proposed grading and the dripline in order to protect the Significant Woodland. Typically look for a 10 m buffer and the environmental impact assessment to confirm the appropriate setback and/or mitigation measures.

With respect to Item 1 above, the Geotechnical Slope Stability Study is included in **Appendix C2** and summarized in the EIR. The Slope Stability Study concluded that the physical top of bank of the lower tier/ primary top of bank is stable. Further, the report confirms that there is no impact to the stability of the slope as a result of the proposed grading to the east. As shown on **Figure 4**, a minimum 10 m setback from the lower tier/primary top of bank to the proposed grading/lot lines has been provided but, in most cases, the setback is much greater than 10 m.

The general approach to restoration and enhancement planting along the newly graded slopes is discussed within the EIR to address Item 2 above. Detailed landscaping plans will be provided as a condition of draft plan approval.

Item 3 was in reference to an earlier grading plan that was provided to the agencies at a meeting on March 12, 2020. The grading as shown on **Figures 3 and 4** reflect the revision as requested in Item 3 above.

3.2.4 Grading Adjacent to the Southern Woodland / Wetland

Grading along the southern development limit has been contained within the residential lots with only a very small area of grading proposed within the outer limit of the 30 m wetland setback and 10 m setback to top of bank behind Lot 24. In addition, some minor grading is proposed at the outer limit of the 30 m wetland setback behind Lots 18-21 however, all grading has been kept outside of the 10 m dripline setback along the southern limit of development. Refer to **Figures 3** and **4** for details.

3.2.5 Grading Adjacent to the Eastern Property Boundary

For the eastern property boundary north of the right-of-way, a 3.0 m undisturbed shelf is proposed to avoid impacts to trees on the existing properties to the east. A maximum 2:1 downwards sloping is proposed within the Subject Lands. The grades along the eastern property boundary south of the Street A right-of-way are regraded to be a local high point. 3:1 sloping within the Subject Lands as well as on the existing properties is proposed to match the existing grades and ensure storm drainage from the existing properties does not enter the site.

4 Storm Drainage & Stormwater Management

4.1 Existing Conditions

4.1.1 Storm Drainage

The Study Area is located within Subwatershed 12 of the Credit River Watershed, which is within the jurisdictional area of Credit Valley Conservation CVC). A tributary of the Credit River flows through the Study Area in a southeasterly direction and flows into the main Credit River approximately 400 m downstream, on the east side of Confederation Street, south of Main Street.

Surface drainage from the Subject Property is generally north to south as shown on **Figure 2A**. Based on analysis of the detailed site topography, the development area of the site drains to four (4) separate outlets as shown on **Figure 2A** and summarized in ***Table 4-1***.

The majority of the drainage from the area to be developed drains to the existing wetland feature to the south. An external area drains across the north property line and also discharges to the wetland as shown in **Image 4-1** and **Figure 2B** This area was delineated based on existing subcatchment and wetland delineation information from CVC and available topographic mapping (2002 MNR LIO topography).

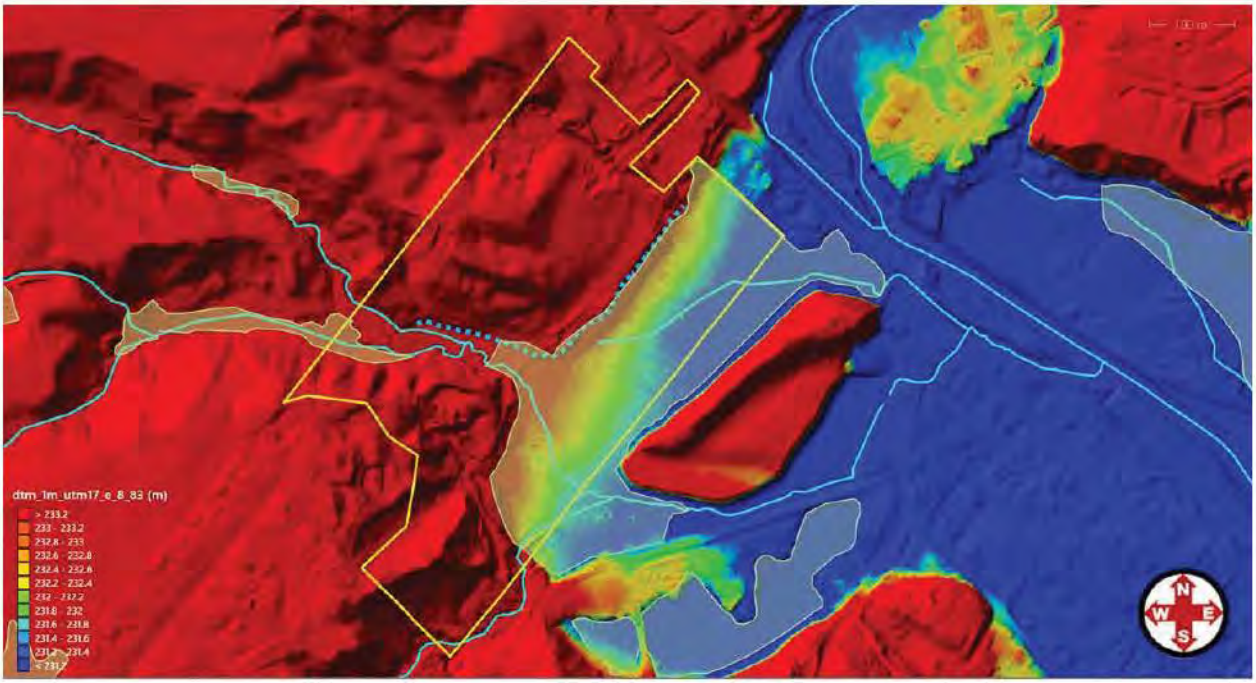


Image 4-1: Topographic interpretation of wetland drainage from external area

Note that the drainage area for the non-development portion of the Subject Property was not discretized / evaluated as no changes are proposed to the existing land use beyond the proposed development limit.

The following table indicates the drainage areas to each "outlet" from the Subject Property as well as the existing land use and average surface slope.

Table 4-1 - Existing Drainage Areas

Outlet ID	Location	Area [ha]	Land use	% IMP	Slope [%]
West	Drainage from west side of Subject Property towards existing watercourse / valley	0.27	Cropland	-	25
South 1	Drainage from majority of Subject Property to existing wetland	2.0	Cropland	-	12
South 2	Drainage from majority of Subject Property to existing wetland	2.70	Cropland	-	8
South 3	Drainage from Subject Property including existing external residential areas, draining to existing wetlands	1.46	Settlement	30	8
East	Drainage directed to Confederation Street from part of Subject Property and existing external areas	3.47	Settlement	25	7
External	Drainage from north discharging across Subject Property to the southern wetland	5.90	Cropland	-	7

Refer to **Figure 2A** for the existing storm drainage details. Note that the drainage areas indicated are those that drain through or from the future development area. The Subject Lands includes undevelopable RNHS lands. Furthermore, the total drainage area to the wetland on the Subject Lands is shown in **Figure 2B** and is approximately 221.9 ha. The existing drainage areas noted

in ***Table 4-1*** and on **Figure 2A** are approximately 5% of the total catchment area to the wetland refer to **Figure 2B** for the wetland drainage area).

To evaluate the stormwater management requirements for the Subject Lands, the existing target flows resulting from the Town of Halton Hills design storm IDF parameters Standard 105) with a 24-hour SCS Type II distribution were established. The 25 mm 4-hour storm was simulated as well. A PCSWMM model was prepared to simulate the peak design event flows at the various outlets, as well as runoff volumes continuous simulation) to assess seasonal runoff to the wetland south of the development, refer to **Appendix D2**.

The PCSWMM model utilized the available physical information including land use, catchment area, slope as well as the measured infiltration rates as per DS Consultant's infiltration testing results for the site (refer to **Appendix C1** for details.).

DS Consultants created shallow and deep test pits at each location. Shallow pits were dug approximately 20 cm below ground surface and deep pits were dug approximately 60 cm below ground surface. Tests were primarily conducted in sand and gravel. Slower infiltration was observed at IT-2D and IT-5D where the material was observed to be silty sand to sandy silt. As a conservative measure, the lowest measured infiltration rate of 50 mm/hour (deep test pit was assumed for the existing and proposed modelling.

Table 4-2 - Measured Infiltration Rates

Infiltration test ID	Elevation masl)	Infiltration Rate mm/hr)	Average Infiltration Rate- Shallow mm/hour)	Average Infiltration Rate- Deep mm/hour)
IT-1S	240.8	156	131	93
IT-1D		283		
IT-2S	251.2	167		
IT-2D		26		
IT-3S	255.6	161		
IT-3D		103		
IT-4S	249.8	121		
IT-4D		173		
IT-5S	245.2	76		
IT-5D		51		

As shown in **Table 4-3**, peak flows discharged from the existing drainage areas are relatively low due to the high infiltration rates measured in the field. For additional details on the infiltration testing, please refer to **Appendix C1**.

Table 4-3 - Existing Peak Flows single-event model)

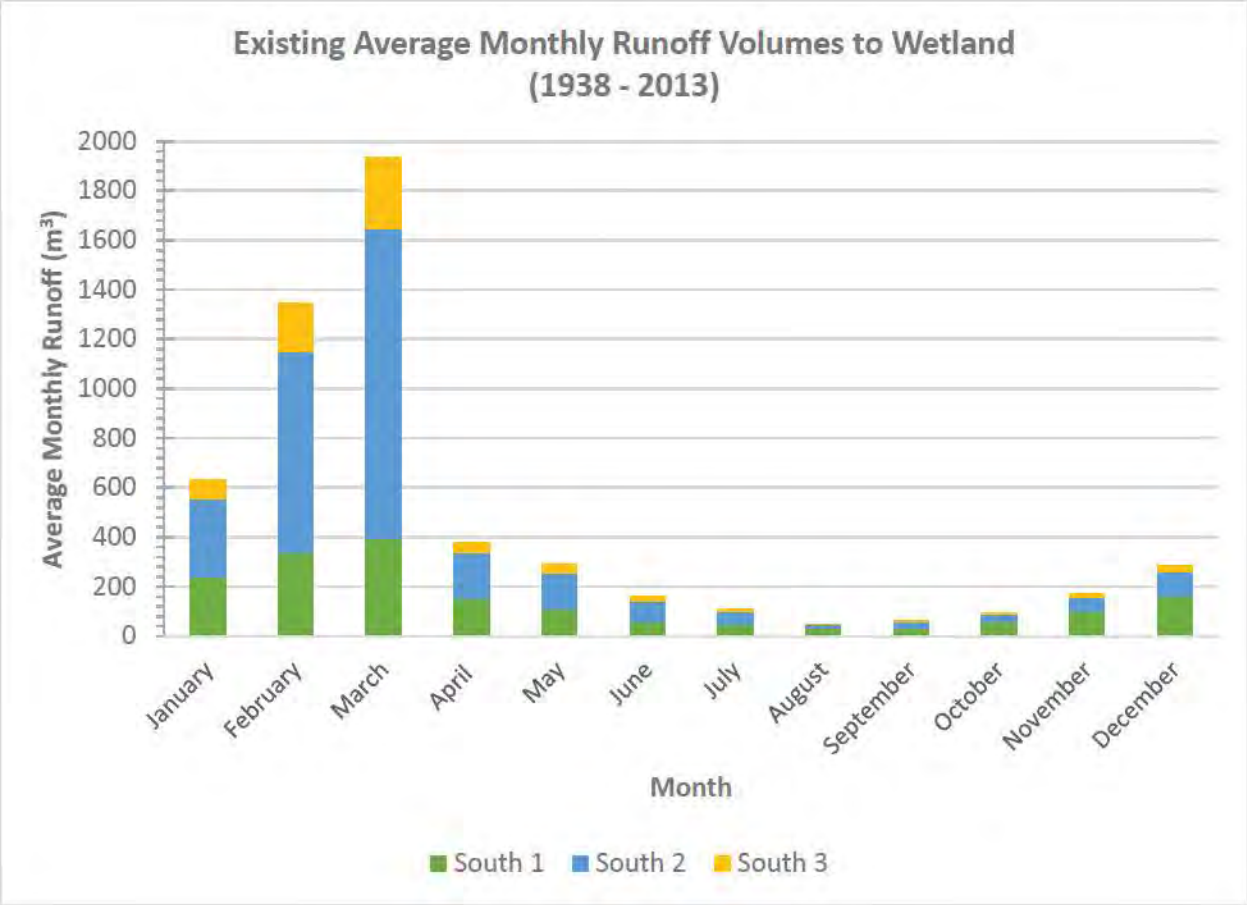
Outlet ID	Area [ha]	Flow [L/s]						
		Q_{25mm}	Q_2	Q5	Q_{10}	Q_{25}	Q_{50}	Q_{100}
West	0.27	0	1	7	14	22	31	39
South 1	2.0	0	5	18	36	65	95	126
South 2	2.70	0	6	23	44	77	114	154
South 3	1.46	14	36	76	107	151	190	230
East	3.47	13	35	79	118	175	231	285
External	5.90	0	10	37	70	124	181	244

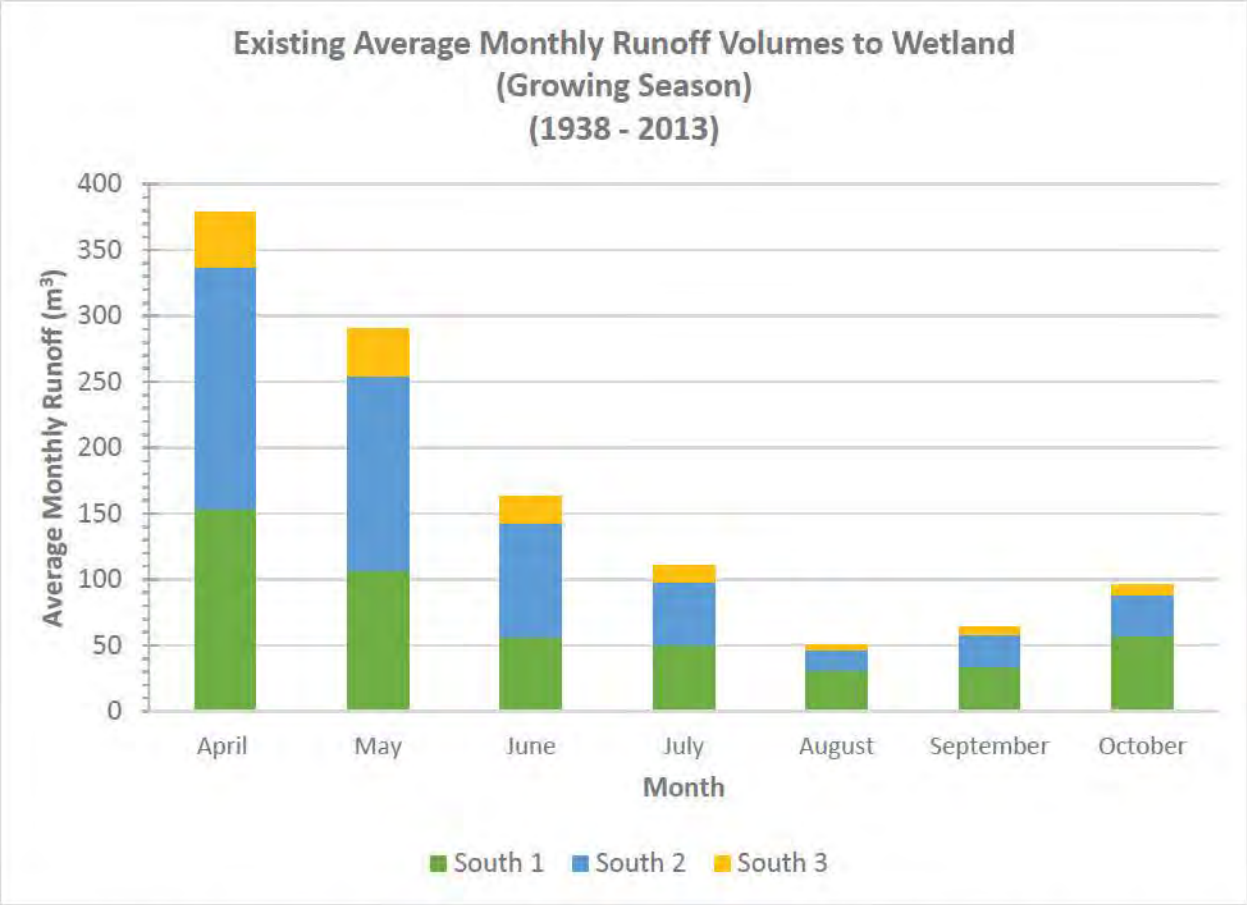
Based on the continuous model results, which simulated climate data from 1938 to 2013 based on the Toronto (Pearson) climate station, the following average runoff volumes from the "south" catchments to the wetland were calculated and summarized in ***Table 4-4***.

Table 4-4 - Existing Monthly Runoff Volumes Discharged to Wetland (average from 1938 to 2013)

Outlet To Wetland	Area [ha]	Existing Average Runoff Volumes (1938 - 2013) [m^3]												
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total
South 1	2	75	194	294	42	36	21	12	4	6	8	14	23	728
South 2	2.7 + 5.9	316	812	1249	184	148	86	48	16	24	31	58	100	3072
South 3	1.46	241	337	394	153	107	56	50	30	34	57	98	161	1720
Total	**12.07**	**632**	**1344**	**1937**	**379**	**291**	**163**	**110**	**50**	**64**	**96**	**170**	**284**	**5520**

These values are depicted in the following graphs prepared for the average year as well as for the growing season (April to October).


Existing Average Monthly Runoff Volumes to Wetland
(1938 - 2013)
Average Monthly Runoff (m³)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
January
February
March
April
May
June
July
August
September
October
November
December
Month
South 1
South 2
South 3



The existing design event peak flows and average monthly runoff results have been used to evaluate the effectiveness of the proposed stormwater management strategy.

4.1.2 Storm Servicing

There are no existing storm sewers along Confederation Street. The existing ROW drainage is accommodated by ditches on either side of the existing ROW. There is no storm drainage infrastructure on the Subject Property.

4.2 Proposed Conditions

4.2.1 Proposed Drainage

The proposed grading of the Subject Property ensures that the existing drainage areas to the various outlets are generally maintained. **Figures 5** and **5A-1** illustrate the proposed drainage plan and **Table 4-5** compares the proposed and existing drainage areas to each outlet. The future lots are estimated to be 30% IMP and the ROW is 45% IMP. **Figure 5** is based on the site grading, and **Figure 5A-1** illustrates the lumped catchment delineations used in the model and as described in the following table.

Table 4-5 - Proposed Drainage Areas

Outlet ID	**Location**	**Area [ha]** proposed (existing)	**Land use**	**Reason for change**	**% IMP**	**Slope [%]**
West	Drainage from west side of Subject Property towards existing watercourse / valley	0.07 0.27)	Rear yards / vegetated transition slope	Lot grading and proposed stormwater management strategy directs drainage away from the west outlet	0	50
South 1	Drainage from majority of Subject Property to existing wetland	0.68 2.0)	Lots / ROW	Majority of drainage area is directed to proposed stormwater outlet at Block 8 to existing wetland	30	20
South 2	Drainage from majority of Subject Property to existing wetland	4.92 2.70)	Lots / ROW		40	5
South 3	Drainage from Subject Property including existing external residential areas, draining to existing wetlands	0.60 1.46)	Lots / ROW	North of Street A existing external residential area drains to proposed Street A	20	8
East	Drainage directed to Confederation Street from part of Subject Property and existing external areas	3.67 3.47)	Lots / ROW	A portion of the proposed ROW cannot drain to the south outlet.	25	7
External	Drainage from north discharging across Subject Property to the southern wetland	5.90)	Cropland	No change	0	7

With the exception of the first 120 m of Street A, the proposed development will have a rural cross-section. **Figure 9** illustrates the proposed 20 m ROW section (9m pavement). The first 120 m of Street A will also have a 20 m ROW however, will be constructed as an urban cross-section with curb and gutter (8.5 m pavement). This is proposed as there is not enough space for a 20 m wide rural section at the entrance due to existing grading constraints with the existing properties to the north and south. Furthermore, the Town of Halton Hills prefers an urban cross-section to accommodate emergency access requirements, and an island is recommended to ensure access to the Subject Property by preventing vehicles from parking across all traffic lanes.

Storm servicing infrastructure for the Subject Property has been designed in accordance with the latest Town of Halton Hills standards and specifications and will consist of storm sewers 450 mm – 825 mm in diameter and with slopes ranging from 0.5% – 1.0%. Storm flows will be captured by the proposed swales along both sides of Street A for infiltration and quality control, and will eventually discharge to the RNHS wetland) via a headwall within the storm drainage block.

Refer to **Figure 5A** and **Appendix D4** for the proposed storm drainage plan and design calculations.

4.2.2 Stormwater Management

The stormwater management strategy for the Subject Property is based on the following objectives and design criteria:

- Control of the post-development design storms flows based on the Town of Halton Hills IDF parameters (Standard 105 and 24-hour SCS Type II distribution. All storms up to and including the 100-year event must be controlled to pre-development rates (as per **Table 4-3** ;
- Provide quality control via a treatment-train approach to achieve 80% TSS removal;
- Detain at least 5 mm on site for at least 48 hours to provide erosion control;
- Capture and convey the 5-year storm in the minor system / road-side swales without surcharging / overtopping;
- Capture / continue to convey the external drainage from north of the development;
- Ensure the wetland water balance is adequately maintained;
- Limit maintenance requirements;
- Take advantage of high infiltration rates on the Subject Property by encouraging infiltration-based stormwater management measures; and,
- Ensure that any fill brought to the site meets the same infiltration rate as the existing soils for areas that will be used for infiltration.

The following measures are proposed to manage stormwater and meet the criteria and objectives:

The proposed drainage areas will be conveyed as follows:

- External area (5.9 ha) – all flows up to and including the 100-year event to be captured in a 450 mm storm sewer within the 5 m easement between Lots 8 and 9, and conveyed through the site to the south storm outfall;
- Lot areas to discharge roof leaders to pervious areas; excess flow to drain to rear or front yards subject to lot grading;
- Remaining lot runoff and ROW runoff to be captured in infiltration swales on either side of the ROW;
- Infiltration swales overflow to minor system (storm sewer);
- Excess flow conveyed by major system to the storm block adjacent to Lot 24, which has additional storage / infiltration; and,
- Major and minor system pass through the storm block.

Based on the drainage areas illustrated in **Figure 5** and shown in ***Table 4-5***, a post-development PCSWMM model was created to simulate the proposed drainage and stormwater management strategy.

Table 4-6 - Proposed Peak Flows (single-event model)

Outlet ID	Area [ha]	Flow [L/s]						
		Q_{25mm}	Q_2	Q5	Q_{10}	Q_{25}	Q_{50}	Q_{100}
West	0.07	0	0.4	2.4	4	6.5	9	12
South 1	0.68	5	16	49	94	138	161	185
South 2	4.92	22	33	46	37	38	80	139
South 3	0.60	4	14	32	48	68	85	105
East	3.67	14	36	80	121	180	236	292
External	5.90	0	10	37	70	124	181	244

In comparison to the existing flows, there is an overall net decrease in the total peak flow discharged from the site, although there are minor increases at the individual East and South 1 outlets. Note that the total peak flow to all three south outlets is reduced below existing conditions for the larger events. Additional control of the frequent events was considered, but as shown in Section 4.2.4, the wetland to the south has a minor deficit in monthly runoff volumes. Additional control of the frequent storms would likely reduce the monthly runoff volumes further. **Table 4-7** indicates the difference between the proposed and existing flows at each outlet for each design storm.

Table 4-7 - Change in Peak Flows (single-event model)

Outlet ID	Area [ha]	Flow [L/s]						
		Q_{25mm}	Q_2	Q5	Q_{10}	Q_{25}	Q_{50}	Q_{100}
West	0.07 0.27)	0	-0.6	-4.6	-10	-15.5	-22	-27
South 1	0.68 2.0)	5	11	31	58	73	66	59
South 2	4.92 2.70)	22	27	23	-7	-39	-34	-15
South 3	0.50 1.46)	-10	-22	-44	-59	-83	-105	-125
South Total	**6.2 6.16)**	**17**	**16**	**10**	**-8**	**-49**	**-73**	**-81**
East	3.67 3.47)	1	1	1	3	5	5	7
External	5.90)	0	0	0	0	0	0	0

4.2.3 LID Measures

The following low-impact development (LID) measures are proposed on the Subject Property:

- Road-side swales with infiltration;
- Additional topsoil on pervious lot areas (300 mm to 450 mm total; not simulated);
- Rain barrels, subject to builder acceptance (not simulated); and,
- End-of-pipe swale / infiltration

The road-side and end-of pipe swales have been modelled in PC-SWMM using the bioretention LID feature, as follows:

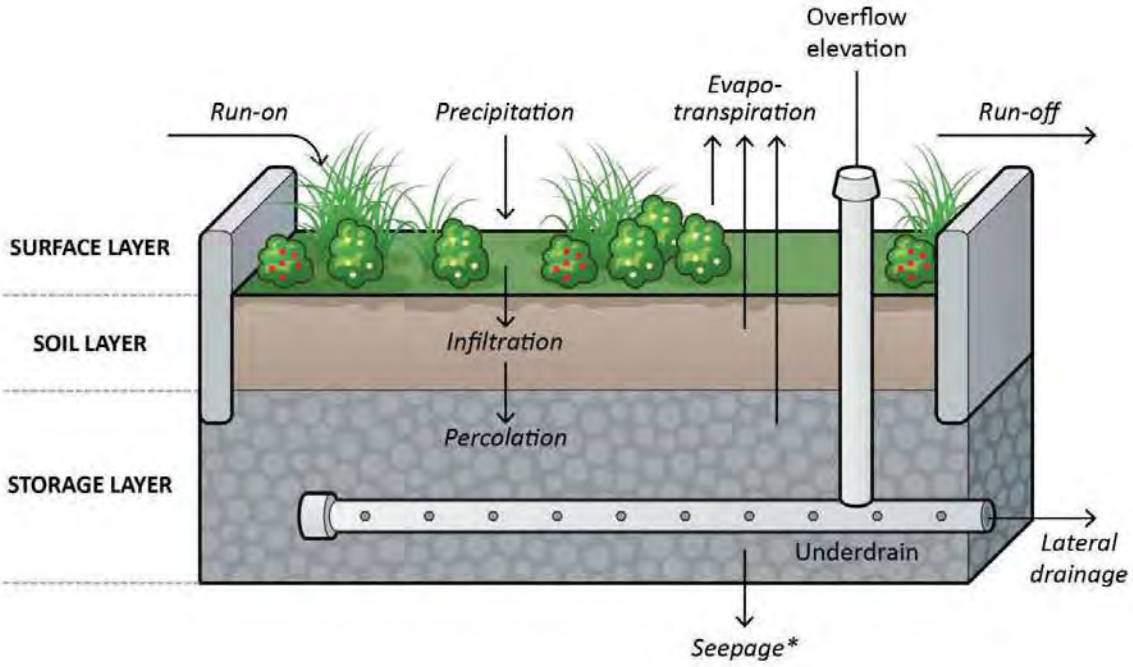


Table 4-8 is taken from PCSWMM Manual and has been modified to include the design parameters of the proposed LID measures.

Table 4-8 - LID Parameters

Parameter	Description	Selected Value
Surface Layer		
Storage Depth/ Berm Height	When confining walls or berms are present this is the maximum depth to which water can pond above the surface of the unit before overflow occurs (in inches or mm). For LIDs that experience overland flow it is the height of any surface depression storage. For swales, it is the height of its trapezoidal cross section.	300 mm (maximum allowable ponding depth in feature)
Vegetation Volume (fraction)	The fraction of the volume within the storage depth filled with vegetation. This is the volume occupied by stems and leaves, not their surface area coverage. Normally this volume can be ignored but may be as high as 0.1 to 0.2 for very dense vegetative growth.	0 assumed for proposed LID landscaping
Surface Roughness Manning's n)	Manning's n for overland flow over the surface of porous pavement or a vegetative swale	Conservative value of 0.1 was applied.
Surface Slope percent)	Slope of porous pavement surface or vegetative swale (percent). Use 0 for other types of LIDs.	Approximately 5%
Parameter	**Description**	**Selected Value**
Soil Layer		
Thickness	The thickness of the soil layer (inches or mm). Typical values range from 18 to 36 inches (450 to 900 mm) for rain gardens, street planters and other types of land-based bio-retention units, but only 3 to 6 inches (75 to 150 mm) for green roofs.	300 mm
Porosity (volume fraction)	The volume of pore space relative to total volume of soil (as a fraction).	0.40
Field Capacity volume fraction)	Volume of pore water relative to total volume after the soil has been allowed to drain fully (as a fraction). Below this level, vertical drainage of water through the soil layer does not occur.	0.1
Wilting Point volume fraction)	Volume of pore water relative to total volume for a well dried soil where only bound water remains (as a fraction). The moisture content of the soil cannot fall below this limit.	0.05

Parameter	Description	Selected Value
Conductivity (mm/hr or in/hr)	The saturated hydraulic conductivity value for the type of soil used in the soils layer.	50 mm/hour
Conductivity slope	Slope of the curve of log(conductivity) versus soil moisture content (dimensionless). Typical values range from 5 for sands to 15 for silty clay.	10
Suction Head (mm or in)	The average value of soil capillary suction along the wetting front (inches or mm). This is the same parameter as used in the Green-Ampt infiltration model.	60 mm
Parameter	**Description**	**Selected Value**
Storage Layer		
Height	This is the thickness of a gravel layer (inches or mm). Crushed stone and gravel layers are typically 6 to 18 inches (150 to 450 mm).	2000 mm
Void Ratio	The volume of void space relative to the volume of solids in the layer. Typical values range from 0.5 to 0.75 for gravel beds. Note that porosity = void ratio / (1 + void ratio).	0.66
Seepage Rate	The maximum allowable rate at which water infiltrates into the native soil below the layer (in inches/hour or mm/hour). This would typically be the Saturated Hydraulic Conductivity of the surrounding subcatchment if Green-Ampt infiltration is used or the Minimum Infiltration Rate for Horton infiltration.	50 mm/hour

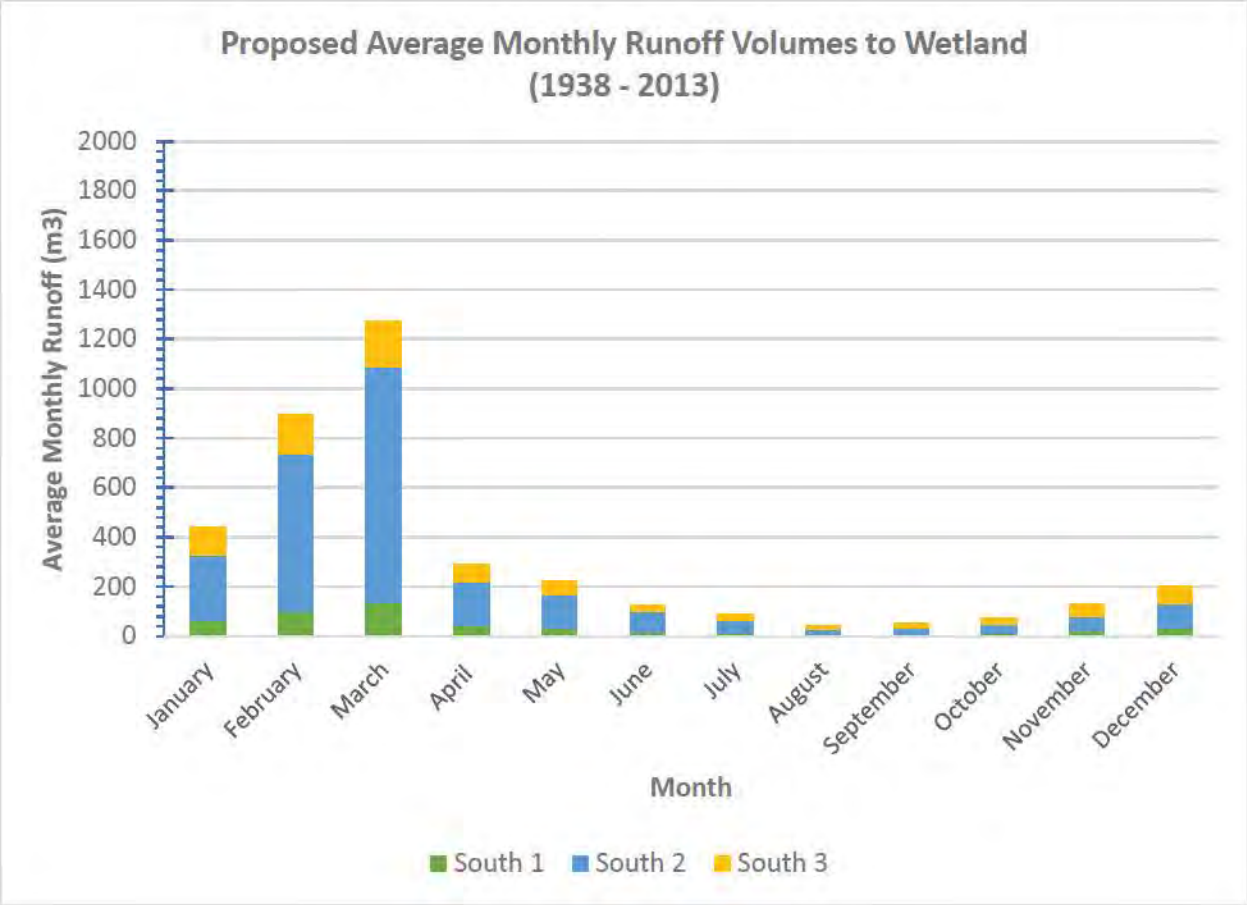
The LID performance results are included in **Appendix D2.**

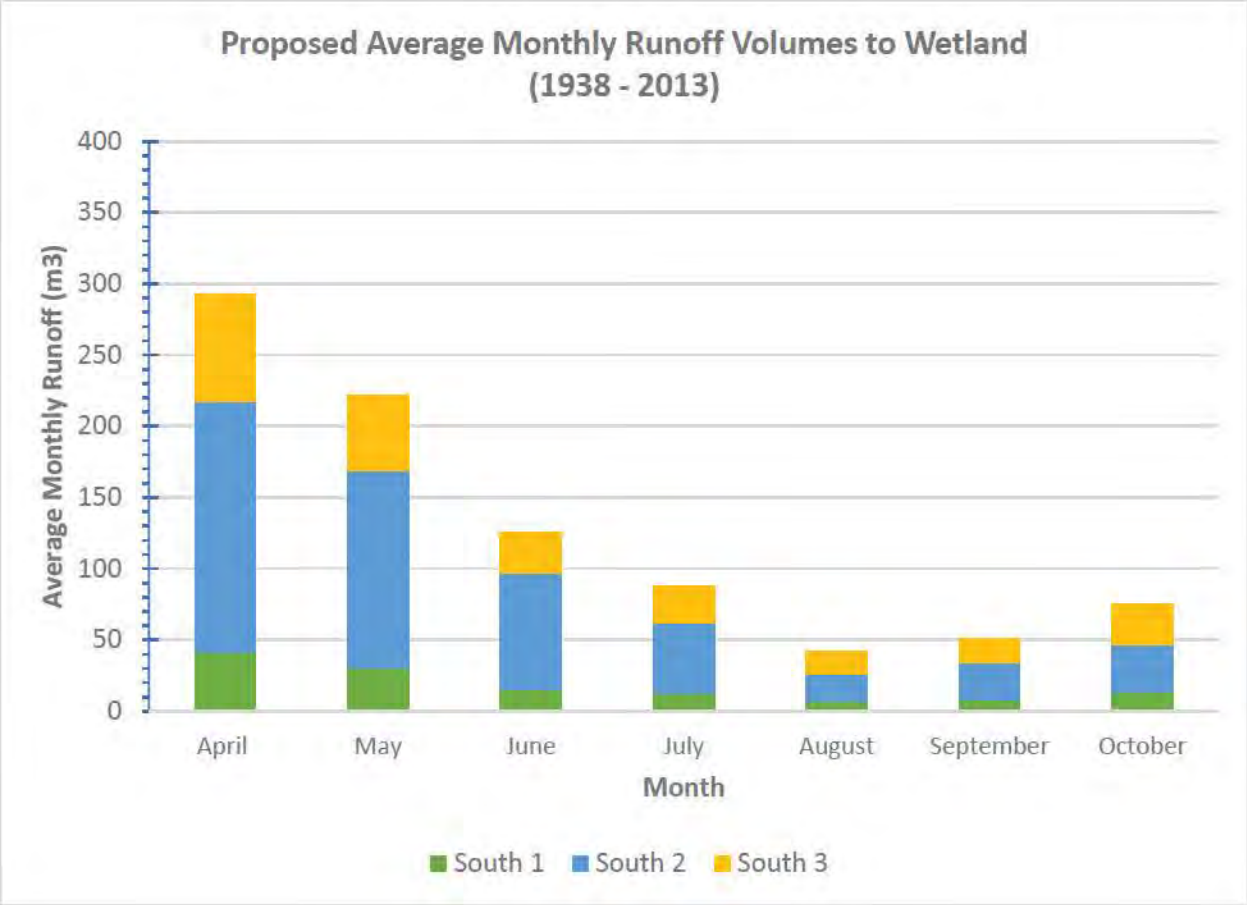
4.2.4 Wetland Water Balance

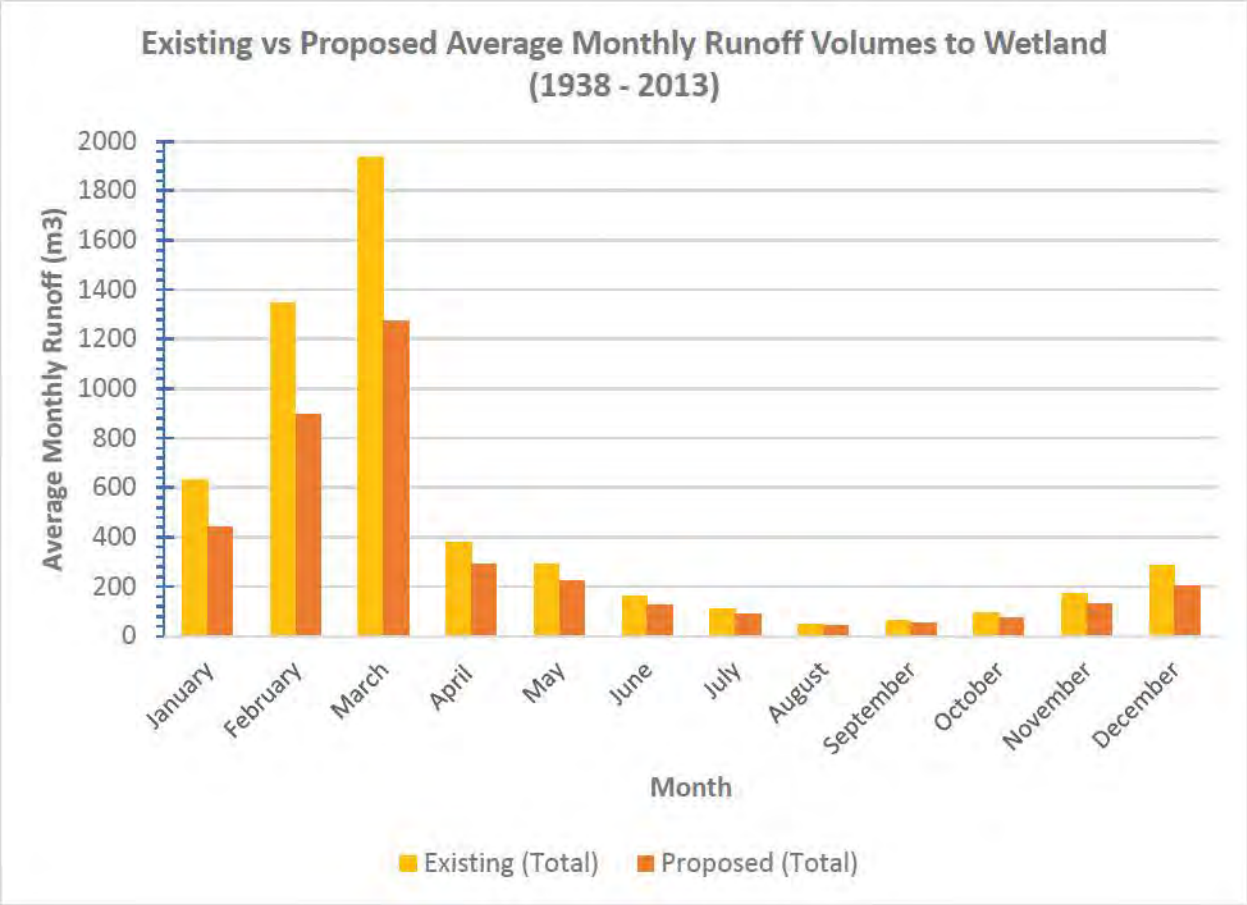
Based on the proposed SWM strategy and LID design, the continuous model was simulated to determine the post-development monthly runoff results for the existing wetland feature. As shown in ***Table 4-9***, there is a net decrease in runoff volumes to the wetland by 20% to 30% from the site, however an overall decrease of less than 2% when the entire catchment is considered in the calculations. Furthermore, it is understood that the wetland feature is predominantly fed by groundwater, and that the overall surface water contributions are a small fraction of the total groundwater flow. The overall decrease in surface water flow is due to the use of LID measures to infiltrate runoff from the Subject Property and reduce the overall monthly runoff volumes. The following results have been coordinated with GeoProcess Research Associates as part of the EIR work.

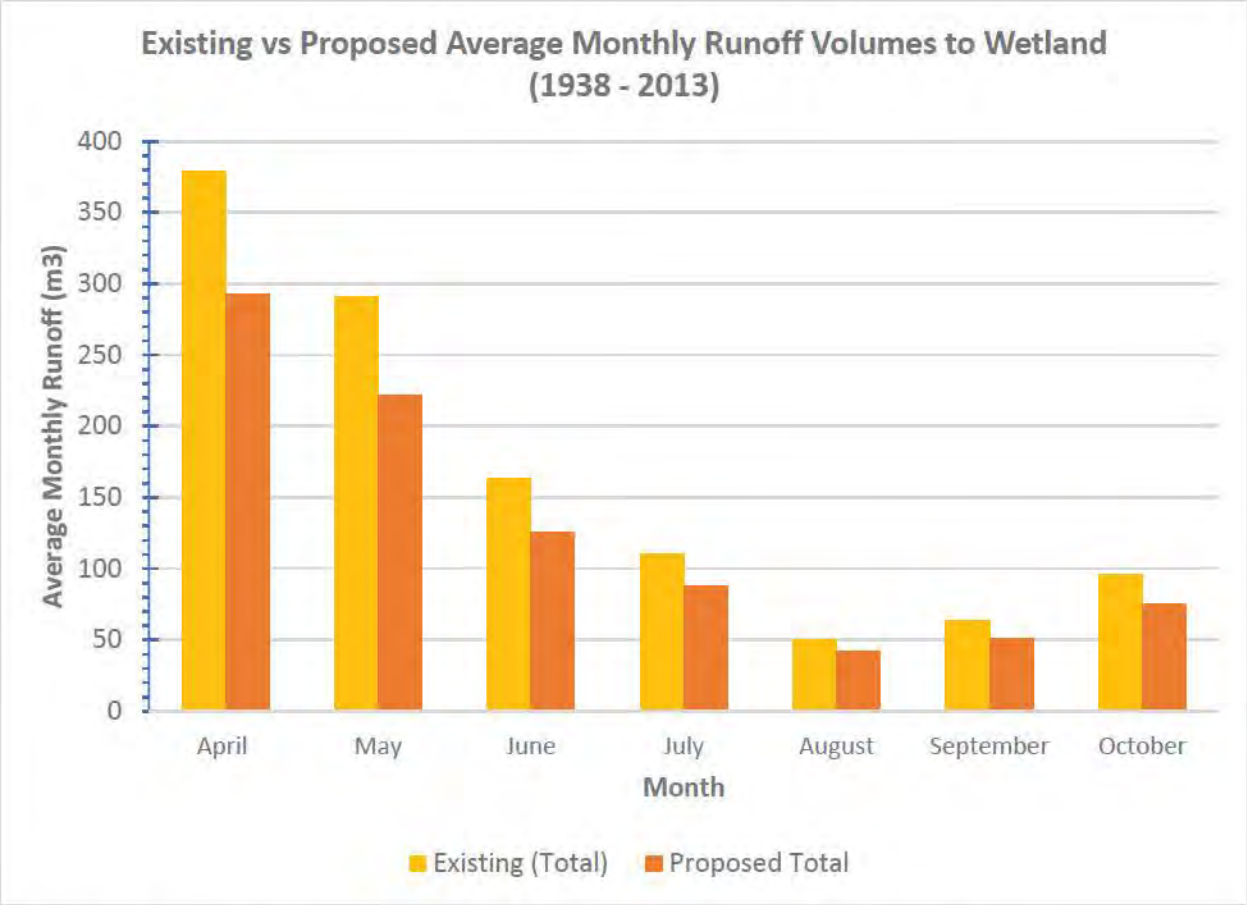
Table 4-9 -Proposed Monthly Runoff Volumes Discharged to Wetland (average from 1938 to 2013)

Outlet to Wetland	Area [ha]	Proposed Average Runoff Volumes (1938 - 2013) [m^3]												
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
South 1	0.68	65	102	134	42	30	15	12	7	8	13	24	34	486
South 2	4.92+ 5.9	261	635	951	176	139	82	50	19	26	34	56	93	2520
South 3	0.60	115	159	188	75	54	29	26	16	17	28	48	77	832
Total	**12.12**	**441**	**895**	**1273**	**293**	**222**	**126**	**88**	**42**	**51**	**75**	**128**	**205**	**3838**
% Change vs. existing	**+0.41%**	**-30%**	**-33%**	**-34%**	**-23%**	**-24%**	**-23%**	**-20%**	**-17%**	**-19%**	**-22%**	**-25%**	**-28%**	**-30%**
% Change vs. overall 221.9 ha area	+0.02%	-1.6%	-1.8%	-1.9%	-1.2%	-1.3%	-1.2%	-1.1%	-0.9%	-1.1%	-1.2%	-1.4%	-1.5%	-1.7%


Proposed Average Monthly Runoff Volumes to Wetland
(1938 - 2013)
Average Monthly Runoff (m3)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
January
February
March
April
May
June
July
August
September
October
November
December
Month
South 1
South 2
South 3


Proposed Average Monthly Runoff Volumes to Wetland
(1938 - 2013)
Average Monthly Runoff (m3)
400
350
300
250
200
150
100
50
0
April
May
June
July
August
September
October
Month
South 1
South 2
South 3


Existing vs Proposed Average Monthly Runoff Volumes to Wetland
(1938 - 2013)
Average Monthly Runoff (m3)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
January
February
March
April
May
June
July
August
September
October
November
December
Month
Existing (Total)
Proposed (Total)



4.2.5 Glen Williams Integrated Planning Project Scoped Subwatershed Plan

The Glen Williams Integrated Planning Project Scoped Subwatershed Plan (Scoped SWP) was completed in January 2003 in conjunction with the Glen Williams Secondary Plan. Given the age of the report, it is recognized that some of the management measures or targets may be superseded by more current approaches and practices. For completeness, the Study Team reviewed the Scoped SWP and have assessed the proposed stormwater and natural heritage/natural hazard management in light of the 2003 recommendations. Tables 3.2 and 4.1 respectively, within the Scoped SWP, provided a summary of management and implementation recommendations pertaining to stormwater management, rehabilitation and enhancement opportunities and monitoring. The two tables have similar content and, as such, have been combined and replicated below with an indication of how/if the proposed development concept has incorporated the management and implementation recommendations. In some cases, the reader will be referred to the EIR for additional details.

Table 4-10 Scoped SWP Recommended Management and Implementation Strategies

Strategy Component	Subcomponent	Management Measures	Implementation Mechanism(s)	Draft Plan Approach
Stormwater Management				
Urban Stormwater Management	Stormwater Management Practices	Lot Level Controls (reduced lot grading, ponding areas, soak away pits. Stormwater Conveyance Controls (grassed swales, catchbasin modification). End-of-pipe Controls (artificial wetlands, wet ponds, dry ponds, infiltration trenches, buffer strips, oil/grit separators).	Preparation and submission of Stormwater Management Plans in conformance with the Scoped Subwatershed Plan. SWM Plans to adhere to MOE/MNR manual of practice, Town and CVC standards and guideline requirements.	Downspouts will be directed to surface to provide opportunities for infiltration within the lot. Bioswales are proposed along Street A to provide quality and quantity control. No end of pipe pond or wetland is required given the size of the development area and ability to infiltrate stormwater.
	Erosion and Sediment Control	Erosion/Sediment Control Plans incorporating site control measures to minimize surficial erosion during construction.	Preparation and submission of Erosion and Sediment Control Plans that accompany Stormwater Management Plan.	Details to be included in the Erosion and Sediment Control plan is outlined in Section 7. ESC plan will be condition of draft plan approval and required prior to site alteration.
	Design Guidelines for Development	Recommend design guidelines for site drainage and servicing, the sizing, design and maintenance of stormwater management ponds.	None provided in Scoped SWP	Guidelines were not prepared specific to Glen Williams however, servicing and SWM have been based on current MECP, Regional, Town and CVC guidelines and standards.

Strategy Component	Subcomponent	Management Measures	Implementation Mechanism(s)	Draft Plan Approach
Rehabilitation and Enhancement Opportunities				
Hazard Land Management	Natural Hazards: Flooding, Erosion and Unstable Slopes	Secondary Plan policies and land use designations to prohibit/restrict development in Hazard Lands and direct development outside of hazardous areas.	Identify hazardous lands as Hazard Prone Areas with land use schedules.	Development conforms to Secondary Plan policies related to hazard lands. Stable top of bank assessment has identified location of stable top of bank associated with eastern valley wall. Flood plain and meander belt is contained within the valley / wetland areas. The valleyland, woodland and wetland, along with their associated buffers, will be designated accordingly in the zoning by-law that will accompany the draft plan. No development, including lot creation, is proposed within hazard lands.
	Man-made Hazards: Illicit Waste Disposal	Secondary Plan policies and land use designations to require that human-made hazards be restored prior to any activity on the site and that illicit waste disposal be eliminated.	Delineate man-made hazards as Special Policy Areas within planning documents.	Neither the Region nor Town's OP designate any portion of the Subject Property as a Special Policy Area related to man-made hazards. No evidence of illicit waste disposal was identified in the Phase 1 ESA (DS Consultants, 2020)

Strategy Component	Subcomponent	Management Measures	Implementation Mechanism(s)	Draft Plan Approach
Natural Heritage and Environmental Protection	Protection of Significant Natural Heritage Features and Ecological Functions	Secondary Plan policies and land use designations to prohibit incompatible development in Category 1 areas and limit development subject to conditions in Category 2 areas. Involve area residents and stakeholders through stewardship workshops and follow-up activities.	Designate Natural Heritage Lands in OP land use schedules. Specify in policy that: • No development land use designations for Category 1 Areas; • Development subject to conditions on land use designations (i.e., EIRs) for Category 2 areas and possibly adjacent areas.	No development is proposed within Category 1 or Category 2 Areas (referred to as Core Greenlands and Supportive Greenlands in the Secondary Plan).
Water Quality and Quantity Management	Surface Water Quality and Quantity	Agricultural/rural BMPs and urban SWMPs to manage runoff. Maintain existing hydrologic regime, surface water drainage patterns.	Subwatershed watch programs coordinated by CVC and Municipality that emphasize landowner, community groups and associations involvement, participation and incorporation of urban/rural BMPs. Preparation and submission of EIR Stormwater Management Plans for new development. OMAF/CVC/MNR staff to provide educational, technical assistance to farmers and rural community emphasizing principles of land stewardship	Stormwater management provided that achieves Level 1 enhanced water quality. Quantity controls match peak flows. Infiltration swales and lots designed to infiltrate stormwater to support local groundwater supplies.
	Groundwater Quality and Quantity	Agricultural/rural BMPs for the safe storage of pesticides, fertilizers and manure near potable sources of water, wells and recharge areas. Assess and maintain infiltration levels, discharge zones and groundwater flow patterns, as required.		

Strategy Component	Subcomponent	Management Measures	Implementation Mechanism(s)	Draft Plan Approach
Rehabilitation, Restoration and Improvement Measures	Reforestation, Natural Corridor and Woodland Improvement	Vegetative plantings and reforestation along natural areas, block regeneration on retired or marginal land.	Regeneration and management plans prepared to target priority areas. Planting to be coordinated by CVC/MNR programs emphasizing landowner, community group and associations, involvement and participation. Education campaigns for improved forest management. Hedgerow/tree preservation strategy to be completed as part of subdivision / site plan approval submissions.	Refer to EIR for details pertaining to planting plans within the buffer blocks.
	Stream and Aquatic Habitat Restoration	Streambank stabilization, channel morphology improvements, streambank plantings, restricted livestock access, removal of fish barriers, habitat enhancement	Rehabilitation plans prepared to target priority areas. Channel stabilization and planting to be coordinated by CVC/MNR programs emphasizing landowner, community group and associations, involvement and participation. DFO authorization is required.	No stream or aquatic habitat restoration identified in EIR. No barriers to fish movement identified. Refer to EIR for more details.
Monitoring				
Refer to EIR for Monitoring details.				

Based on **Table 4-10**, the management and implementation recommendations outlined in the Scoped SWP, as they relate to urban development and stormwater management, servicing and erosion and sediment control, have been addressed through the design of the draft plan as documented in the FSR and EIR.

5 Sanitary Servicing

5.1 Existing Conditions

Based on the as-built site plan and plan & profile drawings provided by Stantec Consulting Ltd., there is an existing pumping station Glen Williams Pumping Station), on the south side of Main Street and east of Confederation Street. The pumping station sends sanitary flow westerly via an existing 250 mm forcemain along Main Street. Based on the existing design sheet prepared by Stantec (July 2008), there is ample capacity downstream. Refer to **Appendix F1** for the capacity analysis of the downstream sewer.

There are no existing sanitary sewers along Confederation Street or near the Subject Property for connections.

5.2 Proposed Conditions

To service the proposed development, new sanitary sewers are proposed within the Subject Lands and from the Subject Lands and along Confederation Street and Main Street to the existing pumping station, refer to **Figure 6**. The proposed sewer will accommodate sanitary flows from the Subject Lands, a future Bayfield Development north of the Subject Lands, and existing residential properties on the west side of Confederation Street south of the Subject Lands.

Based upon the latest standards and criteria prepared by Halton Region, the current Draft Plan concept projects a population of 116 and peak residential flow of 4.0 L/s, using a population density of 55 persons/ha and an infiltration allowance of 0.260 L/s/ha and the average dry weather flow of 275 L/c/day, refer to **Appendix F1**.

Sanitary servicing infrastructure for the Subject Property is designed in accordance with the latest Halton Region standards and specifications. The sanitary sewers within the Subject Property will consist of 200 mm with slopes ranging from 0.5% – 1.0%. The sewers along Confederation Street and Main Street will be 200 mm with 0.5% slopes.

The proposed sewers are required to cross under the Credit River on the south side of Main Street in order to connect into the Glen Williams Pumping Station. The 200 mm sewer will be installed beneath the Credit River via tunneling (methodology to be confirmed at detailed design). The 200 mm sewer will connect to a new sanitary manhole east of the river, from which a sewer will be extended to the existing pump station maintenance hole that is directly connected to the downstream pumping station.

The pump station has the capacity to accommodate proposed wastewater flows from the Subject Property, the future Bayfield Development, and the existing residential properties.

GeoProcess Research Associates evaluated the potential for scour from the streambed to erode / expose the proposed sewer crossing. Their scour analysis report in **Appendix E1** concludes that there will be no impact to the proposed services based on the watercourse velocities provided that the proposed protection measures are implemented.

Refer to **Figure 6**, **Figure 8** and **Appendix E1** for details.

6 Water Servicing

6.1 Existing Conditions

Based on the available infrastructure plans for Confederation Street, there is an existing 300 mm watermain along the property frontage **Figure 7**). This watermain is immediately available to accommodate the Subject Lands.

The Subject Lands are in Pressure Zone 267.

MES was retained to undertake a hydrant test and to evaluate the existing system capacity to accommodate the Subject Property. Additional details are provided in **Section 6.2**.

6.2 Proposed Conditions

Water servicing infrastructure for the Subject Lands has been designed in accordance with the latest Halton Region standards and specifications. A 200 mm watermain is proposed and will connect to the existing 300 mm watermain along Confederation Street to supply water demands to the development.

A conceptual watermain servicing plan showing the proposed water distribution system for the development is provided in **Figure 7**.

According to the MES findings refer to **Appendix F2**, the existing 300 mm watermain pressures and flows are sufficient to service the Subject Lands from a domestic servicing perspective. With respect to fire flow, the previous Region guidelines 91 L/s) can be achieved. However, the recent change to the Fire Underwriters Survey flow targets by the Region results in fire flows slightly below the standards. It is assumed that the adjacent / recent developments around the Subject Property, such as Bishop Court, were based on the lower / original standard of 91 L/s which can be achieved.

Improved fire flows cannot be easily addressed through external infrastructure upgrades – the existing pipe on Confederation Street is already a 300 mm PVC main. The Confederation Street pipe is fed by smaller diameter pipes (refer to **Appendix F2**) and there are many smaller diameter pipes between the Subject Property and the supply.

Given that the surrounding area was likely designed assuming the previous / achievable Region standard, if necessary, the mix of units / floor plans can be optimized to achieve suitable fire flows subject to the FUS requirements i.e., the square footage and construction materials can be adjusted to reduce the fire flow requirements).

7 Roads and Pedestrian Movement

A 3 m walkway block is also proposed between Lots 16 and 17 to provide pedestrian access to the open space trail system within the Credit River tributary valley to the west. This block will connect to the proposed walkway on the rural ROW along the south side of Street A, which will tie in with the sidewalk for the urbanized portion of Street A. in the walkway block and sidewalk is shown in **Figure 3.** The walkway has been positioned such that the Glen Williams Secondary Plan , Town Standards, and Transportation Association of Canada Guidelines for pedestrian movement can be achieved. Further details are included in the Traffic Impact Study Paradigm, June 2020).

8 Erosion and Sediment Control

The erosion and sediment control plan for the site will be designed in conformance with the Town of Halton Hills and CVC as part of the site alteration application process. In general, the following erosion and sediment control measures will be installed and maintained during construction:

- Construction and silt fence and/or filter socks will be placed around the greater of the property line or the RNHS buffer limit prior to earthworks;
- A temporary access/mud mat will be installed at the entrance of Street A;
- Exposed areas will be stabilized as soon as possible. Temporary excavation areas will be stabilized using coir mats or erosion blankets as required; and,
- All temporary erosion and sediment control measures will be routinely inspected and repaired during construction. Temporary controls will not be removed until the areas they serve are restored and stable.

If required, additional / site-specific measures based on an erosion risk assessment will be determined during the detailed design / site alteration application stage.

9 Operations and Maintenance

In general, all roads, infrastructure and the RNHS, including trails, will be maintained by the Town of Halton Hills, with the exception of sanitary sewers and the water distribution system (maintained by Halton Region).An operations and maintenance manual for the proposed infiltration swales is provided in **Appendix D4**.

10 Conclusions and Recommendations

This report has demonstrated that:

- The proposed site can be graded to match into existing grades at all property and buffer limits while adhering to Town of Halton Hills grading standards and specifications. An exception to this is the northern property boundary where external grading is required into the northern lands to allow for grade matching.

- A suitable storm sewer system outlet to the RNHS for the proposed development is provided via the storm drainage block.

- Stormwater Quantity – the infiltration swales within the ROW of the proposed development will provide control of the post-development design storm flows based on the Town of Halton Hills IDF parameters (Standard 105 and 24-hour SCS Type II distribution. All storms up to and including the 100-year event are controlled to pre-development rates.

- Stormwater Quality – the infiltration swales within the ROW of the proposed development will provide quality controls that achieve a minimum 80% TSS removal.

- Stormwater Erosion Control – the first 5 mm of rainfall is retained on site for at least 48 hours to provide erosion control.

- The wetland water balance has been assessed through the EIR. Surface water from the upstream catchment area (north of the Subject Lands) will continue to be directed to the southern wetland and those flows from the Subject Lands that do not infiltrate within the roadside infiltration swales, will also be directed to the southern wetland. Small portions of the residential lands, as well as all of the buffer blocks, will sheet flow to the adjacent natural heritage features.

- A suitable sanitary sewer system outlet for the proposed development is provided by proposed sewers from the development and along Confederation Street and Main Street to the existing Glen Williams Pumping Station located on the south side of Main Street and east of Confederation Street. A crossing of the Credit River will be required to connect the sanitary sewer to the Pumping Station. This will necessitate a Permit from the CVC at detailed design.

- A suitable water service connection for the proposed development is provided by the existing watermain along Confederation Street.

- Erosion and Sediment Control – Measures and controls will be implemented for all construction activities undertaken during site works.

Report Prepared by:

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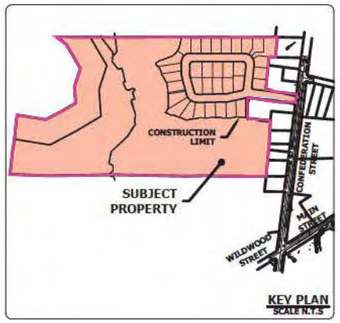
Senior Associate, Water Resources

Jennifer Nhu, EIT
Municipal Designer



SUBJECT PROPERTY

LIMIT OF CONSTRUCTION

urbantech

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3760 14th Ave, Suite 301, Markham, Ontario L3R 3T7
tel: 905.946.9461 fax: 905.946.8595
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GLEN WILLIAMS ESTATE INC. (RINALDI)
TOWN OF HALTON HILLS

SITE LOCATION PLAN

PROJECT No.	DATE	SCALE	FIGURE No.
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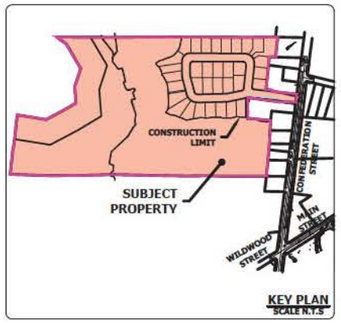

LEGEND

- SUBJECT PROPERTY
- EXISTING CONTOUR
- 2.70ha — DRAINAGE AREA (ha)
- EXISTING DRAINAGE BOUNDARY
- LIMIT OF GRADING
- EXISTING FLOW ARROW

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GLEN WILLIAMS ESTATE INC. (RINALDI)
TOWN OF HALTON HILLS

PRE-DEVELOPMENT DRAINAGE PLAN

PROJECT No.	DATE	SCALE	FIGURE No.
18-604	APR 2020	1:3000	2A

LEGEND

SUBJECT PROPERTY

EXISTING RIVER AND STREAMS

EXISTING DRAINAGE BOUNDARY TO WETLAND

CVC WETLAND

2.70ha — DRAINAGE AREA (ha)

221.9ha

22 SD RD

8 LINE

CONFEDERATION ST.

TOWN OF HALTON HILL

GLEN RIDGE ESTATES (RINALDI)
GLEN WILLIAMS

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EXISTING DRAINAGE TO WETLAND

PROJECT No.:	DRAWING No.:
18-604	2B
DATE: AUGUST, 2020	
SCALE: AS SHOWN	

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TOWN OF HALTON HILLS

GLEN WILLIAM ESTATES (RINALDI)

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SITE GRADING PLAN

PROJECT No.: 18-604	FIGURE No.: 3
DATE: AUGUST, 2020	
SCALE: 1:750	

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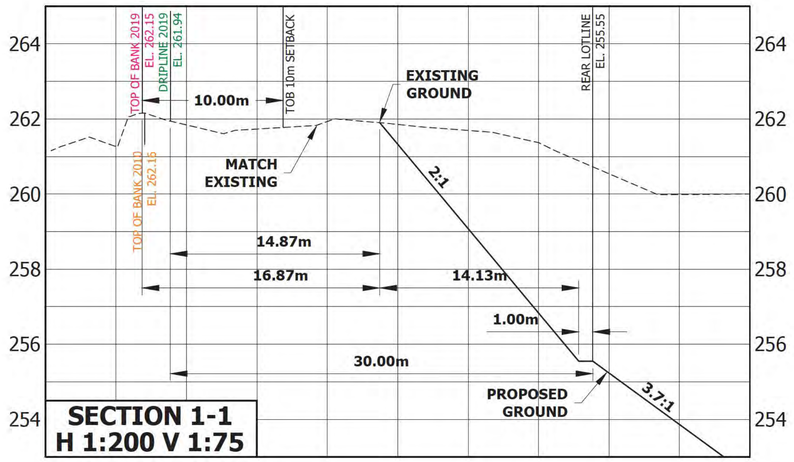

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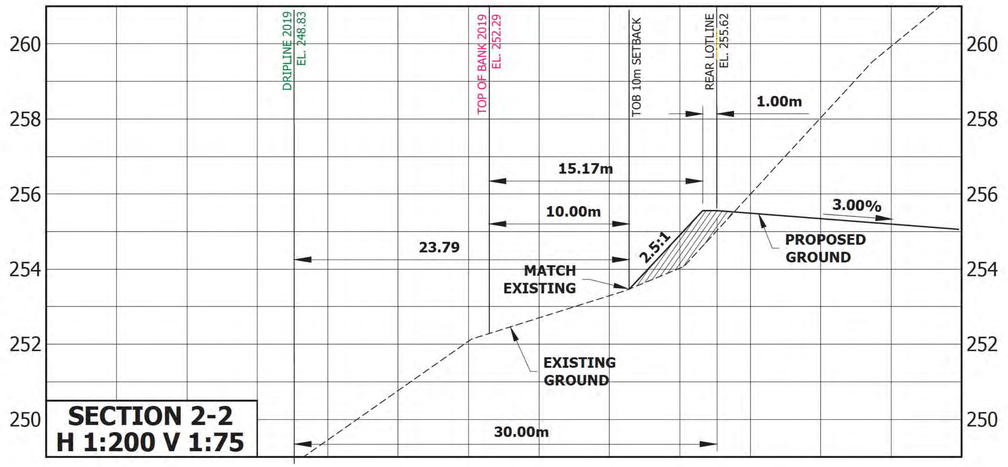

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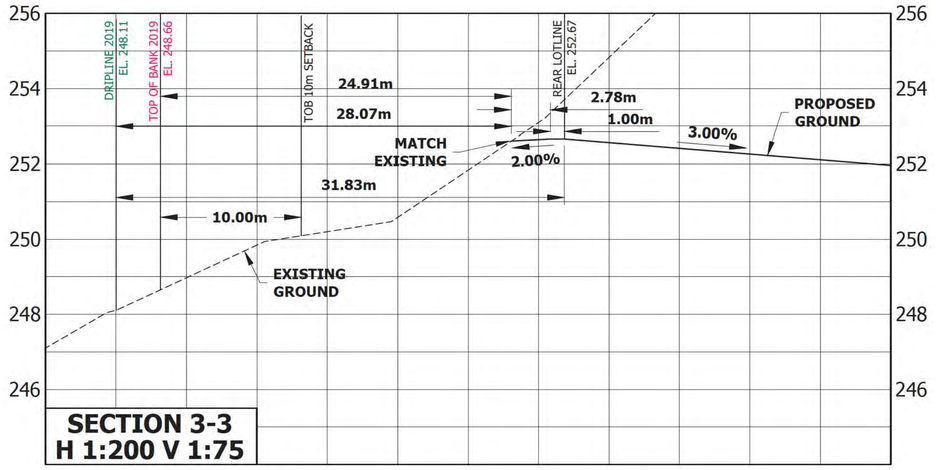

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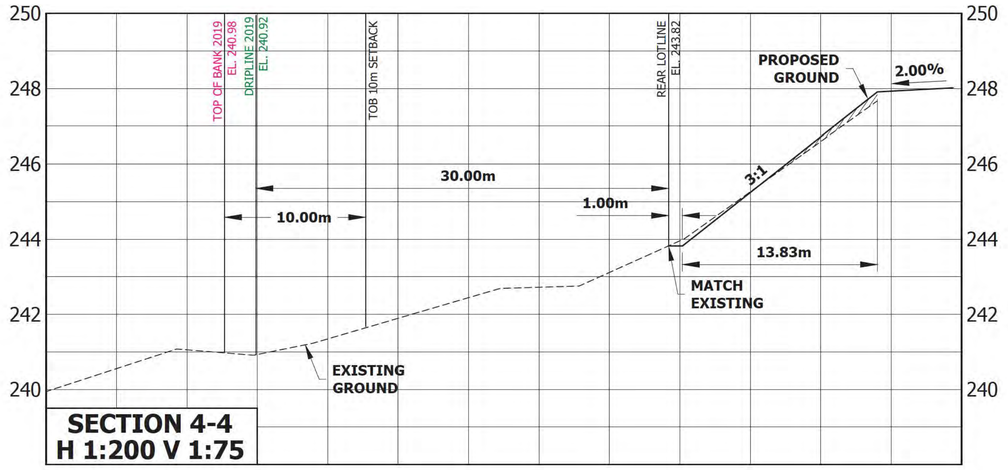

SECTION 4-4
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TOWN OF HALTON HILLS

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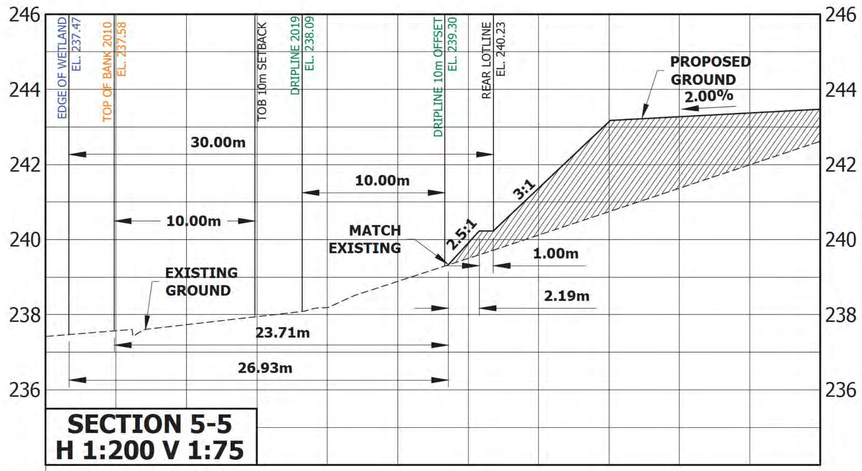
SECTIONS 1-1 TO 4-4

PROJECT No.:	FIGURE No.:
18-604	**4A**
DATE: AUGUST, 2020	
SCALE: AS SHOWN	



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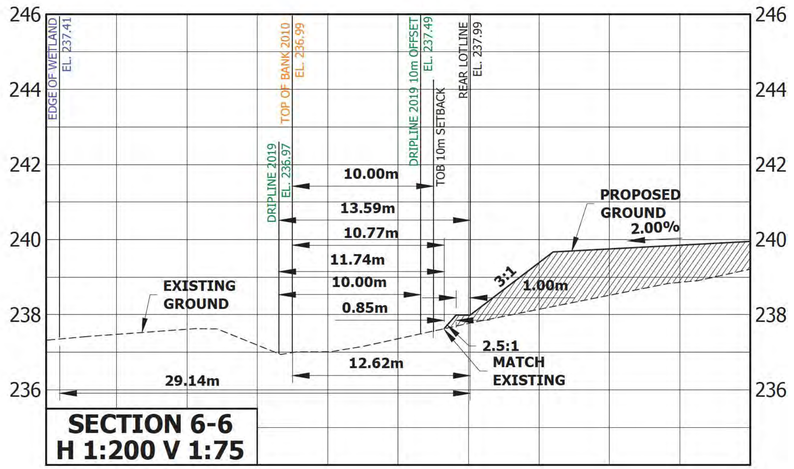

SECTION 6-6
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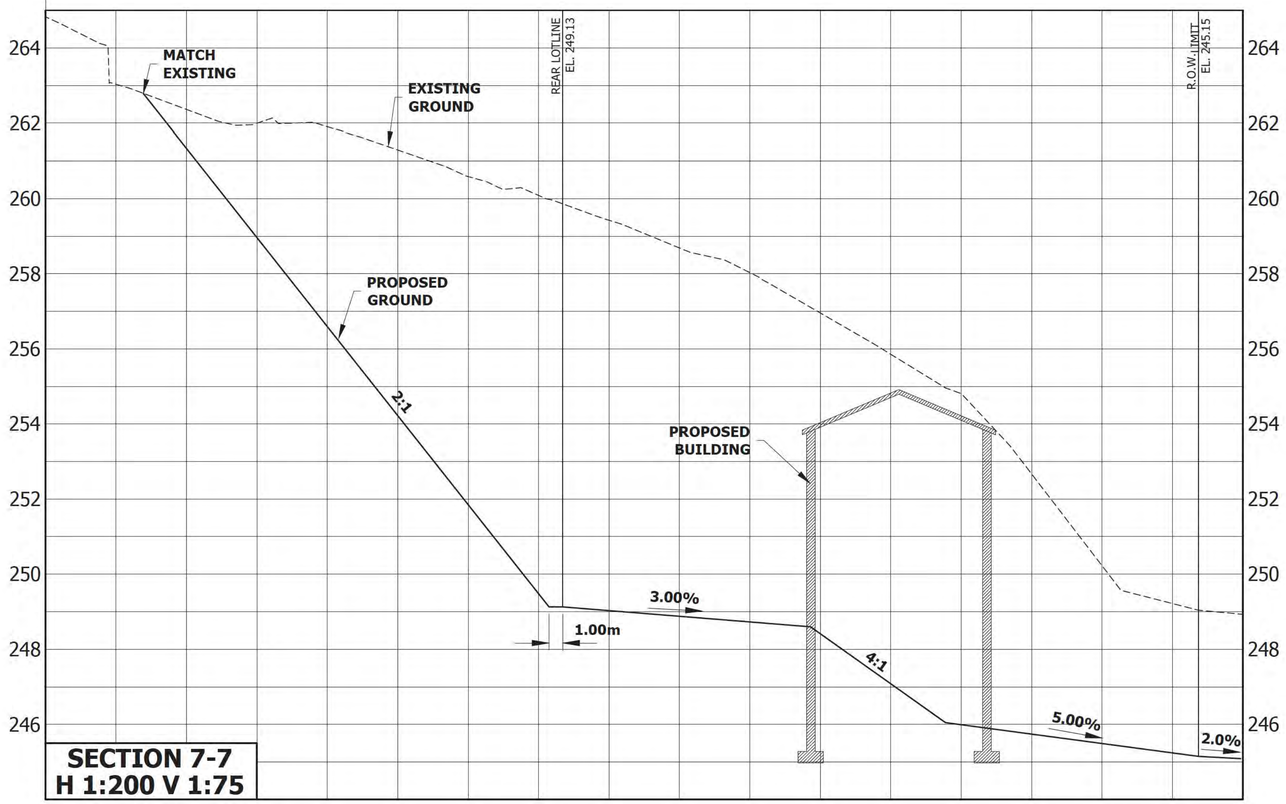

SECTION 7-7
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TOWN OF HALTON HILLS

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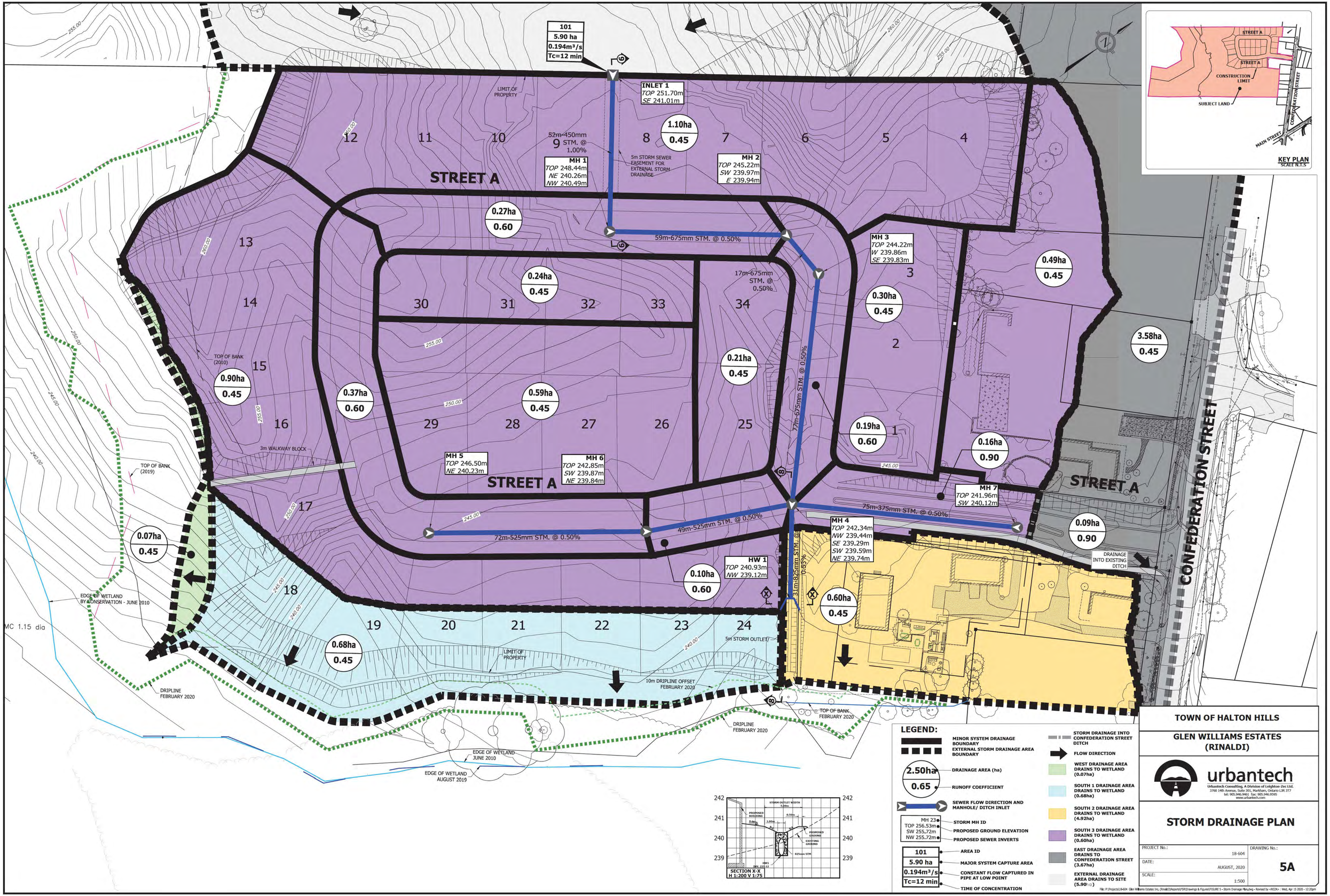
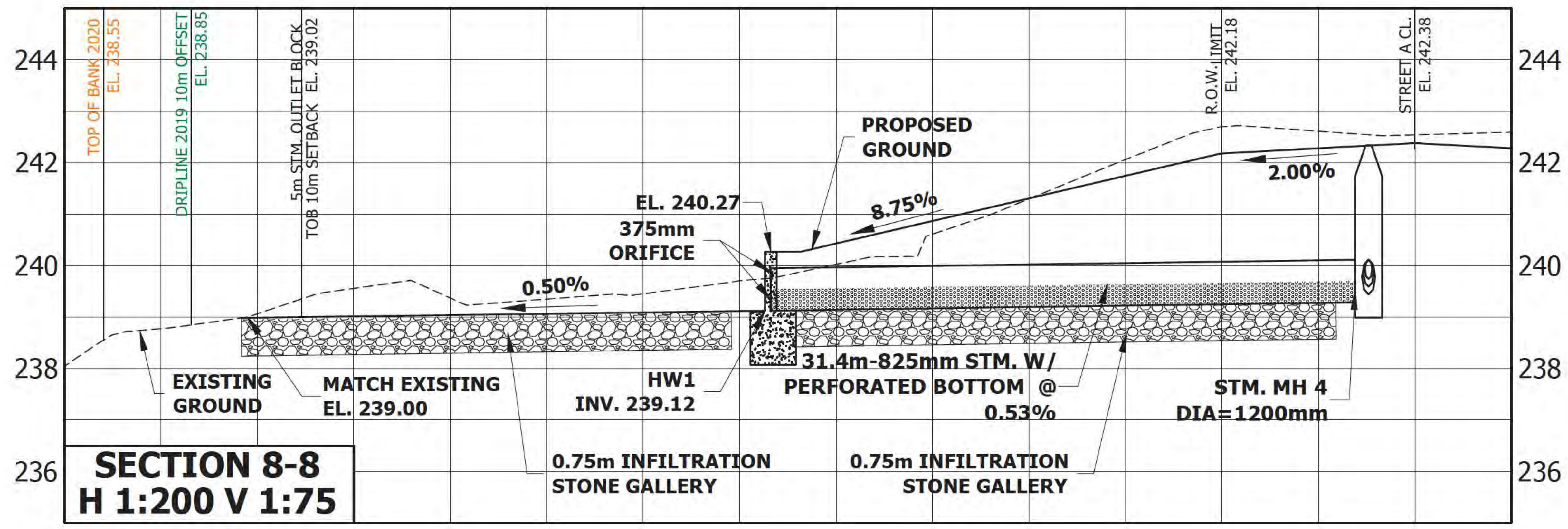
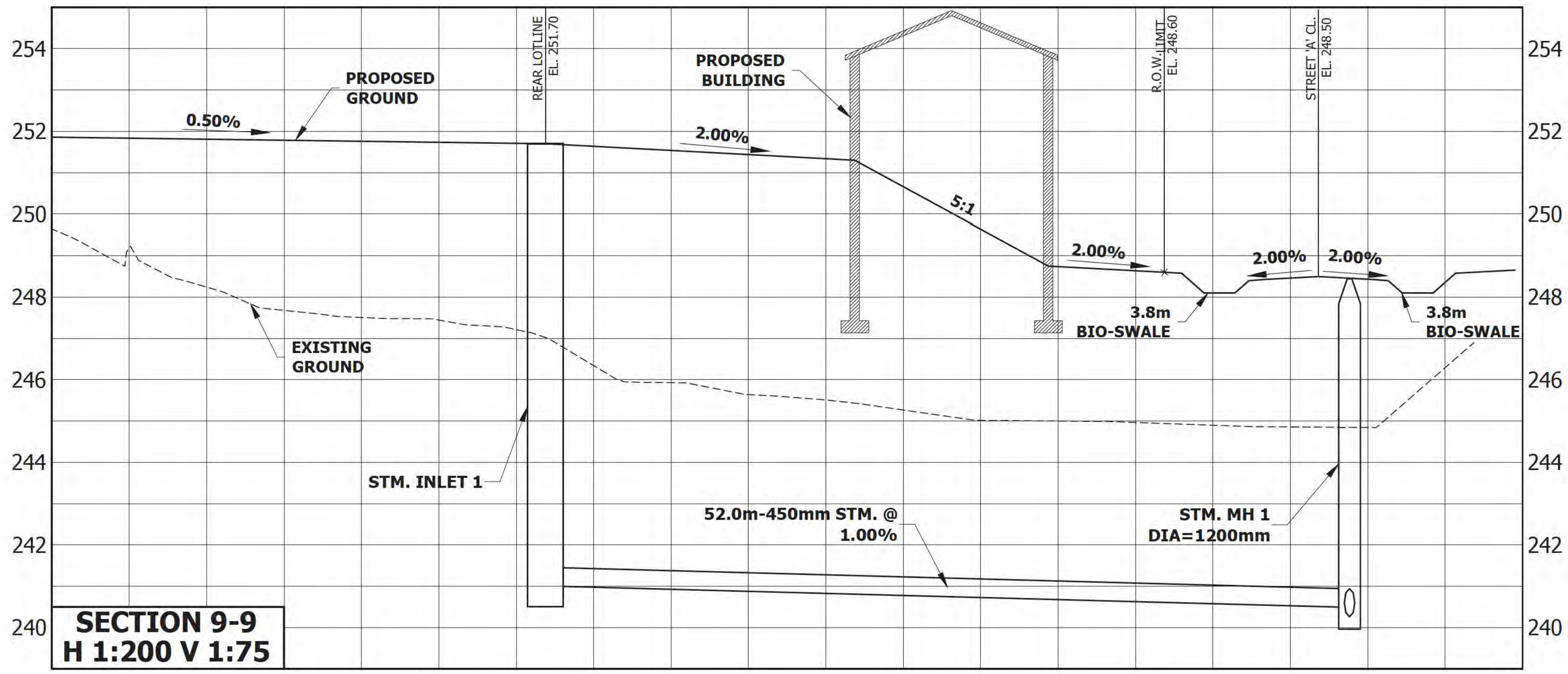
SECTIONS 5-5 TO 7-7

PROJECT No.: 18-604	FIGURE No.: 4B
DATE: AUGUST, 2020	
SCALE: AS SHOWN	


101
5.90 ha
0.194m³/s
Tc=12 min
INLET 1
TOP 251.70m
SE 241.01m
LIMIT OF PROPERTY
52m-450mm STM. @ 1.00%
MH 1
TOP 248.44m
NE 240.26m
NW 240.49m
5m STORM SEWER EASEMENT FOR EXTERNAL STORM DRAINAGE
MH 2
TOP 245.22m
SW 239.97m
E 239.94m
1.10ha
0.45
STREET A
0.27ha
0.60
59m-675mm STM. @ 0.50%
MH 3
TOP 244.22m
W 239.86m
SE 239.83m
17m-675mm STM. @ 0.50%
0.24ha
0.45
0.30ha
0.45
0.49ha
0.45
3.58ha
0.45
0.21ha
0.45
TOP OF BANK (2010)
0.90ha
0.45
0.37ha
0.60
0.59ha
0.45
3m WALKWAY BLOCK
MH 5
TOP 246.50m
NE 240.23m
MH 6
TOP 242.85m
SW 239.87m
NE 239.84m
STREET A
77m-675mm STM. @ 0.50%
0.19ha
0.60
0.16ha
0.90
MH 7
TOP 241.96m
SW 240.12m
STREET A
TOP OF BANK (2019)
75m-375mm STM. @ 0.50%
49m-525mm STM. @ 0.50%
72m-525mm STM. @ 0.50%
MH 4
TOP 242.34m
NW 239.44m
SE 239.29m
SW 239.59m
NE 239.74m
0.09ha
0.90
DRAINAGE INTO EXISTING DITCH
0.07ha
0.45
HW 1
TOP 240.93m
NW 239.12m
0.10ha
0.60
31m-825mm STM. @ 0.65%
EDGE OF WETLAND BY CONSERVATION - JUNE 2010
0.60ha
0.45
MC 1.15 dia
0.68ha
0.45
LIMIT OF PROPERTY
5m STORM OUTLET
10m DRIPLINE OFFSET FEBRUARY 2020
DRIPLINE FEBRUARY 2020
TOP OF BANK FEBRUARY 2020
DRIPLINE FEBRUARY 2020
EDGE OF WETLAND JUNE 2010
EDGE OF WETLAND AUGUST 2019
CONFEDERATION STREET
STREET A
CONSTRUCTION LIMIT
SUBJECT LAND
MAIN STREET
KEY PLAN
SCALE N.T.S
SECTION X-X
H 1:200 V 1:75
STORM OUTLET WIDTH
PROPOSED BUILDING
PROPOSED GROUND
EXISTING GROUND
825mm STM
HW1
INV. 239.10
LEGEND:
MINOR SYSTEM DRAINAGE BOUNDARY
EXTERNAL STORM DRAINAGE AREA BOUNDARY
DRAINAGE AREA (ha)
RUNOFF COEFFICIENT
SEWER FLOW DIRECTION AND MANHOLE/ DITCH INLET
MH 23
TOP 256.53m
SW 255.72m
NW 255.72m
STORM MH ID
PROPOSED GROUND ELEVATION
PROPOSED SEWER INVERTS
101
5.90 ha
0.194m³/s
Tc=12 min
AREA ID
MAJOR SYSTEM CAPTURE AREA
CONSTANT FLOW CAPTURED IN PIPE AT LOW POINT
TIME OF CONCENTRATION
STORM DRAINAGE INTO CONFEDERATION STREET DITCH
FLOW DIRECTION
WEST DRAINAGE AREA DRAINS TO WETLAND (0.07ha)
SOUTH 1 DRAINAGE AREA DRAINS TO WETLAND (0.68ha)
SOUTH 2 DRAINAGE AREA DRAINS TO WETLAND (4.92ha)
SOUTH 3 DRAINAGE AREA DRAINS TO WETLAND (0.60ha)
EAST DRAINAGE AREA DRAINS TO CONFEDERATION STREET (3.67ha)
EXTERNAL DRAINAGE AREA DRAINS TO SITE (5.90ha)
TOWN OF HALTON HILLS
GLEN WILLIAMS ESTATES (RINALDI)
urbantech
Urbantech Consulting, A Division of Leighton-Zec Ltd.
3760 14th Avenue, Suite 301, Markham, Ontario L3R 3T7
tel: 905.946.9461 fax: 905.946.9595
www.urbantech.com
STORM DRAINAGE PLAN
PROJECT No.: 18-604
DATE: AUGUST, 2020
SCALE: 1:500
DRAWING No.: 5A



SECTION 8-8
H 1:200 V 1:75



SECTION 9-9
H 1:200 V 1:75

TOWN OF HALTON HILLS

GLEN WILLIAMS ESTATES (RINALDI)

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SECTIONS 8-8 TO 9-9

PROJECT No.: 18-604	FIGURE No.: 5B
DATE: AUGUST, 2020	
SCALE: AS SHOWN	


STREET A
CONFEDERATION STREET
MAIN STREET
WILDWOOD ROAD
CREDIT RIVER
SAN. MH 1A
TOP 251.97m
NE 240.31m
SAN. MH 2A
TOP 248.03m
SW 239.54m
NE 239.51m
SAN. MH 3A
TOP 245.19m
SW 239.25m
E 239.22m
SAN. MH 4A
TOP 244.23m
W 239.13m
SE 239.10m
SAN. MH 5A
TOP 242.38m
NW 238.72m
NE 238.69m
SW 238.72m
SAN. MH 6A
TOP 251.70m
SE 240.70m
SAN. MH 7A
TOP 250.07m
NW 239.78m
SE 239.75m
SAN. MH 8A
TOP 247.60m
NW 239.52m
E 239.49m
SAN. MH 9A
TOP 246.72m
W 239.41m
NE 239.38m
SAN. MH 10A
TOP 242.99m
SW 239.02m
NE 238.99m
SAN. MH 11A
TOP 241.99m
SW 238.28m
NE 238.25m
SAN. MH 12A
TOP 241.36m
SW 237.99m
SE 230.12m
SAN. MH 13A
TOP 232.66m
NW 229.67m
SE 227.28m
SAN. MH 14A
TOP 229.83m
NW 226.83m
SE 226.45m
SAN. MH 15A
TOP 228.98m
NW 226.00m
SE 224.80m
SAN. MH 16A
TOP 228.95m
NW 224.40m
E 223.89m
SAN. MH 17A
TOP 229.36m
W 223.74m
N 223.68m
SAN. MH 18A
TOP 228.53m
S 223.16m
NE 223.13m
SAN. EX. PS
TOP 229.97m
SW 223.00m
77m - 200mm PVC SAN. @ 1.00%
52m - 200mm PVC SAN. @ 0.50%
75m - 200mm PVC SAN. @ 0.50%
54m - 200mm PVC SAN. @ 0.50%
72m - 200mm PVC SAN. @ 0.50%
62m - 200mm PVC SAN. @ 0.50%
55m - 200mm PVC SAN. @ 0.50%
90m - 200mm PVC SAN. @ 0.50%
150m - 200mm PVC SAN. @ 0.50%
31m - 200mm PVC SAN. @ 3.00%
18m - 200mm PVC SAN. @ 0.50%
16m - 200mm PVC SAN. @ 0.50%
29m - 200mm PVC SAN. @ 0.50%
133m - 200mm PVC SAN. @ 0.50%
27m - 200mm PVC SAN. @ 0.50%
TOP OF BANK (2010)
TOP OF BANK (2019)
EDGE OF WETLAND BY CONSERVATION - JUNE 2010
CMC 1.15 dia
DRIPLINE FEBRUARY 2020
10m DRIPLINE OFFSET FEBRUARY 2020
EDGE OF WETLAND AUGUST 2019
EDGE OF WETLAND JUNE 2010
TOP OF BANK FEBRUARY 2020
FUTURE EXTERNAL DRAINAGE FROM PROPOSED BAYFIELD DEVELOPMENT AREA: 8.01 ha POPULATION: 119
FUTURE EXTERNAL DRAINAGE FROM PROPOSED DEVINS DEVELOPMENT AREA: 6.89ha POPULATION: 112
EXISTING PUMP STATION
KEY PLAN
SCALE N.T.S
STREET A
CONSTRUCTION LIMIT
SUBJECT LAND
CONFEDERATION STREET
MAIN STREET
WILDWOOD ROAD
LEGEND:
EXISTING PAVEMENT
SANITARY DRAINAGE BOUNDARY
DRAINAGE AREA (ha)
POPULATION
POPULATION PER Ha (P/Ha)
PROPOSED SANITARY SEWER & DIRECTION
EXISTING SANITARY FORCEMAIN
MH ID
PROPOSED GROUND ELEVATION
PROPOSED SEWER INVERT
MH 100A
TOP 253.64m
SW 250.63m
SECTION A-A
SCALE H 1:500 V 1:100
CONFEDERATION STREET C.L.
EX. 1050mm CORRUGATED STEEL STM CULVERT INV. 227.04
EX. 200mm WATERMAIN
APPROXIMATE CREDIT RIVER BOTTOM (Vanharten Nov. 2019.
EXISTING BRIDGE STRUCTURE
MAIN STREET CENTERLINE
EX. 200mm WATERMAIN MOUNTED ON BRIDGE STRUCTURE
EXISTING GROUND
EX. 250mm SAN FORCEMAIN
APPROX. 2.7m COVER
EXISTING PUMP STATION FACILITY
3.0 m
2.8 m
29.3m-200mm PVC SAN. @ 0.50%
103.0m-200mm PVC SAN. @ 0.50%
26.8m-200mm PVC SAN. @ 0.50%
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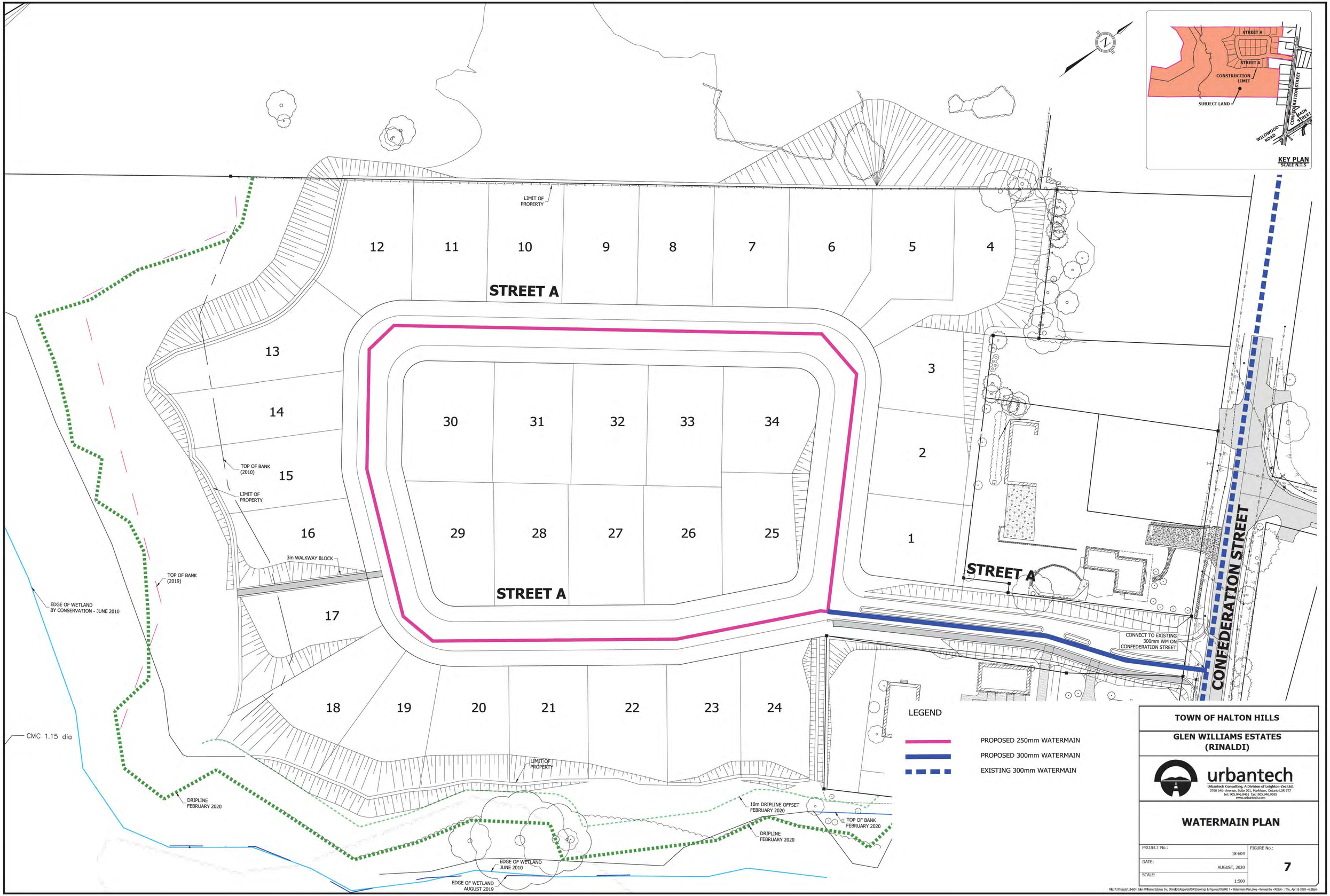
SANITARY DRAINAGE PLAN
PROJECT No.: 18-604
FIGURE No.: 6
DATE: AUGUST, 2020
SCALE: 1:1000



TOWN OF HALTON HILLS

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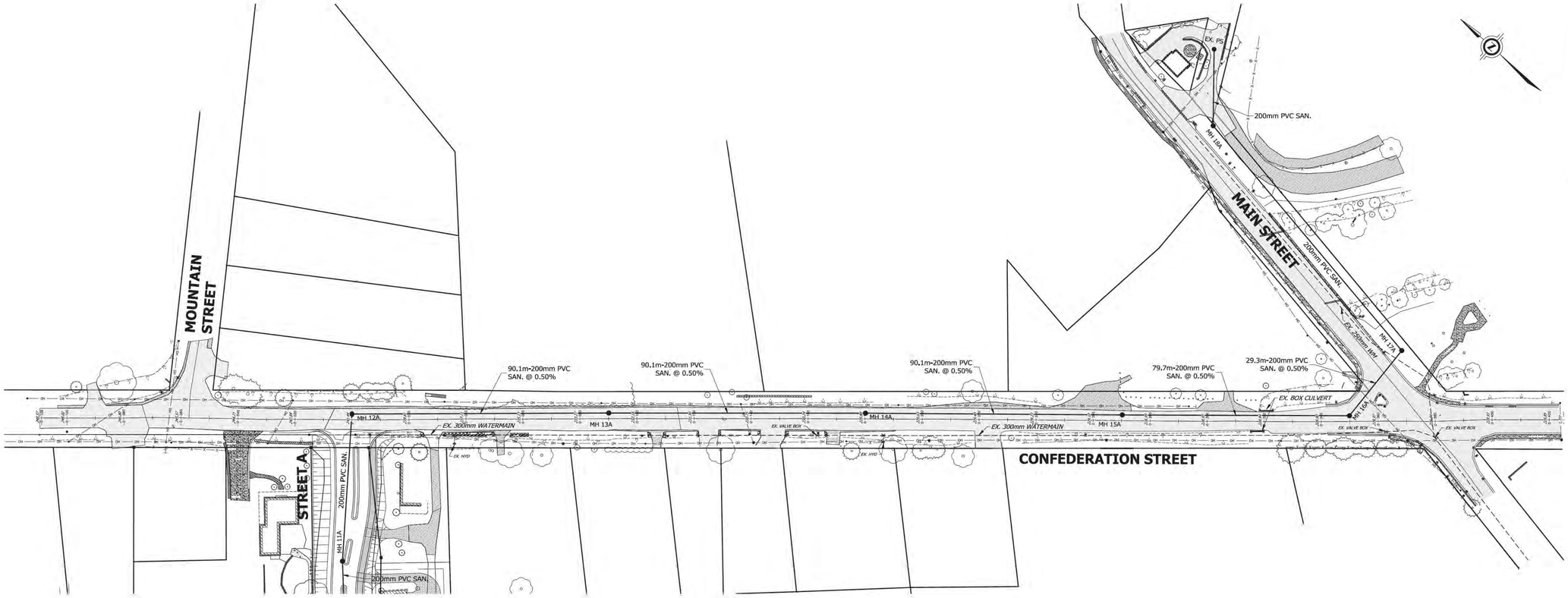
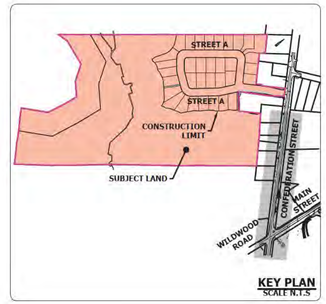
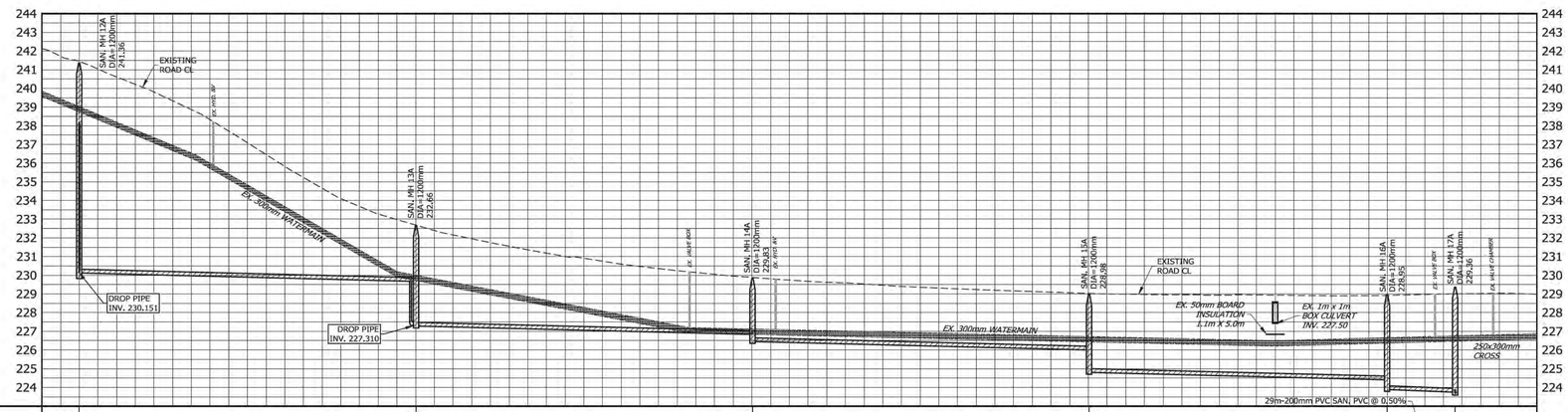
WATERMAIN PLAN

PROJECT No.:	FIGURE No.:
18-604	7
DATE: AUGUST, 2020	
SCALE: 1:500	

File: P:\Projects\18-604 Glen Williams Estates Inc. (Rinaldi)\Reports\FSR\Drawings & Figures\FIGURE 7 - Watermain Plan.dwg - Revised by <REZA> - Thu, Apr 16 2020 - 6:28pm







SANITARY SEWER INVERT	SW237.991 SE230.121	90m-200mm PVC SAN. PVC @ 0.50%				NW229.670 SE227.280	90m-200mm PVC SAN. PVC @ 0.50%				NW226.830 SE226.450	90m-200mm PVC SAN. PVC @ 0.50%				NW226.000 SE224.980	80m-200mm PVC SAN. PVC @ 0.50%				NW224.402 E223.886	W223.739 N223.679
PROPOSED/EXISTING CENTERLINE ELEVATION	241.437	239.806	237.710	235.227	233.272	232.159	231.363	230.752	230.244	229.883	229.626	229.403	229.235	229.096	228.987	228.930	228.936	228.903	228.975	229.036	
CENTERLINE CHAINAGE	0+000	0+020	0+040	0+060	0+080	0+100	0+120	0+140	0+160	0+180	0+200	0+220	0+240	0+260	0+280	0+300	0+320	0+340	0+360	0+380	

TOWN OF HALTON HILLS

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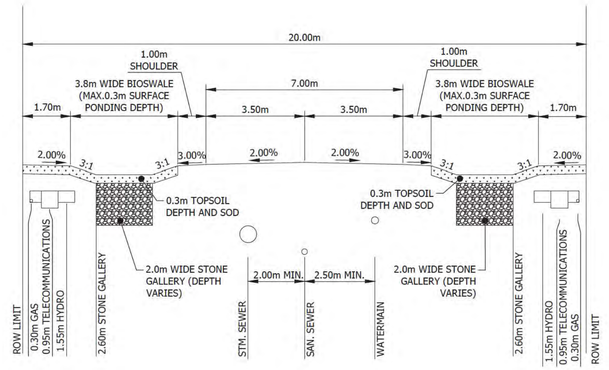
CONFEDERATION STREET PLAN AND PROFILE

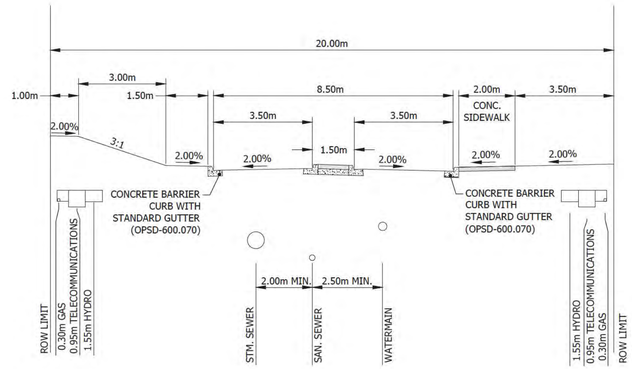
PROJECT No.: 18-604	FIGURE No.: 8
DATE: AUGUST, 2020	
SCALE: H 1:750 V 1:150	

File: P:\Projects\18-604 Glen Williams Estates Inc, (Rinaldi)\Reports\FSR\Drawings & Figures\FIGURE 8 - Confederation Plan & Profile.dwg - Revised by <REGA> - Tue, Apr 28 2020 - 3:47pm



TYPICAL CROSS SECTION (RURAL)

SCALE 1:100



TYPICAL CROSS SECTION (CURB AND GUTTER)

SCALE 1:100

TOWN OF HALTON HILLS

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TYPICAL ROAD R.O.W. CROSS SECTIONS

PROJECT No.:	FIGURE No.:
18-604	9
DATE: AUGUST, 2020	
SCALE: AS SHOWN	